1. GENERAL INFORMATION

1.1 Summary

Project EASI (Easy Access for Students and Institutions) is an effort by members of the postsecondary education community to define and to implement a customer-focused "system" to support postsecondary education, with a particular focus on student financial assistance. Within Project EASI, Project EASI/ED represents the US Department of Education's (ED's) initial effort to implement the Project EASI vision within the scope of its own business processes and systems.

This *Project EASI/ED Technical Vision and Target Architecture (TVTA) Report* recommends a baseline framework technical architecture for Project EASI/ED that reflects Project EASI/ED goals, priorities, and requirements. These goals, priorities, and requirements are documented in the *Project EASI Concept Document* (June 1997), the *Project EASI/ED Program Management Plan* (December 1996), and the *Project EASI/ED Business Area Requirements Document (BARD)* (July 1997). This report is the first in a series of architecture deliverables that will build upon each other, going into progressively lower levels of detail.

Technical architectures describe the hardware, software, and telecommunications components that comprise an information system. At the most basic level, architectural alternatives can be defined in terms of the strategies used to distribute processes and data within the system. Once this fundamental strategy is selected, the architecture “framework” can be fleshed out to fully reflect the technologies, products, and resources required for the system.

The *Project EASI/ED TVTA Report* is intended to serve as a basis for reaching agreement on the process and data distribution strategy for Project EASI/ED. To achieve this, a set of seven alternative architectures representing the possible permutations of process and data distribution strategies were developed. These architectures were reviewed against the Project EASI/ED evaluation criteria, and three were chosen for full evaluation. A fourth candidate architecture was added to the evaluation list at ED’s request. The *TVTA Report* presents the full evaluation of each of these candidate architectures and identifies a recommended framework architecture for Project EASI/ED.

One of the criteria used in the evaluation is procurement cost of each candidate architecture. To calculate estimated hardware and software costs, the architectures are populated with specific vendor products. In an effort to ensure that each distribution strategy is evaluated purely on its own merits, and not on the basis of competing vendors’ products, a similar set of hardware and software products is used to populate each of the candidate architectures. These products appear in the *Project EASI/ED TVTA Report* for cost comparison purposes only, and the inclusion of a particular product does not constitute a recommendation that that product be used to implement Project EASI/ED. A full vendor evaluation will be conducted in a later phase of Project EASI/ED to recommend specific products.

This section of the *Project EASI/ED TVTA Report* briefly summarizes the project background (subsection 1.2), further describes the scope and objectives of the *TVTA Report* (subsection 1.3), outlines the analytical process used to produce this report (subsection 1.4), describes the document’s organization and briefly introduces the content of each remaining section (subsection 1.5), and cites the references used to develop the *TVTA Report* (subsection 1.6).

1.2 Background

This section briefly describes Project EASI/ED objectives, purpose and scope.

Objectives. Project EASI and Project EASI/ED share the following objectives, which were defined by community and ED representatives:

- Create a customer-focused "system" to support postsecondary education.

- Provide the customer a single point of interface with the postsecondary education community.

- Streamline, simplify, and improve the accessibility of processes associated with postsecondary education.

- Reduce costs associated with the management and delivery of services associated with postsecondary education.

The *Project EASI Concept Document* (June 1997), *Project EASI/ED Program Management Plan* (December 1996) and the *Project EASI/ED BARD* (July 1997) provide further information regarding these objectives.

The Project EASI vision encompasses the entire postsecondary education community, its customers, and its potential customers. This includes children, 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). Similarly, 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, as defined above.

Purpose and Scope of Project EASI/ED System. Project EASI/ED (as represented through the functional and data requirements in the *Project EASI/ED BARD*) encompasses the following principal functional areas:

- Information Sharing.

- Applying for Aid.

- Disbursing Funds.

- Repayment.

- Enrollment Tracking and Reporting.

- Program Management and Oversight.

Refer to the *Project EASI Concept Document*, Section 5, and to the *Project EASI/ED BARD*, Sections 2 and 3, for further information regarding the definition of each of these areas and regarding their associated goals and requirements.

1.3 Scope and Objectives of Analysis

The *Project EASI/ED TVTA Report*:

- Defines criteria used to evaluate candidate Project EASI/ED framework technical architectures.
- Describes the methodology used to evaluate candidate Project EASI/ED framework technical architectures.
- Defines a set of candidate Project EASI/ED framework technical architectures.
- Documents the evaluation results for each candidate Project EASI/ED framework technical architecture against the agreed-upon criteria.
- Identifies the candidate framework technical architecture recommended for Project EASI/ED.

Within the context of Project EASI/ED requirements and the agreed-upon evaluation criteria, the recommended framework architecture is intended to:

- Mitigate risk associated with untried technologies.
- Provide independence from proprietary hardware-based operating environments.
- Mitigate vendor dependence through compliance with "open" and de facto standards.
- Facilitate integration of information systems with other resources.
- Scale to meet necessary data volume, transaction volume, and performance requirements.
- Deliver technological and price/performance improvements.
- Provide the flexibility to cope with inevitable change.

1.4 Approach to Analysis

This section describes the methodology followed for this analysis.

Step 1: Collect and analyze data regarding:

- Project EASI and Project EASI/ED vision.
- Project EASI/ED target system data flow diagrams, entity-relationship diagrams, and requirements (as documented in the *Project EASI/ED BARD* [July 1997]).

Step 2: Collect data regarding current student aid delivery system technologies, including:

- Operations (i.e. batch, online inquiry, remote job entry).
- Software (i.e. integrated Commercial Off The Shelf (COTS), software distribution model, custom software).
- Hardware (i.e. hardware type, operating system).
- Data Management (i.e. data management software, data and transaction volumes).
- System Services (i.e. system and archive management software).
- Network (i.e. protocols, physical media, topology).

Step 3: Identify and define a set of criteria for use in evaluating candidate technical architectures.

These criteria were based on Project EASI/ED functional requirements, as defined within the *Project EASI/ED BARD* (July 1997), and on EASI/ED goals and priorities, as documented in the *Project EASI Concept Document* (June 1997). Each evaluation criterion was weighted in accordance with its relative importance to Project EASI/ED. ED confirmed all the evaluation criteria, and the associated weights, to ensure that they reflected the Departments objectives and priorities.

Step 4: Define an evaluation methodology for assessing candidate Project EASI/ED technical architectures.

The Analytic Hierarchy Process (AHP) was used to evaluate the candidate framework architectures. AHP (which is explained more fully in subsection 4.2) is a quantitative decision making methodology that uses pairwise comparisons. to determine the relative strengths of decision alternatives. AHP is particularly useful in situations where difficult decisions between complex alternatives must be made.

Step 5: Develop a suite of alternative architectures.

The team developed a set of seven architectures representing the possible permutations of process and data distribution strategies.

Step 6: Select candidate Project EASI/ED framework technical architectures for further evaluation.

The team informally evaluated the alternatives developed in step 5 using AHP and the agreed upon architecture evaluation criteria. Based on this evaluation three architectures were selected for further evaluation. Later a fourth architecture was included in the evaluation at ED's request. The four architectures are termed "candidate framework architectures."

Step 7: Define, in detail, the four candidate technical architectures to be evaluated.

For the purposes of this evaluation, the team populated each candidate technical architecture with a set of commercial hardware and software products. They also defined services provided by each candidate architecture, estimated the processing and storage capacity requirements of each architecture were made, and calculated an estimated acquisition cost for each candidate.

Step 8: Evaluate the candidate framework architectures using the approved evaluation criteria and methodology developed during Steps 3 and 4.

Using the architecture evaluation criteria, the team performed a structured, qualitative analysis of each candidate's strengths and weaknesses. They scored each architecture based upon this evaluation using the AHP methodology.

Step 9: Recommend a single, best framework technical architecture for the Project EASI/ED.

1.5 Document Organization

The remainder of the *Project EASI/ED TVTA Report* is organized in the following sections:

Section 2 - Technical Architecture Overview. This section provides the reader background information on technical architecture as a basis for better understanding the remainder of the report. It defines technical architecture and describes how architectures are used throughout the system development life cycle. It also provides an overview of architecture services, components, and system distribution models.

Section 3 - Current System. This section describes ED's current Title IV student financial aid delivery systems, and provides a current system inventory, including hardware, software, network, data management, and system management technologies.

Section 4 - Architecture Evaluation Criteria and Methodology. This section defines criteria used to evaluate the Project EASI/ED candidate framework technical architectures. Additionally, this section describes the methodology used to quantitatively and qualitatively evaluate the candidate architectures.

Section 5 - Project EASI/ED Candidate Architectures. This section introduces the four candidate architectures evaluated; identifies the assumptions and constraints affecting this analysis and describes in detail the four candidate framework architectures for Project EASI/ED

Section 6 - Architecture Evaluation. This section presents qualitative and quantitative evaluation results for the four candidate framework architectures identified in Section 5. For each architecture considered, this section describes evaluation findings in relation to criteria listed in Section 4.

Section 7 - Summary. This section identifies the framework technical architecture recommended for Project EASI/ED and summarizes the rationale for that recommendation.

The following appendices present detailed information supplementing the body of this report.

Appendix A Acronyms and Definitions. This appendix presents a full list of acronyms used in the *Project EASI/ED TVTA Report* and their corresponding definitions.

Appendix B - Technology Abstracts. This appendix provides background information regarding some of the technologies used to populate the candidate architectures.

Appendix C - Candidate Architecture Technologies. This appendix describes the technologies that are common to each of the four Project EASI/ED candidate framework architectures.

Appendix D - Evaluation Computations. This appendix presents detailed computations for the criteria weights that are provided in Section 6. It also presents detail computations for the candidate architecture evaluation.

Appendix E - Current Systems Questionnaire. This appendix contains the questionnaire used to gather information regarding ED's 16 Title IV systems.

Appendix F - Alternative Architectures. This appendix provides an overview of the seven alternative framework architectures that were originally considered as part of this analysis.

Appendix G - Calculations for Architecture Assumptions. This appendix lists calculations that support assumptions described in Section 5.2.2.

Appendix H - Candidate Architecture Costs. This appendix lists the components and their costs that were used to develop the estimated costs for each candidate architecture.

1.6 References

The information sources used for this analysis are cited in the following subsections.

1.6.1 Project EASI/ED Resources

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1.6.5 Other Resources:

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