FY07 Budget Formulation
FEA Consolidated Reference Model Document

May 2005

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1 Federal Enterprise Architecture Program

The Office of Management and Budget's (OMB) Office of E-Government (E-Gov) and Information Technology (IT), with the support of the General Services Administration (GSA) and the Federal Chief Information Officers (CIO) Council, established the Federal Enterprise Architecture (FEA) Program which builds a comprehensive business-driven blueprint of the entire Federal government. The FEA Program Management Office (PMO), located within OMB's Office of E-Gov and IT, equips OMB and federal agencies with a common language and framework to describe and analyze IT investments, enhance collaboration and ultimately transform the Federal government into a citizen-centered, results-oriented, and market-based organization as set forth in the President's Management Agenda (PMA).

The FEA Practice adopted three core principles to guide its 2005 strategic direction. They are:

- *Business-driven*: The FEA is most useful when it is closely aligned with government strategic plans and executive level direction. Agency mission statements, presidential management directives and agency business owners give direction to each agency's enterprise architecture (EA) and to the FEA.
- *Proactive and collaborative across the Federal government*: Adoption of the FEA is achieved through active participation by the EA community in its development and use. The FEA community is responsible for the development, evolution and adoption of the FEA.
- *Architecture improves the effectiveness and efficiency of government information resources*: Architecture development is an integral part of the capital investment process. No IT investment should be made without a business-approved architecture.

For more information about the FEA Practice, refer to the "2005-2006 FEA PMO Action Plan" posted on www.egov.gov.

2 Reference Model Overview

The FEA consists of a set of interrelated "reference models" designed to facilitate cross-agency analysis and the identification of duplicative investments, gaps and opportunities for collaboration within and across agencies. Collectively, the reference models comprise a framework for describing important elements of the FEA in a common and consistent way. Through the use of this common framework and vocabulary, IT portfolios can be better managed and leveraged across the federal government. This chapter introduces the purposes and structures of the five FEA reference models:

- Performance Reference Model (PRM)
- Business Reference Model (BRM)
- Service Component Reference Model (SRM)
- Technical Reference Model (TRM)
- Data Reference Model (DRM)

2.1 Performance Reference Model (PRM)

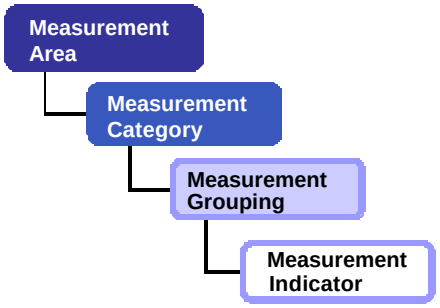
The PRM is a framework for performance measurement providing common output measurements throughout the federal government. It allows agencies to better manage the business of government at a strategic level, by providing a means for using an agency's EA to measure the success of IT investments and their impact on strategic outcomes. The PRM

accomplishes these goals by establishing a common language by which agency EAs can describe the outputs and measures used to achieve program and business objectives. The model articulates the linkage between internal business components and the achievement of business and customer-centric outputs. Most importantly, it facilitates resource-allocation decisions based on comparative determinations of which programs and organizations are more efficient and effective. The PRM focuses on three main objectives:

- Help produce enhanced performance information to improve strategic and daily decision-making
- Improve the alignment and better articulate the contribution of inputs to outputs, thereby creating a clear "line of sight" to desired results
- Identify performance improvement opportunities that span traditional organizational structures and boundaries

The PRM structure is designed to clearly express the cause–and-effect relationship between inputs and outputs. This "line of sight" is articulated through the use of the Measurement Area, Category, Grouping, and Indicator hierarchy. Refer to Figure 1 for the PRM structure.

Figure 1: PRM Structure



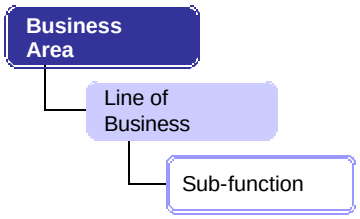
2.2 Business Reference Model (BRM)

The BRM provides a framework that facilitates a functional (rather than organizational) view of the federal government's lines of business (LoBs), including its internal operations and its services for citizens, independent of the agencies, bureaus and offices that perform them. The BRM describes the federal government around common business areas instead of through a stove-piped, agency-by-agency view. It thus promotes agency collaboration and serves as the underlying foundation for the FEA and E-Gov strategies.

While the BRM does provide an improved way of thinking about government operations, its true utility as a model can only be realized when agencies effectively use it. The functional approach promoted by the BRM will do little to help accomplish the E-Gov strategic goals if it is not incorporated into business-focused enterprise architectures and the management processes of federal agencies and OMB.

The BRM is structured into a tiered hierarchy representing the business functions of the federal government. Refer to Figure 2 for the BRM tiered hierarchy.

Figure 2: BRM Structure

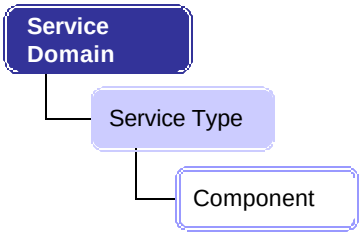


2.3 Service Component Reference Model (SRM)

The SRM is a business-driven, functional framework classifying Service Components according to how they support business and performance objectives. It serves to identify and classify horizontal and vertical Service Components supporting federal agencies and their IT investments and assets. The model aids in recommending service capabilities to support the reuse of business components and services across the federal government.

The SRM is organized across horizontal service areas, independent of the business functions, providing a leverage-able foundation for reuse of applications, application capabilities, components, and business services. It is structured hierarchically as depicted in Figure 3.

Figure 3: SRM Structure

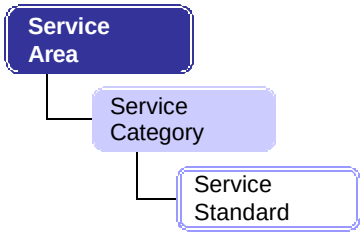


2.4 Technical Reference Model (TRM)

The TRM is a component-driven, technical framework that categorizes the standards and technologies to support and enable the delivery of Service Components and capabilities. It also unifies existing agency TRMs and E-Gov guidance by providing a foundation to advance the reuse and standardization of technology and Service Components from a government-wide perspective.

Aligning agency capital investments to the TRM leverages a common, standardized vocabulary, allowing interagency discovery, collaboration, and interoperability. Agencies and the federal government will benefit from economies of scale by identifying and reusing the best solutions and technologies to support their business functions, mission, and target architecture. The TRM structure is depicted in Figure 4.

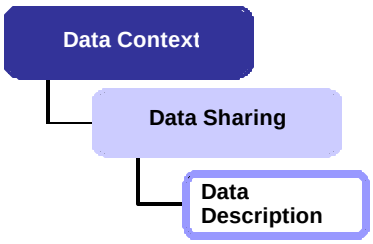
Figure 4: TRM Structure



2.5 Data Reference Model (DRM)

The FEA Data Reference Model (DRM) is intended to promote the common identification, use, and appropriate sharing of data/information across the federal government through its standardization of data in the following three areas: data context, data sharing, and data description (refer to Figure 5).

Figure 5: DRM Structure

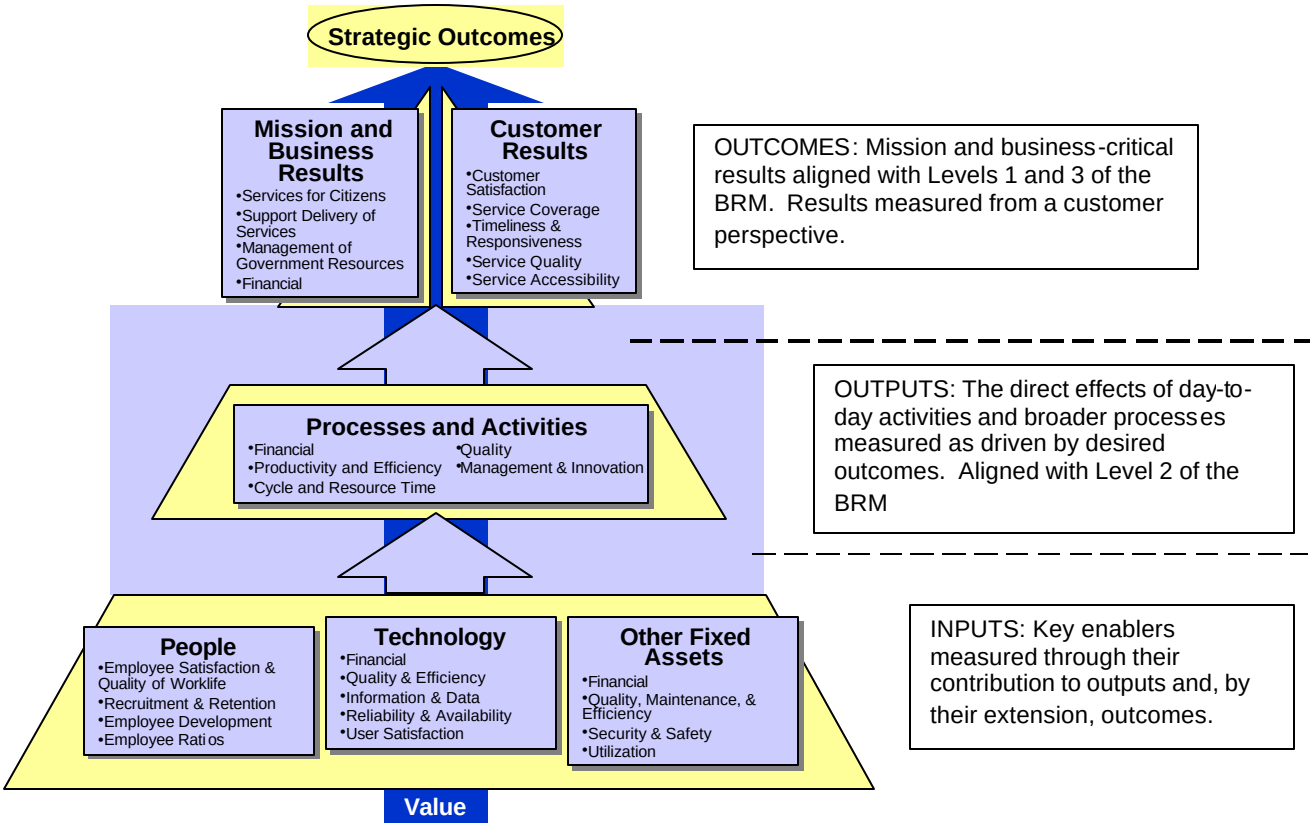


The current published version of the DRM is undergoing revision. The FEA PMO is collaborating with members of the interagency DRM working group, chartered by the Architecture and Infrastructure Committee (AIC) of the Chief Information Officer (CIO) Council, to further enhance and improve this reference model. The DRM structure presented in Figure 5 is the updated description of the DRM based on the work being done by the FEA PMO and the interagency DRM working group. Because the new version of the DRM has not been completed, the latest published version is provided in this document for reference.

3 Performance Reference Model

The PRM framework (Figure 6) is designed to clearly articulate the cause-and-effect relationship between inputs, outputs, and outcomes. The framework builds from the value chain and program logic models. This “line of sight” is critical for IT project managers, program managers, and key decision-makers to understand how, and to the extent, key inputs are enabling progress toward outputs and outcomes. The PRM captures this “line of sight” to reflect how value is created as inputs (such as Technology) and used to create outputs (through Processes and Activities), which in turn, impact outcomes (such as, Mission, Business and Customer Results). Guiding the entire PRM are “Strategic Outcomes,” representing broad, policy priorities driving the direction of government (such as, to Secure the Homeland).

Figure 6: PRM Framework



The PRM is structured around Measurement Areas, Measurement Categories, Measurement Groupings, and Measurement Indicators.

- **Measurement Areas** – The high-level organizing framework of the PRM capturing aspects of performance at the output levels. This layer is directly linked to the performance objectives established at the agency and program levels. The PRM includes six measurement areas: Mission and Business Results, Customer Results, Processes and Activities, Human Capital, Technology, and Other Fixed Assets.
- **Measurement Categories** – Collections within each measurement area describing the attribute or characteristic to be measured. For example, the Mission and Business Results Measurement Area include three Measurement Categories: Services for Citizens, Support Delivery of Services, and Management of Government Resources, corresponding to the Lines of Business in the BRM.
- **Measurement Groupings** – Further refinement of categories into specific types of measurement indicators. For the Mission and Business Results Measurement Area, these groupings align to the Sub-functions of the BRM.
- **Measurement Indicators** – The specific measures, e.g., number and/or percentage of customers satisfied, tailored for a specific BRM Line of Business or Sub-function, agency, program, or IT initiative.

The PRM structure is designed to provide a standardized measurement hierarchy and framework to be uniquely tailored by decision-makers for a specific environment. An agency's strategic planning process establishes specific programs and objectives to meet the needs of its citizen stakeholders. These programs are implemented to deliver citizen services enabling agencies to achieve desired performance objectives. An agency's EA is the management tool program managers can utilize to create views of their IT investments to be integrated into the

performance and strategic planning management processes. Critical to the successful use of the PRM and the EA, performance management ensures an agency's IT investments can be directly linked to the agency's performance objectives.

3.1 Measurement Areas

3.1.1 Mission and Business Results Measurement Area

The Mission and Business Results Measurement Area of the PRM captures the outputs agencies seek to achieve. These outputs are usually developed during the agency budget and strategic planning process prescribed under GPRA. To identify the Mission and Business Results associated with an IT initiative, an agency will need to refer to its agency performance objectives.

To ensure the agency identified outputs are appropriately aligned to what agencies actually do, the Mission and Business Results Measurement Area is driven by the Business Reference Model (BRM). More specifically, the PRM's Measurement Categories are the same as the BRM's Business Areas and LoBs. The Measurement Groupings of the PRM are the same as the Sub-functions of the BRM. These areas of the BRM seek to identify the purpose of the government activity. By extension, the Mission and Business Results Measurement Area of the PRM identifies the extent to which those purposes are being achieved.

The Mission and Business Results Measurement Area is comprised of the following Measurement Categories:

- The LoBs in Services for Citizens
- The LoBs in Support Delivery of Services
- The LoBs in Management of Government Resources

3.1.2 Customer Results Measurement Area

The Customer Results Measurement Area of the PRM captures how well an agency or specific process within an agency is serving its customers—and ultimately citizens. The Customer Results Measurement Indicator captured in this Measurement Area will be associated with the most external customer of the process or activity the IT initiative supports (e.g. citizens, businesses, or other governments). Not all Customer Results are meaningful or even distinct for every IT initiative. For example, for IT initiatives supporting processes with federal employees as their customers, "customer" satisfaction and "IT user" satisfaction may, in fact, be the same. Whatever the specific circumstances, the purpose of the Customer Results Measurement Area is to identify the customer relationship and articulate how it can be measured over time.

The Customer Results Measurement Area is comprised of the following Measurement Categories:

- **Customer Benefit** - Customer satisfaction levels and tangible impacts to customers as a result of the products or services provided
- **Service Coverage** - The extent to which the desired customer population is being served and customers are using products and services
- **Timeliness & Responsiveness** - Time to respond to customer inquiries and requests and time to deliver products or services

- **Service Quality** - Quality from the customer's perspective and accuracy of responses to customer inquiries
- **Service Accessibility** - Availability of products and services to customers and the extent of self-service options and automation

The PRM's true value comes not from each Measurement Area, but when an investment can be shown to directly impact an agency's ability to achieve its performance objectives. To effectively categorize the performance alignment for a given investment, agencies will use the outputs of their EA to identify multiple Measurement Areas so the impact an investment contributes can be seen. The effective use of the PRM requires identification of a critical few Measurement Indicators in each of the relevant Measurement Areas to draw the "line of sight" from the IT initiative to the processes and activities it supports (and, by extension, the customer results and mission and business results it enables). Though the PRM includes many indicators, its value is not in the sheer number of indicators it includes. Rather, its value is realized when it is used to identify a critical few indicators that can provide information for decision-making.

3.1.3 Processes and Activities Measurement Area

The Processes and Activities Measurement Area captures the outputs directly resulting from the process an IT initiative supports. This Measurement Area also captures key aspects of processes or activities required to be monitored and/or improved.

Nearly all IT initiatives are designed to support or improve a single process or set of processes and activities. This is generally where an IT initiative's contribution to improved performance can be most accurately measured. Nevertheless, there are still many factors beyond the IT initiative's control determining the level of process performance. These factors include: efficiency of the overall business process; staff managing or executing the process; statutory requirements; or inputs to the process, such as benefits applications or information from other processes.

The desired output for a process or activity should strongly influence: (1) whether technology is needed to improve or support the process, and (2) if so, what technology is needed to help the processes or activities achieve the desired outputs.

As with Mission and Business Results, use of the Processes and Activities Measurement Area should begin with the BRM. The BRM includes a Mode of Delivery Business Area designed to identify, at a very high level, the process being used to achieve an intended purpose. The Measurement Indicator(s) selected should be an extension of the Mode of Delivery aligned with the IT initiative. For example, if an IT initiative aligns with the Federal Financial Assistance Mode of Delivery in the BRM, the PRM can be used to determine the quality of how that financial assistance is delivered.

The Processes and Activity Measurement Area is comprised of the following Measurement Categories:

- **Financial** - Achieving financial measures, direct and indirect total and per unit costs of producing products and services, and costs saved or avoided
- **Productivity & Efficiency** – The amount of work accomplished per relevant units of time and resources applied
- **Cycle Time & Timeliness** - The time required to produce products or services
- **Quality** - Error rates and complaints related to products or services
- **Security & Privacy** - The extent to which security is improved and privacy addressed

- **Management & Innovation** - Management policies and procedures, compliance with applicable requirements, capabilities in risk mitigation, knowledge management, and continuous improvement

3.1.4 Technology Measurement Area

The Technology Measurement Area captures key elements of performance directly relating to the IT initiative. An IT initiative can include applications, infrastructure, or services provided in support of a process or program. While these IT-specific aspects of performance (e.g. percent system availability) are important, they alone do not truly assess the value of an IT initiative to overall performance. The Technology Measurement Area attains far more relevance only when used with other Measurement Areas to get a full and accurate picture of overall performance.

As with all other Measurement Areas, the Technology Measurement Categories and Groupings do not represent exhaustive lists. Agencies may, and should, have additional Technology measures used as part of their IT Capital Planning and Investment Control (CPIC) and Systems Development Lifecycle processes.

The Technology Measurement Area is comprised of the following Measurement Categories:

- **Financia**l - Technology-related costs and costs avoided through reducing or eliminating IT redundancies
- **Quality** – The extent to which technology satisfies functionality or capability requirements or best practices, and complies with standards
- **Efficiency** - System or application performance in terms of response time, interoperability, user accessibility, and improvement in technical capabilities or characteristics
- **Information & Data** - Data or information sharing, standardization, reliability and quality, and storage capacity
- **Reliability & Availability** - System or application capacity, availability to users, and system or application failures
- **Effectiveness** – Extent to which users are satisfied with the relevant application or system, whether it meets user requirements, and its impact on the performance of the process(es) it enables and the customer or mission results to which it contributes

3.1.5 Human Capital Measurement Area

A review of legislative requirements and best practices shows it is imperative to capture the human capital aspects of performance. As a result, this version includes a “placeholder” for Human Capital. The Human Capital Measurement Area will not be used for FY07, and the PRM does not include specific Measurement Categories at this point. The FEA PMO will begin to engage organizations such as the Office of Personnel Management and the Chief Human Capital Officers Council to work collaboratively to identify the key human capital requirements and a set of practical and usable Measurement Indicators in the Human Capital Measurement Area.

3.1.6 Other Fixed Assets Measurement Area

As with Human Capital, a review of legislative requirements and best practices indicates it is also critical to capture the performance of other fixed assets (e.g. vehicle fleets, facilities, other equipment). Consequently, this version also includes a “placeholder” for Other Fixed Assets. The Other Fixed Assets Measurement Area will not be used for FY07, and the PRM does not include specific Measurement Categories at this point. The FEA PMO will seek to engage

officials knowledgeable about the management of other fixed assets as it begins to improve the PRM.

3.2 Measurement Indicators

3.2.1 Mission and Business Results Measurement Indicators

This section provides the Measurement Categories, Groupings, and Indicators for the Customer Mission and Business Results Measurement Area of the PRM.

Services for Citizens

This Measurement Category captures the extent results are achieved by services the federal government provides both to, and on behalf of, the American citizen. The following measurement groupings are provided to assist agencies in determining measurement indicators. Agencies will use the measurement area, category, and grouping to align their measurement indicators.

Note the placeholder for Measurement Indicators. Agencies' use of the PRM from this point forward will create the actual inventory of Measurement Indicators.

Measurement Category	Measurement Grouping[1]	Measurement Indicator[2]
COMMUNITY AND SOCIAL SERVICES - Community and Social Services includes all activities aimed at creating, expanding, or improving community and social development, social relationships, and social services in the United States. This includes all activities aimed at locality-specific or nationwide social development and general social services. This category includes general community development and social services programs, as well as earned and unearned benefit programs that promote these objectives.	Homeownership Promotion	
	Community and Regional Development	
	Social Services	
	Postal Services	
DEFENSE AND NATIONAL SECURITY - Protect and advance U.S. interests and, if deterrence fails, decisively defeat threats to those interests.	Strategic National and Theater Defense	
	Operational Defense	
	Tactical Defense	
DISASTER MANAGEMENT- Disaster Management involves the activities required to prepare for, mitigate, respond to, and repair the effects of all disasters, whether natural or man-made.	Disaster Monitoring and Prediction	
	Disaster Preparedness and Planning	
	Disaster Repair and Restore	
	Emergency Response	
ECONOMIC DEVELOPMENT- Economic	Business and Industry	

[1] These are the Sub-functions from the Business Reference Model.

[2] As agencies use the PRM for their specific IT initiatives, they will create the inventory of measurement indicators.

Measurement Category	Measurement Grouping[1]	Measurement Indicator[2]
Development includes the activities required to promote commercial/industrial development and to regulate the American financial industry to protect investors. It also includes the management and control of the domestic economy and the money supply, and the protection of intellectual property and innovation.	Development	
	Industry Sector Income Stabilization	
	Intellectual Property Protection	
	Financial Sector Oversight	
EDUCATION - Education refers to those activities that impart knowledge or understanding of a particular subject to the public. Education can take place at a formal school, college, university or other training program. This category includes all government programs that promote the education of the public, including both earned and unearned benefit programs.	Elementary, Secondary, and Vocational Education	
	Higher Education	
	Cultural and Historic Preservation	
	Cultural and Historic Exhibition	
ENERGY - Energy refers to all actions performed by the government to ensure the procurement and management of energy resources, including the production, sale and distribution of energy, as well as the management of spent fuel resources. Energy management includes all types of mass-produced energy (e.g., hydroelectric, nuclear, wind, solar, or fossil fuels). Also included in this category is the oversight of private industry.	Energy Supply	
	Energy Conservation and Preparedness	
	Energy Resource Management	
	Energy Production	
ENVIRONMENTAL MANAGEMENT - Environmental Management includes all functions required to monitor the environment and weather, determine proper environmental standards and ensure their compliance, and address environmental hazards and contamination.	Environmental Monitoring and Forecasting	
	Environmental Remediation	
	Pollution Prevention and Control	
LAW ENFORCEMENT - Law Enforcement involves activities to protect people, places, and things from criminal activity resulting from non-compliance with U.S. laws. This includes patrols, undercover operations, response to emergency calls, as well as arrests, raids, and seizures of property.	Criminal Apprehension	
	Criminal Investigation and Surveillance	
	Citizen Protection	
	Crime Prevention	
	Leadership Protection	
	Property Protection	
	Substance Control	
LITIGATION AND JUDICIAL ACTIVITIES- Litigation and Judicial Activities refer to those activities relating to the administration of justice.	Judicial Hearings	
	Legal Defense	
	Legal Investigation	

Measurement Category	Measurement Grouping[1]	Measurement Indicator[2]
	Legal Prosecution and Litigation	
	Resolution Facilitation	
CORRECTIONAL ACTIVITIES- Correctional Activities involves all federal activities that ensure the effective incarceration and rehabilitation of convicted criminals.	Criminal Incarceration	
	Criminal Rehabilitation	
HEALTH - Health involves federal programs and activities to ensure and provide for the health and well being of the public. This includes the direct provision of health care services and immunizations as well as the monitoring and tracking of public health indicators for the detection of trends and identification of widespread illnesses/diseases. It also includes both earned and unearned health care benefit programs.	Access to Care	
	Population Health Management and Consumer Safety	
	Health Care Delivery Services	
	Health Care Administration	
	Health Care Research and Practitioner Education	
HOMELAND SECURITY- Homeland Security involves protecting the nation against terrorist attacks. This includes analyzing threats and intelligence, guarding borders and airports, protecting critical infrastructure, and coordinating responses to emergencies. The Homeland Security category is defined by the President's Strategy on Homeland Security. Note: Some of the Critical Mission Areas from the President's strategy have already been identified in other LoBs in the BRM.	Border and Transportation Security	
	Key Asset and Critical Infrastructure Protection	
	Catastrophic Defense	
INCOME SECURITY – Income Security includes activities designed to ensure that members of the public are provided with the necessary means – both financial and otherwise – to sustain an adequate level of existence. This includes all benefit programs, both earned and unearned, that promote these goals for members of the public.	General Retirement and Disability	
	Unemployment Compensation	
	Housing Assistance	
	Food and Nutrition Assistance	
	Survivor Compensation	
INTELLIGENCE OPERATIONS- Intelligence Operations involves collecting and analyzing information to meet the national security challenges of the U.S. by processing reliable, accurate foreign intelligence, and disseminating intelligence products to policymakers, military commanders, and other consumers.	Intelligence Planning and Directions/Needs	
	Intelligence Collection	
	Intelligence Analysis and Production	
	Dissemination	

Measurement Category	Measurement Grouping[1]	Measurement Indicator[2]
INTERNATIONAL AFFAIRS AND COMMERCE- International Affairs and Commerce involves the non-military activities that promote U.S. policies and interests beyond our national borders, including the negotiation of conflict resolution, treaties, and agreements. In addition, this category includes: foreign economic development and social/political development; diplomatic relations with other nations; humanitarian, technical and other developmental assistance to key nations; and global trade.	Foreign Affairs	
	International Development and Humanitarian Aid	
	Global Trade	
NATURAL RESOURCES - Natural Resources includes all activities involved in conservation planning, land management, and national park/monument tourism that affect the nation's natural and recreational resources, both private and federal. Note: Energy-related natural resources are covered in the Energy Management Line of Business.	Water Resource Management	
	Conservation, Marine and Land Management	
	Recreational Resource Management and Tourism	
	Agricultural Innovation and Services	
TRANSPORTATION - Transportation involves all federally supported activities related to the safe passage, conveyance, or transportation of goods and/or people.	Air Transportation	
	Ground Transportation	
	Water Transportation	
	Space Operations	
WORKFORCE MANAGEMENT – Workforce Management includes those activities that promote the welfare of the nation's workforce by improving their working conditions, advancing opportunities for profitable employment, and strengthening free collective bargaining.	Training and Employment	
	Labor Rights Management	
	Worker Safety	
GENERAL SCIENCE AND INNOVATION - General Science and Innovation includes all federal activities to meet the national need to advance knowledge in this area. This includes general research and technology programs, space exploration activities, and other research and technology programs that have diverse goals and cannot be readily classified into another Line of Business or Sub-function.	Scientific and Technological Research and Innovation	
	Space Exploration and Innovation	

Support Delivery of Services

This Measurement Category captures the extent intermediate outputs are achieved related to the support delivery of services.

Measurement Category	Measurement Grouping	Measurement Indicators[3]
CONTROLS AND OVERSIGHT - Controls and Oversight ensures that the operations and programs of the federal government and its external business partners comply with applicable laws and regulations and prevent waste, fraud, and abuse.	Corrective Action	
	Program Evaluation	
	Program Monitoring	
INTERNAL RISK MANAGEMENT AND MITIGATION - Internal Risk Management and Mitigation involves all activities relating to the processes of analyzing exposure to risk and determining appropriate countermeasures.	Contingency Planning	
	Continuity Of Operations	
	Service Recovery	
LEGISLATIVE RELATIONS - Legislative Relations involves activities aimed at the development, tracking, and amendment of public laws through the legislative branch of the federal government.	Legislation Tracking	
	Legislation Testimony	
	Proposal Development	
	Congressional Liaison Operations	
REGULATORY DEVELOPMENT - Regulatory Development involves activities associated with developing regulations, policies, and guidance to implement laws.	Policy and Guidance Development	
	Public Comment Tracking	
	Regulatory Creation	
	Rule Publication	
PLANNING AND RESOURCE ALLOCATION - Planning and Resource Allocation involves the activities of determining strategic direction, identifying and establishing programs and processes, and allocating resources (capital and labor) among those programs and processes.	Budget Formulation	
	Capital Planning	
	Enterprise Architecture	
	Strategic Planning	
	Budget Execution	
	Workforce Planning	
	Management Improvement	
PUBLIC AFFAIRS - Public Affairs involves the exchange of information and communication between the federal government, citizens and stakeholders in direct support of citizen services, public policy, and/or national interest.	Customer Services	
	Official Information Dissemination	
	Product Outreach	
	Public Relations	
REVENUE COLLECTION - Revenue Collection	Debt Collection	

[3] As agencies use the PRM for their specific IT initiatives they will create the inventory of measurement indicators.

Measurement Category	Measurement Grouping	Measurement Indicators[3]
includes the collection of Government income from all sources. Note: Tax collection is accounted for in the Taxation Management Sub-function in the General Government Line of Business.	User Fee Collection	
	Federal Asset Sales	
GENERAL GOVERNMENT - General Government involves the general overhead costs of the federal government, including legislative and executive activities; provision of central fiscal, personnel, and property activities; and the provision of services that cannot reasonably be classified in any other Line of Business. As a normal rule, all activities reasonably or closely associated with other LoBs or Sub-functions shall be included in those LoBs or Sub-functions rather than listed as a part of general government. This Line of Business is reserved for central government management operations; agency-specific management activities would not be included here.	Central Fiscal Operations	
	Legislative Functions	
	Executive Functions	
	Central Property Management	
	Central Personnel Management	
	Taxation Management	
	Central Records and Statistics Management	

Management of Government Resources

This Measurement Category captures the extent intermediate outputs are achieved related to back-office support enabling the government to operate efficiently.

Measurement Category	Measurement Grouping	Measurement Indicators[4]
ADMINISTRATIVE MANAGEMENT - Administrative Management involves the day-to-day management and maintenance of the internal infrastructure.	Facilities, Fleet, And Equipment Management	
	Help Desk Services	
	Security Management	
	Travel	
	Workplace Policy Development And Management	
FINANCIAL MANAGEMENT – The use of financial information to measure, operate and predict the effectiveness and efficiency of an entity's activities in relation to its objectives. The ability to obtain and use such information is usually characterized by having in place policies, standards, and a system of controls that reliably capture and report activity in a consistent	Accounting	
	Budget and Finance	
	Payments	
	Collections and Receivables	

[4] As agencies use the PRM for their specific IT initiatives, they will create the inventory of measurement indicators.

Measurement Category	Measurement Grouping	Measurement Indicators[4]
manner.	Asset and Liability Management	
	Reporting and Information	
HUMAN RESOURCE MANAGEMENT - Human Resource Management involves all activities associated with the recruitment and management of personnel.	HR Strategy	
	Benefits Management	
	Staff Acquisition	
	Labor Relations	
	Employee Relations	
	Compensation Management	
	Employee Development and Performance Management	
	Organization and Position Management	
	Separation Management	
INFORMATION AND TECHNOLOGY MANAGEMENT – Information and Technology Management involves the coordination of information and technology resources and systems required to support or provide a service.	Lifecycle/Change Management	
	System Development	
	System Maintenance	
	IT Infrastructure Maintenance	
	IT Security	
	Record Retention	
	Information Management	
SUPPLY CHAIN MANAGEMENT - Supply Chain Management involves the purchasing, tracking, and overall management of goods and services.	Goods Acquisition	
	Inventory Control	
	Logistics Management	
	Services Acquisition	

3.2.2 Customer Results, Processes and Activities, and Technology Measurement Areas

This section provides the Measurement Categories, Groupings, and Indicators for the Customer Results, Processes and Activities, and Technology Measurement Areas of the PRM.

Customer Results

Measurement Category	Measurement Grouping	Measurement Indicators[5]
Customer Benefit	Customer Satisfaction	
	Customer Retention	
	Customer Complaints	
	Customer Impact or Burden	
	Customer Training	
Service Coverage	New Customers & Market Penetration	
	Frequency & Depth	
	Service Efficiency	
Timeliness & Responsiveness	Response Time	
	Delivery Time	
Service Quality	Accuracy of Service or Product Delivered	
Service Accessibility	Access	
	Availability	
	Automation	
	Integration	

Processes and Activities

Measurement Category	Measurement Grouping	Measurement Indicators[6]
Financial	Financial Management	
	Costs	

[5] As agencies use the PRM for their specific IT initiatives, they will create the inventory of measurement indicators.

[6] As agencies use the PRM for their specific IT initiatives, they will create the inventory of measurement indicators.

Measurement Category	Measurement Grouping	Measurement Indicators[6]
	Planning	
	Savings & Cost Avoidance	
Productivity & Efficiency	Productivity	
	Efficiency	
Cycle Time & Timeliness	Cycle Time	
	Timeliness	
Quality	Errors	
	Complaints	
Security & Privacy	Security	
	Privacy	
Management & Innovation	Participation	
	Policies	
	Compliance	
	Risk	
	Knowledge Management	
	Innovation & Improvement	

Technology

Measurement Category	Measurement Grouping[7]	Measurement Indicators[8]
Financial	Overall Costs	
	Licensing Costs	
	Support Costs	
	Operations & Maintenance Costs	
	Training & User Costs	
Quality	Functionality	
	IT Composition	

[7] Certain Measurement Groupings related to IT management, specifically cost and schedule, are addressed in other areas of the Exhibit 300 and consequently not included in the PRM. Specific Technology indicators for IT security are also addressed in other areas of the Exhibit 300 and not included in the PRM.

[8] As agencies use the PRM for their specific IT initiatives, they will create the inventory of measurement indicators.

Measurement Category	Measurement Grouping[7]	Measurement Indicators[8]
	Compliance & Deviations	
Efficiency	Response Time	
	Interoperability	
	Accessibility	
	Load levels	
	Improvement	
Information & Data	External Data Sharing	
	Data Standardization or Tagging	
	Internal Data Sharing	
	Data Reliability & Quality	
	Data Storage	
Reliability & Availability	Availability	
	Reliability	
Effectiveness	User Satisfaction	
	User Requirements	
	IT Contribution to Process, Customer, or Mission	

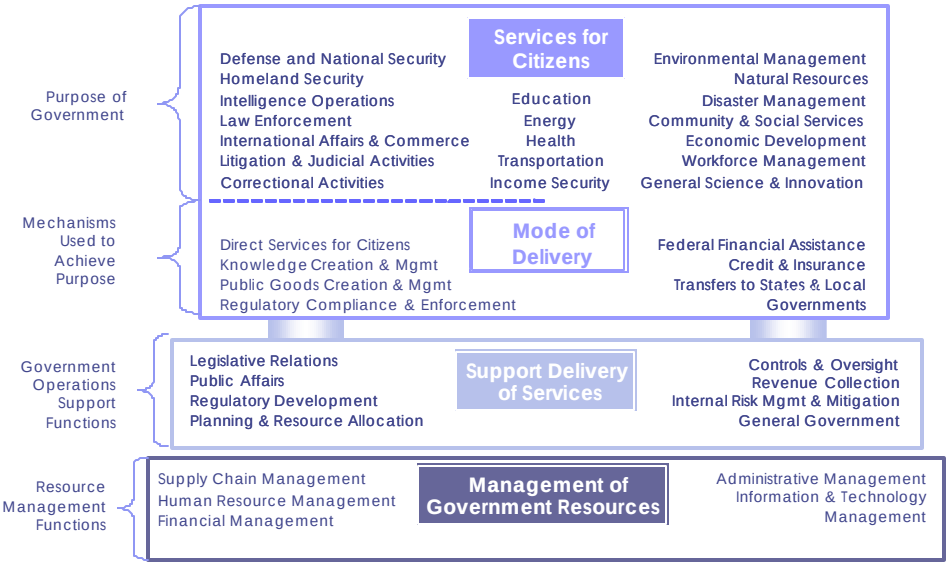
4 Business Reference Model

The Business Reference Model provides a framework that facilitates a functional (as opposed to organizational) view of the federal government's LoBs, including its internal operations and its services for the citizens, independent of the agencies, bureaus and offices that perform them. By describing the federal government around common business areas instead of by a stove-piped, agency-by-agency view, the BRM promotes agency collaboration and serves as the underlying foundation for the FEA and E-Gov strategies.

While the BRM does provide an improved way of thinking about government operations, it is only a model; its true utility can only be realized when it is effectively used. The functional approach promoted by the BRM will do little to help accomplish the goals of E-Government if it is not incorporated into EA business architectures and the management processes of all Federal agencies and OMB.

The BRM is structured into a tiered hierarchy representing the business functions of the federal government. Business Areas are at the highest level followed by LoBs, then the corresponding business Sub-functions related to each LoB. The Business Areas separate government operations into high-level categories relating to the purpose of government (Services for Citizens), the mechanisms the government uses to achieve its purpose (Mode of Delivery), the support functions necessary to conduct government operations (Support Delivery of Services), and the resource management functions that support all areas of the government's business (Management of Government Resources). The Business Areas of the BRM break down further into LoBs, and each LoB is comprised of a collection of Sub-functions that represent the lowest level of granularity in the BRM. Figure 7 provides an overview of the BRM.

Figure 7: BRM Overview



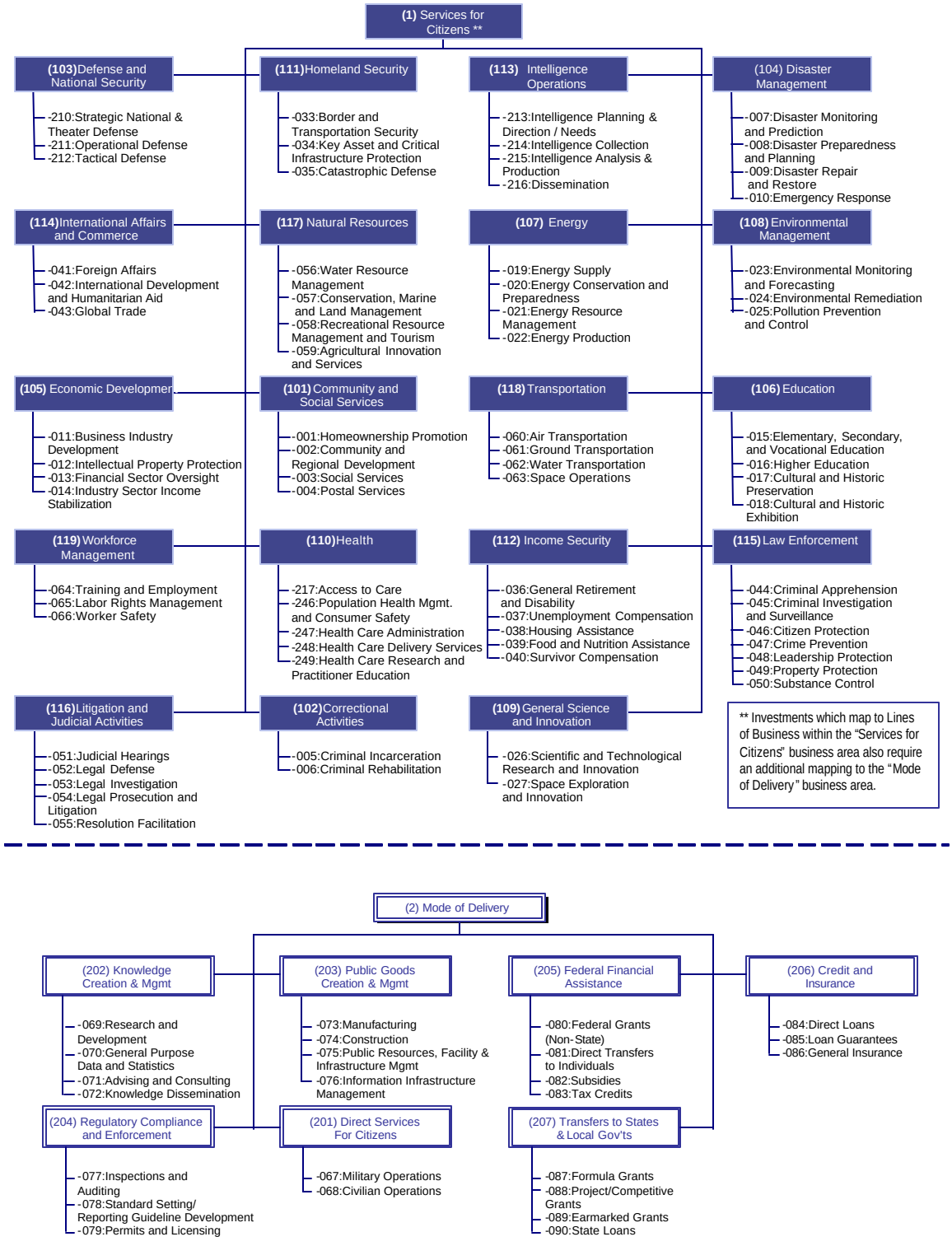
The following sections define the LoBs and Sub-functions that comprise the BRM.

4.1 Services for Citizens and Mode of Delivery Business Areas

The Services for Citizens Business Area describes the mission and purpose of the federal government in terms of the services it provides both to and on behalf of the American citizen. It includes the delivery of citizen-focused, public, and collective goods and/or benefits as a service and/or obligation of the federal government to the benefit and protection of the nation's general population. The Mode of Delivery Business Area is tightly coupled with the Services for Citizens Business Area, and it describes the mechanisms the government uses to achieve the purpose of government. In other words, the Mode of Delivery represents the vehicle by which the federal government delivers its Services to Citizens.

Thus, agency investments which support a Services for Citizens (i.e., external) function require a Mode of Delivery (i.e., internal delivery mechanism) to provide that service to the citizen. For this reason, an additional mapping associated with the appropriate LoB within the Mode of Delivery Business Area is required. To clarify this relationship, the definitions and graphical representation of these two business areas have been combined. Figure 8 provides a graphical representation of these two Business Areas, and it also includes the BRM codes associated with each Business Area, LoB, and Sub-function.

Figure 8: Service for Citizens and Mode of Delivery Business Areas



4.1.1 Services for Citizens Business Area

Community and Social Services

Community and Social Services includes all activities aimed at creating, expanding, or improving community and social development, social relationships, and social services in the

United States. This includes all activities aimed at locality-specific or nationwide social development and general social services. This Line of Business includes general community development and social services programs, as well as earned and unearned benefit programs that promote these objectives.

- **Homeownership Promotion** includes activities devoted to assisting citizens interested in buying homes and educating the public as to the benefits of homeownership. NOTE: Activities devoted to the provision of housing to low-income members of the public are located in the Housing Assistance Sub-Function.
- **Community and Regional Development** involves activities designed to assist communities in preventing and eliminating blight and deterioration, assist economically distressed communities, and encourage and foster economic development through improved public facilities and resources.
- **Social Services** are designed to provide meaningful opportunities for social and economic growth of the disadvantaged sector of the population in order to develop individuals into productive and self-reliant citizens and promote social equity. Included in this category are social welfare services extended to children and adults with special needs, such as the orphaned, neglected, abandoned, disabled, etc. Such services include family life education and counseling, adoption, guardianship, foster family care, rehabilitation services, etc. Note: This Sub-function does not include services that are primarily for income support (Income Security) or are an integral part of some other Line of Business (e.g., Health, Workforce Management, etc.). For mapping purposes, this category should only include IT systems that support programs mapped to the "Social Services" budget functional classification.
- **Postal Services** provide for the timely and consistent exchange and delivery of mail and packages between businesses, organizations, and residents of the United States or between businesses, organizations, and residents of the United States and the rest of the world. It also includes the nationwide retail infrastructure required to make Postal Services easily accessible to customers. (Note: The commercial function of mail is more closely aligned with the "Business and Industry Development" Sub-function in the "Economic Development Line of Business." The international commercial function of mail is more closely aligned with the "Global Trade" Sub-function in the "International Affairs" Line of Business).

Defense and National Security

Protect and advance U.S. national interests and, if deterrence fails, decisively defeat threats to those interests.

- **Strategic National and Theater Defense** involves establishing national and multinational military objectives; sequencing initiatives; defining limits and assess risks for the use of military and other instruments of national power; developing global plans or theater war plans to achieve these objectives; and providing military forces and other capabilities in accordance with strategic plans.
- **Operational Defense** involves linking tactics and strategy by establishing operational objectives needed to accomplish the strategic objectives, sequencing events to achieve the operational objectives, initiating actions, and applying resources to bring about and sustain these events.
- **Tactical Defense** involves focusing on the ordered arrangement and maneuver of combat elements in relation to each other and to the enemy to achieve combat objectives.

Disaster Management

Disaster Management – involves the activities required to prepare for, mitigate, respond to, and repair the effects of all disasters, whether natural or manmade.

- **Disaster Monitoring and Prediction** involves the actions taken to predict when and where a disaster may take place and communicate that information to affected parties. Note: Weather forecasting, while central to Disaster Monitoring and Prediction, is more closely aligned with the "Environmental Monitoring and Forecasting" sub-function in the Environmental Management Line of Business.
- **Disaster Preparedness and Planning** involves the development of response programs to be used in case of a disaster as well as pre-disaster mitigation efforts to minimize the potential for loss of life and property. This involves the development of emergency management programs and activities as well as staffing and equipping regional response centers, and mitigation focused construction and preparation.
- **Disaster Repair and Restore** involves the cleanup and restoration activities that take place after a disaster. This involves the cleanup and rebuilding of homes, buildings, roads, environmental resources, or infrastructure that may be damaged due to a disaster.
- **Emergency Response** involves the immediate actions taken to respond to a disaster. These actions include, but are not limited to, providing mobile telecommunications, operational support, power generation, search and rescue, and medical life-saving actions.

Economic Development

Economic Development includes the activities required to promote commercial/industrial development and to regulate the American financial industry to protect investors. It also includes the management and control of the domestic economy and the money supply, and the protection of intellectual property and innovation.

- **Business and Industry Development** supports activities related to the creation of economic and business opportunities and stimulus, and the promotion of financial and economic stability for corporations and citizens involved in different types of business.
- **Industry Sector Income Stabilization** involves all programs and activities devoted to assisting adversely impacted industrial sectors (farming, commercial transportation, etc.) to ensure the continued availability of their services for the American public and the long-term economic stability of these sectors.
- **Intellectual Property Protection** involves all activities to protect and promote the ownership of ideas and control over the tangible or virtual representation of those ideas, including inventions and discoveries; literary and artistic works; and symbols, names, images, and designs used in commerce.
- **Financial Sector Oversight** involves the regulation of private sector firms and markets (stock exchanges, corporations, etc.) to protect investors from fraud, monopolies, and illegal behavior. This also includes deposit protection.

Education

Education refers to those activities that impart knowledge or understanding of a particular subject to the public. Education can take place at a formal school, college, university or other training program. This Line of Business includes all government programs that promote the education of the public, including both earned and unearned benefit programs.

- **Elementary, Secondary, and Vocational Education** refers to the provision of education in elementary subjects (reading and writing and arithmetic); education provided by a high

school or college preparatory school; and vocational and technical education and training.

- **Higher Education** refers to education beyond the secondary level; specifically, education provided by a college or university.
- **Cultural and Historic Preservation** involves all activities performed by the federal government to collect and preserve information and artifacts important to the culture and history of the United States and its citizenry and the education of U.S. citizens and the world.
- **Cultural and Historic Exhibition** includes all activities undertaken by the U.S. government to promote education through the exhibition of cultural, historical, and other information, archives, art, etc.

Energy

Energy refers to all actions performed by the government to ensure the procurement and management of energy resources, including the production, sale and distribution of energy, as well as the management of spent fuel resources. Energy management includes all types of mass-produced energy (e.g., hydroelectric, nuclear, wind, solar, or fossil fuels). Also included in this Line of Business is the oversight of private industry.

- **Energy Supply** involves all activities devoted to ensuring the availability of an adequate supply of energy for the United States and its citizens.
- **Energy Conservation and Preparedness** involves protection of energy resources from over consumption to ensure the continued availability of fuel resources and to promote environmental protection. This Line of Business also includes measures taken to ensure the provision of energy in the event of an emergency.
- **Energy Resource Management** involves the management and oversight of energy producing resources including facilities, dams, land, and offshore resources.
- **Energy Production** involves the transformation of raw energy resources into useable, deliverable energy.

Environmental Management

Environmental Management includes all functions required to monitor the environment and weather, determine proper environmental standards and ensure their compliance, and address environmental hazards and contamination.

- **Environmental Monitoring and Forecasting** involves the observation and prediction of environmental conditions. This includes but is not limited to the monitoring and forecasting of water quality, water levels, ice sheets, air quality, regulated and non-regulated emissions, as well as the observation and prediction of weather patterns and conditions.
- **Environmental Remediation** supports the immediate and long-term activities associated with the correcting and offsetting of environmental deficiencies or imbalances, including restoration activities.
- **Pollution Prevention and Control** includes activities associated with identifying appropriate pollution standards and controlling levels of harmful substances emitted into the soil, water and atmosphere from manmade sources. Environmental mitigation projects are also included in this business line.

Law Enforcement

Law Enforcement involves activities to protect people, places, and things from criminal activity resulting from non-compliance with U.S. laws. This includes patrols, undercover operations, response to emergency calls, as well as arrests, raids, and seizures of property.

- **Criminal Apprehension** involves activities associated with the tracking, arrest, detention, and transportation of groups or individuals believed to be responsible for committing federal crimes.
- **Criminal Investigation and Surveillance** includes collecting evidence required to determine responsibility for a crime and monitoring and questioning affected parties.
- **Citizen Protection** involves all activities performed to protect the general population of the United States from criminal activity.
- **Crime Prevention** entails all efforts designed to create safer communities through the control and reduction of crime by addressing the causes of crime and reducing opportunities for crimes to occur.
- **Leadership Protection** involves all activities performed to protect the health and well being of the president, vice-president, their families, foreign leaders and dignitaries, and other high-level government officials.
- **Property Protection** entails all activities performed to ensure the security of civilian and government property as well as foreign diplomatic missions.
- **Substance Control** supports activities associated with the enforcement of laws regarding legal substances (i.e., alcohol and tobacco) and illegal narcotics including trafficking, possession, sale, distribution, and other related activities.

Litigation and Judicial Activities

Litigation and Judicial Activities refers to those activities relating to the administration of justice.

- **Judicial Hearings** includes activities associated with proceedings (usually by a court of law) where evidence is taken for the purpose of determining an issue of fact and reaching a decision based on that evidence.
- **Legal Defense** includes those activities associated with the representation of a defendant in a criminal or civil proceeding.
- **Legal Investigation** includes activities associated with gathering information about a given party (government agency, citizen or corporation) that would be admissible in a court of law in an attempt to determine a legal question or matter.
- **Legal Prosecution and Litigation** includes all activities involved with presenting a case in a legal proceeding both in a criminal or civil court of law in an attempt to prove guilt/responsibility.
- **Resolution Facilitation** refers to those activities outside a court of law, such as mediation and arbitration, which may be used in an attempt to settle a dispute between two or more parties (government agency, citizen, or corporation).

Correctional Activities

Correctional Activities involves all federal activities that ensure the effective incarceration and rehabilitation of convicted criminals.

- **Criminal Incarceration** includes activities associated with the housing, custody and general care of criminals serving time in penitentiaries.

- **Criminal Rehabilitation** includes all government activities devoted to providing convicted criminals with the educational resources and life skills necessary to rejoin society as responsible and contributing members.

Health

Health involves federal programs and activities to ensure and provide for the health and well-being of the public. This includes the direct provision of health care services and immunizations as well as the monitoring and tracking of public health indicators for the detection of trends and identification of widespread illnesses/diseases. It also includes both earned and unearned health care benefit programs.

- **Access to Care** focuses on the access to appropriate care. This includes streamlining efforts to receive care; ensuring care is appropriate in terms of type, care, intensity, location and availability; providing seamless access to health knowledge, enrolling providers; performing eligibility determination, and managing patient movement.
- **Population Health Management and Consumer Safety** assesses health indicators and consumer products as a means to protect and promote the health of the general population. This includes monitoring of health, health planning, and health management of humans, animals, animal products, and plants, as well as tracking the spread of diseases and pests. Also includes evaluation of consumer products, drug, and foods to assess the potential risks and dangers; education of the consumer and the general population; and facilitation of health promotion and disease and injury prevention.
- **Health Care Administration** assures that federal health care resources are expended effectively to ensure quality, safety, and efficiency. This includes managing health care quality, cost, workload, utilization, and fraud/abuse efforts.
- **Health Care Delivery Services** provides and supports the delivery of health care to its beneficiaries. This includes assessing health status; planning health services; ensuring quality of services and continuity of care; and managing clinical information and documentation.
- **Health Care Research and Practitioner Education** fosters advancement in health discovery and knowledge. This includes developing new strategies to handle diseases; promoting health knowledge advancement; identifying new means for delivery of services, methods, decision models and practices; making strides in quality improvement; managing clinical trials and research quality; and providing for practitioner education.

Homeland Security

Homeland Security involves protecting the nation against terrorist attacks. This includes analyzing threats and intelligence, guarding borders and airports, protecting critical infrastructure, and coordinating responses to emergencies. The Homeland Security Line of Business is defined by the President's Strategy on Homeland Security. Note: Some of the Critical Mission Areas from the President's strategy have already been identified in other LoBs in the BRM.

- **Border and Transportation Security** includes appropriately facilitating or deterring entry and exit of people, goods, and conveyances at and between U.S. ports of entry, as well as ensuring the security of transportation and infrastructure networks, facilities, vehicles, and personnel within the United States.
- **Key Asset and Critical Infrastructure Protection** involves assessing key asset and critical infrastructure vulnerabilities and taking direct action to mitigate vulnerabilities,

enhance security, and ensure continuity and necessary redundancy in government operations and personnel.

- **Catastrophic Defense** involves the development of technological countermeasures (chemical, biological, radiological and nuclear [CBRN]) to terrorist threats, conducting laboratory testing on new and promising devices, and conducting basic and applied science that can lead to the development of countermeasures.

Income Security

Income Security includes activities designed to ensure that members of the public are provided with the necessary means – both financial and otherwise – to sustain an adequate level of existence. This includes all benefit programs, both earned and unearned, that promote these goals for members of the public.

- **General Retirement and Disability** involves the development and management of retirement benefits, pensions, and income security for those who are retired or disabled.
- **Unemployment Compensation** provides income security to those who are no longer employed, while they seek new employment.
- **Housing Assistance** involves the development and management programs that provide housing to those who are unable to provide housing for themselves including the rental of single-family or multifamily properties, and the management and operation of federally supported housing properties.
- **Food and Nutrition Assistance** involves the development and management of programs that provide food and nutrition assistance to those members of the public who are unable to provide for these needs themselves.
- **Survivor Compensation** provides compensation to the survivors of individuals currently receiving or eligible to receive benefits from the federal government. This includes, but is not limited to, survivors such as spouses or children of veterans or wage earners eligible for social security payments.

Intelligence Operations

Intelligence Operations involves collecting and analyzing information to meet the national security challenges of the U.S. by processing reliable, accurate foreign intelligence, and disseminating intelligence products to policymakers, military commanders, and other consumers.

- **Intelligence Planning and Direction/Needs** – establishes the intelligence requirements of the policymakers the President, the NSC, military commanders, and other officials in major departments and governmental agencies.
- **Intelligence Collection** involves the gathering of raw data from multiple sources from which finished intelligence is produced.
- **Intelligence Analysis and Production** converts large amounts of data to a form suitable for the production of finished intelligence to include translation, decryption, and interpretation of information stored on film and magnetic media through the use of highly refined photographic and electronic processes.
- **Dissemination** consists of delivering the intelligence products to consumers.

International Affairs and Commerce

International Affairs and Commerce involves the non-military activities that promote U.S. policies and interests beyond our national borders, including the negotiation of conflict resolution, treaties, and agreements. In addition, this function includes: foreign economic

development and social/political development; diplomatic relations with other nations; humanitarian, technical and other developmental assistance to key nations; and global trade.

- **Foreign Affairs** refers to those activities associated with the implementation of foreign policy and diplomatic relations, including the operation of embassies, consulates, and other posts; ongoing membership in international organizations; the development of cooperative frameworks to improve relations with other nations; and the development of treaties and agreements.
- **International Development and Humanitarian Aid** refers to those activities related to the implementation of development and humanitarian assistance programs to developing and transitioning countries throughout the world. Development and aid may include technical assistance (the transfer of knowledge and expertise), and the delivery of equipment, commodities and urgent humanitarian assistance including food aid.
- **Global Trade** refers to those activities the federal government undertakes to advance worldwide economic prosperity by increasing trade through the opening of overseas markets and freeing the flow of goods, services, and capital.

Natural Resources

Natural Resources includes all activities involved in conservation planning, land management, and national park/monument tourism that affect the nation's natural and recreational resources, both private and federal. Note: Energy-related natural resources are covered in the Energy Management Line of Business.

- **Water Resource Management** includes all activities that promote the effective use and management of the nation’s water resources. Notes: Environmental protection of water resources is included in the Environmental Management Line of Business. Hydroelectric energy production is included in the Energy Production Sub-Function.
- **Conservation, Marine and Land Management** involves the responsibilities of surveying, maintaining, and operating public lands and monuments, as well as activities devoted to ensuring the preservation of land, water, wildlife, and natural resources, both domestically and internationally. It also includes the sustainable stewardship of natural resources on federally owned/controlled lands for commercial use (mineral mining, grazing, forestry, fishing, etc.).
- **Recreational Resource Management and Tourism** involves the management of national parks, monuments, and tourist attractions as well as visitor centers, campsites, and park service facilities.
- **Agricultural Innovation and Services** involves the creation and dissemination of better methods for farming and forestry, including the development of improved and healthier agricultural and forestry products.

Transportation

Transportation involves all federally supported activities related to the safe passage, conveyance, or transportation of goods and/or people.

- **Air Transportation** involves the activities related to the safe passage of passengers or goods through the air. It also includes command and control activities related to the safe movement of aircraft through all phases of flight for commercial and military operations. Note: The protection of air transportation from deliberate attack is included in the Transportation Security Sub-function in the Homeland Security Line of Business.
- **Ground Transportation** involves the activities related to ensuring the availability of transit and the safe passage of passengers and goods over land. Note: The protection of

ground transportation from deliberate attack is included in the Transportation Security Sub-Function in the Homeland Security Line of Business.

- **Water Transportation** involves the activities related to ensuring the availability of transit and the safe passage of passengers and goods over sea and water. Note: The protection of maritime transportation from deliberate attack is included in the Transportation Security Sub-function in the Homeland Security Line of Business.
- **Space Operations** involves the activities related to the safe launches/missions of passengers or goods into aerospace and includes commercial, scientific, and military operations.

Workforce Management

Workforce Management includes those activities that promote the welfare of the nation's workforce by improving their working conditions, advancing opportunities for profitable employment, and strengthening free collective bargaining.

- **Training and Employment** includes programs of job or skill training, employment services and placement, and programs to promote the hiring of marginal, unemployed, or low-income workers.
- **Labor Rights Management** refers to those activities undertaken to ensure that employees and employers are aware of and comply with all statutes and regulations concerning labor rights, including those pertaining to wages, benefits, safety and health, whistleblower, and non-discrimination policies.
- **Worker Safety** refers to those activities undertaken to save lives, prevent injuries, and protect the health of America's workers.

General Science and Innovation

General Science and Innovation includes all federal activities to meet the national need to advance knowledge in this area. This includes general research and technology programs, space exploration activities, and other research and technology programs that have diverse goals and cannot be readily classified into another Line of Business or Sub-function.

- **Scientific and Technological Research and Innovation** includes all federal activities whose goal is the creation of new scientific and/or technological knowledge as a goal in itself, without a specific link to the other LoBs or Sub-functions of the BRM.
  NOTE: Research and development programs that directly support another Service for Citizen should not be included here.
- **Space Exploration and Innovation** includes all activities devoted to innovations directed at human and robotic space flight and the development and operation of space launch and transportation systems, and the general research and exploration of outer space

4.1.2 Mode of Delivery Business Area

Knowledge Creation and Management

Knowledge Creation and Management involves the programs and activities in which the federal government creates or develops a body or set of knowledge, the manipulation and analysis of which can provide inherent benefits for both the federal and private sector.

- **Research and Development** involves the gathering and analysis of data, dissemination of results, and development of new products, methodologies, and ideas.

- **General Purpose Data and Statistics** includes activities performed in providing empirical, numerical, and related data and information pertaining to the current state of the nation in areas such as the economy, labor, weather, international trade, etc.
- **Advising and Consulting** involves the guidance and consultative services provided by the federal government to support the implementation of a specific Service for Citizen.
- **Knowledge Dissemination** addresses those instances where the primary method used in delivering a service is through the publishing or broadcasting of information, such as the Voice of America or web-based museums maintained by the Smithsonian. It is not intended to address circumstances where the publication of information is a byproduct of the actual Mode of Delivery. For example, an agency might perform research (the Mode of Delivery) addressing a particular service for citizen (for example environmental management) and as a result publish a report on the findings. In this instance, the research would be the mode of delivery and publishing the report would be a Support Delivery of Service.

Public Goods Creation & Management

The construction, manufacturing, administration, and/or management of goods, structures, facilities, common resources, etc. used for the general well being of the American public or society at large.

- **Manufacturing** involves all programs and activities in which the federal government produces both marketable and non-marketable goods.
- **Construction** involves all programs and activities in which the federal government builds or constructs facilities, roads, dams, etc.
- **Public Resources, Facilities, & Infrastructure Management** involves the management and maintenance of government owned capital goods and resources (natural or otherwise) on behalf of the public, usually with benefits to the community at large as well as to the direct user. Examples of facilities and infrastructure include schools, roads, bridges, dams, harbors, and public buildings. Examples of resources include parks, cultural artifacts and art, endangered species, oil reserves, etc.
- **Information Infrastructure Management** involves the management and stewardship of a type of information by the federal government and/or the creation of physical communication infrastructures on behalf of the public in order to facilitate communication. This includes the management of large amounts of information (e.g., environmental and weather data, criminal records, etc.), the creation of information and data standards relating to a specific type of information (patient records), and the creation and management of physical communication infrastructures (networks) on behalf of the public. Note: Information infrastructures for government use are not included here.

Regulatory Compliance and Enforcement

Regulatory Compliance and Enforcement involves the direct monitoring and oversight of a specific individual, group, industry, or community participating in a regulated activity via market mechanisms, command and control features, or other means to control or govern conduct or behavior.

- **Inspections & Auditing** involves the methodical examination and review of regulated activities to ensure compliance with standards for regulated activity.
- **Standard Setting / Reporting Guideline Development** involves the establishment of allowable limits associated with a regulated activity and the development of reporting requirements necessary to monitor and control compliance with allowable limits. This

includes the development of requirements for product sampling and testing, emissions monitoring and control, incident reporting, financial filings, etc.

- **Permits and Licensing** involves activities associated with granting, revoking, and the overall management of the documented authority necessary to perform a regulated task or function.

Direct Services for Citizens

Direct Services for Citizens refers to the delivery of a good or service to (or on behalf of) the citizenry by the federal government with no other intervening persons, conditions, or organizations.

- **Military Operations** - TBD
- **Civilian Operations** describes the direct provision of a non-military service for the citizen by government employees.

Federal Financial Assistance

Federal Financial Assistance refers to the provision of earned and unearned financial or monetary-like benefits to individuals, groups, or corporations

- **Federal Grants** involves the disbursement of funds by the federal government to a non-federal entity to help fund projects or activities. This includes the processes associated with grant administration, including the publication of funds availability notices, development of the grant application guidance, determination of grantee eligibility, coordination of the peer review/evaluation process for competitive grants, the transfer of funds, and the monitoring/oversight as appropriate.
- **Direct Transfers to Individuals** involves the disbursement of funds from the federal government directly to beneficiaries (individuals or organizations) who satisfy federal eligibility requirements with no restrictions imposed on the recipient as to how the money is spent. Direct Transfers include both earned and unearned federal entitlement programs such as Medicare, Social Security, unemployment benefits, etc.
- **Subsidies** involve federal government financial transfers that reduce costs and/or increase revenues of producers.
- **Tax Credits** allow a special exclusion, exemption, or deduction from gross income or which provide a special credit, a preferential rate of tax, or a deferral of tax liability designed to encourage certain kinds of activities or to aid taxpayers in special circumstances.

Transfers to States and Local Governments

Transfers to States and Local Governments involve the transfer of funds or financial assistance from the Federal government to state and local governments and Indian tribes.

- **Formula Grants** involves the allocation of money to states or their subdivisions in accordance with distribution formulas prescribed by law or administrative regulation, for activities of a continuing nature.
- **Project/Competitive Grants** involves the funding, for fixed or known periods, of projects. Project/Competitive grants can include fellowships, scholarships, research grants, training grants, traineeships, experimental and demonstration grants, evaluation grants, planning grants, technical assistance grants, survey grants, and construction grants.
- **Earmarked Grants** involves the distribution of money to state and local governments for a named purpose or service usually specifically noted by Congress in appropriations language, or other program authorizing language.

- **State Loans** involve all disbursement of funds by the government to a state or local government (or Indian Tribe) entity under a contract that requires the repayment of such funds with or without interest.

Credit and Insurance

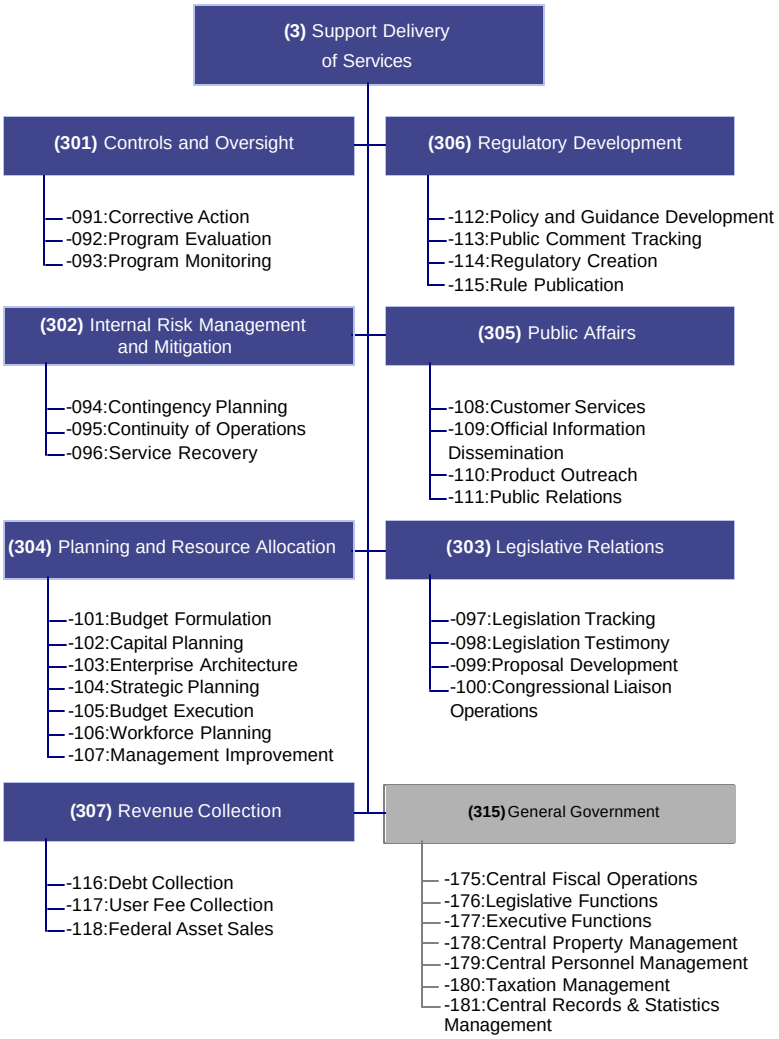
Credit and Insurance involves the use of government funds to cover the subsidy cost of a direct loan or loan guarantee or to protect/indemnify members of the public from financial losses.

- **General Insurance** involves providing protection to individuals or entities against specified risks. The specified protection generally involves risks that private sector entities are unable or unwilling to assume or subsidize and where the provision of insurance is necessary to achieve social objectives.
- **Loan Guarantees** involve any guarantee, insurance, or other pledge with respect to the payment of all or a part of the principal or interest on any debt obligation of a non-federal borrower to a non-federal lender, but does not include the insurance of deposits, shares, or other withdraw able accounts in financial institutions.
- **Direct Loans** involve a disbursement of funds by the government to a non-federal borrower under a contract that requires the repayment of such funds with or without interest.

4.2 Support Delivery of Services Business Area

As shown in Figure 9, Support Delivery of Services provides the critical policy, programmatic and managerial foundation to support federal government operations. Figure 9 also includes the BRM codes for the LoBs and Sub-functions in this Business Area.

Figure 9: Support Delivery of Services Business Area



Controls and Oversight

Controls and Oversight ensures that the operations and programs of the federal government and its external business partners comply with applicable laws and regulations and prevent waste, fraud, and abuse.

- **Corrective Action** involves the enforcement of activities to remedy internal or external programs that have been found noncompliant with a given law, regulation, or policy.
- **Program Evaluation** involves the analysis of internal and external program effectiveness and the determination of corrective actions as appropriate.
- **Program Monitoring** involves the data gathering activities required to determine the effectiveness of internal and external programs and the extent to which they comply with related laws, regulations, and policies.

Internal Risk Management and Mitigation

Internal Risk Management and Mitigation involves all activities relating to the processes of analyzing exposure to risk and determining appropriate countermeasures.

- **Contingency Planning** involves the actions required to plan for, respond to, and mitigate damaging events.
- **Continuity of Operations** involves the activities associated with the identification of critical systems and processes, and the planning and preparation required to ensure that these systems and processes will be available in the event of a catastrophic event.
- **Service Recovery** involves the internal actions necessary to develop a plan for resuming operations after a catastrophic event occurs.

Legislative Relations

Legislative Relations involves activities aimed at the development, tracking, and amendment of public laws through the legislative branch of the federal government.

- **Legislation Tracking** involves monitoring legislation from introduction to enactment.
- **Legislation Testimony** involves activities associated with providing testimony/evidence in support of, or opposition to, legislation.
- **Proposal Development** involves drafting proposed legislation that creates or amends laws subject to Congressional action.
- **Congressional Liaison Operations** involves all activities associated with supporting the formal relationship between a federal agency and the U.S. Congress.

Regulatory Development

Regulatory Development involves activities associated with developing regulations, policies, and guidance to implement laws.

- **Policy and Guidance Development** – involves the creation and dissemination of guidelines to assist in the interpretation and implementation of regulations.
- **Public Comment Tracking** involves the activities of soliciting, maintaining, and responding to public comments regarding proposed regulations.
- **Regulatory Creation** involves the activities of researching and drafting proposed and final regulations.
- **Rule Publication** includes all activities associated with the publication of a proposed or final rule in the Federal Register and Code of Federal Regulations.

Planning and Resource Allocation

Planning and Resource Allocation involves the activities of determining strategic direction, identifying and establishing programs and processes, and allocating resources (capital and labor) among those programs and processes.

- **Budget Formulation** involves all activities undertaken to determine priorities for future spending and to develop an itemized forecast of future funding and expenditures during a targeted period of time. This includes the collection and use of performance information to assess the effectiveness of programs and develop budget priorities.
- **Capital Planning** involves the processes for ensuring that appropriate investments are selected for capital expenditures.
- **Enterprise Architecture** is an established process for describing the current state and defining the target state and transition strategy for an organization's people, processes, and technology.
- **Strategic Planning** entails the determination of annual and long-term goals and the identification of the best approach for achieving those goals.

- **Budget Execution** involves day-to-day requisitions and obligations for agency expenditures, invoices, billing dispute resolution, reconciliation, service level agreements, and distributions of shared expenses.
- **Workforce Planning** involves the processes for identifying the workforce competencies required to meet the agency's strategic goals and for developing the strategies to meet these requirements.
- **Management Improvement** includes all efforts to gauge the ongoing efficiency of business processes and identify opportunities for reengineering or restructuring.

Public Affairs

Public Affairs involve the exchange of information and communication between the federal government, citizens and stakeholders in direct support of citizen services, public policy, and/or national interest.

- **Customer Services** supports activities associated with providing an agency's customers with information regarding the agency's service offerings and managing the interactions and relationships with those customers.
- **Official Information Dissemination** includes all efforts to provide official government information to external stakeholders through the use of various types of media, such as video, paper, web, etc.
- **Product Outreach** relates to the marketing of government services products, and programs to the general public in an attempt to promote awareness and increase the number of customers/beneficiaries of those services and programs.
- **Public Relations** involves the efforts to promote an organization's image through the effective handling of citizen concerns.

Revenue Collection

Revenue Collection includes the collection of government income from all sources. Note: Tax collection is accounted for in Taxation Management Sub-function in the General Government Line of Business.

- **Debt Collection** supports activities associated with the collection of money owed to the U.S. government from both foreign and domestic sources.
- **User Fee Collection** involves the collection of fees assessed on individuals or organizations for the provision of Government services and for the use of Government goods or resources (i.e. National Parks).
- **Federal Asset Sales** encompasses the activities associated with the acquisition, oversight, tracking, and sale of non-internal assets managed by the federal government with a commercial value and sold to the private sector.

General Government

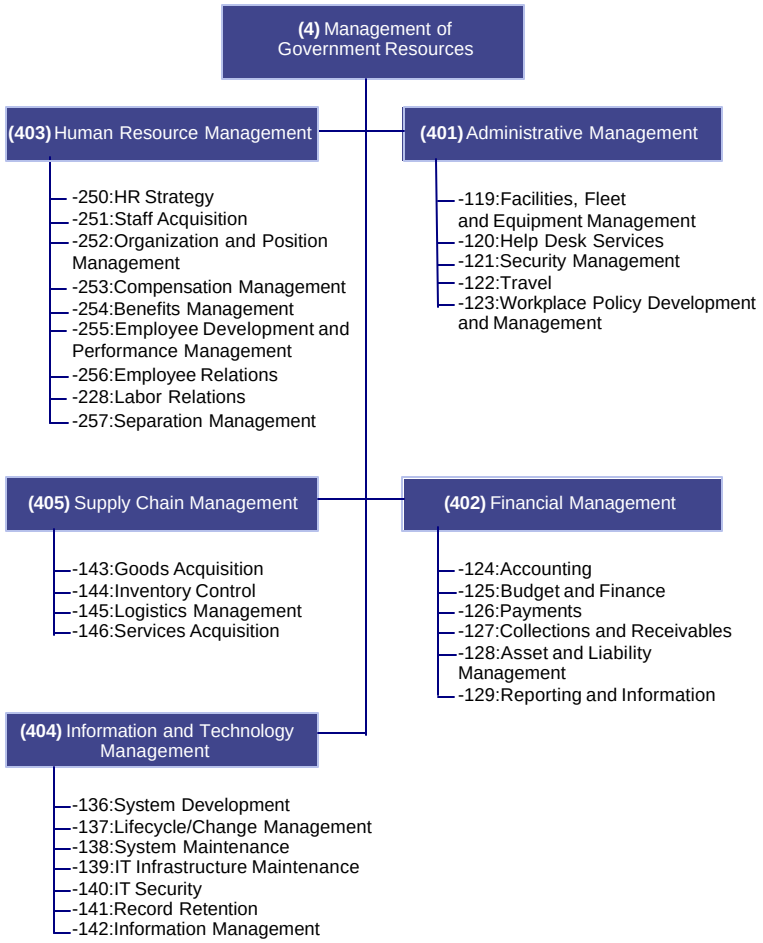
General Government involves the general overhead costs of the federal government, including legislative and executive activities; provision of central fiscal, personnel, and property activities; and the provision of services that cannot reasonably be classified in any other Line of Business. As a normal rule, all activities reasonably or closely associated with other LoBs or Sub-functions shall be included in those LoBs or Sub-functions rather than listed as a part of general government. This Line of Business is reserved for central government management operations; agency-specific management activities would not be included here.

- **Central Fiscal Operations** includes the fiscal operations that the Department of Treasury performs on behalf of the government. Note: Tax-related functions are included within the Taxation Management Sub-function.
- **Legislative Functions** include the costs of the Legislative Branch except for the Tax Court, the Library of Congress, and the Government Printing Office revolving fund.
- **Executive Functions** involve the Executive Office of the President.
- **Central Property Management** involves most of the operations of the General Services Administration.
- **Central Personnel Management** involves most of the operating costs of the Office of Personnel Management and related agencies.
- **Taxation Management** includes activities associated with the implementation of the Internal Revenue Code and the collection of taxes in the United States and abroad.
- **Central Records and Statistics Management** involves the operations surrounding the management of official documents, statistics, and records for the entire federal government. This Sub-function is intended to include the management of records and statistics for the federal government as a whole, such as the records management performed by NARA or the statistics and data collection performed by the Bureau of the Census. Note: Many agencies perform records and statistics management for a particular business function and as such should be mapped to that line of business. The Central Records and Statistics Management is intended for functions performed on behalf of the entire Federal government.

4.3 Management of Government Resources Business Area

Management of Government Resources refers to the back-office support activities that enable the government to operate efficiently. Figure 9 provides a graphical representation of these two Business Areas, and it also includes the BRM codes associated with each LoB and Sub-function.

Figure 10: Management of Government Resources Business Area



Administrative Management

Administrative Management involves the day-to-day management and maintenance of the internal infrastructure.

- **Facilities, Fleet, and Equipment Management** involves the maintenance, administration, and operation of office buildings, fleets, machinery, and other capital assets that are possessions of the federal government.
- **Help Desk Services** involves the management of a service center to respond to government and contract employees' technical and administrative questions.
- **Security Management** involves the physical protection of an organization's personnel, assets, and facilities (including security clearance management). Note: Activities related to securing data and information systems are addressed under the "IT Security" Sub-function.
- **Travel** involves the activities associated with planning, preparing, and monitoring of business related travel for an organization's employees.
- **Workplace Policy Development and Management** includes all activities required to develop and disseminate workplace policies such as dress codes, time reporting requirements, telecommuting, etc.

Financial Management

The use of financial information to measure, operate and predict the effectiveness and efficiency of an entity's activities in relation to its objectives. The ability to obtain and use such information is usually characterized by having in place policies, practices, standards, and a system of controls that reliably capture and report activity in a consistent manner.

- **Accounting** entails accounting for assets, liabilities, fund balances, revenues and expenses associated with the maintenance of federal funds and expenditure of federal appropriations (Salaries and Expenses, Operation and Maintenance, Procurement, Working Capital, Trust Funds, etc.), in accordance with applicable federal standards (FASAB, Treasury, OMB, GAO, etc.).
- **Budget and Finance** includes the management of the federal budget process including the development of plans and programs, budgets, and performance outputs as well as financing federal programs and operations through appropriation and apportionment of direct and reimbursable spending authority, fund transfers, investments and other financing mechanisms.
- **Payments** includes disbursements of federal funds, via a variety of mechanisms, to federal and private individuals, federal agencies, state, local and international governments, and the private sector, to effect payment for goods and services, or distribute entitlements, benefits, grants, subsidies, loans, or claims.
- **Collections and Receivables** includes deposits, fund transfers, and receipts for sales or service.
- **Asset and Liability Management** provides accounting support for the management of assets and liabilities of the Federal government.
- **Reporting and Information** includes providing financial information, reporting and analysis of financial transactions.

Human Resource Management

Human Resource Management involves all activities associated with the recruitment and management of personnel.

- **HR Strategy** develops effective human capital management strategies to ensure federal organizations are able to recruit, select, develop, train, and manage a high-quality, productive workforce in accordance with merit system principles. This sub-function includes: conducting both internal and external environmental scans; developing human resources and human capital strategies and plans; establishing human resources policy and practices; managing current and future workforce competencies; developing workforce plans; developing succession plans; managing the human resources budget; providing human resources and human capital consultative support; and measuring and improving human resources performance.
- **Staff Acquisition** establishes procedures for recruiting and selecting high-quality, productive employees with the right skills and competencies, in accordance with merit system principles. This sub-function includes: developing a staffing strategy and plan; establishing an applicant evaluation approach; announcing the vacancy, sourcing and evaluating candidates against the competency requirements for the position; initiating pre-employment activities; and hiring employees.
- **Organization and Position Management** designs, develops, and implements organizational and position structures that create a high-performance, competency-driven framework that both advances the agency mission and serves agency human capital needs.

- **Compensation Management** designs, develops, and implements compensation programs that attract, retain and fairly compensate agency employees. In addition, designs, develops, and implements pay for performance compensation programs to recognize and reward high performance, with both base pay increases and performance bonus payments. This sub-function includes: developing and implementing discretionary, alternative, and non-discretionary compensation programs; administering bonus and monetary awards programs; administering pay changes; managing time, attendance, leave and pay; and managing payroll.
- **Benefits Management** designs, develops, and implements benefit programs that attract, retain and support current and former agency employees. This sub-function includes: establishing and communicating benefits programs; processing benefits actions; and interacting as necessary with third party benefits providers.
- **Employee Development and Performance Management** designs, develops, and implements a comprehensive employee development approach to ensure that agency employees have the right competencies and skills for current and future work assignments. Designs, develops, and implements a comprehensive performance management strategy that enables managers to make distinctions in performance and links individual performance to agency goal and mission accomplishment. This sub-function also includes conducting employee development needs assessments; designing employee development (e.g., training) programs; administering and delivering employee development programs; managing employee performance; and evaluating the overall effectiveness of the agency's employee development approach.
- **Employee Relations –** designs, develops, and implements programs that strive to maintain an effective employer-employee relationship that balance the agency's needs against its employees' rights. This sub-function includes: addressing employee misconduct; addressing employee performance problems; managing administrative grievances; providing employee accommodation; administering employees assistance programs; participating in administrative third party proceedings; and determining candidate/employee suitability based on information collected outside of the HR process (e.g., background investigation, drug testing, etc.).
- **Labor Relations –** manages the relationship between the agency and its unions and bargaining units. This includes negotiating and administering labor contracts and collective bargaining agreements; managing negotiated grievances; and participating in negotiated third party proceedings.
- **Separation Management –** conducts efficient and effective employee separation programs that assist employees in transitioning to non-Federal employment; facilitates the removal of unproductive, non-performing employees; and assists employees in transitioning to retirement.

Information and Technology Management

Information and Technology Management involves the coordination of information and technology resources and systems required to support or provide a service.

- **Lifecycle/Change Management** involves the processes that facilitate a smooth evolution, composition, and workforce transition of the design and implementation of changes to agency resources such as assets, methodologies, systems, or procedures.
- **System Development** supports all activities associated with the in-house design and development of software applications.

- **System Maintenance** supports all activities associated with the maintenance of in-house designed software applications.
- **IT Infrastructure Maintenance** involves the planning, design, and maintenance of an IT Infrastructure to effectively support automated needs (i.e. platforms, networks, servers, printers, etc.).
- **IT Security** involves all functions pertaining to the securing of federal data and systems through the creation and definition of security policies, procedures and controls covering such services as identification, authentication, and non repudiation.
- **Record Retention** involves the operations surrounding the management of the official documents and records for an agency.
- **Information Management** involves the coordination of information collection, storage, and dissemination, and destruction as well as managing the policies, guidelines, and standards regarding information management.

Supply Chain Management

Supply Chain Management involves the purchasing, tracking, and overall management of goods and services.

- **Goods Acquisition** involves the procurement of physical goods, products, and capital assets to be used by the federal government.
- **Inventory Control** refers to the tracking of information related to procured assets and resources with regard to quantity, quality, and location.
- **Logistics Management** involves the planning and tracking of personnel and their resources in relation to their availability and location.
- **Services Acquisition** involves the oversight and/or management of contractors and service providers from the private sector.

5 Service Component Reference Model

The SRM is a business-driven, functional framework classifying Service Components with respect to how they support business and performance objectives. It serves to identify and classify Service Components that support federal agencies and their IT investments and assets. The model aids in recommending service capabilities to support the reuse of business components and services across the federal government.

The SRM, constructed hierarchically, is structured across horizontal service areas that, independent of the business functions, can provide a leverage-able foundation for reuse of applications, application capabilities, Components, and business services. The SRM is structured around Service Domains, Types, and Components.

The SRM Service Domains provide a high-level view of the services and capabilities that support enterprise and organizational processes and applications. They are differentiated by their business-oriented capability, and include:

- Customer Services
- Process Automation
- Business Management Services
- Digital Asset Services

- Business Analytical Services
- Back Office Services
- Support Services

Service Domains are comprised of Service Types that further categorize and define the capabilities of each Domain. As illustrated below in Figure 11, each Service Domain is classified into one or more Service Types that group similar capabilities in support of the domain. Service Types provide an additional layer of categorization that defines the business context of a specific component within a given domain. Finally, each Service Type includes one or more Service Components that provide the "building blocks' to deliver the Component capability to the business. A Component is defined as "a self contained business process or service with predetermined functionality that may be exposed through a business or technology interface."

Figure 11: SRM Overview

Service Domains	Service Types
Customer Services	• Customer Relationship Management • Customer Preferences • Customer Initiated Assistance
Process Automation	• Tracking and Workflow • Routing and Scheduling
Business Management Services	• Management of Process • Organizational Management • Investment Management • Supply Chain Management
Digital Asset Services	• Content Management • Document Management • Knowledge Management • Records Management
Business Analytical Services	• Analysis and Statistics • Visualization • Knowledge Discovery • Business Intelligence • Reporting
Back Office Services	• Data Management • Human Resources • Financial Management • Asset / Materials Management • Development and Integration • Human Capital / Workforce Management
Support Services	• Security Management • Collaboration • Search • Communication • Systems Management • Forms Management

5.1 Customer Services Domain

The Customer Services Domain defines the set of capabilities that are directly related to an internal or external customer, the business's interaction with the customer, and the customer-driven activities or functions. The Customer Services Domain represents those capabilities and services that are at the front end of a business and interface at varying levels with the customer.

Customer Relationship Management

Capabilities within this Service Type are used to plan, schedule, and control the activities between the customer and the enterprise, both before and after a product or service is offered.

Service Component	Defines the set of capabilities that
Call Center Management	Handle telephone sales and/or service to the end customer
Customer Analytics	Allow for the analysis of an organization's customers, as well as the scoring of third-party information as it relates to an organization's customers
Sales and Marketing	Facilitate the promotion of a product or service and capture of new business
Product Management	Facilitate the creation and maintenance of products and services
Brand Management	Support the application of a trade name to a product or service as well as developing an awareness for the name
Customer / Account Management	Support the retention and delivery of a service or product to an organization's clients
Contact and Profile Management	Provide a comprehensive view of all customer interactions, including calls, email, correspondence and meetings; also provides for the maintenance of a customer's account, business and personal information
Partner Relationship Management	Provide a framework to promote the effective collaboration between an organization and its business partners, particularly members of the distribution chain (e.g., channel and alliance partners, resellers, agents, brokers, and dealers) and other third parties that support operations and service delivery to an organization's customers; includes performance evaluation of partners, if necessary
Customer Feedback	Is used to collect, analyze and handle comments and feedback from an organization's customers
Surveys	Are used to collect useful information from an organization's customers

Customer Preferences

Capabilities within this Service Type allow an organization's customers to change a user interface and the way that data is displayed.

Service Component	Defines the set of capabilities that
Personalization	Change a user interface and how data is displayed
Subscriptions	Allow a customer to join a forum, listserv, or mailing list
Alerts and Notifications	Allow a customer to be contacted in relation to a subscription or service of interest

Customer Initiated Assistance

Capabilities within this Service Type allow customers to proactively seek assistance and service from an organization.

Service Component	Defines the set of capabilities that
Online Help	Provide an electronic interface to customer assistance
Online Tutorials	Provide an electronic interface to educate and assist customers
Self-Service	Allow an organization's customers to sign up for a particular service at their own initiative
Reservations / Registration	Allow electronic enrollment and confirmations for services
Multi-Lingual Support	Allow access to data and information in multiple languages
Assistance Request	Support the solicitation of support from a customer
Scheduling	Define the set of capabilities that support the plan for performing work or service to meet the needs of an organization's customers

5.2 Process Automation Services Domain

The Process Automation Services Domain defines the set of capabilities that support the automation of process and management activities that assist in effectively managing the business. The Process Automation Services domain represents those services and capabilities that serve to automate and facilitate the processes associated with tracking, monitoring, and maintaining liaison throughout the business cycle of an organization.

Tracking and Workflow

Capabilities within this Service Type are provide automatic monitoring and routing of documents to the users responsible for working on them to support each step of the business cycle.

Service Component	Defines the set of capabilities that
Process Tracking	Allow the monitoring of activities within the business cycle
Case Management	Manage the life cycle of a particular claim or investigation within an organization to include creating, routing, tracing, assignment and closing of a case as well as collaboration among case handlers
Conflict Resolution	Support the conclusion of contention or differences within the business cycle

Routing and Scheduling

Capabilities within this Service Type provide automatic directing, assignment, or allocation of time for a particular action or event.

Service Component	Defines the set of capabilities that
Inbound Correspondence	Manage externally initiated communication between an

Service Component	Defines the set of capabilities that
Management	organization and its stakeholders
Outbound Correspondence Management	Manage internally initiated communication between an organization and its stakeholders

5.3 Business Management Services Domain

The Business Management Services Domain defines the set of capabilities that support the management of business functions and organizational activities that maintain continuity across the business and value-chain participants. The Business Management Services Domain represents those capabilities and services that are necessary for projects, programs and planning within a business operation to successfully be managed.

Management of Process

Capabilities within this Service Type regulate the activities surrounding the business cycle of an organization.

Service Component	Defines the set of capabilities that
Change Management	Control the process for updates or modifications to the existing documents, software or business processes of an organization
Configuration Management	Control the hardware and software environments, as well as documents of an organization
Requirements Management	Gather, analyze and fulfill the needs and prerequisites of an organization's efforts
Program / Project Management	Manage and control a particular effort of an organization
Governance / Policy Management	Influence and determine decisions, actions, business rules and other matters within an organization
Quality Management	Help determine the level that a product or service satisfies certain requirements
Business Rule Management	Manage the enterprise processes that support an organization and its policies
Risk Management	Support the identification and probabilities or chances of hazards as they relate to a task, decision or long-term goal

Organizational Management

Capabilities within this Service Type support both collaboration and communication within an organization.

Service Component	Defines the set of capabilities that
Workgroup / Groupware	Support multiple users working on related tasks
Network Management	Monitor and maintain a communications network in order to diagnose problems, gather statistics and provide

Service Component	Defines the set of capabilities that
	general usage

Investment Management

Capabilities within this Service Type manage the financial assets and capital of an organization.

Service Component	Defines the set of capabilities that
Strategic Planning & Mgmt	Support the determination of long-term goals and the identification of the best approach for achieving those goals
Portfolio Management	Support the administration of a group of investments held by an organization
Performance Management	Measure the effectiveness of an organization's financial assets and capital

Supply Chain Management

Capabilities within this Service Type plan, schedule and control a supply chain and the sequence of organizations and functions that mine, make or assemble materials and products from manufacturer to wholesaler to retailer to consumer.

Service Component	Defines the set of capabilities that
Procurement	Support the ordering and purchasing of products and services
Sourcing Management	Support the supply of goods or services as well as the tracking and analysis of costs for these goods
Inventory management	Provide for the balancing of customer service levels with inventory investment
Catalog Management	Support the listing of available products or services that an organization offers
Ordering / Purchasing	Allow the placement of request for a product
Invoice / Requisition Tracking and Approval	Support the identification of where a shipment or delivery is within the business cycle
Storefront / Shopping Cart	Support the online equivalent of the supermarket cart, where orders and merchandise are placed
Warehouse management	Provide for the storage and movement of materials within a warehouse, including these processes: material receipt, order picking, packaging, labeling and shipping
Returns Management	Collect, analyze and resolve product returns or service cancellations
Logistics and Transportation	Provide for efficient freight and traffic management

5.4 Digital Asset Services Domain

The Digital Asset Services Domain defines the set of capabilities that support the generation, management, and distribution of intellectual capital and electronic media across the business and extended enterprise.

Content Management

Capabilities within this Service Type manage the storage, maintenance and retrieval of documents and information of a system or website.

Service Component	Defines the set of capabilities that
Content Authoring	Allow for the creation of tutorials, CBT courseware, web sites, CD-ROMs and other interactive programs
Content Review and Approval	Allow for the approval of interactive programs
Tagging and Aggregation	Support the identification of specific content within a larger set of content for collection and summarization
Content Publishing and Delivery	Allow for the propagation of interactive programs
Syndication Management	Control and regulate an organization's brand

Document Management

Capabilities within this Service Type control the capture and maintenance of an organization's documents and files.

Service Component	Defines the set of capabilities that
Document Imaging and OCR	Support the scanning of documents
Document Referencing	Support the redirection to other documents and information for related content
Document Revisions	Support the versioning and editing of content and documents
Library / Storage	Support document and data warehousing and archiving
Document Review and Approval	Support the editing and commendation of documents before releasing them
Document Conversion	Support the changing of files from one type of format to another
Indexing	Support the rapid retrieval of documents through a structured numbering construct
Classification	Support the categorization of documents

Knowledge Management

Capabilities within this Service Type identify, gather and transform documents, reports and other sources into meaningful information.

Service Component	Defines the set of capabilities that
Information Retrieval	Allow access to data and information for use by an organization and its stakeholders
Information Mapping / Taxonomy	Support the creation and maintenance of relationships between data entities, naming standards and categorization
Information Sharing	Support the use of documents and data in a multi-user environment for use by an organization and its stakeholders
Categorization	Allow classification of data and information into specific layers or types to support an organization
Knowledge Engineering	Support the translation of knowledge from an expert into the knowledge base of an expert system
Knowledge Capture	Facilitate collection of data and information
Knowledge Distribution and Delivery	Support the transfer of knowledge to the end customer.
Smart Documents	Support the interaction of information and process (business logic) rules between users of the document. (i.e. the logic and use of the document is embedded within the document itself and is managed within the document parameters)

Records Management

Capabilities within this Service Type store, protect, archive, classify and retire documents and information.

Service Component	Defines the set of capabilities that
Record Linking / Association	Support the correlation between logical data and information sets
Document Classification	Support the categorization of documents and artifacts, both electronic and physical
Document Retirement	Support the termination or cancellation of documents and artifacts used by an organization and its stakeholders
Digital Rights Management	Support the claim and ownership of intellectual capital and artifacts belonging to an organization

5.5 Business Analytical Services Domain

The Business Analytical Services Domain defines the set of capabilities supporting the extraction, aggregation, and presentation of information to facilitate decision analysis and business evaluation.

Analysis and Statistics

Capabilities within this Service Type examine business issues, problems and their solutions.

Service Component	Defines the set of capabilities that
Mathematical	Support the formulation and mathematical analysis of probabilistic models for random phenomena and the development and investigation of methods and principles for statistical inference
Structural / Thermal	Support the use of data flow and data modeling diagrams for applying systematic analysis of data
Radiological	Support the use of radiation and x-ray technologies for analysis and scientific examination
Forensics	Support the analysis of physical elements using science and technology for investigative and legal purposes

Visualization

Capabilities within this Service Type convert data into graphical or picture form.

Service Component	Defines the set of capabilities that
Graphing / Charting	Support the presentation of information in the form of diagrams or tables
Imagery	Support the creation of film or electronic images from pictures or paper forms
Multimedia	Support the representation of information in more than one form to include text, audio, graphics, animated graphics and full motion video
Mapping / Geospatial / Elevation / GPS	Provide for the representation of position information through the use of attributes such as elevation, latitude, and longitude coordinates
CAD	Support the design of products with computers

Knowledge Discovery

Capabilities within this Service Type facilitate the identification of useful information from data.

Service Component	Defines the set of capabilities that
Data Mining	Provide for the efficient discovery of non-obvious, valuable patterns and relationships within a large collection of data
Modeling	Develop descriptions to adequately explain relevant data for the purpose of prediction, pattern detection, exploration or general organization of data
Simulation	Utilize models to mimic real-world processes

Business Intelligence

Capabilities within this Service Type provide information that pertains to the history, current status or future projections of an organization.

Service Component	Defines the set of capabilities that
Demand Forecasting / Mgmt	Facilitate the prediction of sufficient production to meet an organization's sales of a product or service
Balanced Scorecard	Support the listing and analyzing of both positive and negative impacts associated with a decision
Decision Support and Planning	Support the analyze information and predict the impact of decisions before they are made

Reporting

Capabilities within this Service Type organize data into useful information.

Service Component	Defines the set of capabilities that
Ad Hoc	Support the use of dynamic reports on an as needed basis
Standardized / Canned	Support the use of pre-conceived or pre-written reports
OLAP	Support the analysis of information that has been summarized into multidimensional views and hierarchies

5.6 Back Office Services Domain

The Back Office Services Domain defines the set of capabilities that support the management of enterprise planning and transactional-based functions.

Data Management

Capabilities within this Service Type provide for the usage, processing and general administration of unstructured information.

Service Component	Defines the set of capabilities that
Data Exchange	Support the interchange of information between multiple systems or applications; includes verification that transmitted data was received unaltered
Data Mart	Support a subset of a data warehouse for a single department or function within an organization
Data Warehouse	Support the archiving and storage of large volumes of data
Meta Data Management	Support the maintenance and administration of data that describes data
Data Cleansing	Support the removal of incorrect or unnecessary characters and data from a data source
Extraction and Transformation	Support the manipulation and change of data
Loading and Archiving	Support the population of a data source with external data

Service Component	Defines the set of capabilities that
Data Recovery	Support the restoration and stabilization of data sets to a consistent, desired state
Data Classification	Allow the classification of data

Human Resources

Capabilities within this Service Type provide for the recruitment and management of personnel.

Service Component	Defines the set of capabilities that
Recruiting	Support the identification and hiring of employees for an organization
Resume Management	Support the maintenance and administration of one's professional or work experience and qualifications
Career Development and Retention	Support the monitoring of performance as well as the professional growth, advancement, and retention of an organization's employees
Time Reporting	Support the submission, approval and adjustment of an employee's hours
Awards Management	Support the recognition of achievement among employees of an organization
Benefit Management	Support the enrollment and participation in an organization's compensation and benefits programs
Retirement Management	Support the payment of benefits to retirees
Personnel Administration	Support the matching between an organization's employees and potential opportunities as well as the modification, addition and general upkeep of an organization's employee-specific information
Education / Training	Support the active building of employee capacities
Health and Safety	Support the security and physical well-being of an organization's employees
Travel Management	Support the transit and mobility of an organization's employees for business purposes

Financial Management

Capabilities within this Service Type provide the accounting practices and procedures that allow for the handling of revenues, funding and expenditures.

Service Component	Defines the set of capabilities that
Billing and Accounting	Support the charging, collection and reporting of an organization's accounts
Credit / Charge	Support the use of credit cards or electronic funds transfers for payment and collection of products or services

Service Component	Defines the set of capabilities that
Expense Management	Support the management and reimbursement of costs paid by employees or an organization
Payroll	Involve the administration and determination of employees compensation
Payment / Settlement	Support the process of accounts payable
Debt Collection	Support the process of accounts receivable
Revenue Management	Support the allocation and re-investment of earned net credit or capital within an organization
Internal Controls	Support the methods and procedures used by the organization to safeguard its assets, produce accurate accounting data and reports, contribute to efficient operations, and encourage staff to adhere to management policies and mission requirements
Auditing	Support the examination and verification of records for accuracy
Activity-Based Management	Support a defined, specific set of finance-related tasks for a given objective
Currency Translation	Support the calculations and difference between multiple mediums of exchange

Assets / Materials Management

Capabilities within this Service Type support the acquisition, oversight and tracking of an organization's assets.

Service Component	Defines the set of capabilities that
Property / Asset Management	Support the identification, planning and allocation of an organization's physical capital and resources
Asset Cataloging / Identification	Support the listing and specification of available assets
Asset Transfer, Allocation, and Maintenance	Support the movement, assignment, and replacement of assets
Facilities Management	Support the construction, management and maintenance of facilities for an organization
Computers / Automation Management	Support the identification, upgrade, allocation and replacement of physical devices, including servers and desktops, used to facilitate production and process-driven activities

Development and Integration

Capabilities within this Service Type provide communication between hardware/software applications and the activities associated with deployment of software applications.

Service Component	Defines the set of capabilities that
Legacy Integration	Support the communication between newer generation hardware/software applications and the previous, major generation of hardware/software applications
Enterprise Application Integration	Support the redesigning of disparate information systems into one system that uses a common set of data structures and rules
Data Integration	Support the organization of data from separate data sources into a single source using middleware or application integration as well as the modification of system data models to capture new information within a single system
Instrumentation and Testing	Support the validation of application or system capabilities and requirements
Software Development	Support the creation of both graphical and process application or system software

Human Capital / Workforce Management

Capabilities within this Service Type provide for the planning and supervision of an organization's personnel.

Service Component	Defines the set of capabilities that
Resource Planning and Allocation	Support the determination of strategic direction, the identification and establishment of programs and processes, and the allocation of resources (capital and labor) among those programs and processes
Skills Management	Support the proficiency of employees in the delivery of an organization's products or services
Workforce Directory / Locator	Support the listing of employees and their whereabouts
Team / Org Management	Support the hierarchy structure and identification of employees within the various sub-groups of an organization
Contingent Workforce Management	Support the continuity of operations for an organization's business through the identification of alternative organization personnel
Workforce Acquisition / Optimization	Support the hiring and re-structuring of employees and their roles within an organization

5.7 Support Services Domain

The Support Services Domain defines the set of cross-functional capabilities that can be leveraged independent of Service Domain objective and/or mission.

Security Management

Capabilities within this Service Type protect an organization's hardware/software and related assets.

Service Component	Defines the set of capabilities that
Identification and Authentication	Support obtaining information about those parties attempting to log on to a system or application for security purposes and the validation of those users
Access Control	Support the management of permissions for logging onto a computer or network
Encryption	Support the encoding of data for security purposes
Intrusion Detection	Support the detection of illegal entrance into a computer system
Verification	Support the confirmation of authority to enter a computer system, application or network
Digital Signature	Guarantee the unaltered state of a file
User Management	Support the administration of computer, application and network accounts within an organization
Role / Privilege Management	Support the granting of abilities to users or groups of users of a computer, application or network
Audit Trail Capture and Analysis	Support the identification and monitoring of activities within an application or system

Collaboration

Capabilities within this Service Type allow for the concurrent, simultaneous communication and sharing of content, schedules, messages and ideas within an organization.

Service Component	Defines the set of capabilities that
Email	Support the transmission of memos and messages over a network
Threaded Discussions	Support the running log of remarks and opinions about a given topic or subject
Document Library	Support the grouping and archiving of files and records on a server
Shared Calendaring	Allow an entire team as well as individuals to view, add and modify each other's schedules, meetings and activities
Task Management	Support a specific undertaking or function assigned to an employee

Search

Capabilities within this Service Type provide for the probing and lookup of specific data from a data source.

Service Component	Defines the set of capabilities that
Query	Support retrieval of records that satisfy specific query

Service Component	Defines the set of capabilities that
	selection criteria
Precision / Recall Ranking	Support selection and retrieval of records ranked to optimize precision against recall
Classification	Support selection and retrieval of records organized by shared characteristics in content or context
Pattern Matching	Support retrieval of records generated from a data source by imputing characteristics based on patterns in the content or context

Communication

Capabilities within this Service Type transmit data, messages and information in multiple formats and protocols.

Service Component	Defines the set of capabilities that
Real Time / Chat	Support the conferencing capability between two or more users on a local area network or the internet
Instant Messaging	Support keyboard conferencing over a Local Area Network or the internet between two or more people
Audio Conferencing	Support audio communications sessions among people who are geographically dispersed
Video Conferencing	Support video communications sessions among people who are geographically dispersed
Event / News Management	Monitor servers, workstations and network devices for routine and non-routine events
Community Management	Support the administration of online groups that share common interests
Computer / Telephony Integration	Support the connectivity between server hardware, software and telecommunications equipment into a single logical system
Voice Communications	Provide telephony or other voice communications

Systems Management

Capabilities within this Service Type support the administration and upkeep of an organization's technology assets, including the hardware, software, infrastructure, licenses, and components that comprise those assets.

Service Component	Defines the set of capabilities that
License Management	Support the purchase, upgrade and tracking of legal usage contracts for system software and applications
Remote Systems Control	Support the monitoring, administration and usage of applications and enterprise systems from locations outside of the immediate system environment

Service Component	Defines the set of capabilities that
System Resource Monitoring	Support the balance and allocation of memory, usage, disk space and performance on computers and their applications
Software Distribution	Support the propagation, installation and upgrade of written computer programs, applications and components
Issue Tracking	Receive and track user-reported issues and problems in using IT systems, including help desk calls

Forms Management

Capabilities within this Service Type support the creation, modification, and usage of physical or electronic documents used to capture information within the business cycle.

Service Component	Defines the set of capabilities that
Forms Creation	Support the design and generation of electronic or physical forms and templates for use within the business cycle by an organization and its stakeholders
Forms Modification	Support the maintenance of electronic or physical forms, templates and their respective elements and fields

6 Technical Reference Model

The TRM is a component-driven, technical framework categorizing the standards and technologies to support and enable the delivery of Service Components and capabilities. It also unifies existing agency TRMs and E-Gov guidance by providing a foundation to advance the reuse and standardization of technology and Service Components from a government-wide perspective.

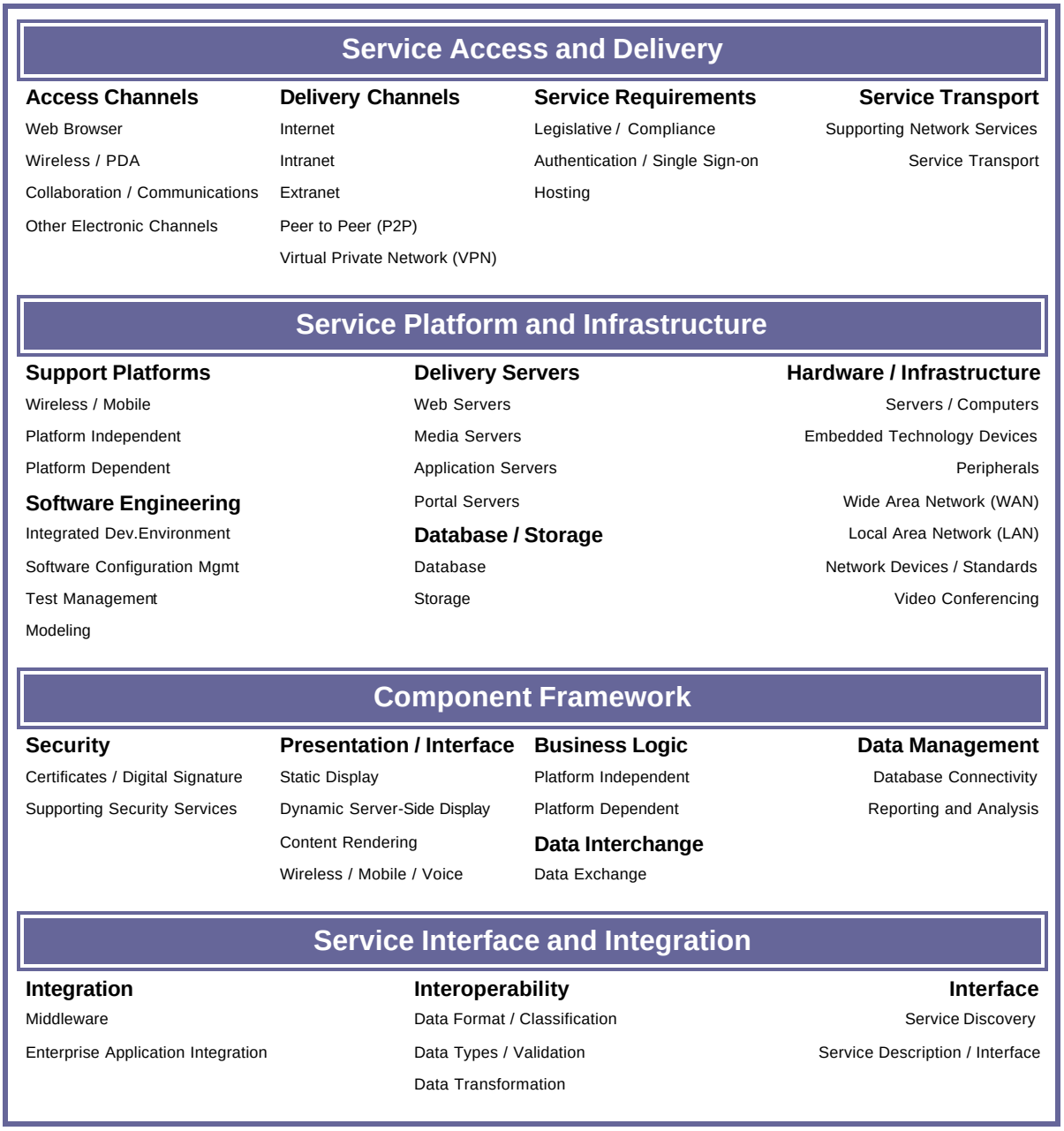
Aligning agency capital investments to the TRM leverages a common, standardized vocabulary, allowing interagency discovery, collaboration, and interoperability. Agencies and the federal government will benefit from economies of scale by identifying and reusing the best solutions and technologies to support their business functions, mission, and target architecture. Organized in a hierarchy, the TRM categorizes the standards and technologies that collectively support the secure delivery, exchange, and construction of business and application Service Components that may be used and leveraged in a component-based or service-oriented architecture (CBA or SOA, used synonymously from here forward). The TRM consists of:

- **Service Areas** represent a technical tier supporting the secure construction, exchange, and delivery of Service Components. Each Service Area aggregates the standards and technologies into lower-level functional areas. Each Service Area consists of multiple Service Categories and Service Standards. This hierarchy provides the framework to group standards and technologies that directly support the Service Area.
- **Service Categories** classify lower levels of technologies and standards with respect to the business or technology function they serve. In turn, each Service Category is comprised of one or more Service Standards.

- **Service Standards** define the standards and technologies that support a Service Category. To support agency mapping into the TRM, many of the Service Standards provide illustrative specifications or technologies as examples.

Figure 12 provides a high-level depiction of the TRM.

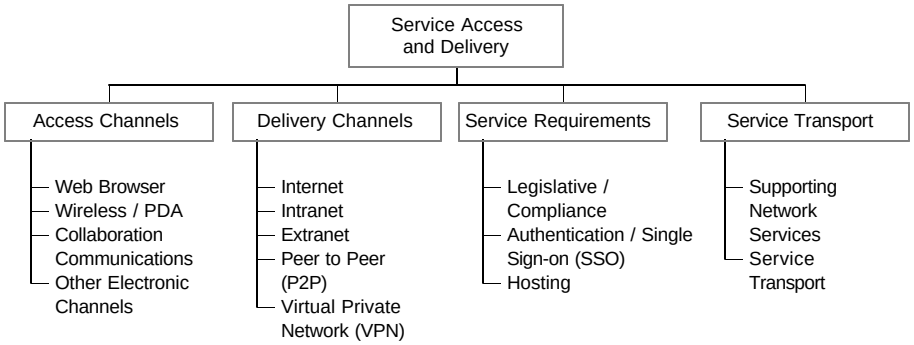
Figure 12: TRM Overview



6.1 Service Access and Delivery

The Service Access and Delivery Service Area, illustrated in Figure 13, defines the collection of Access and Delivery Channels that will be used to leverage the Service Component, and the legislative requirements that govern its use and interaction.

Figure 13: Service Access and Delivery Service Area



The Service Access and Delivery Service Categories and Standards are defined below:

Access Channels

Access Channels define the interface between an application and its users, whether it is a browser, personal digital assistant or other medium.

Web Browser – Define the program that serves as your front end to the World Wide Web on the Internet. In order to view a site, you type its address (URL) into the browser's location field.

Examples of Web Browsers include:

- **Internet Explorer** – Microsoft Internet Explorer (MSIE) is the most widely used World Wide Web browser.
- **Netscape Communicator** – Netscape is the second most widely used World Wide Web browser.

Wireless / PDA – Define the technologies that use transmission via the airwaves. Personal Digital Assistant (PDA) is a handheld computer that serves as an organizer for personal information. It generally includes, at a minimum, a name and address database, to-do list and note taker.

Examples of Wireless/PDA technology include:

- **Palm Operating System** – Palm is the leading Personal Digital Assistant (PDA). Version 5 of Palm OS provides multitasking and other capabilities that will provide an improved platform for E-Gov solutions.
- **Blackberry** – The leading email-enabled wireless device with wide use in several agencies.
- **Pocket PC Phone Edition** – Microsoft's environment for Internet-capable cellular phones.
- **Pocket PC 2000** – Microsoft's environment for PDA level devices.
- **Symbian Epoc** – A leading environment for web capable cellular phones.

Collaboration / Communications – Define the forms of electronic exchange of messages, documents, or other information. Electronic communication provides efficiency through expedited time of delivery.

Examples of Collaboration Communications include:

- **Electronic Mail (Email)** – Email (Electronic mail) is the exchange of computer generated and stored messages by telecommunication. An email can be created manually via messaging applications or dynamically/programmatically such as automated response systems.

- **Facsimile (Fax)** – A fax is the digitized image of text and/or pictures, represented as a series of dots (bit map). Faxes are sent and received through telecommunication channels such as telephone or Internet.
- **Kiosk** – A kiosk is a small physical structure (often including a computer and a display screen) that displays information for people walking by. Kiosks are common in public buildings. Kiosks are also used at trade shows and professional conferences.

Other Electronic Channels – Define the other various mediums of information exchange and interface between a user and an application.

Examples of Other Electronic Channels include:

- **System to System** – System to System involves at least two computers that exchange data or interact with each other independent of human intervention or participation.
- **Web Service** – Web services (sometimes called application services) are services (usually including some combination of programming and data, but possibly including human resources as well) that are made available from a business's web server for web users or other web-connected programs.
- **Uniform Resource Locator (URL)** – URL is the global address of documents and other resources on the World Wide Web. The first part of the address indicates what protocol to use (i.e. “http://”), and the second part specifies the IP address or the domain name where the resource is located (i.e. “www.firstgov.gov”).

Delivery Channels

Delivery Channels define the level of access to applications and systems based upon the type of network used to deliver them.

Internet – The Internet is a worldwide system of computer networks in which users at any one computer can, if they have permission, get information from any other computer.

Intranet – An Intranet is a private network that is contained within an enterprise. It may consist of many interlinked local area networks and is used to share company information and resources among employees.

Extranet – An Extranet is a private network that uses the Internet protocol and the public telecommunication system to securely share part of a business's information or operations with suppliers, vendors, partners, customers, or other businesses. An extranet can be viewed as part of a company's intranet that is extended to users outside the company.

Peer to Peer (P2P) – Peer to Peer is a class of applications that operate outside the DNS system, have significant or total autonomy from central servers, and take advantage of resources available on the Internet.

Virtual Private Network (VPN) – A private data network that makes use of the public telecommunication infrastructure, maintaining privacy through the use of a tunneling protocol and security procedures.

Service Requirements

Service Requirements define the necessary aspects of an application, system or service to include legislative, performance, and hosting.

Legislative / Compliance – Defines the prerequisites that an application, system or service must have mandated by congress or governing bodies.

Examples of Legislative/Compliance technology include:

- **Section 508** – Section 508 requires that federal agencies' electronic and information technology is accessible to people with disabilities, including employees and members of the public.
- **Web Content Accessibility** – Refers to hardware and software that helps people who are physically or visually impaired.
- **Security** – Policy and procedures that protect data against unauthorized access, use, disclosure, disruption, modification or destruction.
- **Privacy: Platform for Privacy Preferences (P3P)** – A specification that will allow users' web browsers to automatically understand web sites' privacy practices. Privacy policies will be embedded in the code of a web site. Browsers will read the policy, and then, automatically provide certain information to specific sites based on the preferences set by the users. For instance, if the site is an e-commerce site, the browser will automatically provide shipping info. If the site is requesting demographic info, then the browser will know to provide it anonymously. The P3P specification was developed by the W3C P3P Syntax, Harmonization, and Protocol Working Groups, including W3C Member organizations and experts in the field of web privacy. P3P is based on W3C specifications that have already been established, including HTTP, XML and Resource Description Framework (RDF). Privacy is policy that deals with the degree to which an individual can determine which personal information is to be shared with whom and for what purpose.
- **Privacy: Liberty Alliance** – The Liberty Alliance Project is an alliance formed to deliver and support a federated network identity solution for the Internet that enables single sign-on for consumers as well as business users in an open, federated way. A federated network identity model will enable every business or user to manage their own data, and ensure that the use of critical personal information is managed and distributed by the appropriate parties, rather than a central authority. Privacy is policy that deals with the degree to which an individual can determine which personal information is to be shared with whom and for what purpose.

Authentication / Single Sign-on (SSO) – Refers a method that provides users with the ability to login one time, getting authenticated access to all their applications and resources.

Hosting – Refers to the service provider who manages and provides availability to a web site or application, often bound to a Service Level Agreement (SLA). The Hosting entity generally maintains a server farm with network support, power backup, fault tolerance, load balancing, and storage backup.

Examples of hosting technology include:

- **Internal (within agency)** – The hosting of a web site or application within an agency. The agency is responsible for the maintenance, support and availability of the web site or application.
- **External (ISP/ASP/FirstGov)** – The outsourcing of a web site or application with a managed service provider. An Internet Service Provider (ISP) provides telecommunications circuits, server collocation, and web site and application hosting. An Application Service Provider (ASP) offers software-based services for high end business applications and specific needs applications such as payroll, sales force automation, and human resources. FirstGov is the official managed service provider for the federal government.

Service Transport

Service Transport defines the end to end management of the communications session to include the access and delivery protocols.

Supporting Network Services – These consist of the protocols that define the format and structure of data and information that is either accessed from a directory or exchanged through communications.

Examples of Support Network Services technology include:

- **Internet Message Access Protocol / Post Office Protocol (IMAP / POP3)** – IMAP allows a client to access and manipulate electronic mail messages on a server. IMAP permits manipulation of remote message folders, called "mailboxes", in a way that is functionally equivalent to local mailboxes. IMAP also provides the capability for an offline client to resynchronize with the server. POP3 is the most commonly used protocol for retrieving email from a mail host.
- **Multipurpose Internet Mail Extensions (MIME)** – MIME extends the format of Internet mail to allow non-U.S. American Standard Code for Information Interchange (ASCII) textual messages, non textual messages, multipart message bodies, and non USASCII information in message headers. MIME support allows compliant email clients and servers to accurately communicate embedded information to internal and external users.
- **Simple Mail Transfer Protocol (SMTP)** – SMTP facilitates transfer of electronic mail messages. It specifies how two systems are to interact, and the messages format used to control the transfer of electronic mail.
- **Extended Simple Mail Transfer Protocol (ESMTP)** – ESMTP allows new service extensions to SMTP to be defined and registered with Internet Assigned Numbers Authority (IANA).
- **T.120** – T.120, an International Telecommunications Union (ITU) standard, contains a series of communication and application protocols and services that provide support for real-time, multipoint data communications. These multipoint facilities are important building blocks for collaborative applications, including desktop data conferencing, and multi-user applications.
- **H.323** – H.323, an International Telecommunications Union (ITU) standard, addresses Video (Audiovisual) communication on Local Area Networks, including Corporate Intranets and packet switched networks generally.
- **Simple Network Management Protocol (SNMP)** – SNMP eliminates several of the security vulnerabilities in earlier version.
- **Lightweight Directory Access Protocol (LDAP)** – LDAP is a subset of X.500 designed to run directly over the TCP/IP stack. LDAP is, like X.500, both an information model and a protocol for querying and manipulating it. LDAPv3 is an update developed in the IETF (Internet Engineering Task Force), which address the limitations found during deployment of the previous version of LDAP.
- **Directory Services (X.500)** – This is a network service that discovers and identifies resources on a network and makes them accessible to users and applications. The resources include users, email addresses, computers, mapped drives, shared folders, and peripherals such as printers and PDA docking stations. Users and computers access these resources without the needing to know how or where the resources are connected.
- **Dynamic Host Configuration Protocol (DHCP)** – A protocol for assigning dynamic IP addresses to devices on a network. A device can receive a different IP address for every connection. Dynamic addressing provides reduced network administration over deploying and connecting user and peripheral devices.
- **Domain Name System (DNS)** – A protocol used for translating domain names (i.e. www.feapmo.gov) to their respective IP addresses. DNS is collectively a network of

devices which store query results. As one DNS server or device cannot provide the translated IP address, it queries other DNS devices. This process is invisible to the user.

- **Border Gateway Protocol (BGP)** – Refers to a routing protocol used to exchange routing information between routers on a network, enabling more efficient routing of data. BGP is part of RFC 1771.
- **X.400** – An ISO and ITU standard for email message addressing and transporting. X.400 supports Ethernet, X.25, TCP/IP and dialup transport methods.

Service Transport – These consist of the protocols that define the format and structure of data and information that is either accessed from a directory or exchanged through communications.

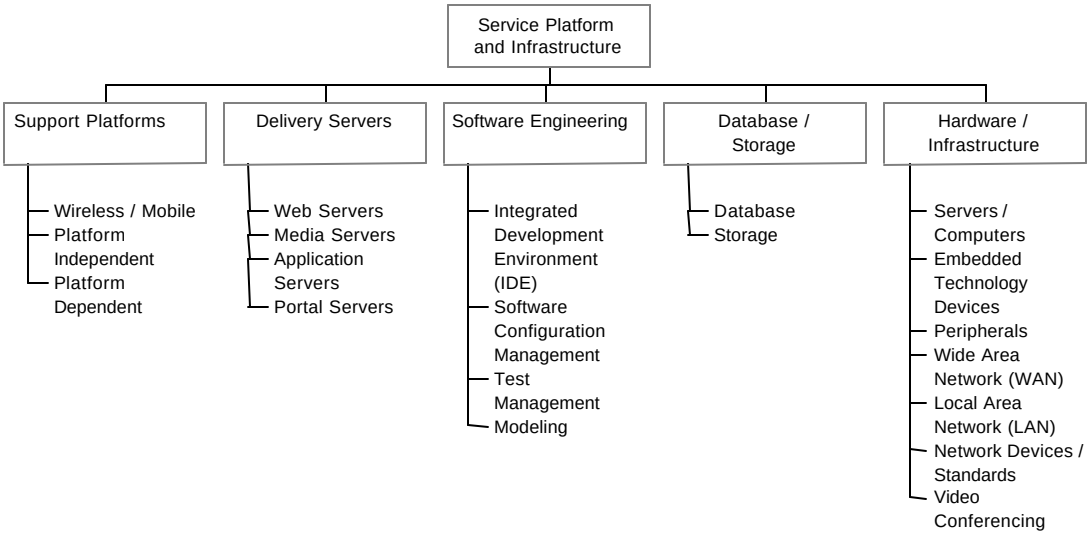
Examples of Service Transport technologies include:

- **Transport Control Protocol (TCP)** – TCP provides transport functions, which ensures that the total amount of bytes sent is received correctly at the destination.
- **Internet Protocol (IP)** – This is the protocol of the Internet and has become the global standard for communications. IP accepts packets from TCP, adds its own header and delivers a "datagram" to the data link layer protocol. It may also break the packet into fragments to support the maximum transmission unit (MTU) of the network.
- **Hyper Text Transfer Protocol (HTTP)** – The communications protocol used to connect to servers on the World Wide Web. Its primary function is to establish a connection with a web server and transmit HTML pages to the client browser.
- **Hyper Text Transfer Protocol Secure (HTTPS)** – The protocol for accessing a secure web server. Using HTTPS in the URL instead of HTTP directs the message to a secure port number rather than the default web port number of 80. The session is then managed by a security protocol.
- **Wireless Application Protocol (WAP)** – The Wireless Application Protocol (WAP) is an open, global specification that empowers users of digital mobile phones, pagers, personal digital assistants and other wireless devices to securely access and interact with Internet/intranet/extranet content, applications, and services.
- **File Transfer Protocol (FTP)** – A protocol used to transfer files over a TCP/IP network (Internet, UNIX, etc.). For example, after developing the HTML pages for a Web site on a local machine, they are typically uploaded to the Web server using FTP.
- **IP Security (IPSEC)** – A set of protocols used to secure IP packet exchange. Tunnel and Transport are the two (2) modes supported by IPSEC. IPSEC uses certificates and Public Keys to authenticate and validate the sender and receiver.

6.2 Service Platform and Infrastructure

The Service Platform and Infrastructure Service Area, illustrated in Figure 14, define the collection of platforms, hardware and infrastructure standards that enable Component Based Architectures and Service Component reuse.

Figure 14: Service Platform and Infrastructure Service Area



The Service Platform and Infrastructure Service Categories and Standards are defined below:

Support Platforms

Support platforms are hardware or software architectures. The term originally dealt with only hardware, and it is still used to refer to a CPU model or computer family.

Wireless / Mobile – Radio transmission via the airwaves. Various communications techniques are used to provide wireless transmission including infrared “line of sight,” cellular, microwave, satellite, packet radio and spread spectrum.

An example of Wireless/Mobile technology includes:

- **Java 2 Platform, Micro Edition (J2ME)** – Sun’s Java environment for devices. It promises a relatively portable environment for those using Java for other tiers of the architecture.

Platform Independent – Defines the operating systems and programming languages that are able to execute and run on any platform or operating system. A platform is the underlying hardware and software comprising a system.

Examples of Platform Independent technologies include:

- **Java 2 Platform Enterprise Edition (J2EE)** – Sun’s J2EE and Microsoft’s .Net are the two dominant distributed computing architecture frameworks. J2EE provides portability of a single language (Java) over multiple operating systems and hardware platforms.
- **Linux** – Linux is an open source operating system that runs on multiple hardware platforms. With the ability to run on many platforms, including the PC and Macintosh, Linux has become an alternative to proprietary systems.

Platform Dependent – Defines the operating systems and programming languages that are able to execute and run on a specific platform or operating system. A platform is the underlying hardware and software comprising a system.

Examples of Platform Dependent technologies include:

- **Windows 2000** – Also known as "Win2K" and "W2K," it is a major upgrade to Windows NT 4. Launched in February 2000, Windows 2000 comes in one client and three server

versions. Windows 2000 looks like Windows 95/98, but adds considerably more features, dialogs and options.

- **Windows.Net** – Microsoft's .Net and Sun's J2EE are the two dominant distributed computing architecture frameworks. .Net supports a wide range of languages but is primarily tied to the Microsoft Windows operating system and Intel hardware.
- **Mac OS X** – Mac OS X is Apple's UNIX based operating system based on industry standards. Launched in March 2001, OS X has advanced built-in security functions and complete interoperability with both Internet standards and Microsoft products.

Delivery Servers

Delivery Servers are front-end platforms that provide information to a requesting application. It includes the hardware, operating system, server software, and networking protocols.

Web Servers – A *web server* is a computer that provides World Wide Web services on the Internet. It includes the hardware, operating system, web server software, TCP/IP protocols and the web site content (web pages). If a web server is used internally and not by the public it may be known as an "intranet server."

Examples of web server technologies include:

- **Apache** – A widely used public domain, UNIX based web server from the Apache Group (www.apache.org). It is based on, and is a plug-in replacement for, NCSA's HTTP server Version 1.3. The name came from a body of existing code and many "patch files."
- **Internet Information Server** – Web server software from Microsoft that runs under Windows NT, Windows 2000, and Microsoft.Net. It supports Netscape's SSL security protocol and turns an NT based PC into a web site. Microsoft's Web browser, Internet Explorer, is also included.

Media Servers – Provide optimized management of media based files such as audio and video streams and digital images.

Examples of Media Servers include:

- **Real Audio** – streaming media server solution designed to supply desktop and mobile content.
- **Windows Media Services** – Part of Windows Server (2000 and .Net) optimized to deliver streaming media and dynamic digital content over intranet and internet delivery channels.

Application Servers – In a three tier environment, a separate computer (application server) performs the business logic, although some part may still be handled by the user's machine. After the web exploded in the mid 1990s, application servers became web-based.

Portal Servers – Portals represent focus points for interaction, providing integration and single source corporate information.

Software Engineering

Software engineering covers the technology associated with building software systems as well as technical solutions supporting management issues, such as testing, modeling and versioning. The TRM is concerned with component technical architecture, not engineering processes.

Integrated Development Environment (IDE) – This consists of the hardware, software and technology that facilitate the development of software applications and systems.

Examples of technologies supporting an Integrated Development Environment include:

- **Web Sphere Studio** – Integrated Java (J2EE) environment for programmers building Java, web, and web services applications – and the successor to IBM Visual Age.
- **Visual Studio** – A complete development system providing the tools for analyzing and modeling all aspects of an application before a single component is built so that developers can design efficient architectures and reduce time to market. Developers can choose the programming language they know best and the language that is best suited to the solution, including Microsoft Visual Basic, Visual C++, Visual J++, and Visual FoxPro. Visual Studio is used to build scalable, data driven Web sites and applications.
- **Visual Studio.Net** – A comprehensive tool set for rapidly building and integrating XML web services, Microsoft Windows–based applications, and web solutions. This is the successor to Visual Studio.

Software Configuration Management – Technology applicable to all aspects of software development from design to delivery specifically focused on the control of all work products and artifacts generated during the development process. Several technical solutions on the market provide the integration of the software configuration management functions.

Examples of functions supporting Software Configuration Management for which technical solutions may be available include:

- **Version Management** – Refers to tracking and controlling versions of files. Version Management includes capabilities such as labeling, branching, merging, version content comparisons, and security and permission management across version controlled projects.
- **Defect Tracking** – Refers to the identification, assignment, and management of discovered defects within an application, product or solution. Defect tracking tools provide searchable defect data to identify urgent and related defects or bugs. The architecture should be built to facilitate the pushing of software patches across the enterprise.
- **Issue Management** – Refers to the management of business, technical, and infrastructure issues throughout the entire lifecycle of a project.
- **Task Management** – Requirements, testing, and issues assignments are transformed into prioritized tasks. Task Management tools provide automation features for managing, delivering, assigning, reminding, and collaborating task management and execution.
- **Change Management** – Refers to the management of application code and content changes across the software development lifecycles.
- **Deployment Management** – Refers to the capability of software delivery to remote networked desktops, servers, and mobile devices across an enterprise. Deployment automation tools provide centralized and accelerated delivery of applications to users via push technologies, eliminating the need for manual installation and configuration.
- **Requirements Management and Traceability** – Consists of information discovery, capture, storage and dissemination. Requirements management reduces software development costs and associated risks through documenting, measuring, and analyzing deviations to project requirements. Traceability refers to tracking requirements artifacts to their source, and changes in requirements to include the impact analysis of the change. Requirements traceability is an integral component in quality software implementation and the management of document succession.

Test Management – Technology which supports the consolidation of all testing activities and results. Test Management activities include test planning, designing (test cases), execution, reporting, code coverage, and heuristic and harness development.

Examples of functions supporting Test Management for which technical solutions may be available include:

- **Functional Testing** – This type of test focuses on any requirements that can be traced directly to use cases (or business functions), business rules, and design.
- **Business Cycle Testing** – Refers to the emulation of activities performed over a period of time that is relevant to the application under test.
- **Usability Testing (508 Testing)** – Refers to a test to ensure that the application navigation, functionality, and GUI allow a user to effectively and efficiently do their work in a way that they are satisfied with the application.
- **Performance Profiling** – Refers to a performance test that measures and evaluates response times and transaction rates.
- **Load/Stress/Volume Testing** – Refers to tests that measure and evaluate how a system performs and functions under varying workloads, large amounts of data and/or resource utilization.
- **Security and Access Control Testing** – Focuses on the technical, administrative and physical security controls that have been designed into the system architecture in order to provide confidentiality, integrity and availability.
- **Reliability Testing** – Refers to the verification that failover methods are invoked properly and the system recovers properly.
- **Configuration Testing** – Refers to a test to ensure that the application or system can handle all hardware and software variables and requirements that have been defined.
- **Installation Testing** – Refers to the verification that the software installation process works properly in different environments and among varying conditions.

Modeling – Technology support the process of representing entities, data, business logic, and capabilities for aiding in software engineering.

Examples of modeling technology include:

- **Unified Modeling Language (UML)** – A general-purpose notational language for specifying and visualizing complex software, especially large, object-oriented projects.
- **Case Management** – Computer Aided Software Engineering (CASE) software that provides a development environment for programming teams. CASE systems offer tools to automate, manage and simplify the development process.

Database / Storage

Database / Storage refers to a collection of programs that enables storage, modification, and extraction of information from a database, and various techniques and devices for storing large amounts of data.

Database – Refers to a collection of information organized in such a way that a computer program can quickly select desired pieces of data. A database management system (DBMS) is a software application providing management, administration, performance, and analysis tools for databases.

Examples of Database technologies include:

- **Database 2 (DB2)** – DB2 is a family of relational database products offered by IBM. DB2 provides an open database environment that runs on a wide variety of computing platforms.
- **Oracle** – Relational database product; the first to support the SQL language.

- **SQL Server** – Data management server product developed by Microsoft.
- **Sybase** – Data management and synchronization server products developed by Sybase.

Storage – Storage devices are designed to provide shared storage access across a network. These devices provide extended storage capabilities to the network with reduced costs compared to traditional file servers.

Examples of storage technologies include:

- **Network Attached Storage (NAS)** – A NAS device is a server that is dedicated to nothing more than file sharing.
- **Storage Area Network (SAN)** – A SAN is a high-speed sub network of shared storage devices. A storage device is a machine that contains nothing but a disk or disks for storing data.

Hardware / Infrastructure

Defines the physical devices, facilities and standards that provide the computing and networking within and between enterprises.

Servers / Computers – This refers to the various types of programmable machines which are capable of responding to sets of instructions and executing programs.

Examples of Servers/Computers technologies include:

- **Enterprise Server** – A computer or device on a network that manages network resources and shared applications for multiple users.
- **Mainframe** – A very large computer capable of supporting hundreds, or even thousands, of users simultaneously. Mainframes support simultaneous programs.

Embedded Technology Devices – This refers to the various devices and parts that make up a Server or Computer as well as devices that perform specific functionality outside of a Server or Computer.

Examples of Embedded Technology Devices include:

- **Random Access Memory (RAM)** – A type of computer memory that can be accessed randomly; that is, any byte of memory can be accessed without touching the preceding bytes. RAM is the most common type of memory found in computers and other devices, such as printers.
- **Hard Disk Drive** – Refers to the area of a computer that where data is stored.
- **Microprocessor** – A silicon chip that contains a CPU. In the world of personal computers, the terms microprocessor and CPU are used interchangeably. At the heart of all personal computers and most workstations sits a microprocessor.
- **Redundant Array of Independent Disks (RAID)** – An assembly of disk drives that employ two or more drives in combination for fault tolerance and performance. RAID disk drives are used frequently on servers but aren't generally necessary for personal computers. RAID is generally configured as mirrored or striped. Mirrored RAID (Level 1) provides a failover drive. Striped RAID (Levels 0, 3, and 5) write data across multiple disk drives so that a single disk failure can be recovered from the data on the remaining drives. There are three (3) types of RAID systems: failure resistant disk systems (that protect against data loss due to disk failure), failure tolerant disk systems (that protect against loss of data access due to failure of any single component), and disaster tolerant disk systems (that consist of two or more independent zones, either of which provides access to stored data).

Peripherals – Computer devices that are not part of the essential computer (i.e. the memory and microprocessor). Peripheral devices can be external and internal.

Examples of Peripherals include:

- **Printer** – Devices that print text or illustrations on paper. There are many different types of printers.
- **Scanner** – Device that can read text or illustrations printed on paper and translate the information into a form the computer can use. A scanner works by digitizing an image dividing it into a grid of boxes and representing each box with either a zero or a one, depending on whether the box is filled in.

Wide Area Network (WAN) – A data network typically extending a LAN outside a building or beyond a campus is known as a WAN. This is typically created by using bridges or routers to connect geographically separated LANs. WANs include commercial or educational dialup networks such as CompuServe, InterNet and BITNET.

Examples of WAN technologies include:

- **Frame Relay** – A packet switching protocol for connecting devices on a Wide Area Network (WAN). Frame Relay networks in the U.S. support data transfer rates at T1 (1.544 Mbps) and T3 (45 Mbps) speeds.
- **Asynchronous Transfer Mode (ATM)** – A high bandwidth, high speed, controlled delay, fixed size packet switching and transmission system integrating multiple data types (voice, video, and data). Uses fixed size packets also known as "cells" (ATM is often referred to as "cell relay").

Local Area Network (LAN) – A network that interconnects devices over a geographically small area, typically in one building or a part of a building. The most popular LAN type is Ethernet. LANs allow the sharing of resources and the exchange of both video and data.

Examples of Local Area Network technologies include:

- **Ethernet** – Local Area Network (LAN) architecture that uses a bus or star topology and supports data transfer rates of 10 Mbps, 100 Mbps (Fast Ethernet) or 1 Gbps (gigabit Ethernet). The Ethernet specification served as the basis for the IEEE 802.3 standard, which specifies the physical and lower software layers. Ethernet uses the CSMA/CD access method to handle simultaneous demands. It is one of the most widely implemented LAN standards.
- **Token Ring** – A type of computer network in which all the computers are arranged (schematically) in a circle. A token, which is a special bit pattern, travels around the circle. To send a message, a computer catches the token, attaches a message to it, and then lets it continue to travel around the network.
- **Virtual LAN (VLAN)** – Short for virtual LAN, a network of computers that behave as if they are connected to the same wire even though they may actually be physically located on different segments of a LAN. VLANs are configured through software rather than hardware, which make them extremely flexible. One of the biggest advantages of VLANs is that when a computer is physically moved to another location, it can stay on the same VLAN without any hardware reconfiguration.

Network Devices / Standards – A group of stations (computers, telephones, or other devices) connected by communications facilities for exchanging information. Connection can be permanent, via cable, or temporary, through telephone or other communications links. The transmission medium can be physical (i.e. fiber optic cable) or wireless (i.e. satellite).

Examples of Network Devices/Standards include:

- **Hub** – A common connection point for devices in a network. Hubs are commonly used to connect segments of a LAN. A hub contains multiple ports. When a packet arrives at one port, it is copied to the other ports so that all segments of the LAN can see all packets.
- **Switch** – In networks, a device that filters and forwards packets between LAN segments. Switches operate at the data link layer (layer 2) and sometimes the network layer (layer 3) of the OSI Reference Model and therefore support any packet protocol. LANs that use switches to join segments are called switched LANs or, in the case of Ethernet networks, switched Ethernet LANs.
- **Router** – A device or setup that finds the best route between any two networks, even if there are several networks to traverse. Like bridges, remote sites can be connected using routers over dedicated or switched lines to create WANs.
- **Network Interface Card (NIC)** – Often abbreviated as NIC, an expansion board you insert into a computer so the computer can be connected to a network. Most NICs are designed for a particular type of network, protocol, and media, although some can serve multiple networks.
- **Transceivers** – Short for transmitter receiver, a device that both transmits and receives analog or digital signals. The term is used most frequently to describe the Component in local area networks (LANs) that actually applies signals onto the network wire and detects signals passing through the wire. For many LANs, the transceiver is built into the network interface card (NIC). Some types of networks, however, require an external transceiver.
- **Gateway** – Gateways are points of entrance to and exit from a communications network. Viewed as a physical entity, a gateway is that node that translates between two otherwise incompatible networks or network segments.
- **Integrated Services Digital Network (ISDN)** – ISDN is a system of digital phone connections which has been available for over a decade. This system allows data to be transmitted simultaneously across the world using end to end digital connectivity.
- **T1/T3** – T1 service delivers 1.544 Mbps. Typically channel into 24 DS0s, each capable of carrying a single voice conversation or data stream. The European T1 or E1 transmission rate is 2.048 Mbps. A T3 circuit communicates at 45 Mbps, or 28 T1 lines.
- **Digital Subscriber Line (DSL)** – Refers collectively to all types of digital subscriber lines, the two main categories being ADSL and SDSL. Two other types of DSL technologies are High data rate DSL (HDSL) and Very high DSL (VDSL).
- **Firewall** – This refers to the network device that is designed to prevent unauthorized access to or from a private network. Firewalls can be implemented in both hardware and software, or a combination of both. Firewalls are frequently used to prevent unauthorized Internet users from accessing private networks connected to the Internet, especially intranets. There are several types of firewall techniques and firewalls may implement one or more simultaneously. Packet filtering inspects inbound and outbound packets, validating against defined business rules. Application gateways apply security rules against applications. Circuit level gateways apply security rules against physical connection attempts to and from the network. Proxy servers mask the internal requestor by inspecting and augmenting the packet header. Four common architectures of firewalls include the packet filtering router, the screened host firewall system, the dual homed host firewall, and the screened subnet firewall (with a DMZ), which is one of the most secure implementations.

Video Conferencing – Communication across long distances with video and audio contact that may also include graphics and data exchange. Digital video transmission systems typically

consist of camera, codec (coder decoder), network access equipment, network, and audio system.

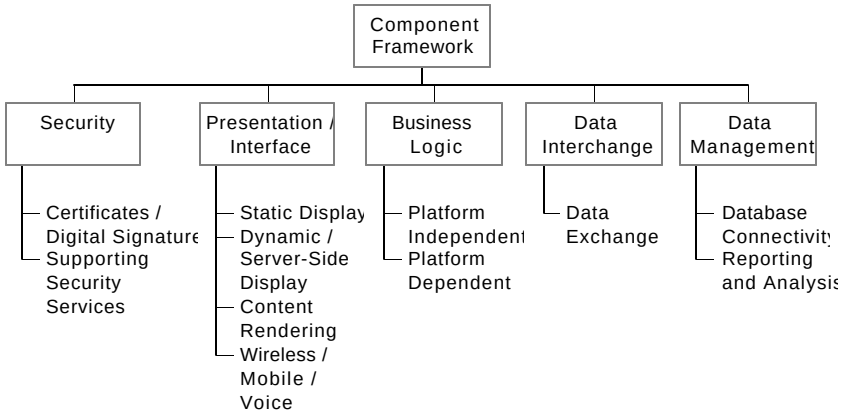
Examples of Video Conferencing technologies include:

- **Bridge** – a bridge connects three or more conference sites so that they can simultaneously pass data, voice, or video. Video conferencing bridges are often called MCUs (multipoint conferencing units).
- **CODEC** – a video codec converts analog video signals from a video camera to digital signals for transmission over digital circuits, and then converts the digital signals back to analog signals for display.
- **Receiver** – An electronic device which enables a particular videoconference signal to be separated from all others being received by an earth station, and converts the signal format into a format for video, voice or data.

6.3 Component Framework

The Component Framework Service Area, illustrated in Figure 15, defines the underlying foundation and technical elements by which Service Components are built, integrated and deployed across Component-Based and Distributed Architectures. The Component Framework consists of the design of application or system software that incorporates interfaces for interacting with other programs and for future flexibility and expandability. This includes, but is not limited to, modules that are designed to interoperate with each other at runtime. Components can be large or small, written by different programmers using different development environments and may be platform independent. Components can be executed on standalone machines, a LAN, Intranet or the Internet.

Figure 15: Component Framework Service Area



The Component Framework Service Categories and Standards are defined below:

Security

Security defines the methods of protecting information and information systems from unauthorized access, use, disclosure, disruption, modification, or destruction in order to provide integrity, confidentiality and availability. Biometrics, two factor identification, encryption, and technologies based on the NIST FIPS140 standards are evolving areas of focus. See: http://csrc.nist.gov/cryptval/

Certificates / Digital Signature – Software used by a certification authority (CA) to issue digital certificates and secure access to information. The evolution of Public Key Infrastructure (PKI) is based on the verification and authentication of the parties involved in information exchange.

Examples of Certificates/Digital Signature technologies include:

- **Digital Certificate Authentication** – Authentication implementation for controlling access to network and internet resources through managing user identification. An electronic document, digital certificate, is issued and used to prove identity and public key ownership over the network or internet.
- **FIPS 186** – The Digital Signature Standard (DSS) specifies a digital signature algorithm (DSA) appropriate for applications requiring a digital, rather than written, signature. The DSA authenticates the integrity of the signed data and the identity of the signatory. The DSA may also be used to prove that data was actually signed by the generator of the signature. Additional references: Draft ANSI X9.30199x Part 1 and ISO/IEC JTC1/SC27/WG2, Project 1.27.08 Digital Signature with Appendix.
- **Secure Sockets Layer (SSL)** – An open, nonproprietary protocol for securing data communications across computer networks. SSL is sandwiched between the application protocol (such as HTTP, Telnet, FTP, and NNTP) and the connection protocol (such as TCP/IP, UDP). SSL provides server authentication, message integrity, data encryption, and optional client authentication for TCP/IP connections.

Supporting Security Services – These consist of the different protocols and components to be used in addition to certificates and digital signatures.

Examples of Supporting Security Services technologies include:

- **Secure Multipurpose Internet Mail Extensions (S/MIME)** – Provides a consistent way to send and receive secure MIME data. Based on the Internet MIME standard, S/MIME provides cryptographic security services for electronic messaging applications: authentication, message integrity and non repudiation of origin (using digital signatures) and data confidentiality (using encryption). S/MIME is not restricted to mail; it can be used with any transport mechanism that transports MIME data, such as HTTP.
- **Transport Layer Security (TLS)** – Standard for the next generation SSL. TLS provides communications privacy over the Internet. The protocol allows client/server applications to communicate in a way that is designed to prevent eavesdropping, tampering, or message forgery.
- **Web Services Security (WS Security)** – Describes enhancements to SOAP messaging to provide message integrity, message confidentiality, and single message authentication. These mechanisms can be used to accommodate a wide variety of security models and encryption technologies including X.509, Kerberos, and SAML.
- **Security Assertion Markup Language (SAML)** – An XML-based framework for exchanging security information expressed in the form of assertions about subjects, where a subject is an entity (either human or computer) that has an identity in some security domain. SAML is expected to play a key role in the federal-wide E-Authentication initiative, and is supported by both the Liberty Alliance and WS Security.
- **Simple Key Management Protocol (SKIP)** – A protocol developed by Sun Microsystems to handle key management across IP networks and VPNs. (http://www.networksorcery.com/enp/rfc/rfc2356.txt) **Secure Shell (SSH)** – A strong method of performing client authentication. Because it supports authentication, compression, confidentiality and integrity, SSH is used frequently on the Internet. SSH has two important Components, RSA certificate exchange for authentication and Triple DES for session encryption.

Presentation / Interface

This defines the connection between the user and the software, consisting of the presentation that is physically represented on the screen.

Static Display – This consists of the software protocols that are used to create a predefined, unchanging graphical interface between the user and the software.

An example of Static Display technology includes:

- **Hyper Text Markup Language (HTML)** – The language used to create web documents and a subset of Standard Generalized Markup Language (SGML)

Dynamic / Server Side Display – This consists of the software that is used to create graphical user interfaces with the ability to change while the program is running.

Examples of Dynamic/Server Side Display technologies include:

- **Java Server Pages (JSP)** – JSP is part of Sun's J2EE architecture and provide template capabilities for presenting dynamically generated web content. ASPs are text files written in a combination of standard HTML tags, JSP tags, and Java code.
- **Active Server Pages (ASP)** – A web server technology from Microsoft that allows for the creation of dynamic, interactive sessions with the user.
- **Active Server Pages .Net (ASP.Net)** – ASP.NET is a set of technologies in the Microsoft .NET Framework for building web applications and XML web services. ASP.NET pages execute on the server and generate markup such as HTML, WML or XML that is sent to a desktop or mobile browser.

Content Rendering – This defines the software and protocols used for transforming data for presentation in a graphical user interface.

Examples of Content Rendering technologies include:

- **Dynamic HTML (DHTML)** – A collective term for a combination of new Hypertext Markup Language (HTML) tags and options, style sheets, and programming that will allow web pages that are more animated and more responsive to user interaction than previous versions of HTML.
- **Extensible HTML (XHTML)** – The W3C's recommendation for the next generation of
- **Cascading Style Sheets (CSS)** – A style sheet format for HTML documents endorsed by the World Wide Web Consortium. CSS1 (Version 1.0) provides hundreds of layout settings that can be applied to all the subsequent HTML pages that are downloaded.

Wireless / Mobile / Voice – This consists of the software and protocols used for wireless and voice enabled presentation devices.

Examples of Wireless/Mobile/Voice technologies include:

- **Wireless Markup Language (WML)** – An XML-based protocol designed for Wireless devices.
- **XHTML Mobile Profile (XHTMLMP)** – XHTMLMP is designed for resource-constrained web clients that do not support the full set of XHTML features, such as mobile phones, PDAs, pagers and set top boxes. It extends XHTML Basic with modules, elements and attributes to provide a richer authoring language. XHTML replaces the Wireless Markup Language (WML).
- **Voice XML (VXML)** – VXML is an XML vocabulary for specifying IVR (Integrated Voice Response) Systems.

Business Logic

Defines the software, protocol or method in which business rules are enforced within applications.

Platform Independent – Consists of all software languages that are able to execute and run on any type of operating system or platform.

Examples of Platform Independent technologies include:

- **Enterprise Java Beans (EJB)** – a software component in Sun's J2EE platform, which provides a pure Java environment for developing and running distributed applications.
- **C, C++** – C is a procedure programming language. C++ is an object-oriented version of C that has been widely used to develop enterprise and commercial applications.
- **JavaScript** – A scripting language that runs within a web browser.
- **Java Servlet (JSR 53)** – Java Servlets provide reusable web components that can be incorporated into portals.
- **Java Portlet API (JSR 168)** – Java Portlet API enables interoperability between Portlets and Portals by defining APIs that address the areas of aggregation, personalization, presentation and security.
- **Web Services for Remote Portals (WSRP)** – WSRP defines an XML and web services standard that will allow the plug and play of visual, user facing web services with portals or other intermediary web applications.

Platform Dependent – Consists of the programming languages and methods for developing software on a specific operating system or platform.

Examples of Platform Dependent technologies include:

- **Visual Basic** – A version of the BASIC programming language from Microsoft specialized for developing Windows applications.
- **Visual Basic .Net (VB.Net)** – A version of the BASIC programming language from Microsoft specialized for developing Windows applications that is used within Microsoft's .NET environment.
- **C-Sharp (C#)** – An object-oriented programming language from Microsoft that is based on C++ with elements from Visual Basic and Java.
- **VB Script** – A scripting language from Microsoft. A subset of Visual Basic, VBScript is widely used on the web for both client processing within a web page and server side processing in Active Server Pages (ASPs).

Data Interchange

Define the methods in which data is transferred and represented in and between software applications.

Data Exchange – Data Exchange is concerned with the sending of data over a communications network and the definition of data communicated from one application to another. Data Exchange provides the communications common denominator between disparate systems.

Examples of Data Exchange technologies include:

- **XMI** – Enables easy interchange of metadata between modeling tools (based on the OMG UML) and metadata repositories (OMG MOF based) in distributed heterogeneous environments. XMI integrates three key industry standards: XML, UML, and MOF. The integration of these three standards into XMI marries the best of OMG and W3C

metadata and modeling technologies, allowing developers of distributed systems to share object models and other metadata over the Internet.

- **XQuery** – A language used for processing and evaluating XML data. The XQuery language provides results of expressions allowing the use of evaluations to the implementation of XQuery.
- **Simple Object Access Protocol (SOAP)** – SOAP provides HTTP/XML based remote procedure call capabilities for XML Web Services.
- **Electronic Business using XML (be-XML)** – A modular suite of specifications that enables enterprises to conduct business over the Internet: exchanging business messages, conducting trading relationships, communicating data in common terms and defining and registering business processes.
- **Resource Description Framework (RDF)** – RDF provides a lightweight ontology system to support the exchange of knowledge on the web. It integrates a variety of web-based metadata activities including sitemaps, content ratings, stream channel definitions, search engine data collection (web crawling), digital library collections, and distributed authoring, using XML as interchange syntax. RDF is the foundation for the Semantic Web envisioned by Tim Berners-Lee – an extension of the current web in which information is given well-defined meaning, to better enable computers and people to work in cooperation.
- **Web Services User Interface (WSUI)** – WSUI uses a simple schema for describing a WSUI "component" that can be used in a portal to call backend SOAP and XML services. WSUI uses XSLT style sheets to construct user facing views to enable users to interact with the services.

Data Management

Data management is the management of all data/information in an organization. It includes data administration, the standards for defining data and the way in which people perceive and use it.

Database Connectivity – Defines the protocol or method in which an application connects to a data store or data base.

Examples of Database Connectivity technologies include:

- **Java Database Connectivity (JDBC)** – JDBC provides access to virtually any tabular data source from the Java programming language. It provides cross-DBMS connectivity to a wide range of SQL databases, and other tabular data sources, such as spreadsheets or flat files.
- **Open Database Connectivity (ODBC)** – A database programming interface from Microsoft that provides a common language for Windows applications to access databases on a network. ODBC is made up of the function calls programmers write into their applications and the ODBC drivers themselves.
- **Active Data Objects (ADO)** – A programming interface from Microsoft that is designed as "the" Microsoft standard for data access. First used with Internet Information Server, ADO is a set of COM objects that provides an interface to OLE DB. The three primary objects are Connection, Command and Record set.
- **Active Data Objects .Net (ADO.Net)** – ADO.Net is the data access component of the Microsoft's .NET Framework. It provides an extensive set of classes that facilitate efficient access to data from a large variety of sources, enable sophisticated manipulation and sorting of data.

- **Object Linking and Embedding/Database (OLE/DB)** – A Microsoft low-level API designed to provide connections to different data sources. OLE/DB allowed connectivity to ODBC-based SQL providers/sources as well as other formats such as text and comma delimited.
- **Data Access Objects (DAO)** – DAO is the Microsoft library for accessing Microsoft Jet engine data sources such as Microsoft Office based applications. DAO is replaced by ADO and ADO.Net.
- **DB2 Connector** – An IBM connectivity API to access DB2 sources.

Reporting and Analysis – Consist of the tools, languages and protocols used to extract data from a data store and process it into useful information.

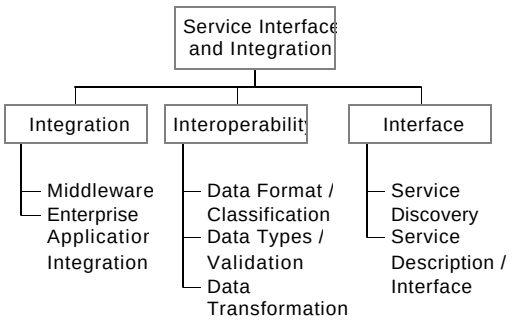
Examples of Reporting and Analysis technologies include:

- **Extensible Business Reporting Language (XBRL)** – Extensible Business Reporting Language (XBRL is an open specification which uses XML-based data tags to describe financial statements for both public and private companies.
- **Java Online Analytical Processing (JOLAP)** – JOLAP is a Java API for the J2EE environment that supports the creation and maintenance of OLAP data and metadata, in a vendor independent manner.
- **Online Analytical Processing (OLAP)** – Decision support software that allows the user to quickly analyze information that has been summarized into multidimensional views and hierarchies.
- **XML for Analysis** – XML for Analysis uses the Simple Object Access Protocol (SOAP) to let Web browser based programs access backend data sources for data analysis. The specification allows companies to build online analytical processing (OLAP) and data mining applications that work over the web.

6.4 Service Interface and Integration

The Service Interface and Integration Service Area, illustrated in Figure 16, defines the discovery, interaction and communication technologies joining disparate systems and information providers. SOAs leverage and incorporate Service Interface and Integration standards to provide interoperability and scalability.

Figure 16: Service Interface and Integration Service Area



The Service Interface and Integration Categories and Standards are defined below:

Integration

Integration defines the software services enabling elements of distributed business applications to interoperate. These elements can share function, content, and communications across heterogeneous computing environments. In particular, service integration offers a set of architecture services such as platform and service location transparency, transaction management, basic messaging between two points, and guaranteed message delivery.

Middleware – Middleware increases the flexibility, interoperability, and portability of existing infrastructure by linking or "gluing" two otherwise separate applications.

Examples of Middleware technologies include:

- **Remote Procedure Call (RPC)** – RPC is a protocol allowing a program on a client computer to invoke a program on a server computer.
- **Message Oriented Middleware (MOM): IBM WebSphere MQ** – Software solution providing APIs, queue management, message routing, automatic failover, and workload balancing. Message Oriented Middleware (MOM) is software residing in both sides of the client/server architecture providing support for asynchronous calls, or messages, between applications. Message queues are used to track and store requests waiting for execution by the source application. Messaging allows otherwise complex programming and networking details to be abstracted from the developer.
- **Message Oriented Middleware (MOM): Microsoft Message Queue (MSMQ)** –Software technology providing synchronous and asynchronous message queuing, routing, and security. Message Oriented Middleware (MOM) is software residing in both sides of the client/server architecture providing support for asynchronous calls, or messages, between applications. Message queues are used to track and store requests waiting for execution by the source application. Messaging allows otherwise complex programming and networking details to be abstracted from the developer.
- **Database Access: PL/SQL** – Oracle's procedural extension to industry standard SQL. Database Access provides access to and across multiple database technologies in a distributed environment. Database Access is provided through the use of native database Application Programming Interfaces (APIs), client side APIs, or server side database gateways.
- **Database Access: ISQL/w** – Microsoft's implementation of ANSI SQL. Database Access provides access to and across multiple database technologies in a distributed environment. Database Access is provided through the use of native database Application Programming Interfaces (APIs), client side APIs, or server side database gateways.
- **Database Access: OPEN ANSI SQL/92)** – SQL is the information processing industry standard language of relational database management systems (RDMS). ANSI X3.1351992 (also referred to as SQL92 and ANSI SQL) is the industry standard for Database Language SQL. This standard promotes the portability and interoperability of database application programs and facilitates maintenance of database systems across heterogeneous data processing environments. SQL92 provides a standardized way for embedding SQL statements into application development languages. Database Access provides access to and across multiple database technologies in a distributed environment. Database Access is provided through the use of native database Application Programming Interfaces (APIs), client side APIs, or server side database gateways.
- **Database Access: NET8** – NET8 (called SQL*NET prior to Oracle8) is Oracle's client/server middleware product that offers transparent connection from client tools to the database, or from one database to another. SQL*Net/ Net8 works across multiple

network protocols and operating systems. Previous versions referred to as SQL*Net. Database Access provides access to and across multiple database technologies in a distributed environment. Database Access is provided through the use of native database APIs, client side APIs, or server side database gateways.

- **Transaction Processing Monitor** – Software providing synchronous messaging and queuing along with other transaction management services designed to support the efficient processing of high volumes of transactions. Core services include load balancing, rollback/commit, and recovery. Transaction Processing provides cost-effective scalability to applications and database systems by managing and throttling transactions on behalf of the database system.
- **Object Request Broker (ORB): Common Object Request Broker Architecture (CORBA)** – An architecture that enables objects to communicate with one another regardless of what programming language they were written in or what operating system they're running on. Object Request Broker (ORB) is a technology enabling distributed objects to communicate and exchange data with remote objects. ORB encapsulates the locality and implementation of the objects, allowing users to develop applications that leverage components by accessing the Components interface.
- **Object Request Broker (ORB): Component Object Model (COM)** – A software architecture created by Microsoft to design and build component-based applications. COM object capabilities are accessible from exposed interfaces. Object Request Broker (ORB) is a technology enabling distributed objects to communicate and exchange data with remote objects. ORB encapsulates the locality and implementation of the objects, allowing users to develop applications that leverage Components by accessing the Components interface.
- **Object Request Broker (ORB): Distributed Component Object Model (DCOM)** – An extension of the Component Object Model (COM) that allows COM components to communicate across network boundaries. Traditional COM components can only perform inter-process communication across process boundaries on the same machine. Object Request Broker (ORB) is a technology enabling distributed objects to communicate and exchange data with remote objects. ORB encapsulates the locality and implementation of the objects, allowing users to develop applications that leverage components by accessing the components interface.
- **Object Request Broker (ORB): Component Object Model + (COM+)** – COM+ is an extension of the COM that provides a runtime and services that are readily used from any programming language or tool, and enables extensive interoperability between Components regardless of how they were implemented. Object Request Broker (ORB) is a technology enabling distributed objects to communicate and exchange data with remote objects. ORB encapsulates the locality and implementation of the objects, allowing users to develop applications that leverage components by accessing the components interface.

Enterprise Application Integration – Refers to the processes and tools specializing in updating and consolidating applications and data within an enterprise. EAI focuses on leveraging existing legacy applications and data sources so that enterprises can add and migrate to current technologies.

Examples of functions supporting Enterprise Application Integration for which technologies might be available include:

- **Business Process Management** – This process is responsible for the definition and management of cross application business processes across the enterprise and/or between enterprises.

- **Application Connectivity** – This process provides reusable, noninvasive connectivity with packaged software. This connectivity is provided by uni- or bidirectional adapters.
- **Transformation and Formatting** – This process is responsible for the conversion of data, message content, information structure, and syntax to reconcile differences in data amongst multiple systems and data sources.

Interoperability

Interoperability defines the capabilities of discovering and sharing data and services across disparate systems and vendors.

Data Format / Classification – Defines the structure of a file. There are hundreds of formats, and every application has many different variations (database, word processing, graphics, executable program, etc.). Each format defines its own layout of the data. The file format for text is the simplest.

Examples of Data Format / Classification technologies include:

- **Extensible Markup Language (XML)** – XML has emerged as the standard format for web data, and is beginning to be used as a common data format at all levels of the architecture. Many specialized vocabularies of XML are being developed to support specific Government and Industry functions.
- **XML Linking Language (XLINK)** – A language used to modify XML documents to include links, similar to hyperlinks, between resources. XLINK provides richer XML content through advanced linking integration with information resources.
- **Namespaces** – Namespaces are qualified references to URI (Uniform Resource Identifier) resources within XML documents.
- **Electronic Data Interchange (EDI)** – Defines the structure for transferring data between enterprises. EDI is used mainly used for purchase related information. ANSI X.12 refers to the approved EDI standards.

Data Types / Validation – Refers to standards used in identifying and affirming common structures and processing rules. This technique is referenced and abstracted from the content document or source data.

Examples of Data Types/Validation technologies include:

- **Document Type Definition (DTD)** – DTD is used to restrict and maintain the conformance of an XML, HTML, or SGML document. The DTD provides definitions for all tags and attributes within the document and the rules for their usage. Alterations to the document are validated with the referenced DTD.
- **XML Schema** – XML Schemas define the structure, content, rules and vocabulary of an XML document. XML Schemas are useful in automation through embedding processing rules.

Data Transformation – Data Transformation consists of the protocols and languages that change the presentation of data within a graphical user interface or application.

Example of Data Transformation technologies include:

- **Extensible Style sheet Language Transform (XSLT)** – Transforms XML document from one schema into another. Used for data transformation between systems using different XML schema, or mapping XML to different output devices.

Interface

Interface defines the capabilities of communicating, transporting and exchanging information through a common dialog or method. Delivery Channels provide the information to reach the intended destination, whereas Interfaces allow the interaction to occur based on a predetermined framework.

Service Discovery – Defines the method in which applications, systems or web services are registered and discovered.

An example of Service Discovery technology includes:

- **Universal Description Discovery and Integration (UDDI)** – UDDI provides a searchable registry of XML Web Services and their associated URLs and WSDL pages.

Service Description / Interface – Defines the method for publishing the way in which web services or applications can be used.

Examples of Service Description/Interface technologies include:

- **Web Services Description Language (WSDL)** – WSDL is an XML based Interface Description Language for describing XML Web Services and how to use them.
- **Application Program Interface (API) / Protocol** – A language and message format used by an application program to communicate with the operating system or some other control program such as a database management system (DBMS) or communications protocol. APIs are implemented by writing function calls in the program, which provide the linkage to the required subroutine for execution. Thus, an API implies that some program module is available in the computer to perform the operation or that it must be linked into the existing program to perform the tasks.

7 Data Reference Model

The FEA Data Reference Model (DRM) is intended to promote the common identification, use, and appropriate sharing of data/information across the federal government through its standardization of data in the following three areas:

- **Data Context** – A standard approach to representing taxonomies that an agency uses to categorize its data. Such categorization enables the business context of data to be well understood.
- **Data Sharing** – A standard approach to describing the characteristics and requirements of interagency data exchanges, including data sources. Defines a standard message structure known as an Information Exchange Package.
- **Data Description** – A standard approach to describing an agency's structured, semi-structured, and unstructured data. Structured data includes individual entities (such as those defined within a data architecture), their attributes, and the relationships between them. Unstructured data includes multimedia files, and documents created using earlier versions of applications such as Microsoft Word. Semi-structured data includes Web pages and e-mails.

In order to facilitate implementation of the DRM by federal agencies, OMB will provide agencies with a DRM Schema (also known as a "DRM XML Profile"). The DRM Schema will enable federal agencies to submit XML instances to OMB that contain information for the agency pertaining to the three DRM areas described above. The DRM Schema will also facilitate data modeling efforts within agencies by providing a capability by which – for example – physical data models may be derived from logical data models. Instances of the DRM Schema may also

potentially be used for configuration and operational purposes (e.g., to automatically configure and/or categorize a data source, to support service-oriented architecture (SOA) based exchanges between agencies, etc.).

The current published version of the DRM is undergoing revision. The FEA PMO is collaborating with members of the interagency DRM working group, chartered by the AIC, to further enhance and improve this reference model. The DRM structure described above is the updated description of the DRM based on the work being done by the FEA PMO and the interagency DRM working group. Because the new version of the DRM has not been completed, the latest published version is provided in this document for reference.

7.1 DRM Foundation

The DRM uses a flexible and standards-based approach to describe the categorization, exchange, and structure of data. The categorization of data is achieved through the use of the BRM as the organizational construct for identifying the data's business context. The exchange of data is facilitated through the information exchange package and describes a packaged set of data categorized into a message that can be re-used by other users. The specific standards associated with this concept will be defined in future volumes of the DRM. In the DRM, a common approach to the structure of data is realized through an adaptation of the ISO/IEC 11179 standard as a guide. This standard provides the structure by which data can be defined in terms of its business context. The common structure implements a basic set of constraints and requirements while providing agencies the flexibility to use the DRM in a way that is consistent with their own business needs.

The DRM addresses business needs through its common approach to the categorization, exchange, and structure of data. The following example illustrates the DRM's approach in the context of an example involving organizations that provide health services. Through this example, one can see how the common categorization, exchange, and structure of data will allow agencies engaged in health services to share data regarding a variety of topics in a common way.

7.1.1 Categorization of Data

Leveraging the BRM, categorization is achieved through the use of the BRM's sub-function. Use of the BRM's sub-function establishes the business context of a given set of data.

Note: The categorization of subject areas at the Line of Business (LoB) level does not imply that data is applicable only within a line of business. Future volumes of the DRM will address the categorization and exchange of data across LoBs.

Line of Business: Many organizations within the federal government provide services that contribute to the health of citizens and residents of the United States of America. These organizations are part of the Health LoB within the Services for Citizens business area (from the BRM). The LoB represents organizations that have a common business or program interest. The organizations in this case include federal programs and activities that ensure and provide for the health and well-being of the public.

Note: Line of Business categories are obtained from the BRM.

Subject Areas: Organizations within the Health LoB perform many business activities. One of these activities is population health management and consumer safety; this is equal to the DRM's subject area. The subject area is the first element used to represent the business

context of a particular set of data. Population health management involves activities associated with the management and monitoring of health, health planning, and health management. Population health management is a sub-function and is located under the Health LoB within the BRM. BRM sub-functions are supported by lower-level activities that represent more detailed views of the business function. For example, immunization is an activity supporting the BRM sub-function of population health management.

Note: Sub-functions are obtained from the BRM.

Super Types: Super types represent lower level business activities that represent data that is used in support of the subject area. Super types provide an additional level of detail regarding the subject area. For example, the super type is immunization which represents an activity in support of the population health management subject area.

Note: Super types are obtained from agency EA. Future volumes of the DRM will address the process of identifying super types from agency EAs.

7.1.2 Exchange of Data

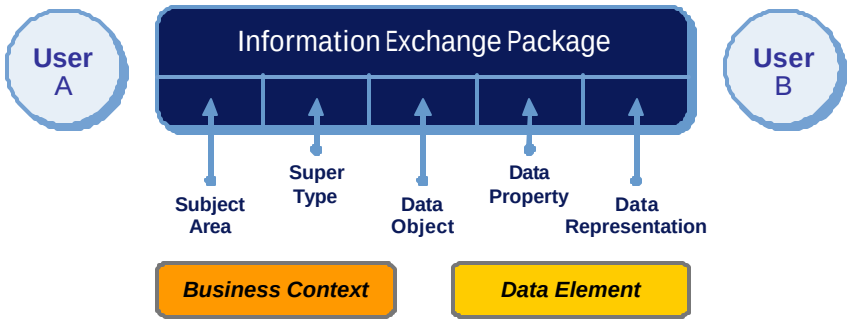
Data that is categorized around a particular business context can be exchanged in support of a business function or process. The DRM uses the information exchange package as a structure to enable the exchange of data:

Information Exchange Package: The information exchange package represents a set of data that is transmitted for a specific business purpose. It makes use of the ISO/IEC 11179 concept of Information Interchange.

The information exchange package is used to fulfill business requests that make use of agency business processes. In this scenario, the information exchange package provides data resulting from a business process that is engaged in supporting the population health management BRM sub-function. The actual content of the information exchange package is dependent upon the particular business process accessed. In this case, it could communicate information about immunization records and/or disease characteristics.

Figure 17 illustrates the information exchange package concept. Future volumes of the DRM will continue to expand on the definition and scope of the information exchange package.
Note: The information exchange package can apply to data that is transmitted or to data that is shared or retrieved.

Figure 17: Information Exchange Package



7.1.3 Structure of Data

Structured data has the standards and definitions necessary to describe the data that is associated with a business context. The ***Data Element*** concept is used to structure data within the DRM. To clarify the business context of a particular set of data, the subject areas and super types of the data set are supported by additional levels of detail described within the data element. A collective set of three layers, the data element enables a more accurate description of the business purpose of the data. It is consistent with the ISO/IEC 11179 standard and includes a ***Data Object***, a ***Data Property,*** and the ***Data Representation***. In practical terms, the data element provides a set of information that is used in a given business context.

Data Element: A data element is a representation of a data object, a data property, and a data representation. The data element defines a particular concept or item that is of interest within the super type.

Data Object: In describing the super type of immunization, it is necessary to more specifically define the particular concept or item that is of interest within the immunization super type. This item is called a data object, and, in this scenario, represents a vaccine. The vaccine represents a particular item of interest within the super type of immunization.

Data Property: The DRM uses a data property to distinguish or describe the actual vaccine. The data property represents the elements used to describe an object and can include characteristics such as type, weight, potency, etc. In this scenario, the data property is the name of the vaccine.

Data Representation: The DRM uses a data representation or value domain to represent the type of value that can be associated with the data element. Representation values can include integers, whole numbers, dollars, etc. In the case of vaccine, the value is plain text.

7.1.4 Security and Privacy

The successful categorization, exchange, and structure of data are dependent on the implementation of security regarding the data being exchanged. Security requirements must be considered at each level of the DRM and, in particular, regarding the exchange-of-data transaction. The DRM is designed to allow for the integration of existing federal information security and privacy policies within each of its elements. It provides for this integration through its common approach and use of standards. Table 1 generally describes the relationships between the DRM and several sets of security/privacy policies and legislation.

Table 1: DRM - Policy and Legislation Relationships

Federal Information Security Management Act (FISMA) (see Title III – Information Security)	Entire Model	FISMA applies to all levels of the DRM. FISMA requirements are applicable to the data of a classified or unclassified information exchange package.
National Institute of Standards and Technology (NIST) FIPS (See NIST FIPS 199)	Entire Model	FIPS standards can be applied to specific data elements and the information exchange packages used to exchange them.
E-Government Act of 2002 (see Title III, Section 208 – Privacy Provisions)	Entire Model	The DRM's approach to the categorization, structure, and exchange of data are consistent with the requirements of the E-Government Act privacy provisions.

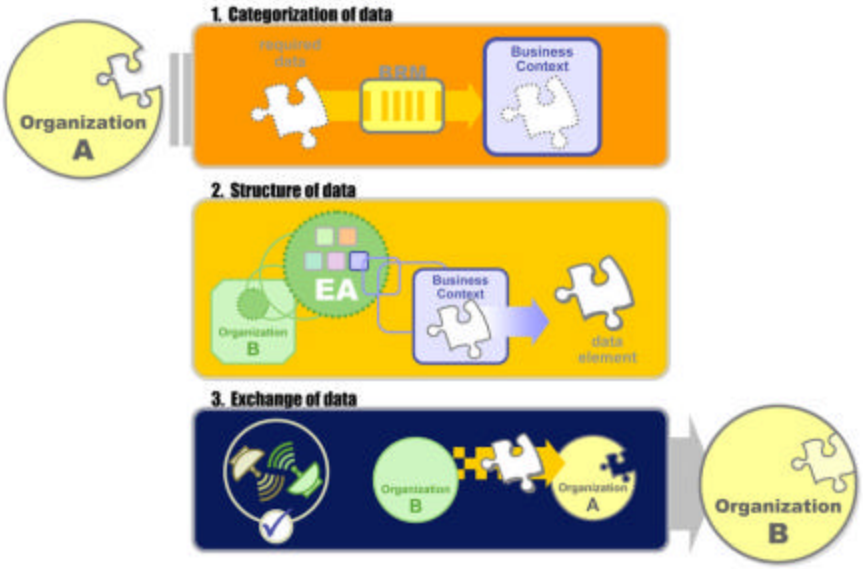
OMB Circular A-11 (see Section 31-8)	Entire Model	Effective use of the DRM within an agency's EA ensures that security is applied correctly at the data element and information exchange package level.
NIST 800-60 (see Volume I)	Entire Model	The use of agency-common information and agency-specific information is supported through the business context, information exchange package, and data element layers of the DRM.

7.2 Use of the DRM

A conceptual process to identify data commonalities across agencies (using the DRM) helps illustrate the context in which agencies use the DRM. The process uses an agency's EA in combination with the DRM's common approach to the categorization, exchange, and structure of data to share information. This section offers a potential collaboration process (

Figure 18) and the results of a pilot conducted by the Department of the Interior (DOI) to demonstrate how the DRM might be used.

Figure 18: DRM Collaboration Process



7.2.1 Collaboration Opportunities

Collaboration opportunities can be identified through the DRM's approach to the categorization, exchange, and structure of data. The process illustrated in Exhibit 26 lays out (at a conceptual level) the steps an agency might go through in its use of the DRM. In this scenario:

Organization B determines that it has the need for a particular set of data that might be available from Organization A.

Organization A uses the DRM to categorize its data (using the BRM) into a business context.

Organization B identifies Organization A's available data through its business context.

Organization A uses the DRM to publish the detailed structure of the actual data element (in support of the business context).

Organizations A and B determine if, in fact, the data produced by Organization A will meet the needs of Organization B.

Once Organizations A and B determine that the data can be re-used, the information exchange package is used to transmit the data.

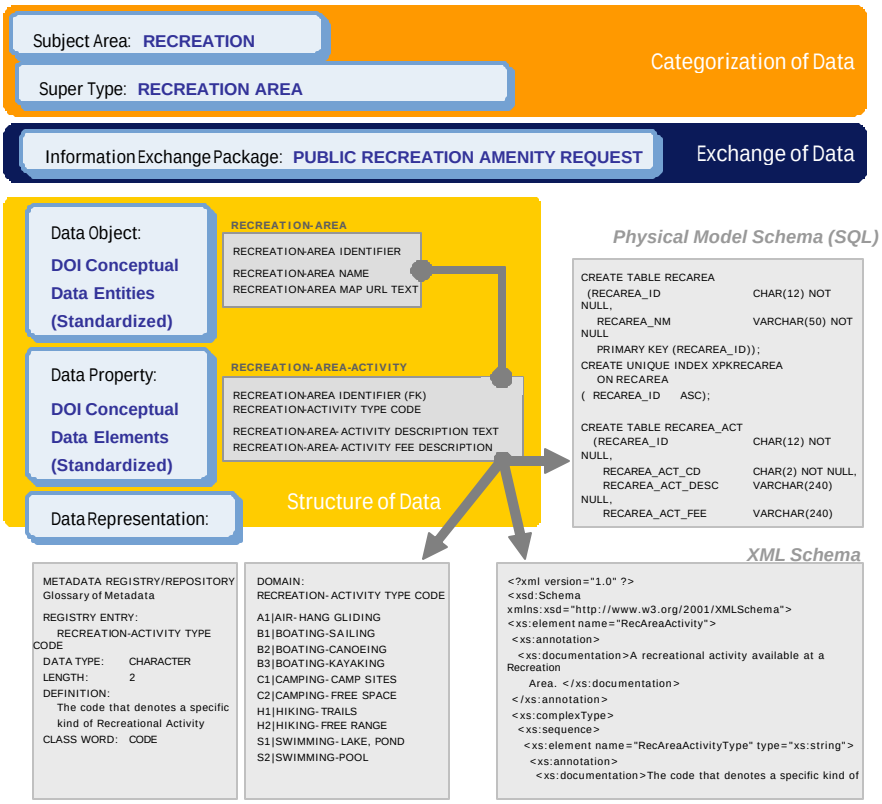
Although the process illustrated in

Figure 18 is simplistic in nature (and it will likely require a level of detail on the part of the organizations seeking to share data), it does provide a conceptual view to the steps an organization might take in order to use the DRM.

7.3 Department of the Interior (DoI) Pilot

The pilot conducted by DoI in Figure 19 provides a perspective on how the DRM might be used to improve the ability to share information and efficiently use IT investments. DoI's pilot uses the DRM to share information regarding its recreational amenities in a common approach that can be easily interpreted and employed by many users. Users who wish to take advantage of DoI recreational information need only understand the DRM to understand and use DoI data properly. Figure 19 illustrates the DoI pilot and the use of the DRM's common approach to the categorization, exchange, and structure of data. This diagram also describes the use of actual data models (schemas). These schemas represent a potential view of the implementation of an information exchange package. Future volumes of the DRM will define in more detail the relationship of schemas to the information exchange package. The DoI pilot demonstrates the potential outcomes provided by the DRM. The pilot's use of the DRM is described in the following sections.

Figure 19: DoI Pilot



7.3.1 Categorization of Data

DOI used the DRM to categorize data through the identification of activities performed within the recreational resource management and tourism sub-functions of the BRM. With the BRM categorization identified, DOI further identified a super type of "recreation area." This super type is a more detailed categorization of the type of data consumed/produced through this business function.

Exchange of Data

Defining data in common terms related to the request of a public amenity enables it to be shared with other users. By using the DRM's approach to the exchange of data, DOI identified a set of information (information exchange package) that directly supports the request for a recreational amenity. DOI used the DRM's categorization approach to relate the information exchange package to a particular business context, and then made it available as a re-usable set of data.

Structure of Data

After using the categorization approach to identify the subject area and super type, DOI used the DRM's common approach to identify the data elements. The data element includes the data object (names of the recreational areas), data property (the types of recreation activities aligned with specific recreational areas), and data representation (specific value of the data element).

7.3.2 Potential Outcomes of the DOI Pilot

Information Sharing

Information sharing related to recreation areas is facilitated because users understand the categorization, exchange, and structure of the data needed to satisfy their business needs. In the pilot, DOI creates information about its recreation areas and the many activities available within them. An agency that wants to make a recreation amenity request would, for example, look in the BRM for a sub-function that describes the activity it is seeking (recreational management and tourism). Once the agency knows the sub-function, it can use the Federal Enterprise Architecture Management System (FEAMS) to identify investments currently supported by DOI that provide recreational-amenity management capabilities. With the investments identified, the agency can work with DOI to determine whether the functions and data supported by the investment meet its needs. Once this is confirmed, the information exchange package would be used to actually transmit the request from the agency's systems to the DOI systems that manage recreational amenities. Once the DOI data is made available to multiple users, it increases the department's ability share information.

Improved Effectiveness of IT investments

The DOI pilot illustrates how an agency might improve the effectiveness of its IT investments by making the data produced by its investments available to others. The DRM's common approach to data categorization, exchange, and structure provides a mechanism whereby an agency does not need to create a new investment when the data it requires is available from another source. Agencies engaged in the DOI pilot now have a common way to describe the business purpose of the data required by their uses and agencies participating in the DOI pilot can re-use the various existing IT investments to meet its business needs.

7.4 DRM Roadmap

Future volumes of the DRM will continue to address the standardization areas necessary to promote a common approach to the categorization, exchange, and structure of data. This is advanced through a focus on three areas:[9]

- ***Information Management*** - Use of data and information in support of business operations
- ***Information Architecture*** - Definition of the data linked to specific business operations (functions)
- ***Information Exchange*** - Standard, repeatable processes and technologies in support of exchanging data

Figure 20 illustrates the DRM roadmap in context of these focus areas.

Figure 20: DRM Roadmap

	Content	DRM Volumes I	II	III	IV
Categorization of Data	**Information Management**				
	Business Context				
	Use of DRM in EA				
	Information Indexing				
	Security of Data				
	Data Standardization Requirements				
Exchange of Data	**Information Exchange**				
	Core DRM Elements				
	Information Exchange Package				
	Federated Data Classifications				
	Data Patterns				
	Data Exchange Requirements				
	Metadata Requirements				
Structure of Data	**Information Architecture**				
	Data Element Definition				
	Information Categories				
	Data Groups				
	Process-based Attributes				
	Data Structures				

Each future volume of the DRM will address different topics within the various focus areas. All topics addressed in future volumes of the DRM will continue to advance the common approach to the categorization, exchange, and structure of data. Each topic is described in Table 2.

[9] The focus areas are adapted from, *The Three Pillars, an Adaptation of Information Management and Data Quality*, by Bryan Aucoin, Panel 1, proceedings of the Eighth International Conference on Information Quality, (ICIQ-03)

Table 2: DRM Future Volume Topics

I	**Business Context**	**Business Purpose of Data**
	Core DRM Elements	Approach to the categorization, exchange, and structure of data.
	Information Exchange Package	Common approach to the exchange of information between units of work. Units of work represent consumers and producers of data.
	Data Element Definition	Categorization and identification of the actual data used in support of a given business context.
II	Use of DRM in EA	Use of the DRM in investment and collaboration decisions.
	Information Indexing	Approach to the indexing of information. Cataloging of information ensures that information is available to its many consumers.
	Federated Data Classifications	Approach to identifying commonalities and opportunities for re-use (at the data level).
	Information Categories	Detailed definition and standards associated with the categorization and structure of data.
III	Security of Data	Information protection, assurance, and privacy.
	Data Patterns	Define data groups (tables, records, messages, text) and attributes that reflect business process needs.
	Data Exchange Requirements	Define data transformation patterns and key attributes that facilitate the sharing of information.
IV	Metadata Requirements	Define the data required to provide or support a specific community of interest or LoB.
	Data Structures	Detailed data design and format requirements.
	Data Standardization	Detailed data composition and requirements.

8 Contact Information

The FEA reference models will be modified periodically as conditions evolve and additional agency architecture information is provided. If there are any questions regarding the FEA reference models or suggestions for future enhancements, send a detailed email to fea@omb.eop.gov.