

**Project EASI/ED  
Technical Vision & Target Architecture Report  
for the  
U.S. Department of Education**



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**FINAL**

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# EXECUTIVE SUMMARY

## Introduction

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 the Project EASI/ED system 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.

The criteria used to evaluate the candidate architectures are:

- **Cost**, which measures expense associated with architecture capital investments and operations/maintenance activities.
- **Implementability**, which is the degree to which technologies comprising the architecture are mature, understandable, Commercial Off The Shelf (COTS) -based, and supportable by available skilled personnel.
- **Flexibility**, which is the degree to which architecture components are open to product/vendor heterogeneity, based on widely accepted standards, and scalable.
- **Manageability**, which is the degree to which the technologies comprising the architecture are reliable, available, serviceable, and controllable.

- **Usability**, which is the degree to which the architecture improves system and data usability, while masking system complexities.
- **Security**, which is the degree to which the architecture provides adequate authentication, information confidentiality and integrity, access control, security administration, and auditing services, as justified by business needs.

## Evaluation Criteria Weighting

Weights were assigned to each of the evaluation criteria. These weights represent the relative importance of each criterion being considered. The weights for the evaluation criteria were determined using the Analytic Hierarchy Process (AHP) methodology in consultation with ED staff. The figure below shows the weight assigned to each evaluation criterion.

CRITERION	Relative Importance
Usability	20%
Cost	15%
Manageability	20%
Security	15%
Implementability	20%
Flexibility	10%

### Evaluation Criteria Weights

## Evaluation Methodology

The Analytic Hierarchy Process (AHP) was used to evaluate and recommend a Project EASI/ED framework architecture. AHP is a quantitative decision making methodology that uses pairwise comparisons to:

- Determine relative evaluation criteria importance.
- Determine relative strengths of decision alternatives.

AHP is particularly useful in situations where difficult decisions between complex alternatives must be made

## Candidate Framework Technical Architectures

The four candidate architectures chosen for full evaluation were:

- **Centralized Processing/Centralized Data.** This architecture includes centralized data and application resources, which facilitate the execution of all data management, application, and presentation processing from a single computing resource.
- **Distributed Processing/Centralized Data.** This architecture includes centralized data management resources, which facilitate the execution of all data management processing (transaction processing and decision support) from a single computing resource. However, unlike the fully centralized architecture, this architecture allows for distribution of application and presentation processing resources and activities.
- **Distributed Processing/Replicated Data for Consolidation.** This architecture includes centralized decision support data management resources, and allows for distribution of resources associated with transaction processing data management, as well application and presentation services. The replication for data consolidation configuration facilitates collection of data from multiple primary sites, each of

which supports transaction processing activities. This “data consolidation” configuration is often useful in those situations where data may need to be regularly aggregated and reviewed, but distributed components need to be able to work without always being connected to the centralized site.

- Distributed Processing/Replicated Data for Publication.** This architecture includes centralized transaction processing data management resources, and allows for distribution of resources associated with decision support data management, and with application and presentation services. With primary-site replication for data publication, the primary site copies data to multiple target data stores; however, data is changed only at the primary site. The most simplistic example of this model is a single primary site that replicates all its data to a secondary system or to a set of identical secondary systems. In another, more complicated, configuration, portions of the primary site database could be copied to specified secondary sites, with each secondary site potentially receiving a different portion of the primary site database.

### Architecture Evaluation Summary

The figure below summarizes the relative strength ratings given to each candidate architecture for each of the evaluation criteria. Using the AHP methodology, the evaluation criteria weights are applied to each of the scores for each of the candidate architectures. Summing each of these individual scores gives a total score for each candidate architecture.

**Weighted Architecture Evaluation Scores**

Criteria	CP/CD	DP/CD	DP/RDP	DP/RDC
Cost	0.03	0.08	0.02	0.02
Implementability	0.08	0.04	0.04	0.04
Flexibility	0.01	0.02	0.04	0.04
Manageability	0.05	0.05	0.05	0.05
Usability	0.02	0.02	0.09	0.06
Security	0.01	0.05	0.05	0.05
<b>Total</b>	<b>0.21</b>	<b>0.26</b>	<b>0.28</b>	<b>0.25</b>



The candidate architecture with the highest total score, and therefore the architecture recommended for Project EASI/ED, is **distributed processing/replicated data for publication**. The scores across all four candidate architectures were quite close, and this should not come as a surprise since all architectures have some inherent strengths and weaknesses. The choice of the preferred architecture in any particular business situation is heavily influenced by the unique drivers and constraints of that situation.

The distributed processing/replicated data for publication architecture is the preferred architecture for Project EASI/ED for a number of reasons. It has stronger flexibility characteristics than the centralized architectures, including the capability to be highly scalable, and to accommodate products from multiple vendors using industry-wide standards. It also has strong security features, with robust application and network security through multi-level security solutions and Internet firewalls. The use of dedicated data warehousing hardware and software allows the distributed processing/replicated data for publication architecture to satisfy the Project EASI/ED requirements for sophisticated decision support functionality. The distributed processing/replicated data for publication architecture gives users improved access to data, but does not require the same level of complicated data synchronization functionality that the distributed processing/replication for consolidation architecture has to provide. While all the candidate architectures described in Section 5 could provide services to meet the Project EASI/ED requirements, the **distributed processing/replicated data for publication** architecture has the mixture of capabilities that best provide a basis for fulfilling the Project EASI/ED vision.

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