FSA Integration Partner

United States Department of Education

Federal Student Aid

Data Strategy Enterprise-Wide Technical Strategies: 123.1.12 Technology Vision and Strategic Plan

Task Order #123

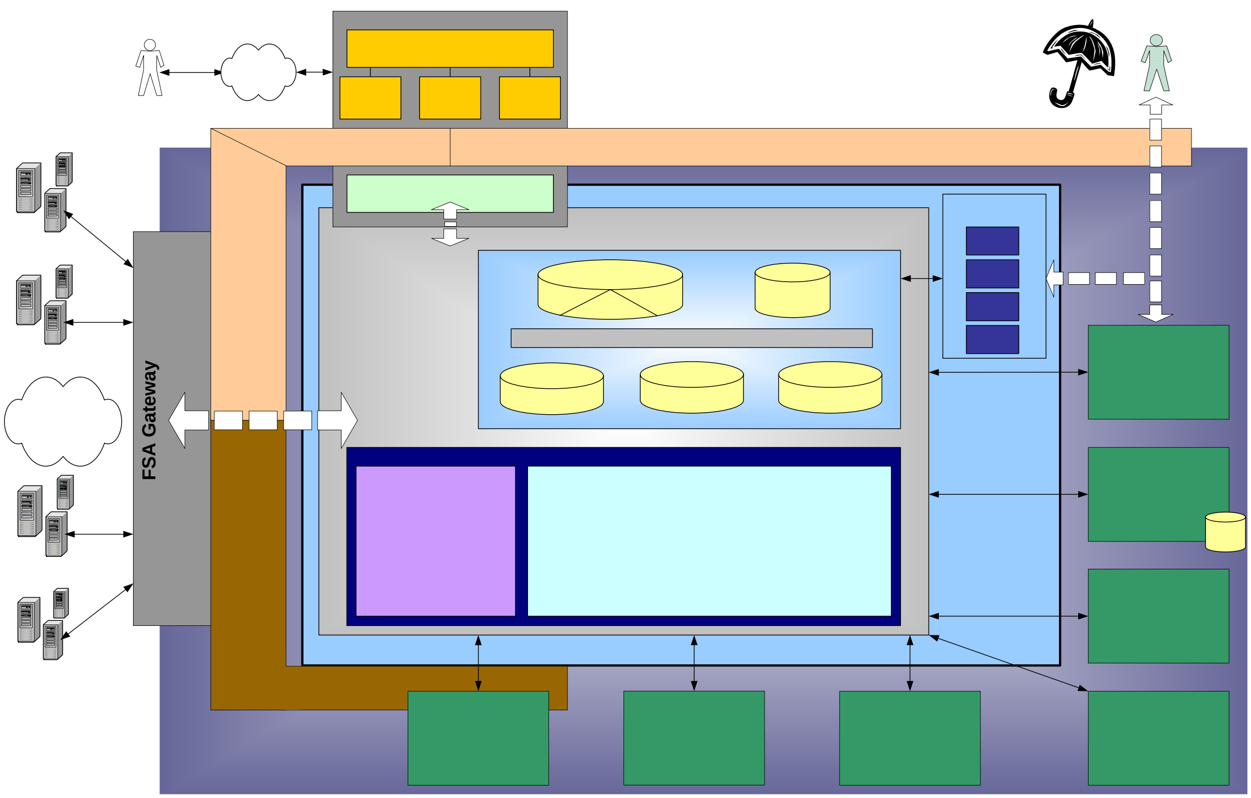
Version 1.0

November 14, 2003

Executive Summary

The Data Strategy initiative outlines a target-state to support FSA's strategic objectives to improve program integrity, provide better service to customers, integrate FSA systems and provide new technology solutions. The vision is comprised of business, data, and technology recommendations. The ability to combine business process and supporting data into a single vision is facilitated by improved technology. The Technical Strategies initially focused on the individual components of the Target Conceptual Architecture to ensure that each component meets the current and future needs of FSA. Integration of these components strengthens the value they can provide by enabling a target state that supports more consistent, accessible, and accurate data. Additionally, continual review of business objectives and business scenarios helps to ensure that technology concepts are grounded with real-world business applicability.

The "To-be" Data Flows delivered in the Technical Specification (Deliverable 123.1.4) outline the evolution of business processes from today's system-to-system exchange, to a more business process-driven environment. This includes a change in system processing, data movement and data storage. The movement to a Common Data Architecture where front-end data is consolidated and enterprise-wide data is accessible through shared services supports this business evolution. Below is the Target Conceptual Architecture that outlines the interplay between the various technical enablers that make the business and data target-state visions possible and represents the culmination of the technical strategy recommendations:



Target Conceptual Architecture[1]

[1] Ancillary services, administrative services (HR, training, etc.) and call centers are not depicted above.

This Target Conceptual Architecture outlines a number of changes from today's current state. The following key technical recommendations are the foundation of the target-state vision:

1. Implement the Common Data Architecture (CDA)
2. Enable a Service-Oriented Architecture (SOA)
3. Consolidate System and Web Access to FSA Content and Services

Key Technical Recommendation	Benefits Achieved
1. Implement the Common Data Architecture • Consolidate front-end operational data storage • Create an enterprise data warehouse • Provide improved access to enterprise data	• Reduction of system-to-system front-end data transfers • Elimination of redundant data storage • Improved data quality

The CDA is founded on the consolidation of FSA's front-end storage and the creation of an enterprise data warehouse. The front-end storage will support day-to-day processes, while the data warehouse will serve as the enterprise-wide source for analytics and reporting.

Key Technical Recommendation	Benefits Achieved
2. Enable a Service-Oriented Architecture • Use shared functions to eliminate redundancy • Consolidate data exchange • Standardize methods and formats used in data exchange	• Improved responsiveness to changing external requirements • Simplified data exchange • Elimination of redundant business functionality

A service-oriented architecture will enable FSA to shift from a system-focused environment to one in which core business logic is available in a shareable format that can be reused across the enterprise. This will allow FSA to provide centralized access to business capabilities. Key differences between today's integration environment and the target-state are outlined in the figure:

Current Architecture	Service-Oriented Architecture
Functionally Oriented	Process Oriented
Inflexible	Designed to Change
Long Development Cycle	Interactive Development and Deployment
System Focused	Business Focused
Varied Levels of Coupling	Loosely Coupled

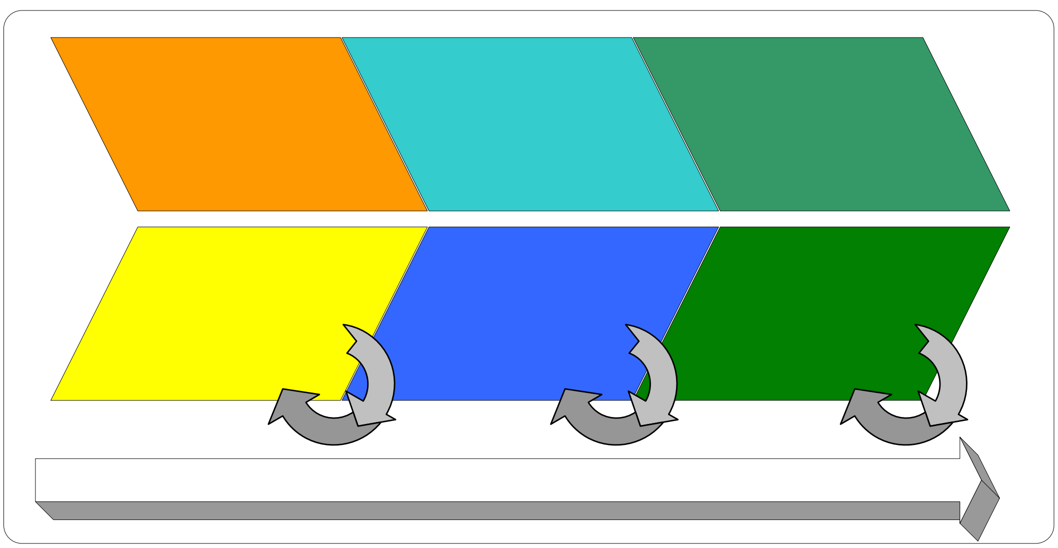
Key Technical Recommendation	Benefits Achieved
3. Consolidate System and Web Access to FSA Content and Services • Consolidate external access via FSA Gateway • Improve end-user communication through Web portals	• Improved visibility to transaction flow with external partners • Improved customer satisfaction • Uniform, marketable Web presence

The FSA Gateway and Web Access combine to form the primary interface between FSA and its external customers and partners. The FSA Gateway provides a consolidated virtual entry point for external systems to interact with FSA in a consistent method. FSA's primary interaction with individuals outside the organization will occur through a consolidated Web portal environment. This portal environment will provide a flexible interface for individuals to interact with FSA and access its available content and services. These two interaction points will extend the benefits and capabilities provided in the data consolidation and Service-Oriented Architecture (SOA) recommendations to the external community.

These recommendations are the individual pieces that, when combined, create the overall FSA Technology Vision. Each individual component aims to provide new or improved methods for FSA to run its business. The separate recommendations, however, are part of a cohesive vision to realize the organization's strategic goals. The implementation of each, affects the other components; therefore, the interrelationships between the technical initiatives must be closely managed.

Strategic Approach:

Technology implementations must be driven by business needs and requirements. Therefore, when outlining a strategic approach it is important to align the technology decisions with the business process evolution. The following figure outlines the key desired business changes and their corresponding technical improvements:



Technology Vision Phasing

Business value can be realized in each phase of the process. Phase Three will represent the culmination of new capabilities, but iterative benefits are achieved throughout the life-cycle. These technical phases are ordered to deliver fundamental capabilities earlier in the process. The earlier capabilities will serve as fundamental building blocks, upon which, more advanced initiatives can be built. The consolidation of data will create a centralized environment where FSA can store much of the information it uses to support day-to-day processes. Each step in the strategic approach requires detailed evaluation. Understanding the high-level dependencies for each phase provides a starting point for addressing risk mitigation:

	Phase One Data Architecture	**Phase Two** Improved Access	**Phase Three** Service-based Integration
Technical Components	Implement the Common Data Architecture (CDA): • Centralize operational and analytical data • Deploy cross-business process analytical and research capabilities • Deploy key shared functions to enable data consolidation and data quality improvements	Improve Individual and System Access: • Individuals: Improved Web experience and functionality • Systems: FSA Gateway enabling standardized data feeds with external systems	Move to Service Oriented Architecture (SOA): • Implement enterprise shared services for both internal and external systems • Consolidate FSA's integration capabilities to enable reusable pieces of business functionality
Dependencies	• Clearly-defined stewardship of data • Technology Infrastructure to support both operational and analytical needs • Understanding of analytical needs across the enterprise to define end-state reporting solution	• Communication of impact to trading partners • Alignment with security policy and enrollment and access management strategy • Evolution of FSA's brand without impacting ability to do business during transition phase	• Ability to identify and extract redundant business logic from systems • Capability to handle diverse operating platforms and exchange protocols • Established governance capability to define and enforce standard data formats and definition

The strength of the Data Strategy recommendations lies in the fact that they have been vetted against FSA's business objectives, processes, data requirements, and supporting technology. Each layer of the conceptual architecture must align with FSA's strategic objectives but also adhere to guiding principles grounded in industry, government, and technology successes and trends. The Technology Vision and Strategic Plan offers a springboard from which detailed planning can occur. Additionally, it outlines a conceptual end-state that enables the dissection of the various solution components into pieces to be further pursued. Ultimately, every change should yield business value and there should be a return on investment to justify the journey towards the target state. The importance of the relationships between business, data and technology should not be underestimated. If considered across the enterprise, they enable the evolution to a more streamlined, flexible, and process-driven business that increases the integrity, quality, and reuse of FSA's data. Simply stated, the goal of this enterprise solution is to get the right data to the right people at the right time.

Amendment History

DATE	SECTION/ PAGE	DESCRIPTION	REQUESTED BY	MADE BY
11/14/03	All	Document submitted for FSA-wide review.	N/A	K. Michl

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Tables and Figures

1 Introduction

1.1 Purpose

The purpose of the Technology Vision and Strategic Plan is to outline recommendations and direction to create a consolidated, enterprise-wide vision that enables key FSA business objectives. The vision includes key FSA strategic initiatives and the technical enablers necessary to realize the end state. This document also outlines a strategic approach that includes implementation guidelines and project dependencies that need to be considered to achieve FSA's target vision. The Technical Architecture works collectively with the business and data architectures to establish an enterprise-wide Data Strategy. The business and data architectures have been defined in detail in the Data Framework Specification (Deliverable 123.1.4). This document reviews, refines, and consolidates the previous technical strategy recommendations and outlines how the Technical Architecture supports FSA's enterprise business processes and corresponding data flows across the lifecycle of the financial aid process.

1.2 Background

The Department of Education's Federal Student Aid (FSA) organization created several action items within the Fiscal Year 2003 FSA Annual Performance Plan that relate to the organization's need to deliver overall improvements in the areas of data quality and data consistency. These improvements are needed to ensure that accurate and consistent data is exchanged between FSA and its customers. Furthermore, FSA has recognized that its business can benefit by providing better access to the data that supports the service capabilities it delivers. Specifically, the Data Strategy initiative has been tasked with addressing Performance Plan Action Item 16: "Define an enterprise-wide data strategy and implementation approach that addresses the business flow of data across the enterprise, architecture, primary ownership, standards, management, access methods and quality." Additional drivers behind the Data Strategy effort stem from FSA's Strategic Business Objectives as presented by the Business Integration Group (BIG) Vision Framework:

1. Integrate FSA systems and provide new technology solutions.
2. Improve program integrity.
3. Reduce program administrative costs.
4. Improve human capital management.
5. Improve products and services to provide better customer service.

To address the various sub-components within Action Item 16 and enable FSA's Strategic Objectives, the Data Strategy team created a number of strategies and high-level design solutions by addressing the components outlined below:

- Data Framework
  - Data Quality
  - Data Stewardship
  - Data Flows and Business Process Alignment

- Enrollment and Access Management for Trading Partners
- Common Identifiers
  - Routing Identifier (RID) for Trading Partners
  - Standard Student Identification Method (SSIM)
- Technical Strategies
  - Internal and External Data Exchange
  - Web Services
  - Web Usage
  - Data Storage, Management, and Access
- XML Framework and Core Components

To better understand FSA's business and develop the target vision, business objective gathering sessions were conducted with key FSA stakeholders. The goal of these sessions was to collect information for each key area and develop a direction for the future state of FSA's business capabilities. The Business, Data and Technical Architecture recommendations that evolved from these working sessions allowed the Data Strategy team to develop a technical vision that aligned with business owners' requirements, changes in business processes and cross-lifecycle enterprise needs.

The Technical Strategies component of the Data Strategy effort reviewed technical capabilities that could fill the identified gaps between the current state and future vision. The Technical Strategies in collaboration with the other Data Strategy initiatives and with consideration of ongoing projects at FSA developed the Target Conceptual Architecture that is reviewed in this document.

1.3 Scope

The goal of this document is to present an enterprise-wide technical strategy to achieve FSA's top priority business objectives. The key items that this document will present include:

- An overview of the Data Strategy recommendations and proposed direction
- Integration considerations across the Data Strategy effort
- A conceptual architecture that enables the target vision
- Phasing guidelines and technical dependencies for achieving FSA's vision

1.4 Assumptions

The following assumptions have been factored into the scope for the Technology Vision and Strategic Plan:

- FSA's target state represents a long term vision; however, there is tangible value in achieving short term successes through phased implementations towards the future state.
- As FSA's business evolves, additional requirements and a further review of the current state may be needed before high-level designs can be completed.

- Ongoing project initiatives that may have an impact to FSA's future direction have been considered when possible in the overall Data Strategy recommendations.
- FSA has accepted and approved the initial direction outlined in previous Data Strategy deliverables. These concepts contain the building blocks from which FSA's future state can be formulated.

1.5 Business Objectives

The goal of the enterprise target state vision is to not only address FSA's Annual Performance Plan Action Items but also provide the core enablers for broader FSA business objectives. The Technical Architecture proposed in this document seeks to enable FSA to achieve its business objectives and realize the following business goals as outlined in the BIG Vision Framework (Appendix A):

- Make it easier for our customers to do business with us.
- Maintain right and effective levels of oversight through the combination of enhanced tools and customer self-monitoring.
- Run the business to enable right actions, right transactions to the right people.

The technological solutions supporting the business capabilities must adapt to changes in the business processes. As FSA migrates away from system-focused application development to more of an enterprise view of business processes, the tools and technology associated with the delivery of financial aid services must adapt with it to provide a more integrated solution. In the end, the ultimate goal is to find the right balance between the efficient delivery of financial aid and effective oversight of the resources that enable the business and FSA's ability to monitor interactions with its customers.

2 Business Architecture

A business architecture should outline how an enterprise accomplishes its mission. Accordingly, the components of FSA's Business Architecture should illustrate how the delivery of Title IV aid is managed and monitored. These components are the business capability areas (i.e., high level divisions of FSA's business) and business functions (i.e., the duties for which a business area is responsible). The business functions create both the student/borrower and trading partner business processes defined by the FSA financial aid lifecycle.

2.1 *Current State*

Business functionality is maintained on a system-by-system level with little sharing of common processing between systems. This siloed nature of the business architecture relies on application-specific implementations of business functions and requires systems to shuttle pieces of information across the enterprise as a borrower progresses through the aid lifecycle. Furthermore, the architectural solution employs a multitude of proprietary interfaces for system-to-system data exchange, including several different connectivity points with external trading partners. These elements contribute to the following gaps that exist between the current state and FSA's future business objectives:

- Limited business owner and user visibility into enterprise data and cross lifecycle borrower information (e.g. customer status)
- Redundant sharing and maintenance of data and business functions between applications
- Limited ability to have consistent information from analytics that can support a variety of business decisions

Additional issues with the current process were identified during the Mad Dog sessions hosted by the Data Strategy team. The detailed conclusions of these meetings can be found in Data Quality Mad Dog Report (Deliverable 123.1.3).

Below is a table that outlines the FSA business functions for each lifecycle phase and the systems that perform them. This represents the current state of FSA's business processes. Important information to note is the redundancy that is caused by the number of different system interactions that are needed to support a single lifecycle phase. For instance, the Postsecondary Education Participants System (PEPS), Financial Management System (FMS), and eZ-Audit are examples of some key systems that contribute to the Institution Participation lifecycle phase.

Lifecycle Phase	Process Step	Key Internal System(s)	As-Is FSA Enterprise Functions
Aid Awareness	Aid Education	CPS (FAFSA), Portals	Provide Aid Education Information

Lifecycle Phase	Process Step	Key Internal System(s)	As-Is FSA Enterprise Functions
Application	Submission	CPS (FAFSA)	Receive Application
		CPS, PIN	Process ED PIN requests & distribute ED PIN
	Eligibility	CPS	Send/Receive from matching agencies (SSA, SS, INS, etc.)
		CPS, COD, NSLDS	Match against NSLDS student data (FAH)
		CPS	Computation Edits - EFC
		CPS	Generate ISIR/SAR
		CPS, NSLDS	Distribute Eligibility
		CPS	Distribute ISIR
		CPS	Distribute SAR
		NSLDS	Perform requested Transfer Monitoring
Delivery	Origination & Disbursement	COD	Process Promissory Notes
		COD	Receive and Validate Direct Loan and Pell Originations
		COD	Receive and Validate Direct Loan and Pell Disbursements
		COD, FMS	Substantiate Federal Aid Payments to Schools
		COD, FMS	Manage Funding Levels
		COD	Run PLUS Borrower Credit Check
		FMS	Process State Agency LEAP/SLEAP
		eCB, FMS	Process FISAP/Campus Based Funds
		NSLDS	Manage Grant and Loan Tracking (disbursement, payment, overpayment) for FFEL, Direct Loan, Pell Grant, and Campus Based Aid
		NSLDS	Manage Transfers records for FFEL, Direct Loan, Pell Grant, and Campus Based Aid
Institution Participation	Partner Application	PEPS	Process School Application to participate in Title IV programs (eAPP)
		eCB	Process School Application to participate in Campus Based programs (FISAP)
		FMS	Process Lender Application & Provide LID for new eligible lenders
		FP Channel Updates, FMS, PEPS, NSLDS	Process GA & State Agency participation changes (State Governor or Non-Profit letters initiate)
		PM, SAIG	Process initial partner enrollment
		PM, SAIG	Process enrollment change requests
		PM, SAIG	Distribute participant file
	Oversight	All Systems	Maintain Partner Relationships
		PEPS	Recertify Institutions
		PEPS	Distribute Institution Eligibility/Review Information
		FMS (LaRS)	Modify Lender Profile Information and Lender Status
		eZ-Audit	Process Institution Financial Statements
		eZ-Audit, PEPS	Process Institution Audits
		PEPS	Process School Eligibility changes (including accrediting agencies
		PEPS, FP Data Mart	Monitor Partners (Case triggers, program reviews, risk scores)
		NSLDS, PEPS	Establish and Distribute Default Rates (CDR)

Lifecycle Phase	Process Step	Key Internal System(s)	As-Is FSA Enterprise Functions
		NSLDS, FMS	Process Partner Invoice (GAs – AMF, LPIF, Forms 2000, and Lenders – 799)
		COD, eCB	Process Schools' ACA Payments
Servicing	Repayment	NSLDS	Collect and Maintain Perkins, DL and FFEL Servicing Information
		NSLDS	Collect and Maintain SSCR information
		NSLDS, DLSS	Perform Entrance & Exit Counseling
		DLSS, COD, DLCS, DMCS	Initiate Loan Servicing/Book Loans
		DLSS	Setup ICR plan - Validate Borrower income via IRS
		DLSS, NSLDS, CMDM	Maintain Borrower Enrollment & Loan Status
		DLSS	Produce Borrower Bills
		DLSS, FMS, CMDM	Process Borrower Remittance
		DLSS, Delinquent Loan DM	Manage Delinquency
		CDDTS, DLSS	Track Conditional Disability Discharges, Death, Bankruptcy
	Consolidation	DLCS	Process Applications for Consolidation
		DLCS	Run PLUS Borrower Credit Status Check
		DLCS	Certify Underlying loan information
		DLCS	Underwrite P-Notes/Establish Consolidated Direct loans
		DLCS, FMS	Pay Off underlying loans
		DLCS, FMS	Set up partner EFT Accounts
	Collections	DMCS	Receive Assigned Loans/Establish Collection Accounts
		DMCS	Assign Defaulted Loans to PCAs
		DMCS, FMS	Perform Normal Collections & Handle Remittance
		DMCS	Perform Forced Collections (TOP - Treasury Offset Program, Wage garnishments)
		DMCS	Notify/Report Default Information
		DMCS	Perform Skip tracing
All	All	Various Systems, Ombudsman	Analytics and Research
		FMS	Financial Management Functions and GL Accounting
		Various Systems	Edit Checks
		Various Systems	Authentication & Access Management (Access Control & Identity Management)

Table 1 - Business Architecture Current State Summary

A review of data, business and technical architecture ensures that the most appropriate collective change can be implemented to not only eliminate current problems but also accommodate future growth and business requirements. The target state outlined in the following section takes into consideration the above business processes and the issues identified during the Mad Dog sessions.

2.2 *Target State*

To achieve its strategic business objectives, FSA recognized the need to restructure its business model and align like business functions into logical groupings. The goal of this effort was to streamline its business processes, allow FSA to more efficiently administer financial aid and improve interactions with customers and trading partners. The vision outlined below was created by the Business Integration Group (BIG). This diagram was created through a series of business integration visioning meetings, which defined the enterprise's business capability areas and business functions. The diagram outlines the realignment of business functions to better enable FSA to do business and share capabilities across the enterprise:

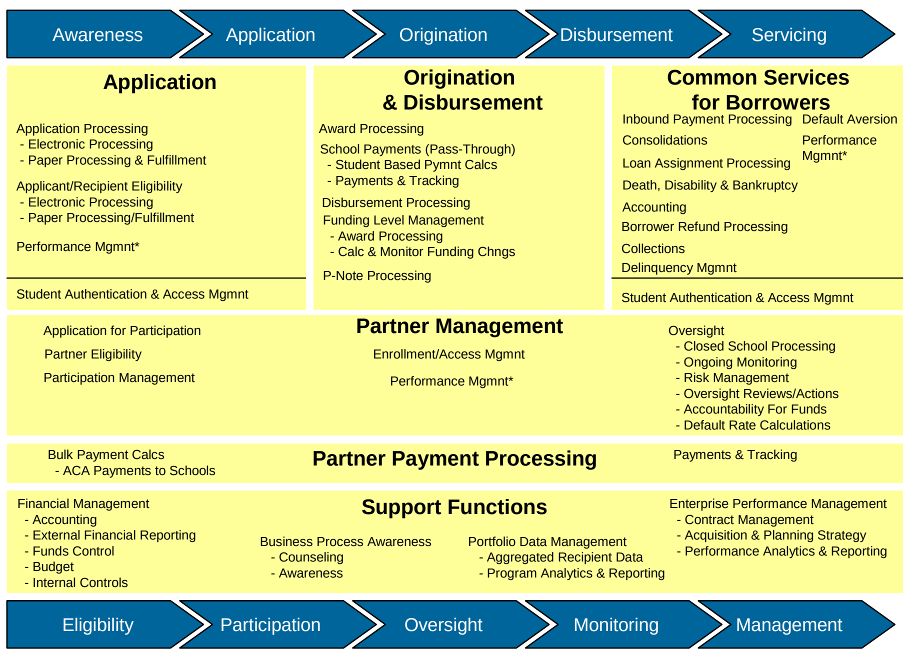

Figure 1 - FSA Business Function View Diagram

The FSA Business Functions View Diagram consists of yellow sections that represent the business capability areas and their business functions, and blue chevrons that represent the business processes. The FSA business capability areas combine common or similar processes and resources to streamline FSA's current Business Architecture. The Data Framework Specification (Deliverable 123.1.4) provides more detailed information pertaining to the business capability areas and their possible functions in the target state.

A clear difference between the current state and the target state is the ability to share common processing between systems and the consolidation of like activities to their most appropriate point in the financial aid lifecycle. For example, in the To-Be vision, the Trading Partner Management business capability area consolidates the functions that deal with the enrollment, eligibility and oversight of FSA's trading partners.

2.3 *Technical Architecture Considerations*

Movement from a current business state to a target business state implies a large shift in system processing. Any shift in business process may have an impact on the technologies supporting today's systems. For example, combining system functions may require business logic to be moved between systems. Additionally as logic is shared between systems, FSA should look to optimize the business logic to make it standard, accessible and portable so that it can more easily enable any business process shifts in the future. The following points should be reviewed when applying broad changes to business processes:

- Can the current architecture handle the changes to business logic/processes?
- If changes are necessary, will the proposed implementation enable future change?
- Can the evolution occur iteratively, and will that require short/long term architecture investments?

3 Data Architecture

The data architecture outlines how the relevant information about a business will be stored and accessed. Data is the heart of any business process; therefore, the ability to store, manage, and access data efficiently is critical to the success of a business enterprise.

3.1 *Current State*

Below is the high-level representation of the "As-Is" flows that highlights the movement of data between systems. Data is stored locally in each system and sent via feeds to the respective systems or data marts that are leveraging the information for transactional or reporting purposes. For example, PEPS sends the Daily School File to the Central Processing System (CPS), Common Origination and Disbursement (COD), Direct Loan Consolidation System (DLCS), eZ-Audit, FMS, e-Campus-Based (eCB), and the National Student Loan Data System (NSLDS). In the case if the school file, some overlaps and redundancy exist in data that is exchanged between systems. For instance, COD sends similar school information to FMS and the Direct Loan Servicing System (DLSS), and DLSS in turn sends school data to the Credit Management Data Mart (CMDM) and Delinquent Loan Data Mart (DLDM). In order to improve access to data, system specific ownership of the data must be released to allow common access to information. As this occurs, the data can become more integrated and consolidated allowing for a more complex implementation that, once in place, should simplify operations by providing a single point for maintenance and issue resolution.

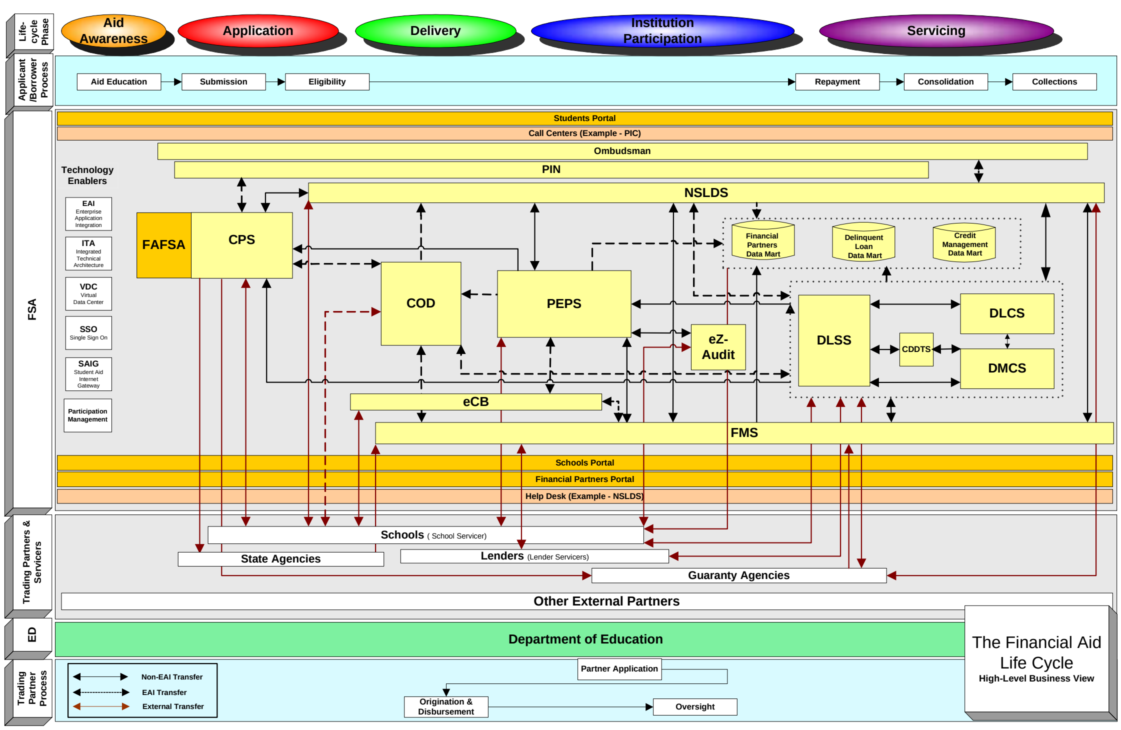

Figure 2 - The Financial Aid Lifecycle

3.2 *Target State*

The target state Data Architecture represents an environment with consolidated front end transaction data and an enterprise analytical data source. These two types of data combine to provide specific subject matter visibility; for example, an integrated student or school view. Additionally, as like business processes are shared/combined, the number of independent system-managed components is reduced.

Evolution from a system-oriented environment to business process-based execution implies not only change in the systems and business processes, but in the management of data as well. Complimentary to consolidating business processes is eliminating the storage and maintenance of redundant data, improving overall data quality and sharing common data across the enterprise. This aligns with the concepts of a service-oriented environment, which will be discussed in further detail in the Technology Vision section.

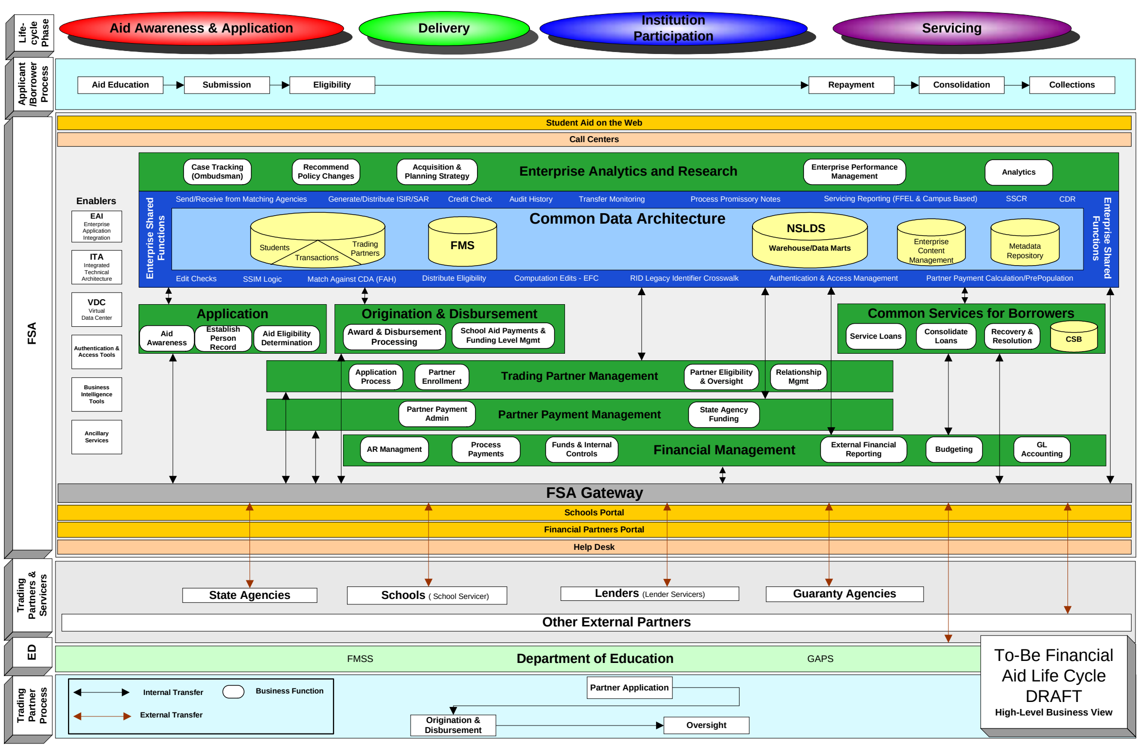

Figure 3 - To-Be Financial Aid Lifecycle

3.3 *Technical Considerations*

This target state picture has supporting technology implications. It requires:

- A robust data architecture capable of supporting both analytical and operational data processing
- Refined business processes that can be shared and leveraged across the enterprise
- Consolidation of entry points for systems' data exchange interfaces and Web user access

- Scalable, high performance architecture for data access and exchange to support all trading partners
- Business awareness for both internal and external exchange

4 Technology Vision

4.1 Target Conceptual Architecture

The Target Conceptual Architecture presented in this section builds upon the Data Framework To-Be Financial Aid Lifecycle and the five previously delivered Technical Strategy recommendations. Elements of each Technical Strategy are combined to present a clear picture of the high-level conceptual architecture that fits into the overall Data Strategy at FSA. The direction of both the Technical Strategy and overall Data Strategy efforts build on the previously mentioned business objectives, which were developed to address the high-level FSA Strategic Objectives and enable realization of the FSA Core Business Outcomes as stated in the FSA Business Integration Group Vision Framework (see Appendix A). By following these business objectives, FSA can ensure proper alignment with the overall Vision Framework. A full list of business objectives can be found in Appendix B; however, examples of business objectives for each strategy area are as follows:

- **High-Level Data Strategy** – Make it easier for customers to do business with FSA.
- **Web Usage** – Create simple, function-based web sites that allow easy access to desired functions and search capabilities throughout the entire lifecycle.
- **Web Services** – Provide access to customer status via centralized means.
- **Internal Data Exchange** – Centralized visibility and data flow control of the end to end interface process.
- **Data Storage, Management, and Access** – Provide data access to varied resource needs, in the formats necessary to provide meaningful business information.
- **FSA Gateway** – Standardize external exchange of commonly referenced data to simplify communication with FSA.

A set of guiding principles have been established to ensure that the Technology Vision fulfills the stated business objectives. These principles will serve to provide the foundation for the Target Conceptual Architecture and are as follows:

1. Shift to business process focus from system-based operation.
2. Consolidate data to a centralized storage environment.
3. Standardize interaction with external customers.
4. Improve FSA architecture response to business change.
5. Eliminate redundancy to promote the reuse of business functions.

These principles can best be met by migrating to a more **service-oriented architecture**, **improving access to FSA data**, and **standardizing data representations** across the enterprise.

Service-Oriented Architecture

The concept of a service-oriented architecture is central to achieving FSA's business goals while providing the flexibility necessary for long-term growth. Central to the Target Conceptual Architecture is movement away from the current system-based architecture to one that is based on providing centralized access to business capabilities. This change has both business and technical implications. Rather than relying on specific systems to perform specialized functions, a service-oriented architecture operates on the principle that business functions can be enabled in a centrally accessible manner. These functions can be leveraged by multiple FSA systems as well as systems external to the enterprise where access is provided. The following chart illustrates some differences between the current architecture and a service-oriented approach:

Figure 4 - Comparison of Current Architecture to a Service-Oriented Architecture

The service-oriented approach will support different aspects of the recommended to-be FSA technical architecture by providing distinct technical and business functions. For example, technical functions such as data transformation, data validation, and error handing can be centrally enabled to support both internal and external data exchange. A set of standardized business functions could also be enabled such as computation edits and borrower status updates. Such functions would be capable of handling both batch and real-time request/response scenarios with the same set of centralized logic. These functions could be provided to both internal and external systems as appropriate without requiring individual systems to build redundant sets of business logic – build once and leverage many times. Typically service-oriented architectures are implemented based upon Web services; however it should be noted that Web services are not a required enabler of a service-oriented architecture. The following diagram illustrates the concept of a service-oriented architecture:

Functionally

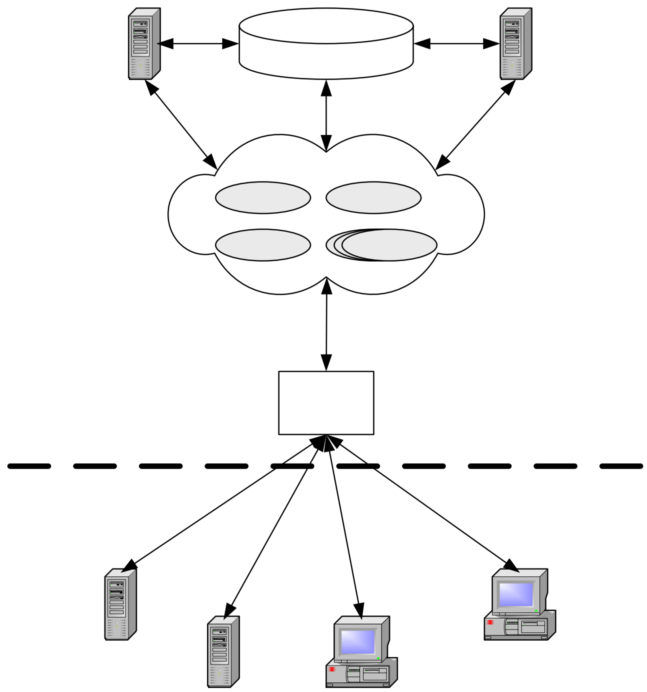

Figure 5 - Service-Oriented Architecture Example

The change to a service-oriented architecture is not one that can take place immediately as an evolution of both business processes and supporting technology must take place to enable movement from an architecture that is largely system-based to one that is based upon providing distinct business services. Examination of FSA's current business processes was performed in the As-Is Analysis order to determine logic that can be consolidated and leveraged across multiple systems. The Data Framework Specification (Deliverable 123.1.4) identifies some of these processes that can be enabled as distinct services or functions. As a service-based exchange model takes hold within the FSA environment, services can be enabled for use by the external trading partner community as well. Some examples of business scenarios that would be supported by a service-oriented architecture include:

- Student Status Confirmation Report (SSCR) process
- Effective Family Contribution (EFC) calculation
- Credit Check

The following diagram illustrates the concept of an evolutionary approach to implementing a service-oriented architecture at FSA:

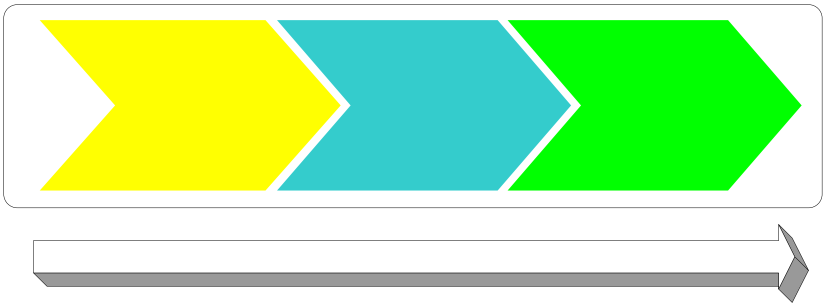

Figure 6 - Service-Oriented Architecture Evolution

Gartner also supports the view that current integration trends are moving in the direction of service-oriented architectures: "With personalized client/server, Web-based and portal-style user interfaces, an increasing number of projects require reuse of application business logic over multiple access channels." Furthermore, "The loosely coupled SOA [Service-Oriented Architecture] provides the natural basis for unintrusive reuse of the back-end logic by multiple styles of clients. Thus the transition to multiclient and multichannel applications naturally pushes toward SOA-based application design."[2]

An example of a United States Government agency that is currently benefiting from the use of a service-oriented architecture is the United States Air Force (USAF). The USAF is deploying Web services as part of a service-oriented architecture to provide command and control functions for its Theatre Battle Management Core System (TBMCS). Once deployed, the USAF will use Web services to assist in the planning and execution of future wars. The USAF has recognized that a service-oriented architecture can provide immediate value as it can serve as the foundation for the USAF to quickly integrate new capabilities into its systems with minimal impact to established components.

The benefits of migrating to a service-oriented architecture include the following:

- Improving return on investment by extending the usable life of existing legacy functionality by packaging legacy capabilities as services
- Simplifying business process integration based upon agreed-upon standards
- Increasing location and platform transparency as interface implementations are decoupled from business logic
- Providing increased levels of reliability and flexibility as backup services can be deployed and different versions of services maintained
- Improving implementation speed as services can be concurrently developed

The phased implementation of a service-oriented architecture has several dependencies with respect to FSA's business processes as well as its technological capabilities. Examples of these dependencies include:

[2] © Copyright Gartner, Inc. Source: "Service-Oriented Architecture Scenario", 16 April 2003.

- Business processes must evolve to support service-based interaction.
- Enterprise shared services logic must be extracted from legacy systems and provided in a centrally accessible location.
- Enterprise-wide governance and management must be in place to ensure for proper implementation and acceptance.
- A strategy and mechanisms for communicating architecture capabilities must be in place.
- An enterprise approach to security must be in place.

Improved Data Access and Quality
A central driver for the movement to the service-oriented architecture mentioned above is the need for improved access to FSA data for citizens, trading partners, and FSA internal users. FSA has a wealth of data that is spread across multiple systems and different phases of the financial aid lifecycle. As indicated by the business objectives, the ability to access the data and obtain needed information in a timely manner is crucial to the future of FSA's business. Currently, internal FSA users have no means of viewing all data for a particular borrower across different lifecycle phases because borrower information is distributed across multiple systems. Additionally, trading partners and borrowers cannot easily access their account information and history.

The Target Conceptual Architecture has the potential to greatly improve both the quality of and access to FSA data. The cornerstone of the Target Conceptual Architecture is the creation of a Common Data Architecture (CDA). The Common Data Architecture will consolidate FSA data in a central location and provide a set of shared services that can be used to access and view data from both within and outside of the enterprise. It will also provide a centralized location for housing FSA Web content though the use of Enterprise Content Management (ECM) capabilities. The Common Data Architecture will reduce the number of locations in which FSA data is currently stored, thus increasing data quality and providing a basis for a uniform view of FSA data.

The Common Data Architecture facilitates how data is stored internally, and how it can be provided to requesting systems and users. However, access into the CDA is provided by additional components of the architecture. Three components of the Target Conceptual Architecture directly address this issue: the FSA Gateway, Portals, and query/reporting services.

The FSA Gateway and Portals address how systems and people outside of the enterprise access FSA data. The FSA Gateway will serve as the interface point for external systems that require interaction with FSA systems. Most of the interactions that take place across enterprise boundaries will take place via the FSA Gateway. The FSA Gateway will leverage validation services, Enrollment and Access Management capabilities, and common data formats to better enable external system-to-system communication. Additionally, the FSA Gateway will leverage the Routing Identifier component of TPM in order to effectively track and identify trading partner interactions.

The FSA Portals will handle a majority of the citizen-to-FSA interaction that takes place with FSA. Like the FSA Gateway, they will leverage Enrollment and Access Management functions to control access to FSA data and services. The Portals will provide a window to FSA services and data, thus enabling exposure of FSA shared services and data within the Common Data Architecture (CDA) to Web users when appropriate.

Providing better access to FSA data for both citizens and trading partners is directly in line with current trends across government. According to the President's E-Government Strategy, "Citizens should be able to find what they need quickly and easily, and access information in minutes or seconds, instead of days or hours." This is being currently being done in the United States Government. For example, the Federal Government is providing instant information about government benefits programs and services to all government employees though a single Web site – GovBenefits.gov. Additionally, the Strategy emphasizes the need for improved interaction between government and business through the appropriate reuse of data and the leveraging of commercial data exchange protocols. [3]

The benefits of enhancing access to data through the Portals and FSA Gateway include the following:

- Providing uniform methods to both systems and people for accessing FSA data.
- Standardizing interfaces for system-to-system interactions with consistent levels of security applied.
- Increasing the citizen's capabilities for self-service by making FSA data readily accessible via the FSA Portals.
- Standardizing how enterprise data is accessed and modified can help to improve the overall quality of enterprise data.

The implementation of the Common Data Architecture and uniform data access methods has several dependencies with respect to FSA's business processes as well as its technological capabilities. Examples of these dependencies include:

- A communication strategy must be in place to ensure that access methods to FSA data are publicized
- The Enrollment and Access Management services must be applied to methods of data access to ensure that external users and systems have access to the data that they need
- A consistent approach to enterprise security must exist
- Data format and content standards must be in place to help improve the quality of accessible data

Standardized Data Definitions and Format

Another enabler of the Target Conceptual Architecture is the standardization of data definitions and format. Data definition refers to the contents of the data, whereas data format addresses the representation of the data. Data definitions and format come into play in nearly every

[3] http://www.whitehouse.gov/omb/egov/downloads/2003egov_strat.pdf

interaction between FSA, its trading partners and its customers that involves the sending and receiving of data. This interaction can take place internally and externally between systems via the Common Data Architecture and FSA Gateway as well as between FSA and citizens via the Portals.

In order to ensure that data definitions and formats are standardized across the enterprise, Core Component definitions and XML formatting should be applied to data that is commonly exchanged between multiple systems. The Core Component definitions describe commonly referenced data as a set of XML schema entities and serve as the building blocks for the definition of data across the enterprise. Standardizing the definition and format of commonly referenced data will provide a starting point for migrating to the service-oriented architecture depicted in the Target Conceptual Design. Further information with respect to Core Components can be found in the XML Core Component Dictionaries (Deliverable 123.1.15).

Data content and format standardization through the application of Core Component definitions can also help to better facilitate data exchange in that it will provide the foundation for enabling validation on all forms of data exchange. Data validation is important to the improvement of the overall data quality at FSA in that it has the potential to ensure that data exchanged both within and across enterprise lines meets basic standards for correctness. This will serve to improve and maintain the quality of the data in the Common Data Architecture. In addition to being applied in system-to-system data exchange, data input via Web pages can also be validated against Core Component definitions to further ensure data quality.

A common metadata repository should be implemented as part of the Common Data Architecture. Initially, the metadata repository would be based upon data standards defined as part of the Core Component definitions. It is vital that the metadata repository be centrally accessible across the enterprise. In some cases, metadata should be made accessible to trading partners. This can be accomplished by making the enterprise metadata accessible via the FSA Portals.

With the Portals themselves, standardization of data content and format has some additional implications. A standardized approach to enterprise content management is required to ensure that FSA Portals and Web sites contain correct and up-to-date information that is conveyed in a consistent manner with uniform look and feel. An enterprise content management approach will potentially reduce redundancy as well as provide a more consistent user experience. It also facilitates and enhances cross-application knowledge sharing of content and improves integration of FSA applications across the lifecycle by centrally maintaining resources.

Current government trends support the standardization of data content and formats. The President's E-Government initiative references the use of XML with goals being "to reduce burdens on business, provide one-stop access to information and enable digital communication using the language of e-business (XML)."[4] The Internal Revenue Service is currently leveraging XML for the submission of tax forms as part of the e-File system, and the Social Security

[4] http://www.whitehouse.gov/omb/egov/downloads/2003egov_strat.pdf

Administration is using XML as part of a process for federal and state agencies to share information regarding birth and death records. Standardization of data formats through the use of XML is already underway at FSA as the COD Common Record is already in place. Additionally, the XML version of the CPS Individual Student Information Record (ISIR) is currently under development and scheduled for implementation in the 2005-2006 award year.

Standardizing data format and content across the enterprise can provide the following benefits:

- Providing the foundation for implementing Web services as part of a service-oriented architecture.
- Increasing the overall quality of FSA data.
- Providing a basis for initial validation of data that is exchanged with FSA by external systems or portal users.
- Reducing the amount of data transformation logic required over time to enable inter-system communication.
- Reducing the effort to integrate systems as a common cross-enterprise language is spoken.
- Decreasing the number of errors that take place during data exchange resulting from misunderstanding or misuse of data formats and content.
- Reducing the impact to systems as changes to data content and format standards can be made in a central location and propagated to affected systems.

The following dependencies exist between other initiatives and the standardization of data content and format:

- An approach to enterprise governance and management must be in place to ensure uniform application and enforcement of standards.
- Data content definitions must be in place for the implementation of a Common Data Architecture to succeed.
- A method for publishing updates to standards and formats must be available.
- Architecture must allow for different data definition versions to be used concurrently as to allow for iterative changes to standards.
- Core Components need to be established and understood to maximize the value of a Common Data Architecture.

When combined, movement to a more service-oriented architecture, improvement of data access capabilities, and standardization of data representation result in an overall Technical Conceptual Architecture that is represented by the following diagram:

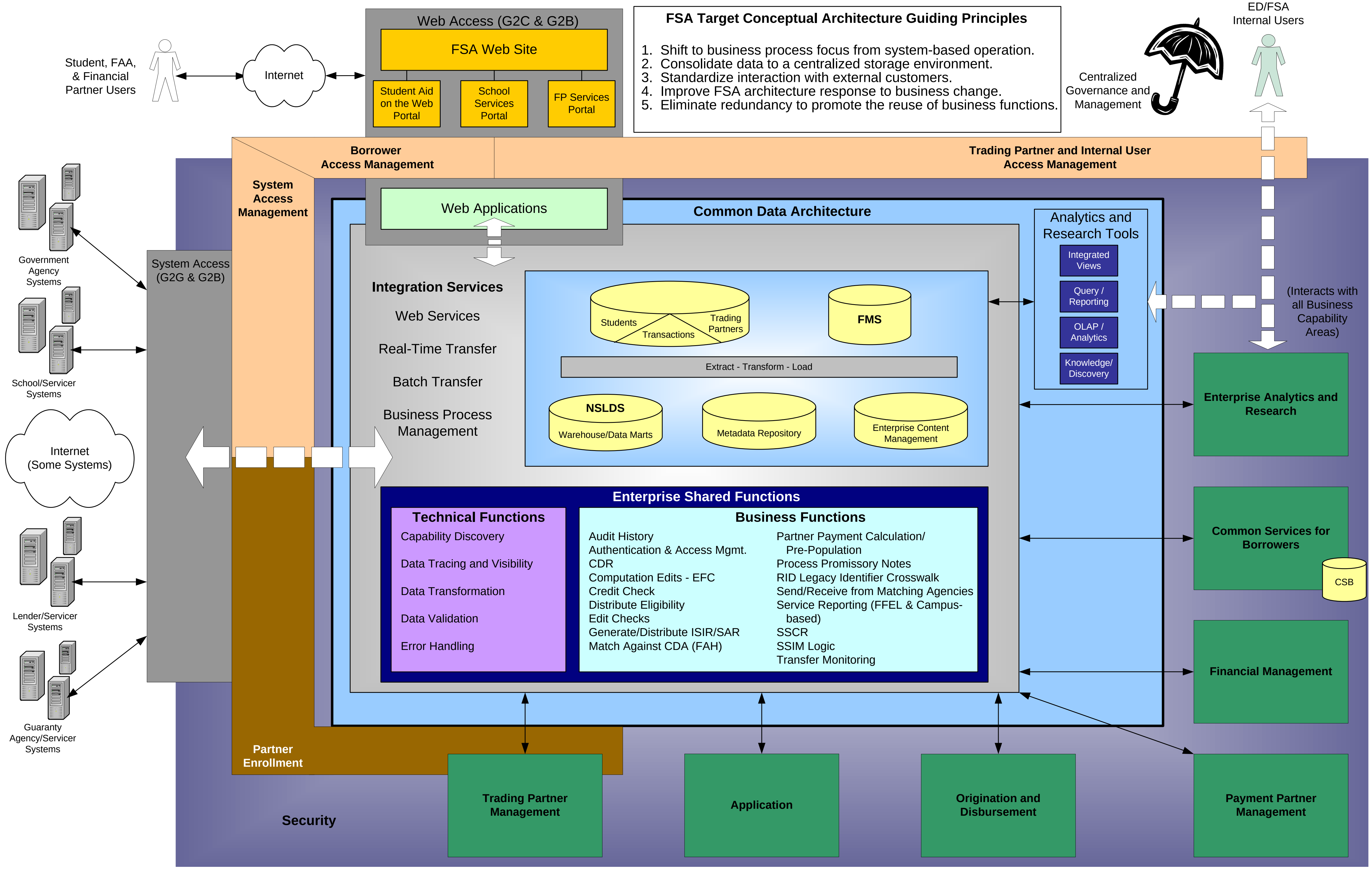

Figure 7 - Target Conceptual Architecture

The following table provides high-level descriptions of the major components of the Target Conceptual Architecture:

Component	Description
Access Management	Uniformly manages access to FSA systems and services. Different levels of access management are required for systems, internal, and external users.
Analytics and Research Tools	A common set of tools, available across the enterprise, used to extract meaningful information from the centralized data storage environment.
Business Capability Areas (green)	Provide business capabilities that serve different phases of the student aid lifecycle.
Business Functions	Enterprise Shared Functions that enable specific business functions for use across the enterprise.
Common Data Architecture	Houses and provides access to enterprise data. Analytics and research tools are located here.
Enterprise Shared Functions	Business capabilities that can be leveraged by systems across the enterprise, and potentially by trading partners externally.
Integration Services	Facilitates data exchange between internal FSA systems. Also facilitates external system-to-system exchange through the FSA Gateway.
Partner Enrollment	Capability that allows trading partners to enroll for access to FSA data and services. This will be a component of TPM in the to-be architecture.
Security Layer	Provides consistent levels of security across the FSA enterprise.
System Access(FSA Gateway)	Provides a single, entry point into FSA to better facilitate system-to-system data exchange with trading partners. Supports Web services, real-time, and batch data exchange.
Technical Functions	Enterprise shared functions that help to enable data exchange both internally and externally.
Web Access	Enables human-to-FSA interaction through a set of centrally managed portals.

Table 2 - Target Conceptual Architecture Components

4.2 *Vision Breakdown*

After reviewing the high-level technology vision of the Target Conceptual Architecture, the next level of understanding can be realized by breaking down the various components that enable this target vision. The following sections will highlight the integrated pieces of the Target Conceptual Architecture and discuss how each component layer interacts with others so that FSA can bring improvements to its business capabilities and successfully fulfill its key strategic initiatives. Previously, the components of the target state were categorized and delivered in five separate strategy documents. Now that a comprehensive picture can be drawn for the enterprise vision technical architecture, it is appropriate to review the various components as they relate to the overall vision and highlight the interactions between these components. The vision and Target Conceptual Architecture are broken down into the following components:

- Access
- Integration
- Common Data Architecture
- Enterprise Analytics and Research
- Security
- Management

4.2.1 Access

The following diagram highlights those portions of the Target Conceptual Architecture that relate to Access. The target state vision reveals that three kinds of access methods exist: 1) System Access, 2) External User Access and 3) Internal User Access. Furthermore, the bridge that connects user and system access to FSA business capabilities encompasses the Security, Access Management, Trading Partner Management and Partner Enrollment layers of this integrated solution. In the current environment, access management is handled distinctly across the enterprise with students utilizing the PIN and Financial Aid Administrators (FAAs) maintaining multiple user IDs and passwords for access to various systems. The goal of the target state is to maintain consistent practices for administering access privileges to the different user groups.

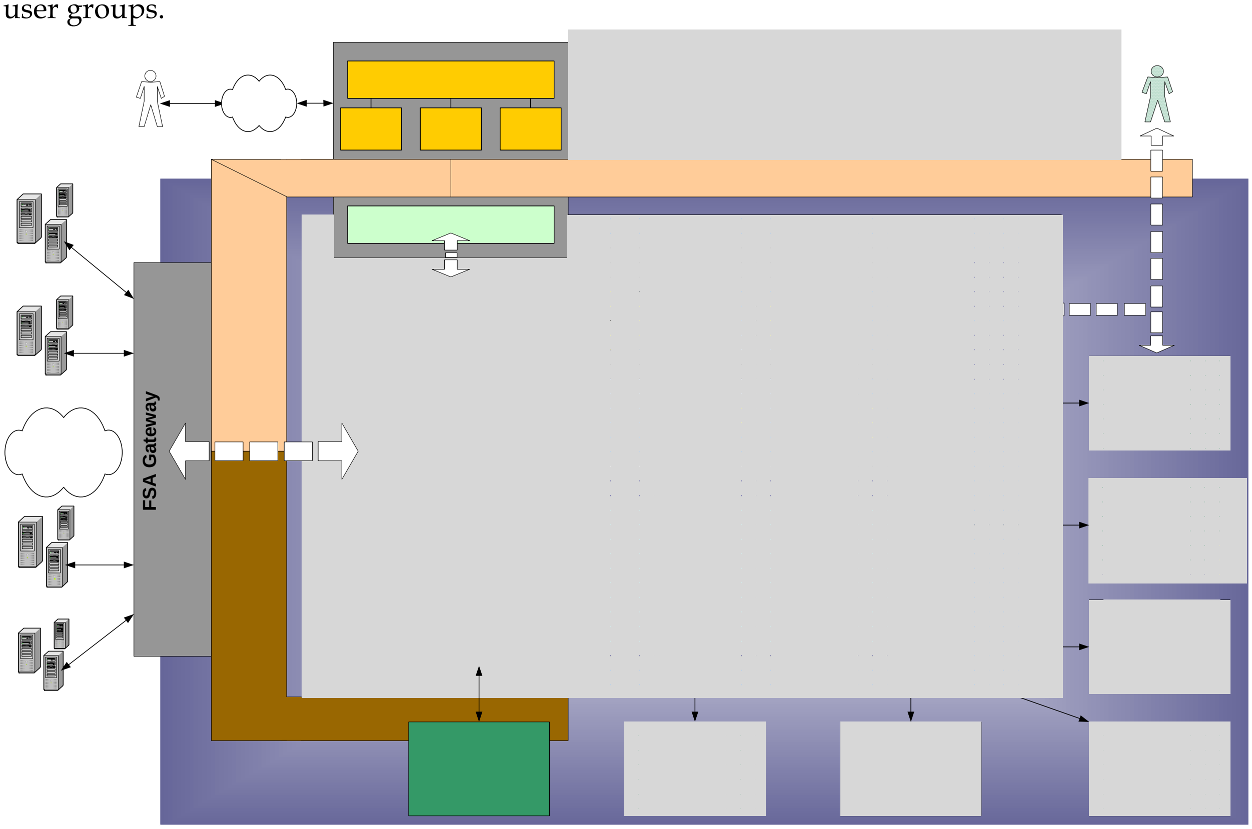

Figure 8 - Access

As FSA migrates towards its target state, the organization needs to leverage the protection that the security layer can bring to FSA's business capabilities. The integration of an enterprise-wide security, enrollment and access management strategy will enhance and promote traceability, confidentiality, accountability and integrity for FSA data and services. For example, access controls and identity management are two components of the overall security framework that can control a user or system's ability to access FSA's CDA and the services it provides. For additional information on the role of the security layer within the Target Conceptual Architecture refer to Section 4.2.5 below.

In addition to the security layer and its role in the access strategy for FSA, the overall vision for Partner Enrollment and Access Management is that FSA can improve services to trading partners by implementing consistent, consolidated methods for enrolling and providing access to FSA systems. This is especially relevant for not only user access via the Web but also external system access for data exchange with FSA. By managing enrollment and access at the enterprise level, FSA can consolidate the data that supports these services and reduce the complexity associated with trading partners' interaction with FSA systems and services. For example, the Trading Partner Management (TPM) business capability area maintains the functions that handle enrollment, eligibility and oversight of FSA's trading partners. TPM will work with the CDA and security layer to maintain enrollment and access privileges and perform enrollment updates to trading partner information.

By consolidating and centralizing the integration services and shared functions, FSA can provide access to enterprise functionality for both external systems (via the Gateway) and Web channels. This configuration means that enterprise services like business process management capabilities, Web services technology and shared business functions can be accessed by both external systems (e.g., Schools and Guaranty Agency systems) and Web applications (e.g., Student Aid on the Web portal).

Although there are common functions (e.g., Security, Access Management and Partner Enrollment etc…) of the conceptual architecture that are shared between the User Access and System Access components of the end state vision, each method of access distinctly interacts with the CDA. The following sections detail the integration of System Access via the FSA Gateway, User Access via the Web and Internal User Access via tools and services of the business capability areas.

4.2.1.1 System Access

The target vision involves improving access for trading partners' systems in order to facilitate data exchange that supplements the financial aid process. To reduce the number of proprietary file exchange interfaces that currently exist between trading partners and FSA systems, the enterprise architecture will need to provide a solution that will consolidate and simplify these exchanges so they are more manageable and cost effective to operate.

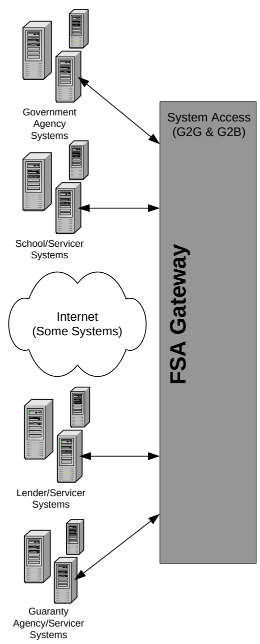

Figure 9 - FSA Gateway

The FSA Gateway is the proposed method of access for trading partner systems. As the image to the left depicts, the goal is to simplify trading partner interaction with FSA through the consolidation and standardization of trading partner interfaces. In addition to facilitating data exchange through real-time and batch transfers, the FSA Gateway provides a central location for communicating with trading partners and allowing them to discover FSA capabilities. Additionally, the following points summarize the strategy for external system access and data exchange:

- Implement an FSA Gateway as a single, virtual entry point for external access to FSA services
- Provide right-time access to FSA data and business functions
- Leverage standard data formats in data exchange
- Integrate with existing FSA capabilities and leverage components of the Target Conceptual Architecture

Finally, the FSA Gateway can be the conduit through which FSA exposes Web services externally and provides trading partner access to enterprise shared functions. The security layer and capability discovery functions play heavily into FSA's ability provide Web services to trading partner systems.

To support external system access, the FSA Gateway will need to leverage enterprise security standards and the Enrollment and Access Management components of the Target Conceptual Architecture. This multi-tiered integration of security and access controls will allow FSA to uniformly manage authorization, provide secure access and protect privacy data. One step in this direction is the Trading Partner Management business capability area, which will manage enrollment and access privileges at the enterprise level. Working with the CDA and Security components of the Target Conceptual Architecture supported by related oversight/governance procedures, TPM will enable the integration between FSA and its trading partners and grant access to data and services that support the financial aid lifecycle process.

4.2.1.2 User Access

In order for FSA staff, borrowers/students and trading partners to have improved visibility into data and customer status across the lifecycle process, these user groups need better access to the data. The Web has become a proven method for government agencies to deliver self-service capabilities to citizens and trading partners. Furthermore, the Web enables FSA to automate citizen services and improve the speed at which a borrower can apply and receive financial aid. Web applications can be used for enabling the functions of the business capability areas (e.g., Application, Trading Partner Management, etc.) The Web can also be leveraged by internal FSA staff to gain right-time access to information to support business decisions (i.e., online analytical tools that aid reporting procedures and requirements).

One way users can access FSA data and services is through business specific Portal applications. The conceptual architecture proposes that FSA simplify its online business processes by consolidating its current Web infrastructure and expanding the amount of Web-enabled self-service capabilities. The Enterprise Shared Functions from the CDA can be integrated with the portal framework to further provide business value and expedite the application for and administration of financial aid. Utilizing business specific portals will allow services and business capabilities to be directed to the appropriate target audience.

Furthermore, the business capability areas can leverage the Web to provide application processing and interaction with the CDA. One way this can be accomplished by the enterprise architecture is to expose its shared business functions to the external community via Web services. This concept further promotes the integration of a service-orientated architecture as Web services can be called by enterprise websites that support the business applications. Utilizing Web services supports FSA's need to have more real-time access to enterprise data. For example, as a borrower moves along the spectrum of the financial aid lifecycle, the business capabilities that that borrower encounters may require a customer look up service to determine his status before proceeding downstream in the business process.

In addition to providing user access via the Web, FSA's Target Conceptual Architecture supports the enterprise's need for internal users to have access to tools and business capabilities that support their efforts of administering financial aid. Internal users participate in the activities that support each business capability area. Internal users are also subjected to the security, enrollment and access management practices similar to other enterprise users.

Some key elements of the user access recommendations include:

- Consolidating access and promoting uniformity across the enterprise
- Simplifying online business processes and increasing the amount of self-service capability
- Integrating Web services' capabilities with the Web Usage Framework to provide right-time access to business capabilities through the Portals
- Providing FSA staff and internal users access to analytical and research tools

4.2.2 Integration

Although there are several components to the Target Conceptual Architecture, to enable FSA to best achieve its target vision of a service-oriented architecture, the enterprise requires the successful interaction of these pieces to support its business capabilities. The interaction between each interconnected component of the Target Conceptual Architecture is paramount to FSA realizing its goal of moving away from system focused application dependent processing and achieving a business process-focused, integrated data and service solution. FSA can utilize a number of Integration Services to support both business and technical functions shared by the enterprise as depicted in the figure below:

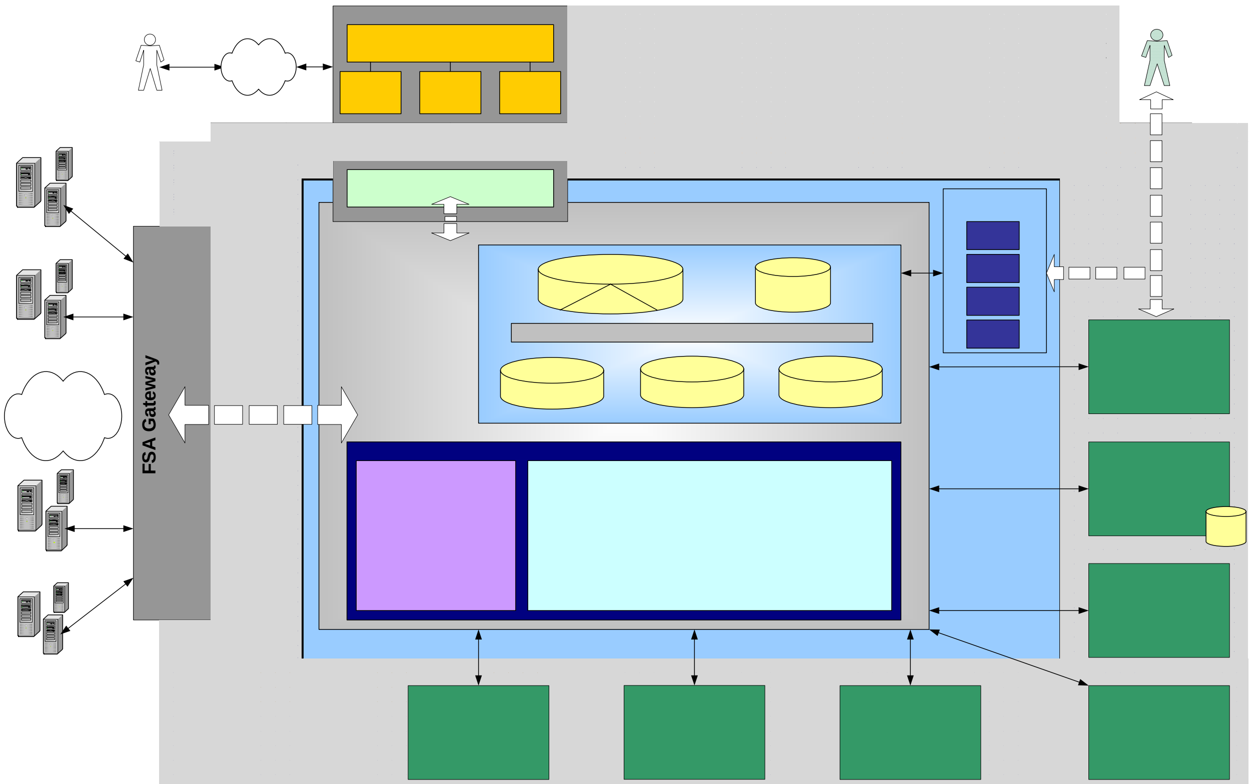

Figure 10: Integration

The Integration Services that the end state vision offers will propel FSA toward a service-oriented architecture. In order for each business capability area (e.g., Application, Origination and Disbursement, Trading Partner Management etc.) to accomplish its lifecycle functions, it will need to interact with the various components of the CDA (i.e., Data Storage, Enterprise Shared Functions and the Integration Services layer etc.). The Integration Services support enterprise integration by enabling the business capability areas to interact with one another and the external community through real-time and batch transfers.

To provide centralized access to FSA's business capabilities and share common business logic among multiple entities, FSA can leverage Web services to provide consistent and reliable information as well as right-time access to data. Web services can enable proposed enterprise shared functions (e.g., Credit Checks, Computation Edits, SSIM logic, etc.) by utilizing the CDA as the single source of data. These integrated functions of the Target Conceptual Architecture expose enterprise business capabilities from a central location so multiple systems, internal and external, can call its service and receive the same response. This integration between the business capability areas and the CDA not only promotes efficiency through the reusability of business logic but it also ensures consistency and imposes data integrity checks so that multiple entities execute business processes based on the same information.

The integration between the business capability areas, the enterprise shared functions and the data storage configuration is aided by functionality associated with the Integration Services layer of the CDA. The Target Conceptual Architecture proposes a group of shared technical functions that can support and monitor the integration and interaction between systems (both internal and external). By utilizing the capabilities of the enterprise shared technical functions of the Integration Services layer, FSA could improve accessibility and performance of data exchange that supports the application processing across the lifecycle. These functions include but are not limited to: data transformation, data validation and error handling. Instead of requiring each business capability area to build and maintain this functionality for its application processing, it is centrally located so the enterprise as a whole can benefit from its implementation. This is especially relevant for providing cross-lifecycle information related to data tracking, audit trails and capability discovery. The figure below highlights the enterprise shared functions (both business and technical) of the Target Conceptual Architecture:

Figure 11 - Enterprise Shared Functions

The Integration Services layer also provides a platform for coordinating the integration of complex service-based solutions. The business rules that dictate the execution sequence for data exchange and service delivery can be managed by this layer for activities that occur both within and between enterprise network boundaries. Because the Target Conceptual Architecture supports both real-time and batch transfers, business owners must be able to understand where data is across the lifecycle in order to make informed decisions during the administration of financial aid. The business process management capabilities of the Integration Services platform enables centralized management of cross-lifecycle business processes by executing specific business rules that aid in the correct routing of enterprise data.

The benefits associated with the Integration Services layer hold true not only for the internal interaction among business capability areas but also external data exchange with trading partners. The integration activities between the trading partner systems and internal FSA systems utilize similar functions (i.e., data validation, error handling, etc.) and realize the same benefits as internal data exchange but the interfaces between the two require extra security considerations to make the capabilities of the Target Conceptual Architecture available to the external community. For example, the FSA Gateway can utilize the business process management capabilities and data transformation services provided by the Integration Services layer of the CDA to better facilitate connectivity with systems external to FSA and improve the exchange of data from external sources.

Additionally, centralized business process management services can be leveraged by both internal and external data exchange to coordinate complex cross-lifecycle business processes that take place between multiple systems. For instance, business process management can control and provide insight into each step of the student aid process including external credit checks to determine eligibility and the generation of the ISIR based on the receipt of information or changes to it.

Finally, the integration of FSA's service-orientated architecture will benefit from the use of Core Component definitions to standardize data exchange across the enterprise for both internal and external system communication as well as Web services delivery of business functions. The standardization of data exchange methods and message formats will promote more seamless integration among systems and improve access to enterprise shared functions. Also, the Core Components will help FSA improve data quality and integration services between systems by providing a framework that FSA can leverage as part of future data reconciliation efforts.

4.2.3 Common Data Architecture

The Common Data Architecture (CDA) forms the core of the Target Conceptual Architecture by combining elements of Access and Integration with a centralized storage environment and a platform for conducting enterprise analytics and research. The centralized storage components of the CDA will allow FSA to consolidate its front-end storage, provide an analytical data environment, and allow users to find information associated with Enterprise Content Management. The following figure highlights those portions of the Target Conceptual Architecture that relate to the data storage component of the end state vision:

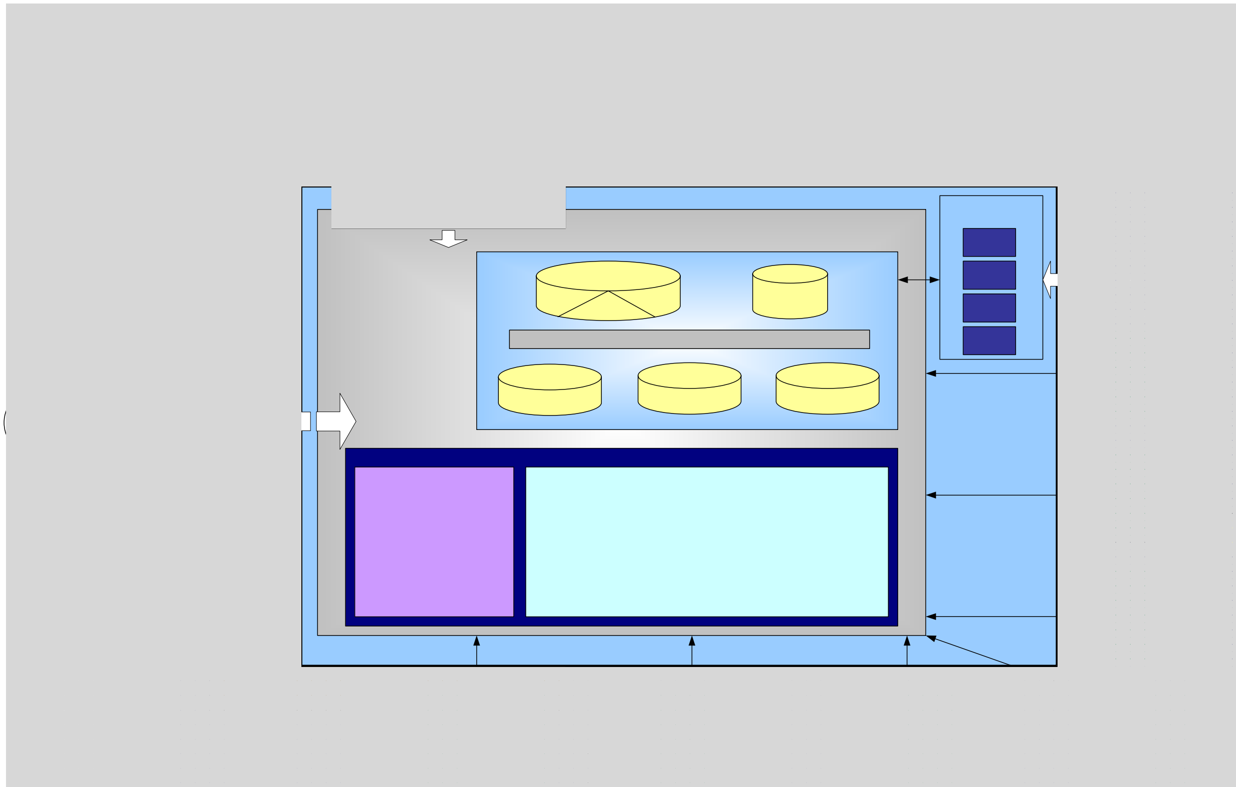

Figure 12 - Common Data Architecture

The goal of the Common Data Architecture (CDA), as proposed in the Target Conceptual Architecture, is to consolidate information collected and used by FSA. By enabling a CDA and reducing the number of systems that need to maintain the same data, FSA can make key strides toward improved data quality by establishing enterprise stewardship over the various categories of data needed to administer financial aid.

As the Target Conceptual Architecture picture implies, the evolution of data is the central factor that enables FSA to reach its target state. It supports FSA's ability to deliver shared functions across the enterprise as well as produce meaningful business analytics and research. The CDA provides a more comprehensive view into enterprise information and can better support business decisions that rely on the data stored by FSA. Additionally, the CDA better enables stewardship to be carried out as data flows across the spectrum of lifecycle application processing and breaks up the siloed nature of system specific application processing. By consolidating the data and building out service capabilities provided by the CDA, FSA can provide cross-lifecycle integrated data views. This is accomplished through the use of a single operational data store for all front-end business processes and corresponding data warehouse/data marts for analytical purposes. Data marts can be developed and populated from the data warehouse to provide specific insight into a business area and support specialized reporting requirements. Data marts can provide a custom environment to perform complex reporting not possible or inefficient to perform in the enterprise data warehouse. Extract, Transform and Load (ETL) processes should be deployed to control the population of both the data warehouse (from the transactional environment) and data marts.

Once the target state is fully implemented, systems will not need to aggregate data from multiple sources to accomplish its business processes; instead the CDA will store aggregated information in a common location to be used across the enterprise. The figure below illustrates how the data storage can be configured to centrally store relevant business information (e.g., Student and Trading Partner data) with supplemental repositories (e.g. warehouse, metadata, ECM and FMS) to enable the business processes.

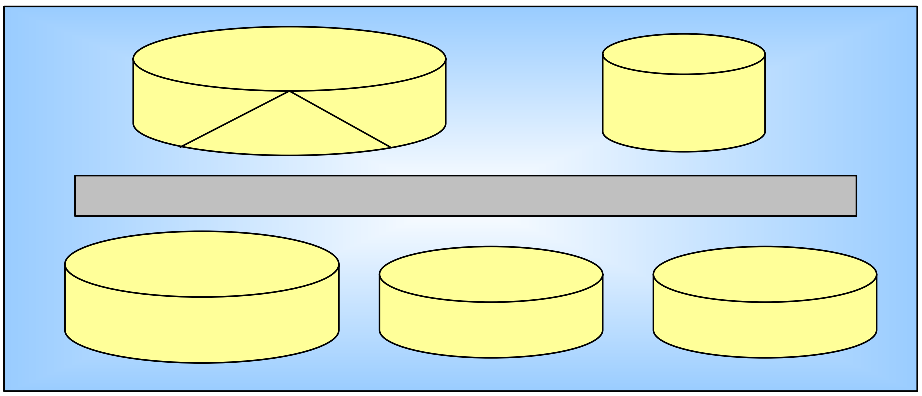

Figure 13 - Data Repositories

FSA's new business model will benefit from a centralized CDA because with the current solution, data that defines such information as borrower status and institution eligibility is dispersed throughout various systems. It is the organization of and access to this data that brings value to the business process. In addition to creating an enterprise data warehouse, access management and metadata organization for the CDA provide the understanding and insight required by the business process so informed business decisions can be made based on accurate and readily available information.

Besides handling operational and analytical information through a transactional data store and data warehouse, the target state also requires a storage component that handles the organization's content management. An enterprise content management data solution consists of three key elements: document management, Web content management and digital asset management.

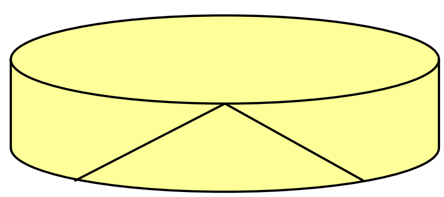

Figure 14 - Enterprise Content Management

- **<u>Document Management (DM)</u>** is a technology for capturing, storing, categorizing, editing, and retrieving critical business documents in a controlled and secured environment. It also provides a vehicle for collaboration and workflow with its use of content integration, publishing, distribution, and processing capabilities. Document Management solutions are designed to integrate with portals, enterprise search engines, and legacy systems in order to support the business processes. For example, the new eCMO decision model requires that the enterprise provide a mechanism for maintaining all information collected throughout the life of a case, including paper case-related documents. Document Management could be a key technical enabler of the eCMO process and determining institutions' eligibility to participate in Federal Student Aid.

- **Web Content Management (WCM)** encompasses the strategies, technologies, and process required to create, store, retrieve, approve, aggregate, distribute, and leverage content targeted for delivery via Web channels. Consolidating resources into a single, accessible location for the enterprise Web environment is a key component of FSA's Web Usage Strategy of leveraging reusable material and eliminating the redundancy associated with maintaining similar content for a variety of websites.

- **Digital Asset Management (DAM)** technologies support building integrated, enterprise-wide solutions for capturing, managing, and distributing an organization's digital assets (i.e., rich media content such as video, film, audio, images, and graphics). DAM contributes files to Web Content Management environments.

Because the migration to a CDA requires business, data and technical changes, the implementation of such an architecture and the integration with additional enterprise functions will be an evolutionary process. This evolution will bring FSA from system focused, application dependent data storage to an enterprise that is business process focused with an integrated data solution. Additionally, effective governance is required in order to achieve the proper oversight into a centrally maintained architecture. The breadth of the CDA's capabilities will grow and its flexibility will need to accommodate the demands set forth by business requirements.

The key elements of the CDA recommendation are to:

- Store shared data to support front-end business processes
- Build an enterprise data warehouse that maintains historical information across all phases of the lifecycle
- Provide uniform business intelligence capabilities for improved access to information
- Leverage internal integration capabilities to support business service requests

Key benefits that can be achieved by implementing the data storage architecture proposed by the CDA concept include:

- Improving data visibility and providing managed and consistent access for enterprise analytics
- Reducing maintenance costs and streamlining business processes by eliminating redundant data
- Enabling integration efforts and supporting shared functions across the enterprise
- Improving data quality and reusability of data by multiple application across the aid lifecycle

4.2.4 Enterprise Analytics and Research

The Target Conceptual Architecture contains a single enterprise data warehouse and specialized data marts to support FSA's analytical capabilities. In today's environment, FSA stores and manages data in several disparate systems making it difficult to: 1) identify the true source of valid information, and 2) determine which data is most relevant to satisfy analytical requirements. A centralized data warehouse will enable a consistent picture of FSA data because it establishes a single source of "truth" for FSA data inquiries. An enterprise source of analytical data will also improve the current state of data accessibility by not forcing users to interact with multiple systems in order to retrieve a comprehensive picture of data. Establishing a single source from which to retrieve analytical information can help eliminate data quality problems that exist with the present data storage solution whereby the same data is not updated across the enterprise in a consistent manner (e.g., address updates). Finally, by separating the data warehouse from the operational components of the data architecture, FSA can optimize its analytical environment for reporting and query performance needs. The Enterprise Analytics and Research components of the Target Conceptual Architecture are illustrated below:

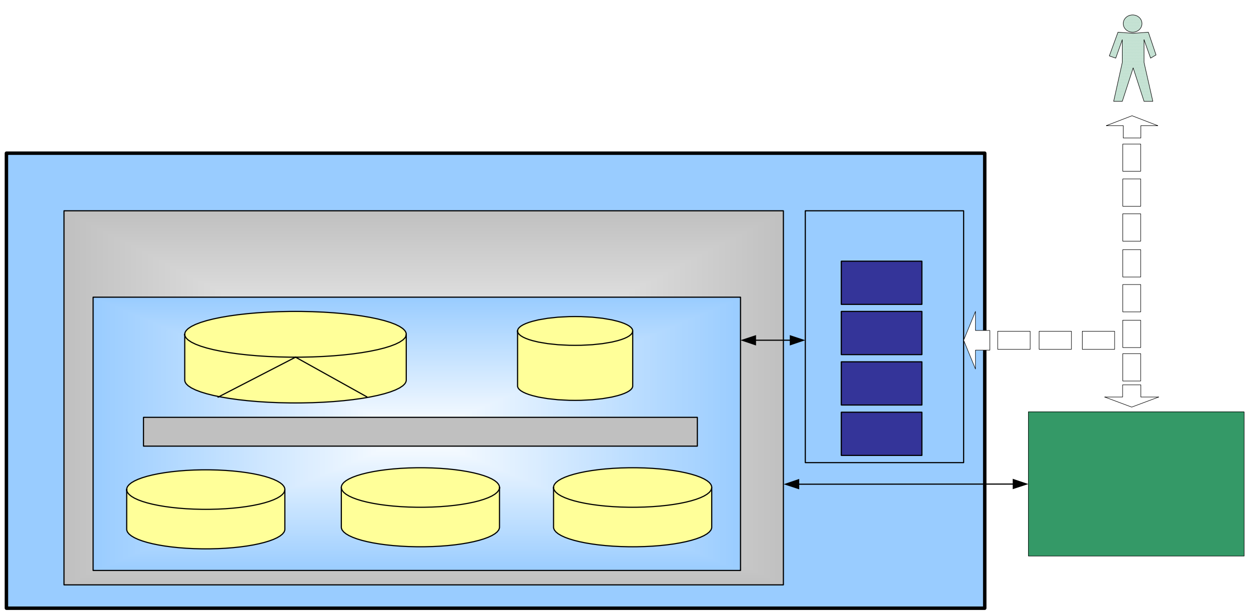

Figure 15 - Enterprise Analytics and Research

One of the recommendations for the end state vision is to establish a single business intelligence (BI) platform as the primary access method for end-users across the enterprise. BI capabilities include query and reporting functionality that allows users to search for specific data and trending information across FSA. On-Line Analytical Processing (OLAP) and other analytical capabilities such as executive dashboards allow users to customize the way in which summary data is gathered and presented. These tools allow a broad range of users to make the most use of the information contained in the centralized storage environment. Case Management Office

(CMO) users, for example, could use OLAP tools to store a point-in-time snapshot of data related to a specific school as part of their investigations.

The BI tools as a whole can provide valuable insight into historical information for business decision purposes. Data warehouse and data mart functionality can be built out to align with the reporting and data requirements of each business capability area and executive management committees. FSA currently has access to BI capabilities through a small set of custom data marts. In the target state, expanding access to BI functionality and leveraging capabilities of the CDA will offer increased flexibility for multiple business entities to satisfy their specific reporting requirements. The end-state business intelligence solution will create new functionality and expand upon current capabilities by deploying the solution across the entire organization and by using the centralized data storage as its foundation. This configuration will allow the enterprise to better accommodate enterprise reporting requirements by broadening access to analytical information and more efficiently handling changes in data requests.

In addition to the varied reporting capabilities of the BI tools, the Target Conceptual Architecture supports FSA's need to have historical and right time access to integrated views for data that exists across the lifecycle. For example, FSA could provide look-up capabilities through its Portals that make a call to a Web service that retrieves customer status information from the CDA. The data may need to be compiled from multiple entities but an aggregate view of this information can seamlessly be displayed to the end-user. This is just one example of a possible implementation of Enterprise Analytics and Research capabilities.

The knowledge and discovery capabilities of the Target Conceptual Architecture allow FSA users to interactively search for "non-data" information. The Enterprise Content Management (ECM) solution will house this data including document, web content, and digital asset management. These components of ECM will be made accessible in a central location through the knowledge and discovery research capabilities, allowing a broad range of users to find the information they need to run the business.

4.2.5 Security

The Technology Vision for FSA requires that technical implementations align with recommendations and standards proposed by FSA's IT Security and Privacy Policy and the Security and Privacy Architecture Framework (124.1.3). FSA's Target Conceptual Architecture includes a security layer that surrounds the CDA and provides a layer of protection for data and services contained within the boundaries of FSA's architecture. Also, there are security considerations that must be made for enterprise functionality and data exchange shared between internal and external entities. The communication channels that are established between FSA and Trading Partners must be secured in order to properly protect data being transferred. The key concepts that are embedded in the Security layer of the Target Conceptual Architecture include mechanisms and tools that administer and monitor the following capabilities:

- Authentication – Verification that students or trading partners interacting with FSA really are who they claim to be.
- Authorization – Approval and control of access to FSA data and systems based upon an entity authenticated ID.
- Integrity – Verification that data and message contents are received intact and without tampering.
- Confidentiality – Ensuring that data exchanged between FSA and its trading partners is hidden from all except the intended recipient.
- Non-repudiation – Having the ability to undeniably trace a message back to a specific entity as well as ensure transaction content integrity.
- Administration and Management – Having the ability to manage applications and user security services.

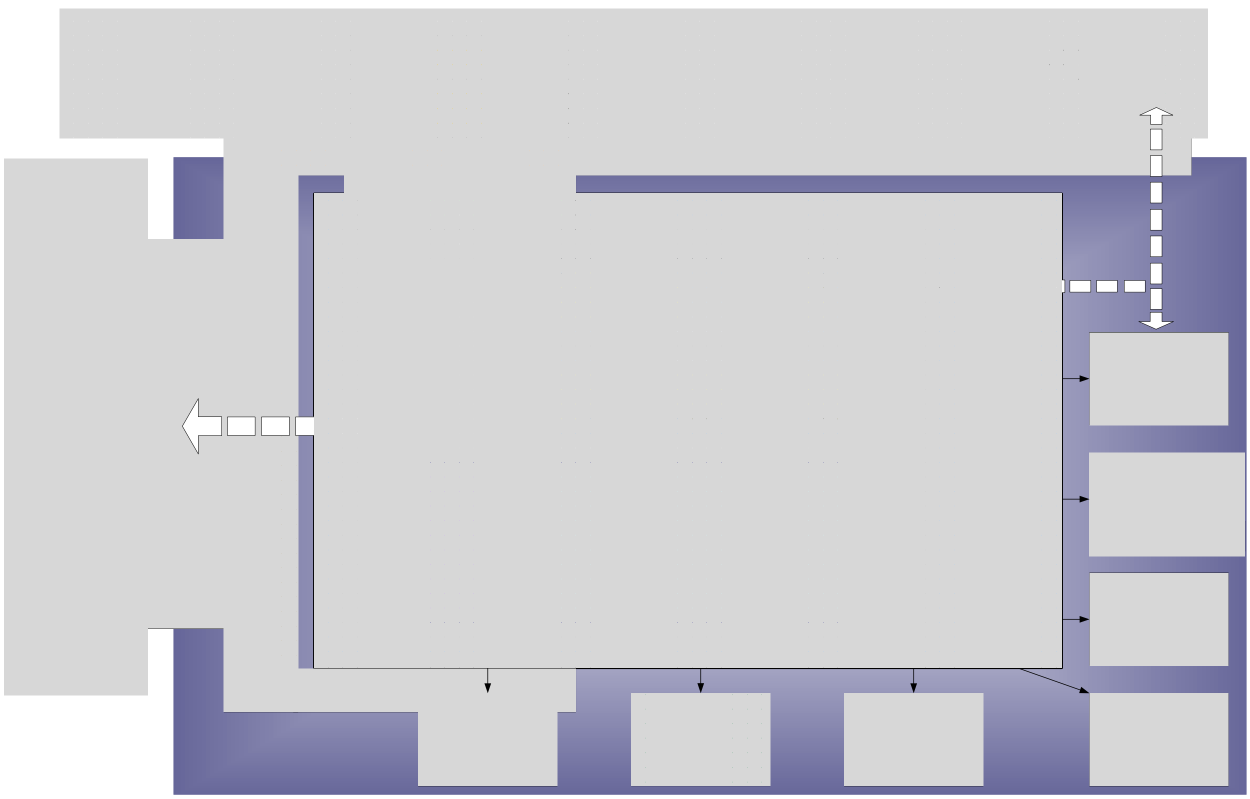

Figure 16 - Security

The blue security layer that surrounds and protects FSA's CDA includes a number of components that are presented in a more detailed format below in the proposed Security and Privacy Technical Architecture framework (refer to Security and Privacy Architecture Specification – 124.1.3 for additional information):

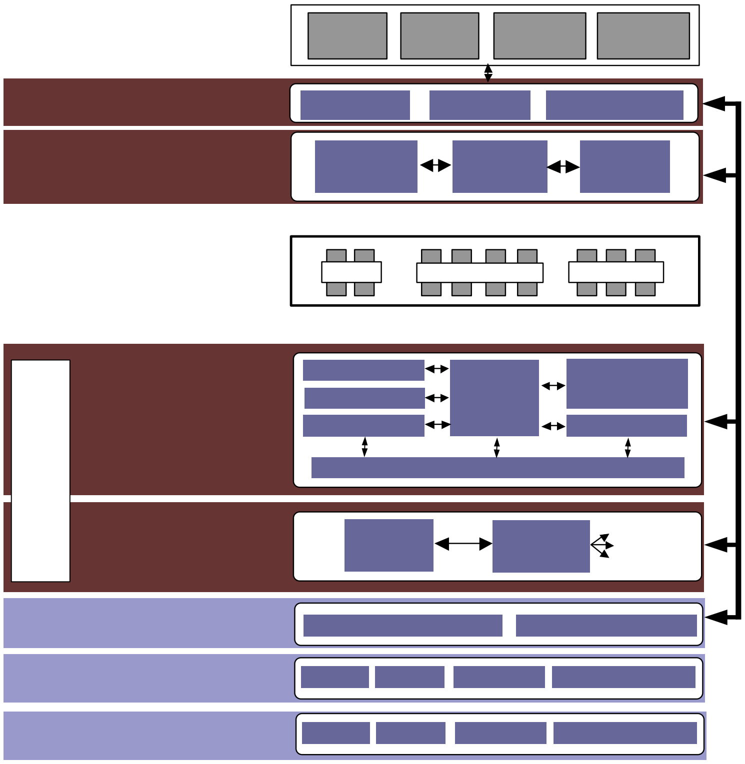

Figure 17 - Proposed Security and Privacy Technical Architecture[5]

The Security Framework enables secure interaction with the CDA and allows access to FSA services, business capabilities and data exchange mechanisms. The security layer provides mechanisms to ensure the integrity of the messages being exchanged within the enterprise and from outside entities. Encryption is used to enforce privacy protection and safeguard data that is collected and shared by FSA. Also, the tools and mechanisms that support the enterprise encryption services will need to provide an end-to-end file transfer security solution. Finally, the enterprise architecture requires a layer of infrastructure security services to implement security policy at boundaries between networks. This is accomplished through firewall management, intrusion detection and event monitoring.

The Security Framework's vision for FSA's technical infrastructure includes:

- Increasing the integrity of FSA's data by preventing theft and maximizing accuracy
- Providing a mechanism to ensure confidentiality and prevent unauthorized access
- Preventing the disruption of service through corruption and security violations
- Enforcing accountability and maintaining clean security audits of FSA's data exchanges

[5] "Security and Privacy Architecture Framework Specification." Deliverable 124.1.3. May 30, 2003.

- Allowing the reuse of security services across the enterprise to reduce deployment and development costs

Additional details concerning the Access and Identity Management Services of the Proposed Security and Privacy Technical Architecture are outlined in the following deliverables: Access Management Business Objectives and High Level Requirements and Access Management High-Level Design (123.1.27 and 123.1.29 respectively).

4.2.6 Governance and Enterprise Management

For FSA's Target Conceptual Architecture to be effective it requires robust management processes and enterprise oversight to ensure that systems and processes supporting the business capability areas are efficiently delivering services. By migrating from a system-focused architecture to a business process integrated solution, FSA needs to institute centralized governance procedures to monitor the development and maintenance of its business capabilities and enterprise architecture. This uniform delivery of services and access to data allows FSA to operate as a single business entity and collectively interact with its customers and trading partners.

One facet of the Enterprise Management component of the Target Conceptual Architecture is data governance over enterprise resources. Data governance enables effective management and delivery of shared or common data assets / resources. Data governance encompasses the actions by which an organization controls the delivery of information (internally and externally) and manages the overall data strategy and architecture resources. Data governance addresses the processes, skills, leadership and assets required to successfully administer an organization's information resources. The following diagram illustrates additional concepts of the data governance model:

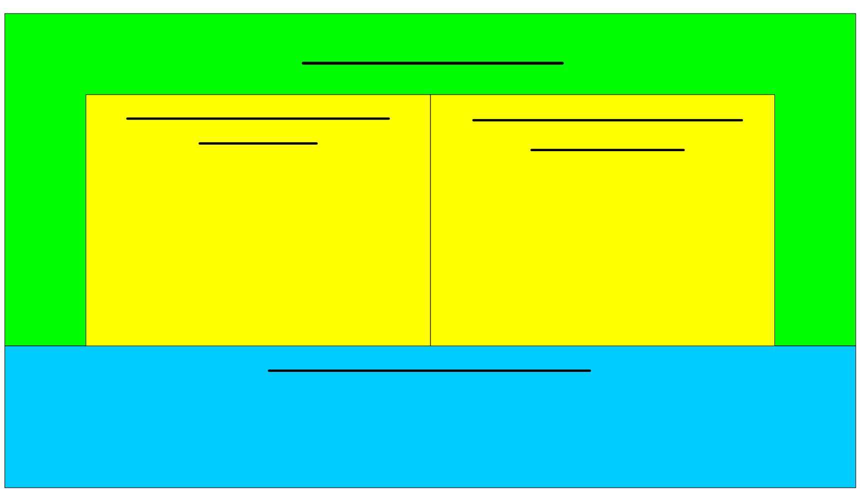

Figure 18 - Data Management and Delivery Functions

This management and governance strategy requires a communication and marketing plan to build awareness, understanding and eventually commitment to change among those business areas affected by the migration to the target state. Communication considerations also focus on the enterprise's ability to provide service discovery capabilities to inform system users and trading partners about the capabilities that are available from FSA. For example, the FSA Gateway can support automated discovery capabilities for Web services that provide trading partners' systems access to FSA shared functions.

A communication approach is also required to socialize the service-oriented model and coordinate support for changes in business processes associated with the adoption of new components that enable the enterprise architecture to execute its service capabilities. Developing a communication and marketing strategy is a supplemental component to the Data Strategy initiative and the evolution to the target state of the FSA's enterprise (business, data and technical) architecture. Although investigation into how to best approach a communication and marketing strategy still needs to be conducted by business owners, the communication plan must take place at all levels and across all phases of implementation as FSA needs to continue to have key stakeholder buy in from business owners in order to make the Data Strategy a reality.

4.3 *Vision Summary*

To support the target state business and data architectures, the Technology Vision recommendation consists of migrating to a more service-oriented architecture, improving access to FSA data, and standardizing data representations across the enterprise. The Target Conceptual Architecture consists of a number of technical enablers that help FSA achieve this vision. The components of each vision area discussed in Section 4.2 Vision Breakdown are summarized below:

Vision Areas	Components	
Access	• Enrollment and Access Management • FSA Gateway • Portals	• Security • Trading Partner Management • Web Applications
Common Data Architecture	• Data Marts • Data Warehouse (analytical) • Enterprise Analytics and Research	• ETL • Integration Services • Operational Data
Integration	• Business Capability Areas • Business Process Management • Data Transfer – Real Time – Batch	• Enterprise Shared Functions – Business – Technical • Web services
Enterprise Analytics and Research Tools	• Integrated Views • Knowledge/Discovery	• OLAP/Analytics • Query/Reporting

Vision Areas	Components	
Security[6]	• Access Management • Audit • Authentication	• Authorization • Delegated Administration • Profile Administration
Governance and Enterprise Management	• Capability Marketing • Compliance	• Data Stewardship • Standards

Table 3 - Vision Summary

The components outlined above are necessary to achieve FSA's outlined business objectives, key strategic initiatives and enterprise vision. As FSA moves toward the implementation of a solution, an overall Implementation Plan must be developed. The technical enablers are only one piece of this, and while technology influences these decisions, business need is the actual driver for change. Additionally, consideration must be given to the dependencies between the technical components and the business capabilities they enable and support.

Risks and dependencies between the recommendation components should be understood when creating an overall plan. While there is not currently sufficient information to develop an overall Data Strategy Sequencing Plan, and technology alone cannot be the driver for such a plan, identifying logical grouping of the technical components and their respective dependencies can support the process. A phasing of common elements can be reviewed to highlight the logical component groupings, their dependencies and the risks of iteratively phasing in technology to support FSA's target vision. The strategic approach for the high-level technology components is outlined in section five below.

[6] For detailed information regarding security, see Access Management High-Level Design (Deliverable 123.1.29).

5 Strategic Approach

5.1 *High-Level Phasing*

The overall technology vision is built using individual components to deliver incremental capabilities and benefits. Institutional change of this magnitude requires detailed planning to prepare for long-term goals. FSA will need to define a detailed implementation sequence to ensure that high-priority objectives are achieved as soon as possible, with all required foundational components in-place.

There are three levels of business and technology change necessary for FSA to begin to realize the target state. Desired business changes are supported by the three technical phases: Data Architecture, Improved Access, and Service-based Integration. Each level will require a detailed review of requirements and an outline of a detailed implementation plan. This strategic approach focuses on the three technical phases with consideration for the high-level business and data evolution. FSA's strategic business objectives, the issues gathered and prioritized as part of the Mad Dog report, and various Data Strategy retreats and working sessions helped define the business changes. Each business change requires multiple technology components to enable new or improved capabilities. The technological components are not created for their own sake, but instead act as enablers for specific business functions. These technology phases represent a logical progression of capability delivery, making possible the evolutionary improvement of FSA's business processes.

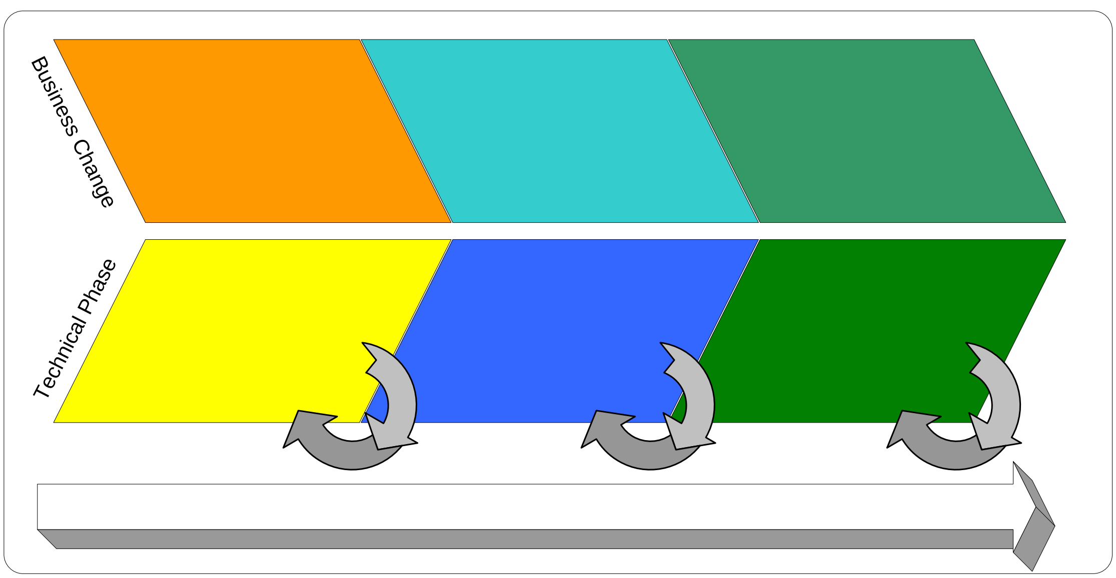

Figure 19 - Technology Vision Phasing

5.2 *Strategic Approach Matrix*

Each business change enables a set of core business outcomes. These outcomes are enabled by deploying the underlying technology components in tandem with business and organizational change. The following matrix presents these business changes mapped to their supporting technology components.

		Phase 1	Phase 2	Phase 3
Business Focus	**Business Change**	**Improve enterprise data quality and visibility**	**Share information more effectively**	**Improve operational processing**
	Core Business Outcomes	- Consistent and accurate data across the enterprise - Actionable data to drive decision making - Easy and timely access to required oversight information	- Easy customer access to required information throughout the delivery cycle - Self-service capabilities	- Automated standardized business processes - Tailored and relevant business services for all customer lifecycle activities - System-independent, reusable, integrated services to customers across the lifecycle
	High-Level Business Objectives	- Increase business decision efficiency by providing integrated views of students, schools, and other FSA information - Simplify ownership/stewardship of data	-Make it easier for customers to do business with FSA -Establish common method for communicating with external systems	- Centralize and reuse common business logic - Enable right-time data exchange between systems
Technology Focus	**Technology Change**	**Data Architecture**	**Improved Access**	**Service-based Integration**
	Tech/Architecture Components	**Implement the Common Data Architecture (CDA):** - Centralize operational and analytical data - Deploy cross-business process analytical and research capabilities - Deploy key shared functions to enable data consolidation and data quality improvements	**Improve Individual and System Access:** - Individuals: Improved Web experience and functionality - Systems: FSA Gateway enabling standardized data feeds with external systems	**Move to Service Oriented Architecture (SOA):** - Implement enterprise shared services for both internal and external systems - Consolidate FSA's integration capabilities to enable reusable pieces of business functionality
	New Capabilities	- Integrated school and student views - Cross-business process visibility	- Single entry point to FSA for customers and partners - Expanded options for customer self-service - Enterprise content management	- Reduced effort to add/remove systems - Build functionality once; reuse across enterprise - Faster deployment of new services
	New Benefits	- Improve data quality - Eliminate front-end system-to-system interfaces - Reduce redundant storage - One source of front-end data will assist Phase 2 and 3 initiatives	- Improved customer satisfaction - Reduced operational costs (fewer service calls, etc.) - Uniform FSA presence on the web - Standardized external inputs will enable Phase 3 FSA Gateway	- Eliminate maintenance of duplicated business logic - Improved visibility to transaction flow across FSA
	Risks	- Operational performance concerns - Complex integration	- High level of interaction with partners, requiring change adoption needed	- Realignment to business process-based functionality will require complex changes across multiple systems
	Dependencies	- Common data definitions - Defined data ownership policies - Enterprise approach to security and access management	- Communication strategy must be in place to ensure that changes are well publicized. - Enterprise approach to enrollment and access management	- Standardized internal/external interfaces - Data ownership/stewardship policies
	External Impacts	Low - Internal data storage scheme shielded from external systems and users	High - Significantly alter the way customers and partners interact with FSA	Medium - Most impacts due to SOA implementation could be shielded from external sources

Table 4 - Strategic Approach Matrix

5.2.1 Phase 1 –Data Architecture

Implementation of the Common Data Architecture (CDA) is a key underlying enabler for many of FSA's long-term goals. Centralized data storage is a core component of FSA's vision and will act as a foundation upon which other capabilities can be built. By creating a single source for key FSA data, FSA can simplify future enhancements. Consolidated front-end data will allow other initiatives, such as shared services, to source data from a single supply rather than building multiple connections to various systems. Additionally, implementation of the CDA will allow FSA to pursue data quality improvements. By reducing the number of times a piece of data is stored, the full implementation of the CDA will eliminate conflicting views of the current state of business.

5.2.1.1 Business Drivers and Objectives

Phase One aims to increase business decision efficiency by providing integrated views of students, schools, and other FSA information. FSA needs increased visibility to cross-business data in order to better support business processes. The centralized data environment of the Common Data Architecture will form the base of this capability, with enterprise-wide reporting and analytical capabilities providing users with a way to efficiently find the information they need. Consolidating front-end data in a central location will also allow FSA to simplify the ownership and facilitate the stewardship of various enterprise attributes. In today's environment, each independent system can present conflicting data; by standardizing and consolidating the data, FSA can evolve to a single, known source for key information.

5.2.1.2 Technical/Architectural Components

The business drivers will be supported by a set of technical and architectural components. Key architectural components of Phase One include:

- Consolidate front-end system storage
- Implement an enterprise data warehouse to store cross-FSA data in an accessible manner
- Deploy cross-business process analytical and research capabilities
- Deploy key shared functions to enable data consolidation and data quality improvements
- Define population procedures to load data from operational storage into the warehouse, providing a reporting environment

5.2.1.3 New Capabilities

Implementation of the CDA will enable many new capabilities for FSA. Cross-business process visibility and integrated school and student views are two key capabilities not possible today. The storage and reporting components of the Common Data Architecture are integral to developing other components of the FSA Technology Vision. A strong, centralized data architecture will reduce the implementation effort required to design and implement other initiatives by providing a single-source for front-end data, as well as enabling an enterprise-wide source for historical and analytical purposes. A consolidated storage environment with cross-business process data will enable FSA to extract new, previously unknown value from its data.

5.2.1.4 External Impact

Impact to external users, organizations, and systems will be relatively low during Phase One. The vast majority of change will be to internal FSA data storage systems, and should be shielded from partners and customers. Pieces of new capabilities, such as the integrated student view, could be provided to external partners and customers, but present-day communication should not be greatly disrupted by these new capabilities.

5.2.2 Phase 2 – Improved Access

Phase Two will provide better access for individuals and systems to communicate with FSA. An integrated web usage strategy will enable people to more effectively gather information and communicate with the organization, while the FSA Gateway will focus on standardizing the way external systems interact with FSA. These two initiatives, taken together, will provide a standard and consistent manner in which FSA communicates with its external partners and customers.

5.2.2.1 Business Drivers and Objectives

Phase Two will focus on improving the way FSA does business with its customers. FSA customers, including students, schools, financial partners, employees, and others, all interact with FSA either through a personal or systems-based channel. Phase Two aims to improve both of these communication paths. This phase should provide easier customer access to required information throughout the delivery cycle as well as enable new and improved self-service capabilities.

5.2.2.2 Technical/Architectural Components

Meeting the business objectives will require the implementation of the following technical components:

- Improve Web experience and functionality for individuals
- Develop a marketable, uniform FSA Web presence
- Use the consolidated Web portal strategy to provide individuals with better access to FSA
- Enable standardized data feeds with external systems through the FSA Gateway

5.2.2.3 New Capabilities

Implementing the FSA Gateway and Web Usage Strategies will enable the following capabilities, used to achieve the business objectives:

- Single entry point to FSA for customers and partners

- Expanded options for customer self-service
- Enterprise content management

5.2.2.4 External Impact

The focus of Phase Two is to improve the way people, organizations, and systems communicate with FSA. Accordingly, the level of impact to external entities is relatively high. To ensure a smooth transition, careful attention needs to be paid to the communication of planned changes and improvements to all users of FSA data.

5.2.3 Phase 3 – Service-based Integration

Phase Three will improve the way FSA systems communicate with one another. Transitioning to a service-oriented architecture will allow FSA to realize many of its long-term integration goals. Phase Three initiatives aim to enable a seamless method for FSA systems to communicate. Rather than focusing on individual systems developing unique or re-creating existing logic, the shared service approach will allow FSA to consolidate and share business logic.

5.2.3.1 Business Drivers and Objectives

Phase Three aims to centralize and reuse common business logic across FSA. Current procedures duplicate and recreate business processes across the enterprise. Centralizing these common functions will allow for a uniform execution of FSA's business processes. The second objective of this phase is to eliminate unwanted delays and uncertainty regarding the timeliness of data by enabling right-time data exchange between systems.

5.2.3.2 Technical/Architectural Components

This third phase of the FSA Technology Vision restructures the way business logic is executed within FSA. This reorganization is aimed at providing reusable, centralized logic to many disparate business processes. Key enabling components of this phase include:

- Implement enterprise shared services for both internal and external systems
- Begin with internal shared services, exposing them externally over time
- Incorporate the FSA Gateway as an extension to internal integration services

5.2.3.3 New Capabilities

Transitioning to a service-oriented architecture (SOA) will enable FSA to adapt to adapt more quickly to new and changing business requirements. This flexibility of SOA enables faster development and deployment of new capabilities by using interchangeable and reusable components to provide business logic. Capabilities supported as part of Phase Three include:

- Reduced effort to add/remove systems

- Build functionality once; reuse across enterprise
- Faster deployment of new services

5.2.3.4 External Impact

Implementation of this third phase will primarily affect internal FSA systems and processes. There will be some impact to external partners and customers. A service-oriented architecture, in and of itself, will not necessarily change the way people do business with FSA. However, new capabilities and processes will likely be provided to trading partners and others. In order to take advantage of these improvements, it is likely that external entities will need to change the way they interact with FSA.

Appendix A: FSA Business Integration Group Vision Framework

FSA Strategic Objectives

Integrate FSA systems and provide new technology solutions	Improve program integrity	Reduce program administrative costs	Improve human capital management	Improve products and services to provide better customer service

Core Business Driver

Find the Right Balance Between Efficient Delivery & Effective Oversight

Core Business Outcomes

Core Business Enablers	Provide Easier Access to Make it Easier for Our Customers to do Business With Us	Maintain Right & Effective Levels of Oversight Through Combination of Enhanced Tools & Customer Self-Monitoring	Run the Business to Enable Right Actions, Right Transactions to the Right People
Support Effective & Informed Decision Making by Making the Right Information Available at the Right Time to the Right People	**Easy customer access to required information throughout the delivery cycle** *-CSID implementation across the lifecycle* *-RID implementation across the lifecycle* *-Better common loan identification* *-Provide an integrated, cross-lifecycle, web-delivered customer view that is system independent* *-Customer centric buildup for students across the lifecycle* *-Provide information to prospective students*	**Easy and timely access to required oversight information** *-Enterprise (cross-functions) information and analysis* *-RID implementation across the lifecycle* *-Customer centric buildup for schools across the lifecycle* *-Delivery partner access to information to support self-monitoring and decision making*	**Ability to proactively inform regulatory and statutory changes** *-Simplify programs through proactive informing to policy and legislative processes* **Actionable data to drive decision making** *-Right data available at right time and organizational agreement about what is required and when*
Provide the Right Security, Tools, Systems, Architecture & Technology to Enable the Business to Achieve its Outcomes	**Self-service capabilities** *-Clear indication of aid status displayed throughout the enterprise* *-Provide enrollment status via the web* *-Maximize access to available resources* **Automated business processes** *-Uniform business rules across systems* *-Common edits* *-Automate internal/system interfaces* *-Single, secure external gateway for file exchange* *-Automate identity and management processes* *-Configure security to minimize and simplify user interfaces*	**Efficient, automated oversight capabilities** *-Support analytic approach to oversight/problem identification, decision making, policy and legislation through data, information and tools* *-Support audit functions to track access to FSA systems and data.*	**Deployment of technology solutions to meet program objectives** *-Timely delivery/deployment of systems* *-Analytic approach to system changes* **Clearly defined ownership and management of data** *-Ownership and definition of shared data* *-Define data related standards (including XML standards)* **Consistent and accurate data across the enterprise** *-Continuous data quality verification* *-Establish and follow common data definitions to facilitate the exchange of data internally and externally* **Maintain appropriately secured information** *-Defined, secure access points* *-Right access to right person/entity at right point in time* **Flexible standards, technologies and services** *-Balance between COTS procurement and enterprise technology standards* *-Define data access authorization standards* *-Infrastructure capacity that is secure, scalable and flexible to meet the changing needs of FSA*
Improve & Integrate Business Processes Into Delivery Solutions	**System-independent, integrated services to customers across the lifecycle** *-Right time data exchange between systems* *-Right time data exchange with delivery partners* *-Easier and more accurate external exchanges that meet the needs of delivery partners* *-Easier for FSA to support customers by providing views across the person and entity* *-Establish a common method and process for transition that is easy and accurate for administering trading partner enrollment and access to FSA systems and resources* *-Defined roles and responsibilities of FSA in supporting delivery partners driven by what they need, what should be provided and how/priority* *-Reduce reporting requirements (use the data we have)* **Standardized business processes** *-Uniform business rules across functions* *-Common edits*	**Effective and balanced oversight** **Streamlined processes for routine oversight functions** **Timely identification of risk-based non-compliance**	**Tailored and relevant business services for all customer lifecycle activities** **Actionable information to inform business processes** *-Include customer input and feedback* *-Analytic approach to process changes* **Effectively & efficiently manage organizational financial well-being** *-Easier financial internal exchange* *-Smarter contracting for customer service* *-Strategic contracting/acquisition strategy supporting* **Right skilled/trained workforce aligned with business processes** *-Maximize access to available resources* **Maximize effectiveness of program based goals** *-Greatest return in collections* *-Effectively deliver financial aid to recipients*

Assumption 1: It is presumed an Enterprise Plan will be in place to support the vision (resource allocation, budgeting, training, QA processes).
Assumption 2: Customers are defined as Students, Schools, Financial Partners, DoED, FSA Employees, External/Internal Audit Groups, Delivery Partners and Budget Services.

Appendix B: Business Objectives

The list below contains the consolidate list of FSA's prioritized business objectives that have been used to formulate recommendations and propose a direction for FSA's future state:

High-Level	
Rank	**Business Objective**
1.	Make it easier for customers to do business with FSA.
2.	Intelligently combine technology and process to Increase Business Decision Efficiency by providing the right data, with the right security levels, to the right people at the right time.
3.	Need to clarify who is the owner/steward of the data at various times throughout the FSA Aid Life Cycle.
4.	Need to develop policy standards, and clearly defined common identifiers for sharing data across the enterprise and compliance with federal regulations
5.	Provide an integrated, cross-Life Cycle, web-delivered customer view that is system independent.
6.	FSA needs to establish and follow common data definitions to facilitate the exchange of data internally and externally.
7.	Right-Time Data Exchange between systems
8.	Infrastructure Capacity that is scaleable and flexible to meet the changing needs of FSA.
9.	FSA needs to establish a common method for administering trading partner enrollment and access to FSA Systems and Resources.
10.	Document and communicate vision.

Internal Data Exchange	
Rank	**Business Objective**
1.	Centralized visibility and data flow control of the end-to-end interface process.
2.	Establish common identifiers to enable a reduction of internally exchanged and commonly referenced data.
3.	Provide Right Time Processing for Internal system communications.
4.	Ability to share customer's status throughout all phases of the lifecycle.
5.	Consolidate Interfaces and provide reuse of services across the enterprise.

Web Services	
Rank	**Business Objective**
1.	Provide access to customer status via centralized means.
2.	Provide access to common calculations as well as lookup and update (corrections) capabilities in a standardized and central location.
3.	Enable Authentication capabilities via Web Service.
4.	Enable a pre-population of FSA Web forms using Web Services and leveraging information already gathered regarding a customer.

Web Usage	
Rank	**Business Objective**
1.	Create simple, function-based web sites that allow easy access to desired functions and search

Web Usage	
Rank	**Business Objective**
	capabilities throughout the entire lifecycle.
2.	Provide dynamic content and personalization for unique customer experience.
3.	Provide the capability to collect/view FSA customer's touch points.
4.	Leverage a common "look and feel" while maintaining individual customer needs.
5.	Establish a single entry point (one URL to remember) for new FSA customers.
6.	Share certificates with external sites (shared authentication/credentials with Third Party).

Data Storage, Management and Access	
Rank	**Business Objective**
1.	Provide data access to varied resource needs, in the formats necessary to provide meaningful business information and provide data mining and analytics tools that allow simple access to data and facilitate trending, forecasting and the necessary information for business decisions.
2.	Improve the timeliness and efficiency of data feeds to accommodate varied audience data needs.
3.	Store, exchange, and manage data in a system independent format that enables access to key data across FSA throughout all phases of the lifecycle.

External Information Access	
Rank	**Business Objective**
1.	Standardize external exchange of commonly referenced data through a single, virtual, secure FSA gateway to simplify communication with FSA.
2.	Enable access to key business services for the external community.
3.	Right-Time exchange of necessary data with trading partners.
4.	Clarify, communicate, and enforce data access standards with external trading partners.

Appendix C: Meeting Minutes – Enterprise Target State Visioning

Date: October 28, 2003

Time: 1:00 pm – 4:00 pm

Location: 820 WDCUCP Room 221 B&C

Objectives:
- Review/Validate Technical Strategies Target Vision High Level Diagram
- Review/Validate To-Be Business Entity Flow Diagrams
- Place any key issues into the 'parking lot'

Agenda
1:00 Technical Strategies Target Vision High Level Diagram Review
2:30 To-Be Business Entity Flow Diagrams

Attendees

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Summary

- The Technical Strategies' FSA Target Conceptual Architecture was reviewed. All comments and feedback were used to update the diagram. The final diagram will be available as part of Deliverable 123.1.12 – Technology Vision and Strategic Plan.
- The School and Direct Loan Business Entity Flows were reviewed. All comments and feedback were used to update the diagrams. Attached are the updated versions of the diagrams for further review.

Parking Lot

- Knowledge based data (dear colleague, "non-data info") needs to be further addressed. Are "cubes" within the data warehouse/marts sufficient to illustrate the point
- Need to revisit eCmo data management requirements.
- "Individual User" access management (customer access)
- Centralized governance approach – FSA discussion
- Should we continue to pass all "O&D" financial transactions from GAPS through FMS? How could this be done otherwise? How does this impact the PPM Business Capability Area?

Discussion Points

- Technical Strategies Target Vision High Level Diagram Review
  - Initially the group walked through the steps from the previous Data Strategy Retreats that were used for arriving at the target state vision (Note: Meeting Minutes from the previous two Data Strategy retreats were distributed by email to all participants; they can also be found in the 123.1.4 Data Framework Specification Deliverable appendix).
  - The Technical Strategies Target Conceptual Diagram uses the To-Be Financial Aid Life Cycle Diagram as a baseline. The Technical Strategies Conceptual Diagram shows the To-Be vision from a more technical perspective. The group began reviewing the diagram starting in the middle data store box and moved outward, discussing the various layers.
  - As part of the central data repository, the metadata repository was noted as a new bucket depicted as part of the technical view of the target state vision (this data being where the standards and explanations of data fields are found). In response to a question, it was verified that the metadata is both data standards and process standards.
  - There was some confusion as to why the Enterprise Shared Functions were listed separately from the blue box items in the Integration Services layer. Furthermore, some of the group initially did not understand why some of the integration items were listed both in the gray integration layer and in the FSA Gateway box. It was pointed out that the duplication of items in the Gateway and the Integration Services Layer was to show that services are made available to the external community via the Gateway, but it was agreed that pictorially it was somewhat confusing and the integration items could be better illustrated.
  - In response to a question, it was noted that "Capability Discovery" (item in the Integration Services Layer) is where you have a directory of services and where you would find out how to interface with FSA.
  - A question arose as to whether the list of Enterprise Shared Functions was complete. The group agreed that the list only contained functions identified to-date and that additional ESFs could be identified in the future.
  - The "Data Tracing and Visibility" integration service was defined as being services which allow the business owners to know where the life-cycle processing is occurring and whether it is successful. The service could also allow users to find how many records are in each stage of the business process. This

capability should also be accessible via the FSA Gateway with the understanding that it would be limited access provided to the external partners.

- The group agreed that not all external partners go through an "internet cloud" to interface with FSA (e.g., some GAs have a direct feed into FSA). However, it was suggested that there be indication that some systems do go through the "internet cloud" to get the FSA Gateway.
- It was note that Web Services needs to be added as an Integration Service either in the Web Access box or in the Integration Services layer.
- It was agreed that the Enterprise Analytics and Research Green Box should remain in the security layer but should move outside of the Common Data Architecture; having the Green box inside loses the concept that it has business functions and is not just tools. The tools used by EA&R would remain inside the CDA as "Analytics and Research Tools".
- While reviewing the tools used by EA&R, it was suggested that "Enterprise Content Management" may not be accurately depicted as part of the data repositories and that another repository (yellow cylinder) may need to be added. Items were added to the parking lot noting that concept of "cubes" in the data warehouse may not be enough to illustrate knowledge management data and noting that eCMO data requirements need to be further researched.
- Some of the participants felt the Access Management (brown layer) does not accurately depict the fact that it is system access management, borrower user access management, and trading partner and internal access management.
- The security layer (blue) was defined as a mechanism for approving or authenticating before giving access and was determined to have both physical and software components.
- It was agreed that the ED/FSA Internal Users should be depicted as being outside of the security layer and coming in through the access management layer.
- It was pointed out that the student access management goes through the web access box. The students are able to view their data without going through a business capability area (green box).
- While the illustration may infer that students and trading partner individuals are managed at the same level, the group agreed that this issue still needs to be further researched and addressed.
- It was noted that in addition to the access management layer (brown layer) the business capability areas (green boxes) could have another lower-level of access management.

- To-Be Business Entity Flow Diagrams Review
  - School Business Entity Flow Suggested Revisions
    - The "FISAP" needs to be mentioned as being used by schools for Campus Based Funding application
    - There should be mention in the Entity Flow to the fact that the Federal School Code may be updated on an annual basis based on enrollment changes.

    - It was agreed that O&D, rather than TPM, should establish initial funding levels for Direct Loans and Pell Grants.
    - It was noted that in the To-Be O&D should not have the ability to modify any school demographic fields; all updates should be routed through TPM.
    - In the Origination and Disbursement process step it was suggested that there be reference to the maintenance processes (i.e., COA updates) which may have an effect on funding.
    - There needs to be an overriding paragraph in the "oversight" box that focuses on the TPM's oversight core processes.
    - It was pointed out that ACA payments are not invoices but are monies in GAPS that the schools are able to drawdown.
- Direct Loan/Pell Grant Business Entity Flow Suggested Revisions
    - In addition to the Common Record being sent via the FSA Gateway, there needs to be reference in the Delivery O&D box to the schools' capability to submit individual updates via the web.
    - It was noted that reference to O&D processing paper promissory notes should be removed. O&D processes only electronic MPNs (either an electronic signature or an imaged paper note).
    - O&D should trigger the push of data from the CDA to CSB, rather than CSB retrieving the data.