FEDERAL STUDENT AID

We Help Put America Through School

FSA Modernization Partner Enterprise Application Integration (EAI) Core Release 3.0

Technical Specification

Version 1.0

Task Order 80
Deliverable 80.1.2

May 3, 2002

Amendment History

DATE	DESCRIPTION	REFERENCE	APPROVALS / DATE
5/3/02	Initial Delivery	Ganesh Reddy, Janet Scott, Carol Seifert	5/17/02
6/11/02	Resubmitted with change log.	Ganesh Reddy, Janet Scott, Carol Seifert	6/18/02
6/28/02	Resubmitted with change log.	Ganesh Reddy, Janet Scott, Carol Seifert	7/5/02

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1 Introduction

This document provides an overview of the detailed design of the Technical Specification for Release 3.0 EAI Core Architecture. EAI Release 3.0 will build additional and enhanced technical services to enable FY02 modernization initiatives to implement end-to-end business processes. Business applications will be able to integrate and communicate with back-end systems via the common, reusable services provided by Release 1.0 and Release 2.0 of the EAI Core Architecture, as well as those that will be provided in Release 3.0.

1.1 Document Purpose

This document is intended to provide the FSA specific EAI architectural detail information. The EAI Technical Specification Release 3.0 deliverable defines the architecture design and services provided by the EAI Core Architecture to enable business applications to utilize the EAI Bus. The objective of this document is to provide the information necessary to understand the components comprising the EAI Bus, and the architectural design for enabling the Release 3.0 business applications and systems to utilize the services provided by the enterprise EAI architecture at FSA.

1.2 Scope

Key FY02 investment priorities depend upon EAI Release 3.0 Capabilities and associated support. The applications implemented and underway in FY02 include:

- Common Origination and Disbursement
- FARS Retirement
- FMS IV
- NSLDS Replacement
- eCB
- EFS
- FAFSA 7.0
- Financial Partners DataMart
- Consistent Answers
- DMCS Replacement
- OCTS
- CMDM

1.3 Document Organization

Section 1, Introduction, provides the document purpose, scope, organization, and relationship to other documents.

Section 2, EAI Architecture Overview, provides the overall vision for EAI at FSA and discusses the Business Functions that EAI has provided to the enterprise, is in the process of providing, and planned and potential business functions.

Section 3, Technical Specification, provides the detail specification information for the Release 3.0 EAI implementation. It is divided into several subsections.

EAI Framework describes the areas of functionality of an EAI architecture.

EAI Infrastructure defines the components that make up an EAI implementation.

Business Process Analysis provides an overview of the analysis process being used to map EAI functionality into the overall business needs of the enterprise.

New Initiative Interfaces defines the near-term interface requirements for modernization initiatives that are not yet mature enough to have interface designs.

Interface Designs provides an overview of the interface designs that are recently completed or in progress

EAI Security provides a description of the security features of the EAI architecture, and how they fit within the context of the overall FSA security architecture.

Development Architecture provides an overview of the environments used in the development, testing, and deployment of EAI. It also defines the migration control process, tools, and procedures.

Operations Architecture defines the operations environment and the roles of the various organizations involved; including the definition of how the EAI support is imbedded in the existing support process.

Execution Architecture documents the overall EAI architecture across the enterprise, and defines a typical implementation of a transactional interface and a file transfer interface

1.4 Relationship to Other Documents

This is a design document, which builds off of the requirements outlined in 80.1.1 EAI Release 3.0 Assessment and Requirements Matrix. It provides a foundation for the work that will be documented in EAI Release 3.0 Application Enablement Guides (80.1.4a and 80.1.4b) and the EAI Build and Test Report (80.1.3).

2 EAI Architecture Overview

2.1 The Vision

The Enterprise Application Integration (EAI) architecture is intended not only as a tool for integrating the existing legacy systems at FSA, but as a means of supporting customer access and future development efforts which require access to common data and business processes by making the data available enterprise-wide.

The EAI architecture is designed to provide a set of common technology services that enable the integration of the processes and data of disparate systems. FSA can use the common services to integrate existing legacy systems, and to quickly develop e-Commerce applications that can easily reuse business logic and data that is in FSA legacy systems.

The EAI Architecture will enable FSA to convert and format data and message content from several different systems and data sources. EAI will provide the messaging infrastructure for connectivity between existing legacy systems, COTS applications, Data-Warehousing systems, and Web-based solutions. The EAI messaging infrastructure and the advanced integration capabilities, such as message/data transformation, will provide an overall service delivery system with standard interfaces that all new and legacy systems can depend on.

The Enterprise Application Integration (EAI) provides the services necessary to support application integration across the FSA Enterprise. The topology supports the implementation of an asynchronous messaging back-plane that forms the basis for the deployment of a hub and spoke network infrastructure. The topology also supports application connectivity and transaction processing through the integration of pre-built application adapters, gateways and connector frameworks. The following topology diagram depicts execution topology and product mapping for the EAI Infrastructure Domain.

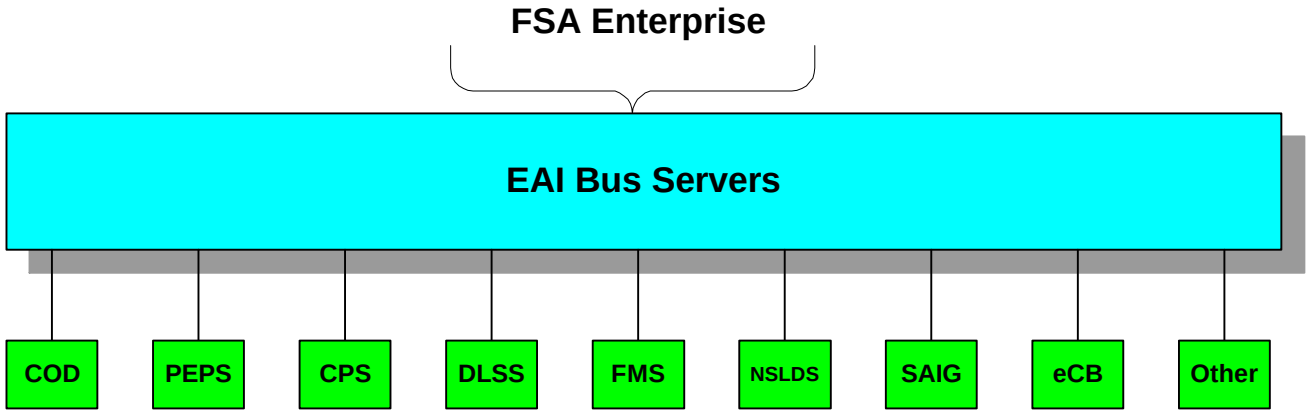


Figure 1: An example of the general EAI vision. This is not intended to be a comprehensive diagram covering all aspects of EAI work.

2.1.1 Enterprise-wide Access

One of the benefits of EAI is that it supports re-use of components. The EAI Architecture does not create functionality; it creates links between systems that need to exchange functionality. Even though the business functions may have been implemented to support a particular application, the intention is to make that functionality available across the enterprise (with appropriate access constraints).

2.1.2 External Access

The EAI Team is investigating methods to provide access and connectivity to external entities via such approaches as the SOAP reusable common service being provided by the Integrated Technical Architecture team.

2.2 Business Functions

In building interfaces between applications and systems, the EAI team works with the application teams to identify the business functions that will enable the completion of business processes across the enterprise. Units of information shared between applications can often be reused. As more applications build interfaces to the EAI bus, there will be increased opportunities for reuse of business functions.

This section describes the current Business Function view of FSA EAI capabilities, in terms of the functions already installed, those that are in progress, planned implementations and potential future opportunities. This section is intended as a non-technical view of capabilities.

Business Functions—Installed: These business functions are currently supported by EAI.	
Function	**Description**
Direct Loan Exit Counseling	The Direct Loan Exit Counseling function provides reliable, performance enhanced, NSLDS-based loan status information to Direct Loan holders during web-based exit counseling. The data are provided from NSLDS to DLSS as individual transactions in real-time.
Ombudsman Case Resolution	The Ombudsman Case Resolution function provides automation of the NSLDS-based loan information to Ombudsman caseworkers. The data are provided from NSLDS to OCTS as individual transactions in real-time.
Direct Loan Portfolio Analysis	Direct Loan transaction details and demographic data are provided to the Credit Management Data Mart (CMDM) to support Direct Loan portfolio analysis.

Business Functions--In-Progress: These business functions are currently being developed, and some of them have already started production.	
Function	**Description**
School Eligibility Verification	PEPS provides data regarding School Eligibility currently to eCB supporting Campus Based, and is scheduled to provide School Eligibility data to COD when COD goes live. The data include eligibility for Title IV programs, Campus Based, Pell Grant, and Direct Loan. The interface for this function has been installed, but will not be fully in production

Business Functions--In-Progress: These business functions are currently being developed, and some of them have already started production.	
Function	**Description**
	until COD goes live.
Student Eligibility Verification	Validates student eligibility for Direct Loan and Pell Grants. The Direct Loan and Pell data are provided to COD. This function has gone into production with COD.
Direct Loan and Pell Accounting	This capability posts financial and non-financial accounting events for Direct Loans and Pell Grants. COD provides the data to FMS. This function has gone into production with COD.
Direct Loan Tracking	COD provides loan Bookings to DLSS to record Direct Loans as soon as they are booked to enable repayment and deferment calculations. This function has gone into production with COD.
Promissory Note Information	Promissory Note Information, whether from the Imaging System or from the electronic Master Promissory Note web site is provided to COD in real-time. This function has gone into production with COD.
Pell Grant Notifications	COD provides NSLDS with notification of changes in status of Pell Grants each day. This function will go into production with COD, scheduled for July, 2002.
Originations and Disbursements	Disbursement requests from Schools for individual Pell Grants and Direct Loans are sent through SAIG to COD, either in the new Common Record format, or the current Direct Loan and Pell formats. This capability has gone into production with COD.
Campus Based Funds Management Coordination	eCB provides FMS with Financial Data
Direct Loan Demographics	DLSS provides demographic data to the Credit Management DataMart.
Direct Loan Portfolio Analysis	FMS pulls data from CMDM. Credit Management Data Mart provides Direct Loan analysis data to FMS.

Business Functions—Planned: These business functions are preliminary. They have been identified during the assessment process, but are subject to refinement. Also, it has not yet been confirmed that they can all be implemented within the budget and schedule constraints of Core Release 3.0	
Function	**Description**
Individual Authentication	An individual transaction request to the PIN Site provides identification data about a particular individual, including a Personal Identification Number. The PIN Site responds with an indication of whether or not that individual was authenticated. This is a proposed capability that is currently under discussion. An EAI interface to this capability would provide a single standard method for non-web applications, like Interactive Voice Response Units, to authenticate individuals.
Student Address Update	Most FSA systems that deal with student data maintain address information for the students. This proposed business function would capture address updates from any one of multiple FSA systems, validate the update with the System Owner of the student address, and distribute the update to the other FSA systems that keep student addresses. Eventually, the FSA data architecture may evolve to eliminate redundancy of student addresses, but until that time, this function would provide all subscribing FSA systems with the most current student address data available.
Campus Based Summary for FISAP	COD will summarize Campus Based results each year for each School, and provide that summary to eCB to pre-populate the appropriate fields on the FISAP. This saves schools

Business Functions—Planned: These business functions are preliminary. They have been identified during the assessment process, but are subject to refinement. Also, it has not yet been confirmed that they can all be implemented within the budget and schedule constraints of Core Release 3.0

Function	Description
	from having to track and calculate the annual statistics themselves.
Direct Loan and Pell Status for an Individual Student	COD will provide current award status for an individual student for both Pell Grants and Direct Loans. This status transaction will be available to whichever FSA systems require the data. It is anticipated that the Consistent Answers initiative will be the first to make use of this capability.
FAFSA Status for an Individual Student	CPS will provide a status of the FAFSA for an Individual Student in response to a request. FAFSA on the Web will likely be the main user of this function.
Student Aid Record for an Individual Student	CPS provides the results for an individual student of its eligibility determination, including the Expected Family Contribution for need based aid. Again, FAFSA on the Web will likely be the main user of this capability.
Direct Loan Repayment Status for an Individual Student	DLSS provides the Direct Loan Repayment Status for an Individual Student in response to a query with the student identifier data. The Status includes current loan balance, payment history, and recent transactions.
Debt Collection Status for an Individual Student	DCMS provides the Debt Collection Status for an Individual Student in response to a query containing the Student's identifying data.
Campus Based Award Status for an Individual Student	The eCB system provides the award status for an individual student in response to a query containing identification data for a particular student.
Student Aid Financial History for an Individual Student	NSLDS provides a complete history of financial aid for an individual student in response to a query containing the identification data for a particular student.
Student Aid Application Data for an Individual Student	This capability would provide students' basic information, attendance information, financial information, parental information and school choice information captured during the Aid Application process. It is envisioned that CPS would likely be the primary user of this information receiving it from FAFSA on the Web, but future sharing of this information with the Consistent Answers application is also a possibility.
Imaged Document Data	The Electronic Records Management system (ERM) provides data about documents that have been imaged. The data are provided either in response to a query containing document identifier, or published to applications that have indicated an interest in particular types of documents.
Financial Partner Status	This capability will enable PEPS to provide data regarding Financial Partner Eligibility to various FSA systems.
Student Fulfillment Status	This capability will provide students with information regarding the status of the materials that they have requested from FSA.
Update of Loan Status	This capability will enable DMCS to update the loan status in DLSS.

Business Functions—Potential: The following business functions are a preliminary list of potential integration opportunities. They have been identified through the business process analysis effort, and are subject to refinement. It has not yet been confirmed that they can all be implemented within the budget and schedule constraints of Core Release 3.0

Function	Description
New Institution Application for Participation	A school that wishes to participate in the federal loan programs offered by FSA must submit an application to participate using the eApp application. This capability would provide information on new school applicants' including school ID, demographics, loan and grant programs and any relevant default information. It is envisioned that this information could be transmitted from the eApp application to PEPS.
Institution Application for Re-certification	Every few years schools are required to become re-certified in order to remain eligible to participate in the federal loan programs. Schools must submit this re-certification information using the eApp application. This capability would provide information on a school's re-certification application including school ID, demographics, loan and grant programs and any relevant default information. It is envisioned that this information would be transmitted from the eApp application to PEPS.
Update Institution Demographic Data	Schools have the ability to update their demographic data using the eApp application. This information is then reviewed and if approved is updated in the PEPS application. This capability would provide information on any updates to a school's demographic data. It is envisioned that this information would be transmitted from the eApp application to PEPS.
Internal Distribution of Institution Eligibility Information	PEPS provides data regarding School Eligibility currently to eCB, and is scheduled to provide School Eligibility data to COD when it goes live. The data include eligibility for Title IV programs, Campus Based, Pell Grant and Direct Loans. In addition to these business functions it is envisioned that this information could be further shared with the FMS and NSLDS applications. Eligibility information may change when a new institution applies, when demographic data updates are invalid or when an institution is denied during re-certification.
External Distribution of Institution Eligibility Information	Currently the eligibility status is communicated to a school when a new school applies, becomes re-certified, update their demographic data or when cohort default rates are received by PEPS. This capability would provide schools with information regarding their eligibility status. It is envisioned that this information would be transmitted from PEPS to the eApp application for school's to review their eligibility status.
Stop Institution Payment resulting from Re-certification Denial	Every few years schools must become re-certified in order to continue participation in the federal loan programs. In the event that a school is denied their re-certification all payments to the school will be stopped. This capability would provide the necessary information needed to stop payments to a school once a school's denial for re-certification is confirmed. It is envisioned that this stop institution payment information would be transmitted from PEPS to the Grants Administrative and Payment System (GAPS).
PIN Creation and Signature Authentication using PIN	In an effort to centralize and simplify the loan application process for students, the on-line loan application process may be redesigned to be centered around FAFSA on the web. In addition, the new redesign may leverage the PIN for user authentication. This capability would provide users with the ability to apply for a PIN from FAFSA on the Web, receive it and authenticate to the system when logging in. Additionally, this capability would enable students to submit their applications with an electronic signature.
Request for Help when Applying for a Loan	Currently students can apply for loans using the on-line FAFSA application. Frequently questions arise regarding the loan application. This capability would facilitate the exchange of information between the applicant during the on-line loan application process and the Customer Service Application aiding in the request for help.

Business Functions—Potential: The following business functions are a preliminary list of potential integration opportunities. They have been identified through the business process analysis effort, and are subject to refinement. It has not yet been confirmed that they can all be implemented within the budget and schedule constraints of Core Release 3.0

Function	Description
Update Customer Service Application with new Applicant Data	Currently students fill out a FAFSA application to apply for federal student aid. This information is then sent to and processed by the CPS application. One of the key calculations performed by CPS is the determination of the Expected Family Contribution (EFC). This capability would leverage a redesign in the on-line loan application process and would allow the FAFSA data and EFC information to be shared with the Customer Service application. This would enable the customer service team to have the most up to date information shortly after completion of the loan application.
Cross-check Applicant Eligibility with External Federal Agencies	This capability would facilitate the eligibility check with external agencies (e.g., Social Security Agency, Secret Service, etc.).
Cross-check Applicant Eligibility Internally	This capability would facilitate the eligibility check internally within FSA. Currently this check is done between CPS and NSLDS, but in is envisioned that in the future this check may be done between FAFSA on the Web and Common Servicing for Borrowers Application.
Determine Pell Eligibility	This capability would provide the information necessary to determine Pell eligibility and Pell authorization amounts. It is envisioned that this Pell information would be determined by sending applicant data from FAFSA on the web to COD and COD would return Pell Eligibility and authorization amounts to FAFSA on the web. This information along with the FAFSA and eligibility information is then passed on to schools for creation of the school loan package.
Update Customer Service Application with Final Eligibility Information	During the Applicant Eligibility for Federal Aid Process, internal and external eligibility checks are performed, and Pell eligibility is determined. Upon completion of these eligibility checks, this capability would provide this additional applicant eligibility information to the Customer Service Application. This would enable the customer service team to have the most up to date eligibility information for an applicant shortly after the checks have been performed.

3 Technical Specification

3.1 EAI Framework

Enterprise Application Integration (EAI) is a set of technology services that enables the sharing of processes and data of disparate systems to support end-to-end business processes. The EAI Architecture will enable the many "stovepipe" applications to exchange information via common, reusable methods and infrastructure. The technical services that comprise EAI are grouped into four layers within the EAI framework. The layers of this framework are Business Process Management, Application Connectivity, Transformation and Formatting, and Communications Middleware.

3.1.1 Business Process Management

The Business Process Management layer is responsible for the definition and management of cross-application business processes across the enterprise and between enterprises. These services enable the communication not just of data, but also of the business process context of the data being sent to another application. The Business Process Management component provides for:

- Centralized visibility and control of multi-step business processes traversing multiple applications
- Real-time analysis capabilities
- Workflow-like coordination of multi-step processes
- Transactional control
- Process state information maintained to support rollback processes
- Graphical tools and metadata to define processes and rules

Implementation: This layer is not currently addressed

3.1.2 Application Connectivity

The Application Connectivity layer provides reusable, non-invasive connectivity with packaged software (e.g., Enterprise Resource Planning (ERP), third-party best-of-breed) and custom legacy systems enabled by reliable, event-driven messaging.

The Application Connectivity layer provides:

- Pre-built application adapters to ERP and packaged systems
- Custom adapter development kits
- Connection managed to and from source application
- Connectors to common technologies such as Object Request Brokers (ORBs), support for Common Object Request Broker Architecture (CORBA), Enterprise Java Beans (EJB), etc.

Implementation: See Section 3.2.3

3.1.3 Transformation and Formatting

The Transformation and Formatting layer is responsible for the conversion of data and message content and syntax to reconcile the differences between data from multiple heterogeneous systems and data sources. This layer is responsible for maintaining the information structure of the

messages passed between systems and their meaning in a format that can be comprehended by another application.

The transformation and formatting layer supports:

- Message protocol and format transformation
- Syntactic translation of one data set into another. (Example: translation of date formats, 01 Aug 1999 -> 19990801)
- Semantic translation of data based on underlying data definitions or meaning. (Example: conversion from the English system to the metric system)

Implementation: See Section 3.2.2

3.1.4 Communications Middleware

The Communications Middleware component provides the architecture that implements various messaging models and route messages according to message content and context. These services provide the connection among disparate resources, as well as security, queuing, and the functionality to reconcile network protocol differences.

The communications middleware:

- Directs the flow of messages among applications
- Supports both synchronous and asynchronous communications
- Routes messages to applications based on message subject and / or content
- Provides services via message brokers, ORBs or message queues

Implementation: See Section 3.2.1

3.2 EAI Infrastructure

The EAI includes the following components or nodes:

3.2.1 Queue Managers

Queue Managers are run-time processes that are responsible for managing queues of messages for application programs using International Business Machine's (IBM) MQSeries. Queue Managers help maintain the flow of messages through a queue and manage communication links between other queues.

3.2.2 Message Broker

The role of the Message Broker is to provide a layer of logic to the messaging layer. The Message Broker is the 'glue' between intercommunicating applications. The Message Broker ensures that messages are routed correctly between applications and in a format in which the applications can understand each other. FSA applications will use the Message Broker MQSeries Integrator (MQSI) to provide a mechanism for:

- Intercommunication between applications that are served by the application server
- Asynchronously obtaining data from legacy applications

- Asynchronously updating legacy applications
- Routing data to and from Enterprise Data Warehouses and Data Marts.

3.2.3 Application Adapters

Application Adapters provide direct connectivity to applications and disparate data sources. Application Adapters allow applications to coordinate transactional updates across different data sources. Application Adapters are used by Application Servers such as Component Broker (CB) to provide support for On-Line Transaction Processing (OLTP).

3.3 Business Process Analysis

At the center of any organization are the business processes. It is these processes that define the activities that must occur in order to produce results. As such, a comprehensive process model serves as a tool for organizations to use in communicating, refining and utilizing their process information in a variety of ways. The goal of Business Process Analysis is to examine each of the processes within the enterprise process model, and assist teams in identifying and defining integration opportunities that support FSA's future enterprise vision. The Business Process Analysis effort will decompose high-level processes to a level of detail where processes, applications and data interaction can be fully understood and will be used to prepare business process flowcharts. The resulting flowcharts will:

- Analyze application and data interaction within and across processes to identify and define potential integration opportunities
- Identify opportunities to build reusable business process components across the enterprise
- Facilitate the usage of key business entities that flow within and across processes
- Raise issues and identify gaps that may impact current or future releases
- Assist initiatives in aligning with the overall Enterprise Architecture Vision

The Business Process Analysis effort works closely with the project teams to leverage the most current process flow information developed / utilized by each of the project teams. By providing teams with a better understanding of how their evolving processes, systems and data needs fit in to the Enterprise Architecture Vision, teams will be better equipped to guide their efforts in developing their part of a cohesive enterprise solution.

3.4 New Initiative Interfaces

The implementation schedule for EAI is driven by the modernization initiatives. Interfaces are typically either transactional or bulk data transfer. A typical transactional interface is described in section 3.9.2. A typical file transfer interface is described in section 3.9.1. The following new initiatives are conceptual and are still in the process of defining interface requirements. The EAI schedule for these new initiatives depends on the schedules of other initiatives.

3.4.1 Consistent Answers

The Consistent Answers project is focused on providing more consistent service across all major customer interaction centers and through all media (Internet, automated voice response systems, Customer Service Representative (CSR), and paper based submissions). The EAI will allow access

to multiple sources of data through a single access point providing consistent answers to all FSA customers (including students, schools, and lenders / guaranty agencies).

The purpose of the Consistent Answers for Customers solution is to provide the ability for anyone within FSA or anyone representing FSA, to provide customers with accurate, complete and consistent answers, regardless of who is answering the question. This will be accomplished in 2003; the exact date is pending and will depend upon the Consistent Answers schedule.

3.4.1.1 Release Schedule

Two releases of the current initiative are planned; the first release is scheduled for October 14, 2002. The second release will be completed by the first of March 2003.

3.4.1.2 Interface Requirements

The Consistent Answers system will require interfaces with up to 9 other FSA systems:

- Common Origination and Disbursement (COD)
- Central Processing System (CPS)
- Direct Loan Consolidation System (DLCS)
- Direct Loan Servicing System (DLSS)
- The replacement for the Debt Management and Collection System (DMCS)
- National Student Loan Data System (NSLDS)
- Campus Based (eCB)
- Interactive Voice Response (IVR)
- Personal Identification Number (PIN) Site

It has not yet been determined exactly which of these interfaces will be transactional, but almost all will be.

It has not yet been determined which interfaces will be included in which releases.

3.4.1.3 New Adapter Requirements

Of the systems that Consistent Answers needs to connect, four do not yet have EAI Adapters installed:

- Direct Loan Consolidation System (DLCS)
- The replacement for the Debt Management and Collection System (DMCS)
- Interactive Voice Response (IVR)
- PIN Site

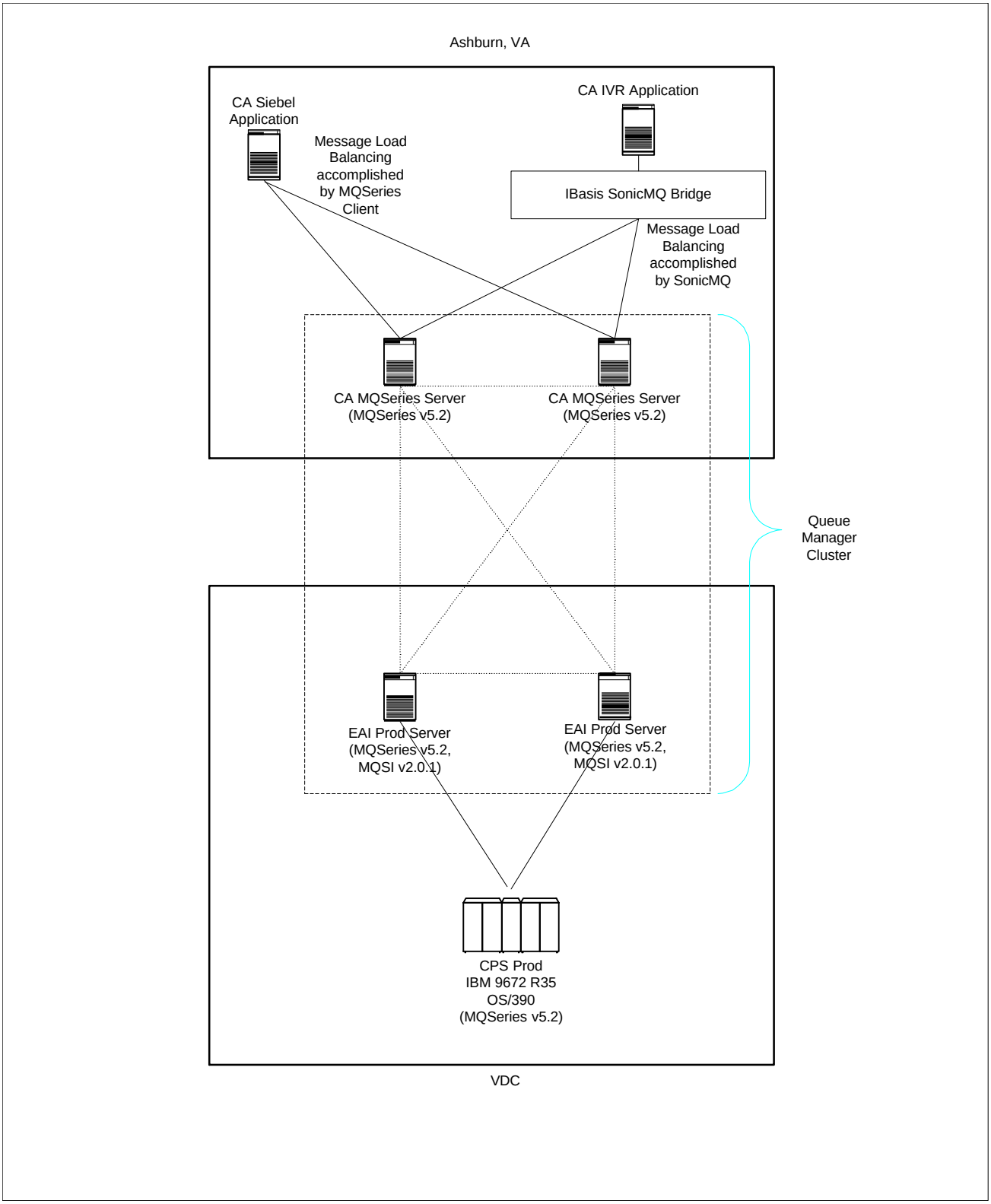
The software approach for the DMCS replacement has not yet been selected, so the Adapter approach will be determined after that selection. The two contenders are the LondonBridge commercial off the shelf product, and the DMCS replacement system developed by Raytheon.

The IVR system for Consistent Answers has been selected, so design of the Adapter approach has just begun.

The EAI Team is coordinating with the Consistent Answers Team to work with the business owners and technical teams for the DLCS and PIN Site interfaces.

The diagram below shows the EAI architecture design for the Consistent Answers Initiative.

EAI Core Environment with Consistent Answers



3.4.2 NSLDS Replacement

The National Student Loan Data System (NLSDS) replacement will provide access to student loan data with a data mart approach. EAI interfaces will provide the mechanism for loading the data. Phase II of NSLDS Replacement is looking into implementing the data fetch concept whereby data are retrieved in near-real-time from the system of record for each data item.

The initiative is examining the option of using Informatica data transformation on the EAI Bus Servers to prepare data from the various feeder systems for the data mart. The data feeds from each system would occur once a day at the same time, and use the bulk data transfer approach to move the data.

3.4.2.1 Release Schedule

The preliminary schedule for NSLDS Replacement, Phase I includes the following milestones:

- Preliminary Design – June 15, 2002
- Detail Design – September 30, 2002
- Build and Test – April, 2003

3.4.2.2 Interface Requirements

Phase I of NSLDS Replacement will require file transfer interfaces to the following FSA systems:

- Common Origination and Disbursement (COD)
- Central Processing System (CPS)
- The replacement for the Debt Management and Collection System (DMCS)
- Direct Loan Servicing System (DLSS)
- Postsecondary Education Participation System (PEPS)

3.4.2.3 New Adapter Requirements

Of the systems that NDLDS Replacement needs to connect, only DMCS does not yet have an EAI Adapters installed.

3.4.3 FAFSA on the Web (FOTW)

FAFSA on the Web (FOTW) is an application used by college students and schools to submit financial applications via the Internet.

MQSeries products and the EAI architecture will enable integration of legacy system functionality with FOTW Version 7.0, allowing these systems to be upgraded for increased supportability and scalability. EAI will also enable the FOTW application to display results from the Central Processing System (CPS) in real-time. Other benefits of the new version of FOTW will be:

- Elimination of the Shadow Direct project from the overall architecture. FSA already has purchased MQSeries products and following Version 7.0 of FOTW; they will be able to discontinue the utilization of Shadow Direct.
- Adherence to agreed upon and published Integrated Technical Architecture (ITA) standards. The ITA supports the use of MQSeries products, not Shadow Direct.

3.4.3.1 Release Schedule

The release schedule for FOTW 7.0 has not yet been established. Because the rules governing the FAFSA form change every year, a release date of January 1, 2003 is assumed.

3.4.3.2 Interface Requirements

FOTW will require a transactional interface to CPS.

3.4.3.3 New Adapter Requirements

The CPS adapter is already in place; no new adapters are required.

3.4.4 Electronic Financial Statements (eZ-Audit)

Under authority of Section 487 of the Higher Education Act of 1965 (HEA), as amended, the Department of Education collects financial statements and compliance audits in paper form from 6,500 proprietary, non-profit and public institutions that participate in Title IV programs. Collecting, copying, screening, disseminating, reviewing and filing all these documents is an extremely awkward and time-consuming process. The purpose of this initiative is to provide a paperless single point of receipt and access for financial statements and compliance audits by ensuring the following:

- Fully accessible, web-based application to replace current manual operations
- Electronic data capture to minimize errors, reduce paper, and eliminate lost documents
- Automated workflow tools to decrease backlogs, shorten cycle times, and balance resources
- Integrated business rules for improved decision-making throughout the review process
- User-friendly interfaces to reduce the manual data entry points and improve data access
- Data Store to eliminate duplicate data and immediately identify missing or late documents

In concept, institutions would sign on through the Schools Portal and enter standard audit and financial data through a forms-based web application. They would attach an electronic version of their compliance audit and financial statement to the web form, such as a portable document format file. The institution's independent auditor may need to sign on to certify that the data submission is correct.

3.4.4.1 Release Schedule

The start and end dates for the major components of this initiative are:

- Detailed Design May 2002 – July 2002
- Software Programming July 2002 – October 2002
- Implementation November 2002
- Production and Support December 2002 – February 2003

3.4.4.2 Interface Requirements

Requirements are preliminary, but it appears a transactional interface will be required with the ability to update the PEPS database.

3.4.4.3 New Adapter Requirements

The PEPS Adapter is already in place.

3.4.5 Debt Management and Collection System (DMCS) Replacement

Functionally, DMCS provides for the processing of outstanding financial aid debts from the time a debt is assigned to Department of Education until it is paid-in-full or otherwise satisfied.

The objective of the DMCS Replacement is to replace the current DMCS with a robust, modern and flexible Commercial-off-the-Shelf (COTS) package.

3.4.5.1 Release Schedule

The initiative is currently analyzing interface requirements with a planned implementation in June 2003.

3.4.5.2 Interface Requirements

DMCS Replacement will potentially require interfaces with 7 other FSA systems:

- Direct Loan Servicing System (DLSS)
- National Student Loan Data System (NSLDS)
- Common Origination and Disbursement (COD)
- Financial Management System (FMS)
- Direct Loan Consolidation System (DLCS)
- Electronic Campus Based (eCB)
- Post-secondary Education Participant System (PEPS)

In addition to FSA interfaces, the system interacts with many external systems. Private Collection Agencies and Guarantee Agencies currently have screen access to data, and may need some kind of automated interface.

The industry is starting to discuss standards for data interchange. FSA may want to build the capability to support such standard data interchange, but the technological approach has not yet been determined.

3.4.5.3 New Adapter Requirements

Adapters are already in place for all FSA systems, except DLCS and 14 other Government Agencies, including 36 Guarantee Agencies and 12 Private Collection Agencies. Significant configuration work may be required to implement the COD interface.

3.5 Interface Designs

The following interfaces have been implemented and deployed:

- Common Origination and Disbursement (COD)
- Financial Management System (FMS)
- Financial Partners Data Mart
- electronic Campus Based (eCB)

- FARS Retirement – Credit Management Data Mart (CMDM)

Detailed ICDs for these initiatives are a part of each project's documentation.

3.5.1 Common Origination and Disbursement (COD)

COD interfaces are documented in Interface Control Documents referenced in the Trading Partner Agreements with each of the interface systems. The interfaces are illustrated in the following diagram:

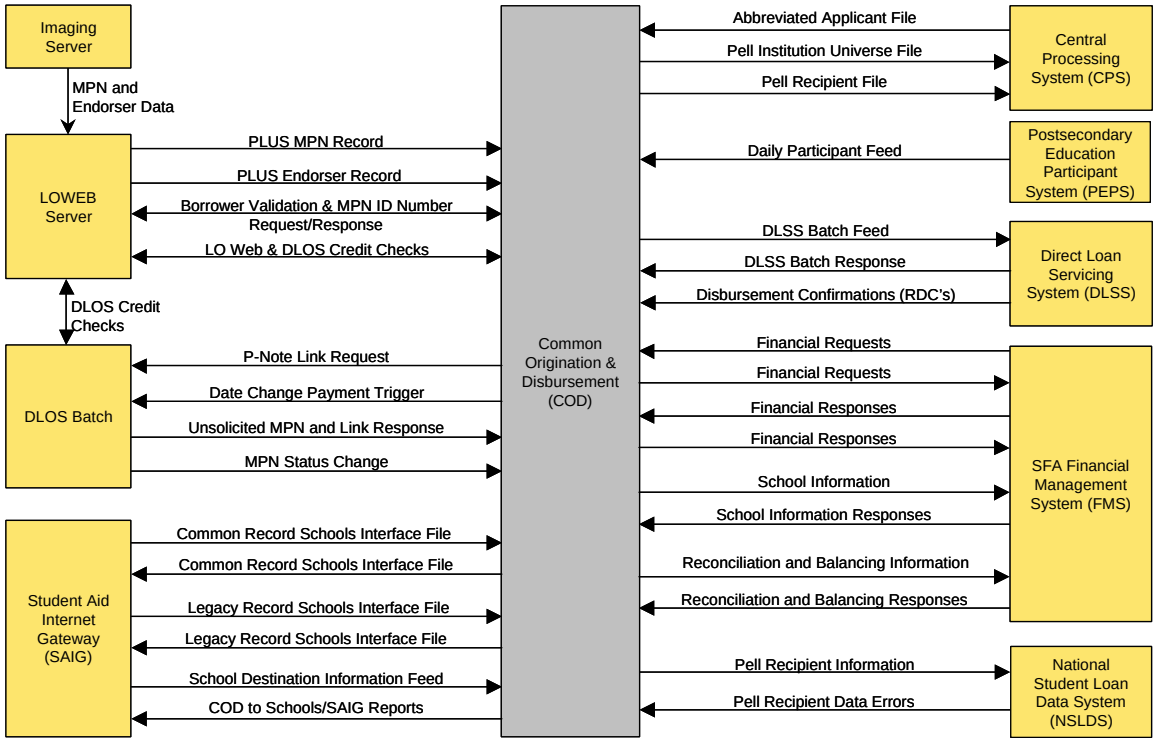


Figure 2: COD Interfaces

3.5.2 Financial Management System (FMS)

FMS Interfaces are implemented as transactional on the FMS side, even though the feeder system may be sending a batch file. The FMS – COD Interface Documentation is listed in the following table:

Document	Description
EAI_FMS_INST_ICD_001a_v4.doc	COD - FMS Institution Data Interface ICD
EAI_FMS_INST_ICD_001t_v4.doc	COD - FMS Institution Data Interface ICD
EAI_FMS_RESP_ICD_001a_v4.doc	COD - FMS Financial Interface

EAI_FMS_RESP_ICD_001t_v6.doc	COD – FMS Financial Interface
EAI_FMS_TRAN_ICD_002a_v6.doc	COD – FMS Confirmation / Error Response Interface
EAI_FMS_TRAN_ICD_002t_v7.doc	COD – FMS Confirmation / Error Response Interface

3.5.3 Financial Partners Data Mart

All of the interfaces are bulk file transfer. The FP Data Mart team has the responsibility for the interface documentation. The following diagram illustrates the interfaces:

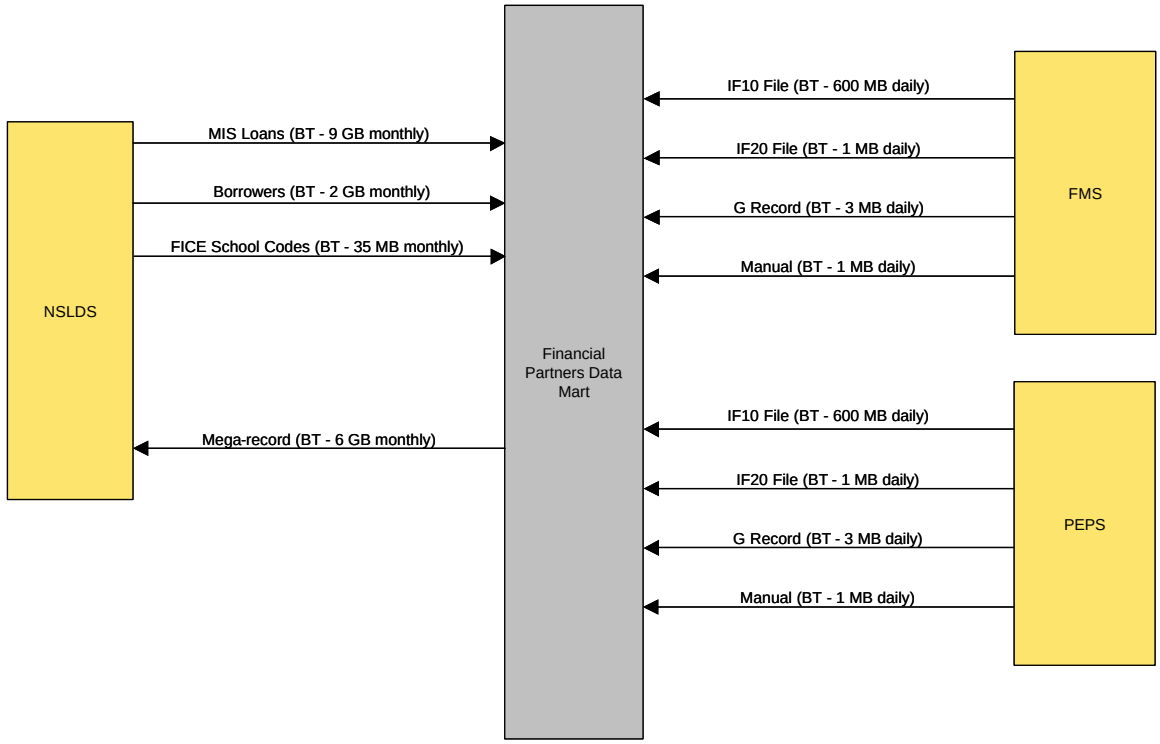


Figure 3: FP Data Mart Interfaces

3.5.4 electronic Campus Based (eCB)

The documentation for the eCB interface is delineated in the following table:

Document	Description
EAI_ECB_FMS_UTCL_IID_001a_v1.doc	eCB to FMS UTCL Internal Interface Design
EAI_FMS_UTCL_ICD_001b_v1.doc	UTCL Interface Control Document

eCB-FMS Technical Design.doc	eCB to FMS Interface Technical Design
PEPS-eCB Technical Design.doc	PEPS to eCB Interface Technical Design

3.5.5 FARS Retirement – Credit Management Data Mart (CMDM)

The interfaces associated with the CMDM are illustrated below.

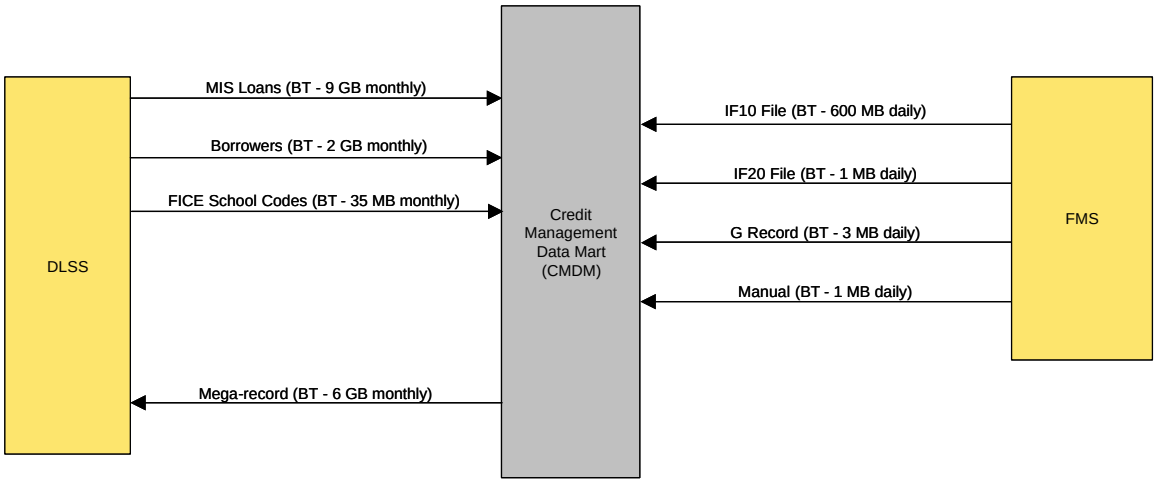


Figure 4: CMDM Interfaces

3.6 EAI Security

In general, security can be addressed at several different levels in a messaging environment. These security levels are identified as the application level, the architecture level and the infrastructure level (operating systems, network, and servers).

3.6.1 Infrastructure Security

Federal Student Aid provides security to its physical plant and facilities. This includes, but is not limited to, access to the building(s) and facilities, access to the server room(s), fire detection and suppression, water protection, and power protection.

The system components (hardware) are housed in a secure area with controlled access.

3.6.2 Architecture Security

Queue Managers ensure that they exchange messages with the correct partner Queue Managers. It is just as important for the sending Queue Manager to be sure of the receiver's identity as it is for the receiving Queue Manager to be sure of the sender's identify. Such an environment is called mutual authentication. EAI will develop, test, and implement MQSeries channel exits to authenticate connectivity between Queue Managers. Only Queue Managers in an authorized list

will be permitted to communicate. Each Queue Manager will have it's own list of who it can talk to.

3.6.3 Application Security

Individual applications that make use of the EAI Infrastructure have their own security officers and FSA security procedures in place to manage access to the systems by individuals.

The EAI development team is subject to the same FSA security controls regarding system access. All the developers have gone through the FSA security approval process, and have been granted FSA user ID access to the EAI infrastructure for development.

FSA's operations contractor supporting the data center controls access to systems in production.

3.7 EAI Development Architecture

3.7.1 Environments

The EAI team supports multiple environments for many different systems. In addition to Development and Production sets of queues, there are queue managers for two concurrent test environments. For COD testing, they were called User Acceptance Testing and Inter System Testing. The Inter System Testing environment will likely become the EAI Staging environment. The production environment will utilize clustering in order to provide failover should a system go down. The queue managers defined for the environments are listed in the following table:

FSA Queue Managers

System	Development	User Acceptance Testing	Inter System Testing	Production
EAI	EAID1 EAID2	EAIU1 EAIU2	EAII1 EAII2	EAIP1 EAIP2
SAIG	SAIGD1	SAIGU1	SAIGI1	SAIGP1
PEPS	PEPSD1	PEPSU1	PEPSI1	PEPSP1
CPS	CPD1	CPA1	PT1	CPP1
NSLDS	NPD1	NPA1	NPT1	NPP1
COD/TSYS	-	VDOQ	VDOQ	PPOQ
FMS	FMSD1	FMSU1	FMSI1	FMSP1
eCB	ECBSD1 ECBSD2	ECBSU1 ECBSU2	ECBSI1 ECBSI2	ECBSP1 ECBSP2
DLSS	DLSST1	-	-	DLSSP1
WAS	WASD1 WASD2	WASU1 WASU2	WASI1 WASI2	WASP1 WASP2

3.7.2 Migration Control

EAI release 3 code will be migrated from development UNIX servers onto test UNIX servers on a regularly scheduled time basis. The configuration manager will migrate emergency code fixes on a case-by-case basis. After successful testing on the test UNIX servers, the configuration manager will create change requests and coordinate with production system's administrators to migrate the code to production UNIX servers. Developers should not be changing code on test and production UNIX servers, this is ensured by the change control process in place at the VDC. Any upgrades to the production environment will happen when the functionality provided warrants the upgrade.

Test, production, and baseline will be the three version levels. Test is the level at which developers want code to be migrated to test UNIX servers. Production is the level where code has been successfully tested and ready to be migrated to production UNIX servers. Baseline is the level of the last workable test code for roll backs on test UNIX servers. Developers will be responsible for checking code into ClearCase and assigning test and production version labels on code. The configuration manager will be responsible for assigning the baseline version label on code.

3.7.3 Tools and Procedures

The EAI team will use Rational ClearCase for version control of code on Unix servers.

The configuration manager will create the necessary directories on the test UNIX server for the code. The developers will be responsible for checking in code, configuration files, Makefiles to compile and build code, and scripts. The configuration manager will create a script to update files

with site-specific information. Developers can work with the configuration manager to update environment variables.

The following process is used to migrate code into test:

1. FTP the test code from the ClearCase tool to the UNIX server
2. Create a tar file of the test code on the UNIX server
3. FTP the tar file to the targeted test UNIX server
4. Updated environment variables on the targeted test UNIX server
5. Extract the tar file on the targeted test UNIX server
6. Execute the script that updates files with site specific information
7. Run the make to compile and build code on the targeted test UNIX server
8. Validate the code on the targeted test UNIX server

Once the code is ready for production, the configuration manager will create a production ready tar file on the targeted test UNIX server. The configuration manager will create a change request with instructions and coordinate with the production system's administrators to migrate the code to production UNIX servers. Any rollout will happen as required to support modernization initiatives.

3.8 EAI Operations Architecture

3.8.1 Operations Monitoring

All MQSeries monitoring is performed by the VDC using the CSC developed tool, MQMON. The EAI team is responsible for creating the MQ object definitions with the attributes monitored by MQMON. The EAI team hands MQ object creation scripts to CSC for Production deployment.

If the VDC detects or is notified of problems with MQSeries, the VDC technicians will contact the EAI team for problem resolution support.

EAI needs a tool to trace messages and queue performance to support the development process, performance tracking and tuning and usage data. In addition, EAI needs to measure MQ traffic in terms of the number of messages and/or data volume. A preliminary evaluation of the Bristol Technologies product, Transaction Vision, has been completed. Final selection is on hold pending a monitoring decision.

3.8.2 Operations Support

The EAI Operations Support strategy is to embed the EAI support team into the current Operations Support process. The EAI Team will track issues and change control items, provide timely support and escalation, and use a tiered organizational structure to support Applications. Figure 5 illustrates the overall support model.

The EAI Team will use the Rational ClearQuest tool for Issue Management, including issue logging, issue notification, and issue tracking.

Escalation procedures will be based on the following problem severity levels:

- Critical
- High
- Work Request

Operations support is separated into the following tiers:

- Application Tier: Help Desk, FSA Operations
- Infrastructure Tier: Data Center
- Architecture Tier – EAI

The responsibilities for operations support are shared among the following groups:

- FSA Help Desk(s):
  - Field all user calls
  - Problem resolution using Troubleshooting Guides
  - Problem resolution assistance to Application Management Excellence team
  - Issue logging
  - Issue tracking
- Application Maintenance Team:
  - Application problem investigation
  - Application problem resolution
  - Issue Escalation (VDC)
  - Issue tracking
  - Issue closing (application owners)
- Data Center:
  - System Monitoring
  - Infrastructure maintenance
  - Problem identification
  - Problem resolution using Troubleshooting Guides
  - Problem resolution assistance to ITA & EAI teams
  - Issue logging
  - Issue assignment
- EAI Team:
  - Architecture problem investigation
  - Architecture problem resolution
  - Architecture production change and enhancement support instructions
  - Architecture product specialty support
  - Examples:

    In the course of resolving technical issues, the EAI team installed multiple Corrective Services Deliverables (CSD's) to MQSeries and MQSI, and applied two IBM ServicePacs to MQSI.

In addition, the team worked out configuration issues with ACS on the DLSS OpenVMS platform, including changing system parameters, installing IBM recommended patches, and planning a version upgrade to support ACS's operating system upgrade.

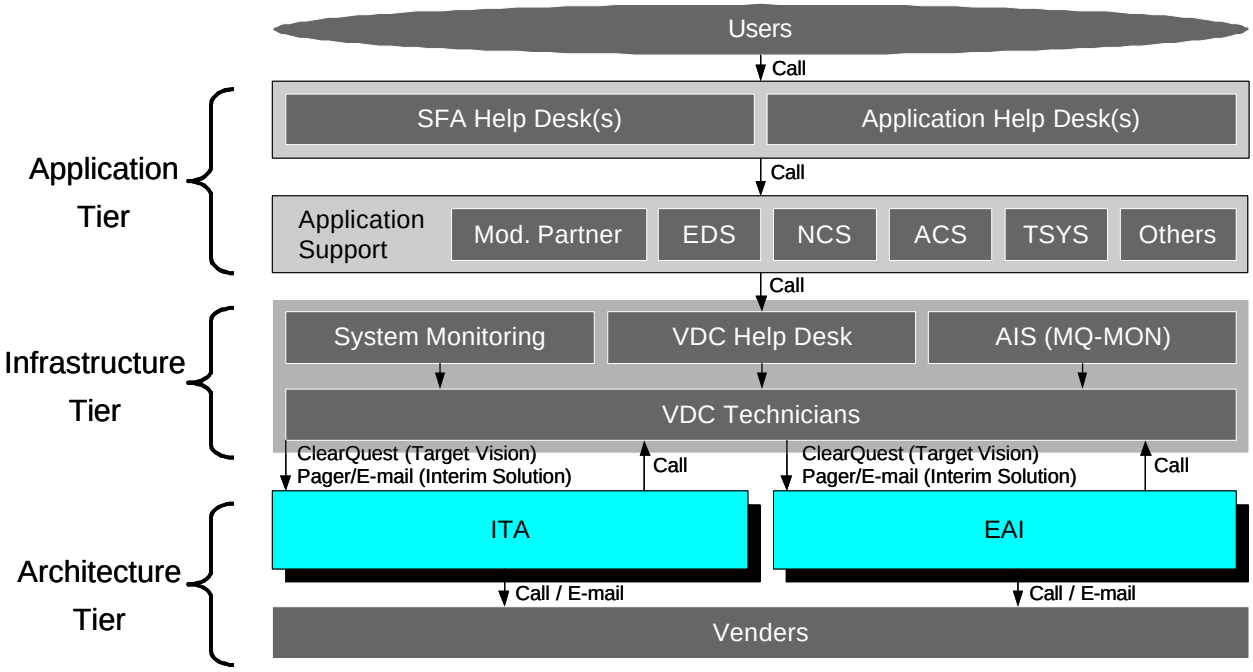


Figure 5: Operations Support Model

3.9 EAI Execution Architecture

The EAI infrastructure executes in production environments managed by various support organizations. Most of the FSA systems run at the Virtual Data Center (VDC) in Meriden, Connecticut. Computer Sciences Corporation operates the VDC. The Direct Loan Servicing System runs in an environment managed by ACS in Rockville, MD, and the COD system runs at the TSYS operations center in Columbus, GA. The overall production EAI architecture is illustrated in Figure 6. EAI also maintains development and testing environments that mirror the production environment as closely as possible (software version numbers, queue names, etc.).

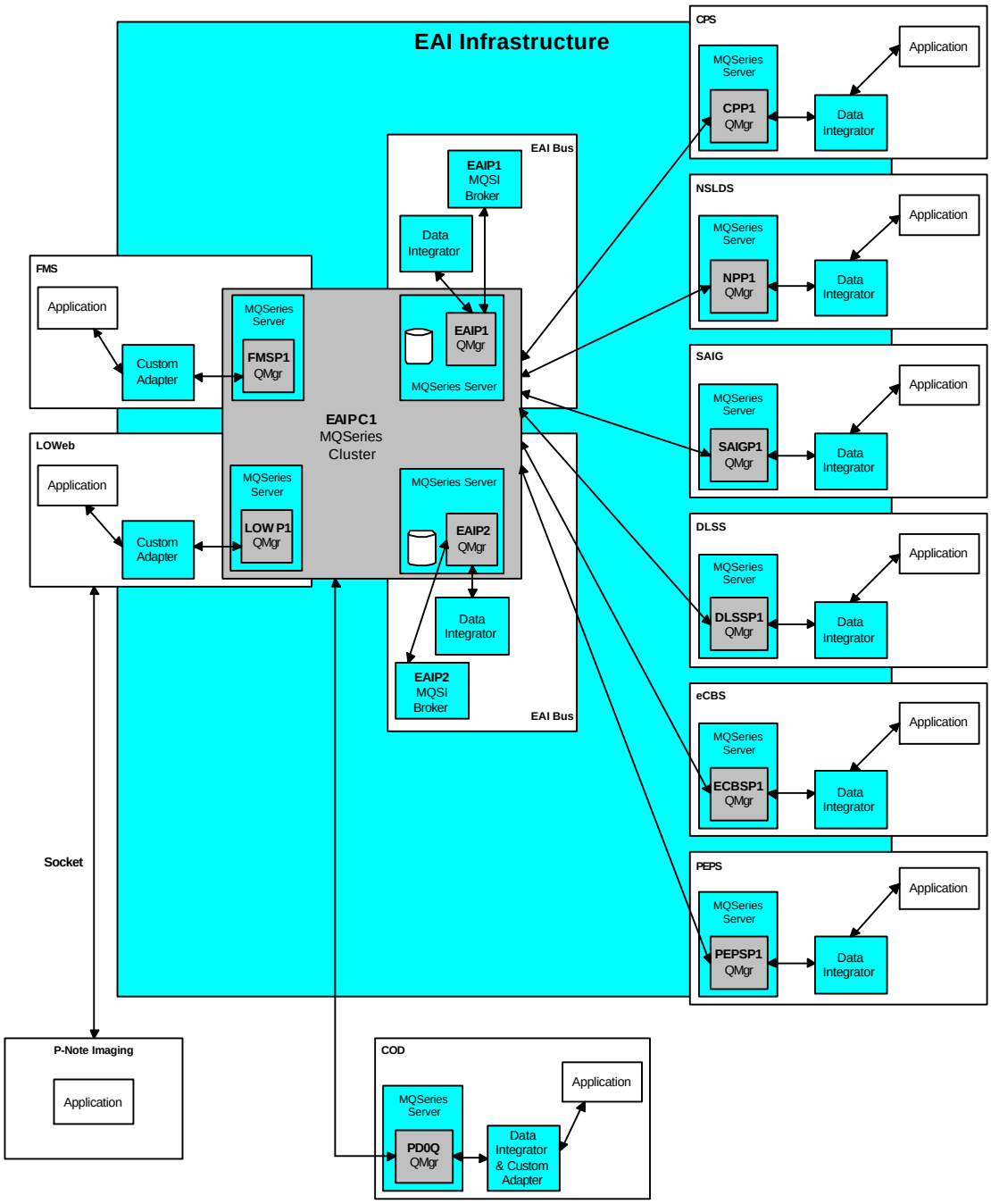


Figure 6: EAI Execution Architecture

3.9.1 Typical File Transfer Interface Design

A commercial off the shelf software product from Commerce Quest, Data Integrator (DI), is used to transfer bulk files using the MQSeries infrastructure. A typical transfer scenario is illustrated in Figure 7, and would perform the following steps:

1. A DI command is issued. In this example, a request to send a file to the destination system. The request is passed to the DI Managers input queue.
2. The DI Manager accepts the request and submits the request to the DI Sender via the DI Sender's input queue.
3. The DI Sender reads and transforms the data into MQSeries messages. This is when the data is put on the system's transmit queue. The messages arrive on the EAI Bus and are delivered to the destination system.
4. The messages that make up the data are submitted to the DI Receiver via the DI Receiver's input queue and data queues. The DI Receiver processes the messages and creates the output file.
5. The DI Manager receives all responses and ends the logical unit of work. DI status log files are updated accordingly.

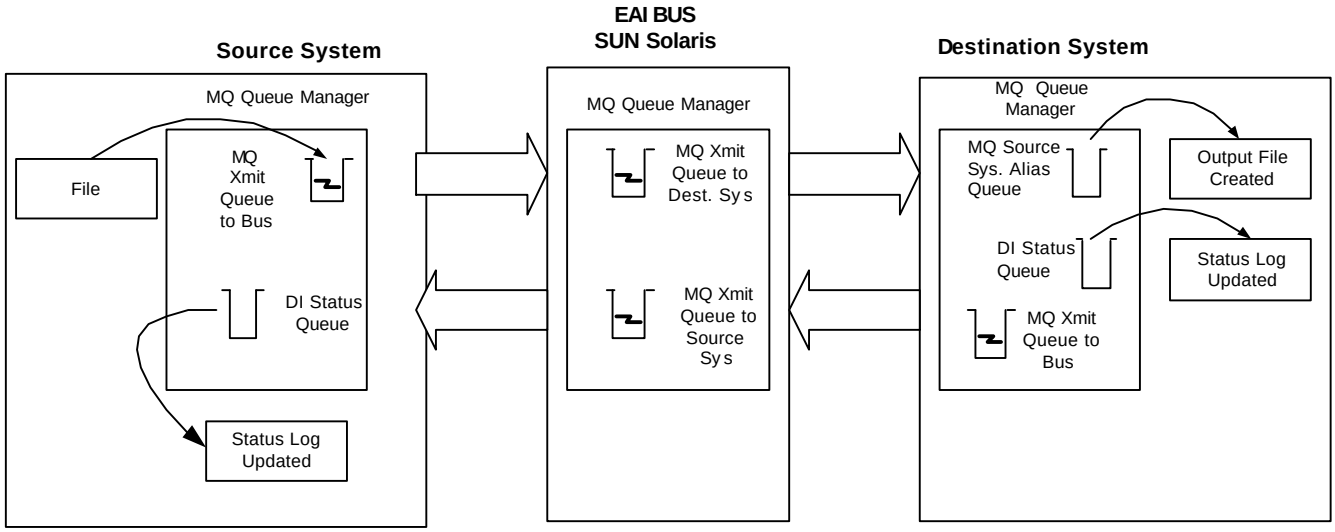


Figure 7: File Transfer Design

3.9.2 Typical Transactional Interface Design Using MQSeries Integrator

A typical transaction interface scenario is illustrated in Figure 8. The Source Application needs to send transactions to the Destination Application, but the Destination Application cannot accept transactions in the format of the Source Application. The transfer scenario would perform the following steps:

1. The Source Application places the transactions as MQSeries messages on the Source Output Queue. The transactions are sent, via the transmit queue, to the MQSI Input Queue on the EAI Bus for processing.
2. Once at the EAI Bus, MQSI retrieves the transactions and processes based on the actions defined in the message flow. Actions may include data transformation, content based routing, publish/subscribe routing, database integration, message enrichment and data warehousing.
3. Once complete the transactions are placed on the MQSI Output Queue. The transactions are sent, via the transmit queue, to the Destination Input Queue on the Destination System for processing.
4. Once at the Destination System, the Destination Application retrieves the transactions in a format that it can understand and processes it accordingly.

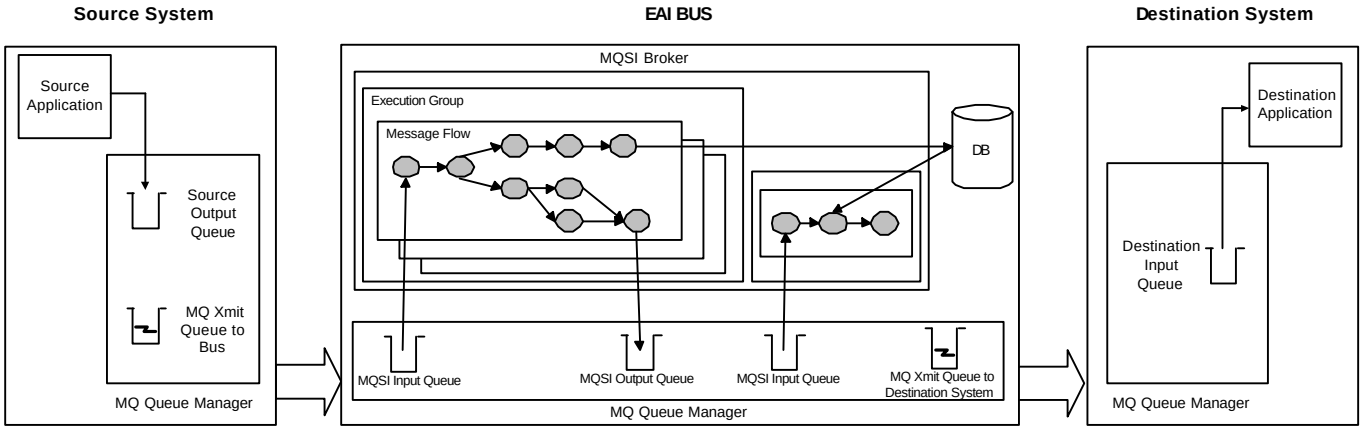


Figure 8: Typical Transactional Design

3.9.3 Reusable Components

3.9.3.1 Common Logging

EAI provides a common logging component that can by used by adapters when they are built to log appropriate interface data. Some basic capability has already been implemented.

3.9.3.2 File Transfer

EAI provides a common component that will transfer large files from one application to another using the CommerceQuest DataIntegrator 4.0.1 tool that builds upon the MQSeries messaging capability. This will interface with the files that each application produces.

3.9.3.3 Database Functionality

EAI provides a common component that will be used by adapters when global units of work need to occur between MQSeries and a database. In addition, EAI will provide a common component that will be used by adapters when stored procedures or PL/SQL calls need to be executed. MQSI will be upgraded to the next release, which will fulfill these requirements.

3.9.3.4 Data Transfer

EAI provides a common function that will allow adapters to communicate with MQSeries using HTTP/HTTPS. EAI and ITA are jointly evaluating a SOAP (Simple Object Access Protocol) solution.

3.9.3.5 Notification

EAI will provide a common component that will be used by adapters when an e-mail notification needs to be sent. MQSI will be upgraded to the next release, which will fulfill this requirement.

3.10 EAI Services

The services provided to application teams by the EAI Core team are comprehensive and are described below. A diagram outlining the services is attached in Appendix A of this deliverable.

3.10.1 Business Integration Design

This service provides guidance and support to application teams in their integration with the enterprise solution. The EAI team works with the application teams to identify the business needs of the trading partners. In addition, the teams identify trading partner data specifications.

3.10.2 Architecture Design

The EAI team and the application team determine the needs of the application. The needs are then assessed and an EAI solution is proposed.

3.10.3 System Installation/Admin

The EAI team installs, configures and administers the EAI software products for the application team.

3.10.4 Interface Development

The EAI team installs, configures and verifies the IBM MQ software to build interfaces to the EAI Bus for application teams. EAI Subject Matter Expert's provide support during application testing.

3.10.5 Performance Testing

The EAI team provides performance testing services after the interface has been deployed. This includes measuring the message response time and analyzing data throughput rates.

3.10.6 Operations Support and Maintenance

After interfaces are deployed and tested they are supported by EAI Subject Matter Experts. The EAI team applies patches and upgrades to maintain the EAI architecture. In addition, the EAI team provides problem resolution support.