

Project EASI/ED
Application Services Definition Document:
Subsystem and Interface Definition

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1. INTRODUCTION

This section provides an overview of the Project EASI/ED (Easy Access for Students and Institutions/ United States Department of Education) Application Services Definition Document (ASDD). It describes the purpose of the document, gives background information related to the development of Project EASI/ED subsystems, lists related documents, and provides the document organization.

1.1 Overview

Project EASI is a joint effort by ED and members of the external postsecondary education community to define and implement a customer-focused “system” to support postsecondary education. The Project EASI vision encompasses the entire postsecondary education community and its current customers. This includes prospective students, families, students, borrowers, schools, lenders, secondary markets, servicers, guarantors, state agencies, ED, professional organizations, and external organizations that may wish to share appropriate information (e.g., employers, financial counselors). Project EASI/ED encompasses ED's internal areas of responsibility as they relate to the overall vision, as well as ED's interactions with the postsecondary education community.

1.2 Document Purpose

The purpose of the *Project EASI/ED ASDD* is to deliver the baseline version of the Project EASI/ED process model by defining EASI/ED subsystems. It presents detailed subsystem definitions, including each subsystem's processes, external and internal interfaces, and its physical access and processing modes. Finally, it presents an EASI/ED subsystem implementation options analysis by identifying candidate subsystems for implementation via either commercial-off-the-shelf (COTS) packages, re-use of existing Title IV systems, or through outsourcing.

1.3 Background

The Project EASI Core Team, a group of ED and postsecondary education community representatives, began work in January 1995 to define a vision for Project EASI. Through the latter half of 1996, Project EASI Core Team members worked closely with ED and postsecondary education representatives to document, at the highest level, the overall Project EASI vision. In January 1997, the *Project EASI Concept Document* established a shared understanding of the Project EASI concept among the organizations and individuals involved in Project EASI.

In late December 1996, Project EASI/ED was initiated with the beginning of the definition phase of the system development life cycle. The early stages of this phase encompassed the identification of functional and data requirements for EASI/ED. The resulting *Project EASI/ED Business Area Requirements Document (BARD) version 1.0*, published on July 1, 1997, identified the high-level functional and kernel entity type requirements for the project.

Following completion of the *Project EASI/ED BARD version 1.0*, Project EASI/ED continued through the definition phase by completing the activities listed below.

- Development of a Logical Data Model (LDM) that represents the data required at the enterprise level.
- Definition of Project EASI/ED subsystems, comprising of logical grouping of processes that perform related functionality. These definitions also include subsystem interfaces, and access and processing modes.
- Identification of subsystem implementation options, through commercial-of-the-shelf (COTS) packages, re-use of existing Title IV systems, or outsourcing.

The *Project EASI/ED Application Services Definition Document (ASDD) version 1.0* was published concurrently with the *Project EASI/ED Logical Data Model Document (LDMD) version 1.0*. Together, these documents detail the result of the definition phase activities listed above.

This *ASDD version 2.0* reflects updates to the EASI/ED functional requirements identified during the development of the *Project EASI/ED BARD version 2.0*.

1.4 Relationship to Other Documents

The relationship of the *Project EASI/ED ASDD* and the *LDMD* to preceding Project EASI/ED documents is listed below.

- *Project EASI Concept Document*, January 1997, was the baseline of the Project EASI/ED vision.
- *Project EASI/ED Business Area Requirements Document (BARD) version 1.0*, July 1997, was the precursor to the *Project EASI/ED Subject Area Definition Report (SADR)* and provided the framework for its development.
- *Project EASI/ED Technical Vision and Target Architecture (TVTA)*, September 1997, presented the baseline framework technical architecture for the Project EASI/ED system.
- *Project EASI/ED Subject Area Definition Report (SADR)*, October 1997, identified the subject areas, entity types, and attributes required for the Project EASI/ED LDM.
- *Project EASI/ED Subsystem Definition Report (SDR)*, October 1997, developed in conjunction with the *SADR* and defines the initial interactions of processes with data.
- *Project EASI/ED BARD version 2.0*, August 1998, updated the Project EASI/ED requirements and replaced the *BARD, version 1.0*.

1.5 Document Organization

The *Project EASI/ED ASDD* is comprised of three volumes. Volume I, *Project EASI/ED ASDD: Subsystem & Interface Definition*, documents EASI/ED subsystem definitions. Its companion, Volume II, *Project EASI/ED ASDD: Implementation Options Analysis*, presents subsystem implementation analysis. Lastly, the ASD analysis workpapers are presented in Volume III: *Project EASI/ED ASDD Workpapers*.

This subsection briefly describes each following section and appendix comprising Volume I, *Project EASI/ED ASDD: Subsystem & Interface Definition*. Whenever appropriate, readers are referred to other Project EASI and Project EASI/ED documents for relevant information, rather than reproducing previously published information in this ASDD.

- **Section 2 - Technical Approach.** This section describes in detail the technical approach for analysis.
- **Section 3 - Subsystem Definition.** This section presents in detail the Project EASI/ED subsystems.

Detailed information supplementing the sections noted above is presented in the following appendices:

- **Appendix A - Acronyms and Definitions.** Presents a full list of acronyms used in the *ASDD* and their corresponding definitions.
- **Appendix B - Internal Interfaces Reports.** Presents the details of internal interfaces between EASI/ED subsystems.
- **Appendix C - Issues and Resolutions.** Presents open Project EASI/ED issues related to the LDM.
- **Appendix D - References.** Cites the principal references used in the *Project EASI/ED ASDD*.
- **Appendix E - Data Element Definitions.** Presents the definitions of the data attributes.
- **Appendix F - Key Data Flow Volumetrics.** Presents the estimated volume of transactions for key data flows.
- **Appendix G – Activity Hierarchy Diagram.** Presents the Activity Hierarchy Diagram, documented in the Composer tool.

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2. TECHNICAL APPROACH

This section describes the technical approach followed to define EASI/ED subsystems, and each subsystem's interfaces, transaction processing modes and physical access modes.

Subsection 2.1 explains the approach followed to define EASI/ED subsystems. Subsection 2.2 describes the approach used to identify and define external interfaces exchanging information between EASI/ED subsystems and external entities (individuals and organizations expected to interact with EASI/ED), and internal interfaces between subsystems. Subsection 2.3 explains the approach used to define subsystem processing and access modes (i.e., the methods used to create, change or access data in the EASI/ED system, and to connect to the EASI/ED system). Finally, Subsection 2.4 describes the technical environment that supported the analysis effort.

2.1 Subsystem Definition Approach

This section defines the steps used to define EASI/ED subsystems. The team developed and analyzed process/data interaction models using the Composer tool to define EASI/ED subsystems, using the steps below for this analysis.

Step 1: Perform Interaction Analysis. This step includes (1) reviewing and revising the Composer process model decomposition for completeness and consistency, and (2) analyzing process/entity type interaction (i.e., the expected effects processes will have on data in the LDM). This ensures that the information on EASI/ED functionality gathered at JIG sessions is incorporated in the model and the model conforms to data flow and requirement definitions related to each lowest defined process in the decomposition. Process/entity type interactions are defined in terms of the “Create”, “Read”, “Uppdate”, and “Delete” (CRUD) actions performed by a process on LDM entity types and documented in a process/entity type interaction matrix in the Composer tool.

Step 2: Perform Cluster Analysis. In this step, the Composer tool is used to rearrange and create groupings of processes, clustered together based on their common usage of data, using the process/entity type interaction matrix from the previous step as an input. In addition to identifying cohesive processes useful to subsystem definition analysis, this step also identified interaction anomalies (e.g., instances where entity types are not created or otherwise acted upon by any process). These anomalies were resolved with the help of the LDM team to achieve a consistent and complete process/entity type interaction matrix.

Step 3: Perform Affinity Analysis and Define Subsystems. The Composer tool is used to generate a process/process affinity matrix, using the interaction matrix resulting from the cluster analysis as input. This matrix (structured with processes represented on both the horizontal and vertical axes) is populated with Composer-generated process-to-process affinity values. These affinity clusters were used as a primary input in determining EASI/ED subsystems by identifying logical groupings of processes that exhibit high cohesion and low coupling characteristics. Highly cohesive processes operate on a common set of data. Processes with low coupling tend to have common functionality (or dependencies) with the other processes in their own group (rather than with processes outside their group).

Step 4: Review Requirements and Identify Other Subsystems. In this step, the team identified additional EASI/ED subsystems that would not necessarily be identified through the analysis steps

described in the prior subsections, but need to be defined to ensure that all Project EASI/ED requirements are satisfied. The team analyzed *Project EASI/ED BARD* requirements for those needing optimized information retrieval, simulation, statistical analysis and other analytical processing functionality, to identify additional subsystems.

2.2 Subsystem Interfaces Definition Approach

This subsection describes the approach followed to define EASI/ED external and internal interfaces. The team identified and defined EASI/ED subsystem interfaces using the steps listed in the following subsections. Subsection 2.2.1 lists the steps used to define external interfaces. Subsection 2.2.2 presents the steps used to define internal interfaces.

2.2.1 External Interface Definition Approach

External interfaces consist of the logical information flows necessary to support the functionality of the system. The following steps describe the approach followed to define external interfaces.

Step 1: Analyze Government Furnished Information. At the outset, the team researched the *Project EASI/ED BARD version 1.0* and other Government Furnished Information (GFI) to identify interfaces and initially populate these data flows with data elements.

Step 2: Conduct Joint Information Gathering Sessions. Next, a series of Joint Information Gathering (JIG) sessions were scheduled to gather detailed information about these data flow transactions. Subject matter experts from across the postsecondary education community were invited to provide the necessary expertise to review existing information about these flows and to supplement this information with additional input. Through these sessions new data flows were identified; redundant data flows were eliminated; and the data elements involved in each data flow transaction were identified and preliminarily defined.

Step 3: Perform Post-JIG Analysis. After each JIG session, information obtained was analyzed. The Interface Tracking Module (ITM) tool was used to document analysis results, including:

- Data flows between EASI/ED subsystems and external entities.
- Data elements included in each data flow.
- Data flow characteristics, including flow timing (how often the data flow transactions are transmitted), currency (how up-to-date the data flow information needs to be), media (the current, and preferred media for transmitting the data flow), and volumes (the number of flow occurrences sent/received during a defined time period).

Data elements and data flow characteristics were provided as an input to the logical data modeling activity. Feedback returned from the LDM team was incorporated into the analysis, and periodic reviews held to ensure correlation between the data flow analysis and the evolving LDM. Issues and action items originating at JIG sessions or during analysis were researched and resolved through analysis and through discussion at technical review sessions.

Step 4: Perform Technical Reviews. Periodically, the team presented interim work in progress at a series of five technical reviews by members of the postsecondary education community, senior

ED management and ED technical staff. These reviews were used as a forum to validate correctness and completeness of analysis and to resolve issues.

Step 5: Update ASDD. The team updated the flows and processes to create the *ASDD version 2.0*. This *ASDD version 2.0* reflects updates to the EASI/ED functional requirements identified during the development of the Project EASI/ED *BARD version 2.0*.

2.2.2 Internal Interfaces Definition Approach

This section describes the steps followed to define EASI/ED logical internal interfaces. Internal interfaces are logical flows of information between EASI/ED subsystems.

Step 1: Identify Cross-Subsystem Process Dependencies. The Composer process/process affinity matrix was analyzed to identify cross-subsystem process interactions and therefore dependencies between the subsystems. Such dependencies indicate the potential for one subsystem's need for information from another subsystem, and identify a potential logical internal interface between the two subsystems. For each potential internal interface identified in this manner, the processes' expected effects were reviewed to determine the entity types shared by the interface.

Step 2: Validate Internal Interface. The team analyzed (1) how each process interacted with the shared entity types in the internal interface and (2) the process functionality, to determine if the potential interface indicated a valid requirement for information exchange between the processes (and hence the subsystems).

Step 3: Define Internal Interface. Where a valid requirement for information exchange between subsystems existed, internal interfaces were defined and documented.

2.3 Subsystem Processing and Physical Access Mode Approach

This subsection describes the approach used to define subsystem processing and physical access modes. Subsystem transaction processing modes define the methods by which subsystem users can create, change or access data in the system. These processing modes are an input in selecting the architecture services that determine the capabilities delivered by the Project EASI/ED Common Operating Environment. Subsystem physical access modes define how users will connect to the EASI/ED system. Access modes need to be considered when determining architecture technologies suitable for Project EASI/ED.

Step 1: Identify EASI/ED Requirements Associated With Subsystem. Requirements associated with subsystems were identified through processes that comprise the subsystem, since individual processes are related to EASI/ED requirements in the RTM tool.

Step 2: Determine Subsystem Processing Mode. Review each subsystem requirement and subsystem data flow currency characteristics to determine the transactional processing mode implied by the requirement. Processing modes fall into one of the following categories:

- Batch mode, where the user has no immediate capability to change system data, while allowing batch file updating, and batch data entry, validation and collection. Data is processed at scheduled intervals.

- On-line, where the user has interactive capability to change system data, while allowing on-line inquiry, data entry and file updating.
- Both batch and on-line (a combination of the above stated modes)

Step 3: Determine Subsystem Physical Access Mode. Review each subsystem's requirements and subsystem data flow media characteristics to determine the physical access mode implied by the requirement. Access modes fall into the following categories:

- Electronic (including access over local area and wide area networks/ Internet)
- Facsimile
- Voice communication
- Paper
- Any combination of the above stated modes

Step 4: Update ASDD. The team updated the flows and processes to create the *ASDD version 2.0*. This *ASDD version 2.0* reflects updates to the EASI/ED functional requirements identified during the development of the Project EASI/ED *BARD version 2.0*.

2.4 Technical Environment

The technical environment used to support analysis and document results comprised the tools listed below:

- **Composer Computer Aided Software Engineering (CASE) tool.** This tool is used to maintain EASI/ED process and data models and to perform process/data interaction analysis to define EASI/ED subsystems.
- **Requirements Traceability Matrix (RTM).** The RTM (custom developed in MS Access) is used to provide traceability from Project EASI requirements to processes that constitute EASI/ED subsystems.
- **Interface Tracking Module.** The ITM application (custom developed in MS Access) documents the results of the interface definition analysis.

3. SUBSYSTEM DEFINITIONS

This section presents in detail Project EASI/ED subsystems. For each subsystem, it presents the following information:

- **Description.** Describes the functionality performed by the subsystem.
- **Processes And Requirements.** Identifies the logical grouping of processes comprising the subsystem, and their related *Project EASI/ED BARD* requirements.
- **External Interfaces.** Describes in detail the subsystem interfaces (current and envisioned flows of information between EASI/ED and users expected to interact with the system).
- **Internal Interfaces.** Describes internal flows of information between subsystems.
- **Processing and Physical Access Modes.** Presents processing and physical access modes for the subsystem.

This section identifies the six Project EASI/ED subsystems that interface with the LDM, as depicted in **Exhibit 3-1: EASI/ED System**.

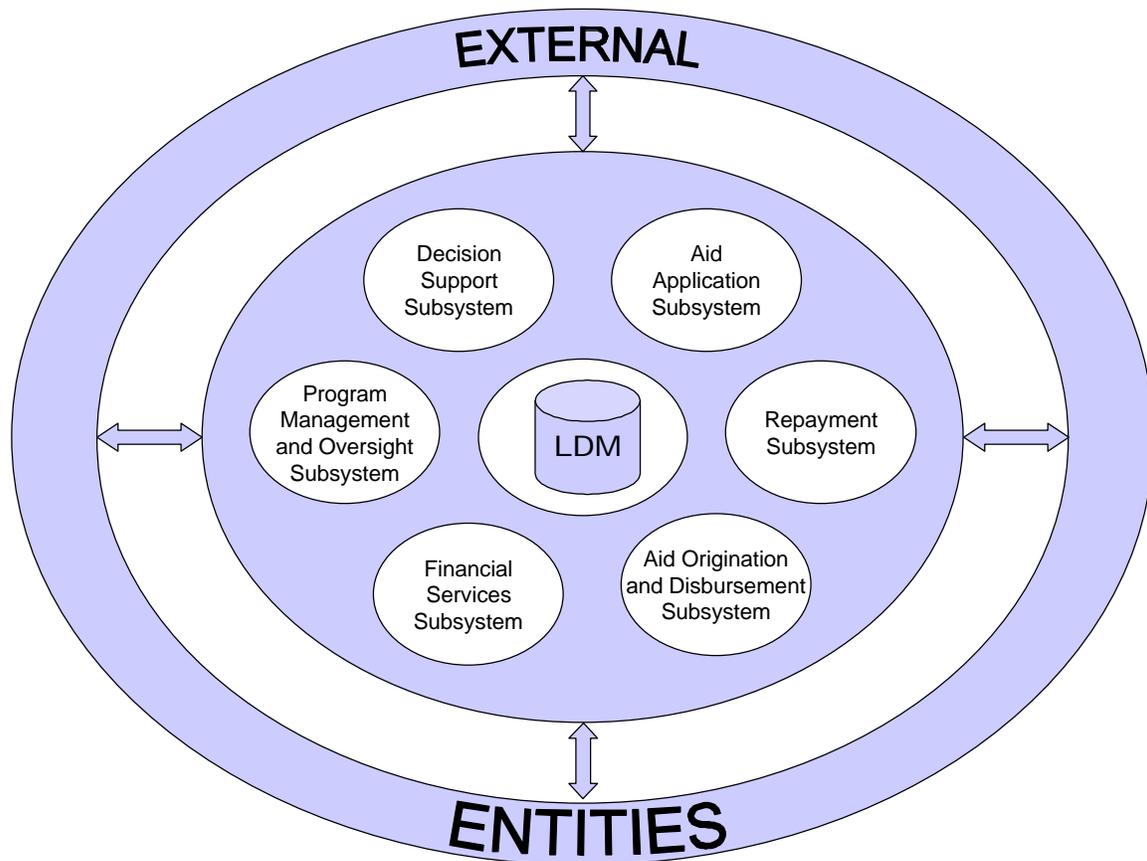


Exhibit 3-1: EASI/ED System

The external entities ring in **Exhibit 3.1: EASI/ED System** represents the various organizations that EASI/ED communicates with. These external entities are highlighted in **subsections 3.1** through **3.6**.

The six subsystems identified in **Exhibit 3-1: EASI/ED System** are listed below:

- **Aid Application.** Processes aid applications and renewals, determines participant eligibility for financial aid, facilitates financial aid simulation and provides participant aid history information to schools. This subsystem is presented in **subsection 3.1**.
- **Aid Origination And Disbursement.** Manages the disbursement of funds to schools, tracks disbursement information, manages authorization levels for schools, process payment claims from schools and fund sources, and manages the origination of aid. This subsystem is presented in **subsection 3.2**.
- **Aid Repayment.** Provides exit counseling, processes loan payments and changes in loan status, verifies loan history, and processes defaulted loans. This subsystem is presented in **subsection 3.3**.
- **Financial Services.** Processes financial transactions between EASI/ED and the postsecondary community, maintains account payables and account receivables records and manages the system ledgers. This subsystem is presented in **subsection 3.4**.
- **Program Management And Oversight.** Maintains financial aid program information and school business information, manages cohort default rates and appeals, maintains school and aid organizations program review and audit data, and handles inquiries and correspondence from participants, schools and aid organizations. This subsystem is presented in **subsection 3.5**.
- **Decision Support Subsystem.** Facilitates optimized information retrieval, simulation, statistical analysis and other complex analytical needs. This subsystem is presented in **subsection 3.6**.

The LDM is represented in the center of **Exhibit 3-1: EASI/ED System**. The LDM represents the data needed to support the functional and data requirements outlined in the *BARD version 2.0*. For more information on the LDM, see the *Project EASI/ED LDMD*.