

Modernization Partner



Enterprise Architecture Management

***Evaluation of Project
EASI/ED COE***

February 16th, 2000



Introduction

This report presents the findings of an evaluation of the Student Financial Aid (SFA) Common Operating Environment (COE). A COE assists in the definition of information system requirements and architecture. The evaluation is based on the technology standards defined for each COE element in the Project EASI/ED COE Document and the adherence to, and development of, these standards in the current and target SFA COE. Additionally, the EASI COE was compared to the DoD COE for currency of standards and comprehensiveness of architecture.

•EASI COE

The Project EASI COE is relatively current, needing only a few updates to accommodate new standards.

•Current COE

The current COE is comprised of the systems and architecture currently in use, represented by the information contained in the Architecture Baseline Characterization Document, version 1.0. Generally the current COE is in accordance with the EASI COE. However, there are a number of technologies employed at ED that are not within the bounds of the EASI COE.

•Target COE

The high level information gathered concerning the target COE, through interviews with OSFA personnel, indicates the direction OSFA is taking, technologically, is in accord with the EASI COE.

•Recommendations

Use the EASI/ED COE as a baseline and update, to accommodate newer standards. Place the updated COE under an architecture management process. Update the OSFA Blueprint with the necessary transition plans to allow for the retirement of technologies not compliant with the EASI COE.

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COE Overview



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The COE is the primary tool for ensuring implementation using a standards-based, open architecture. The COE defines the architecture services expected to comprise OSFA systems, and identifies the standards and products with which might be used in any OSFA system implementation. The core of the COE is comprised of the following service components

- **Data Interchange and Data Management Services** - Provides specialized support for the exchange of information between application software on the same or different platforms. Data management services provide access to data, store data, monitor data storage, and control data I/O operations.
- **Document Management Services** - Provides technologies that enable organizations to disseminate information to internal resources, clients, and suppliers.
- **Distributed Computing Services** - Enables various tasks, operations, and/or information transfers to occur on multiple, physically or logically dispersed computer platforms while maintaining a cooperative processing environment.
- **Middleware Services** - Provides network-aware services that layer between an application, the operating system, and the network transport layers.

COE Overview (cont.)



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- **Network Services** - Provides connectivity and basic services to facilitate communications across workgroups and among sites.
- **Software Engineering Services** - Application of a systematic, disciplined, quantifiable approach to developing, operating, and maintaining software.
- **User Interface Services** - Combines menus, screen design, keyboard commands, command language, and help screens to create a way for a user to interact with a computer.
- **Operating System Services** – Provides a software layer that resides between hardware and application software. It manages program execution and the flow of data to connected peripheral devices.
- **Security Services** - Provides cross-platform management control over who can do what within a computer system and network.
- **System and Network Management** - Provides mechanisms to monitor and control operation of individual applications, databases, operating systems, platforms, telecommunications and data communications systems, networks, and user interaction with these resources.
- **Communication Services** - Provides the communications infrastructure needed to move information across systems and to support data access and interoperability among distributed applications working in homogenous or heterogeneous networked environments.

Evaluation Approach



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- A comparison of the EASI COE (Project EASI/ED COE Document, 07/10/1998) was made against the Department of Defense (DoD) COE (Joint Technical Architecture, version 3.0 12/15/1999) , to provide a check for currency of standards and to provide a high level assessment of the EASI COE. The DoD COE is used for comparison, as it provides a comprehensive, complex and complete COE specification that covers a broad array of the technologies, a subset of which are addressed in the EASI COE.
- The technology standards supported in the current COE (Architecture Baseline Characterization Document, version 1.0 10/23/1998) and target COE (as defined through high level interviews with Virtual Data Center (VDC) personnel) were compared at a high level against the EASI COE, to identify gaps and commonality between the three COEs.



Summary of COE Evaluation

<u>COE Element</u>	<u>Compliance with EASI COE</u>		
	<u>DoD COE</u>	<u>Current COE</u>	<u>Target COE</u>
Data Interchange and Management Services	●	◐	●
Document Management Services	○	○	○
Distributed Computing Services	●	○	●
Middleware Services	◐	■	●
Network Services	◐	●	●
Software Engineering Services	●	◐	●

- – Empty Circle – The technologies specified do not conform to the Project EASI/ED COE.
- ◐ – Half filled Circle – Some technologies specified conform to the Project EASI/ED COE.
- – Full Circle – The technologies specified conform to the Project EASI/ED COE.
- – Insufficient data for evaluation.



Summary of COE Evaluation (cont.)

<u>COE Element</u>	<u>Compliance with EASI COE</u>		
	<u>DoD COE</u>	<u>Current COE</u>	<u>Target COE</u>
User Interface Services	●	●	●
Operating System Services	●	○	●
Security Services	○	■	●
System and Network Management	●	○	●
Communication Services	●	●	●



Summary of COE Evaluation (cont.)

- The Project EASI/ED COE document is relatively current and comprehensive
- Some technologies currently employed by SFA are not compliant with the standards presented in the Project EASI/ED COE
- The current SFA direction (as defined through high level interviews with VDC personnel) for technology implementations and selections generally conform to the Project EASI/ED COE



Data Interchange and Data Management Services

	<u>EASI COE Standards Compliance</u>
EASI COE	<ul style="list-style-type: none"> •EDI, facsimile, multimedia, graphics interchange, data compression, document interchange, characters and symbols (EASI/ED COE Document, pgs. 4-4 through 4-18) •Database management system, data dictionary and data warehousing (EASI/ED COE Document, pgs. 4-20 through 4-25)
DoD COE	<ul style="list-style-type: none"> •DoD Joint Technical Architecture version 3.0; sections 2.2.2.2.1.3 , 2.3.2.1.3, 2.2.3.2, CS.2.2.2.4 <p><i>* The EASI COE is consistent with the DoD COE in this area</i></p>
Current COE	<p>DB2, Oracle7, VSAM, MS-Access, Informix, IDMS, RRI DMS (Project EASI/ED Architecture Baseline Characterization Document, pgs. 4-2 through 4-12)</p> <p><i>* Some technologies currently employed conform to the EASI COE</i></p>
Target COE Direction	<ul style="list-style-type: none"> •Oracle 8i, Oracle Financials, DB2, and SAN for future data warehousing <p><i>* The technologies considered for future SFA use generally conform to the EASI COE</i></p>



Document Management Services

	<u>EASI COE Standards Compliance</u>
EASI COE	•Imaging and workflow (EASI/ED COE Document, pgs. 4-27 through 4-30)
DoD COE	* <i>This area is not addressed in the DoD COE</i>
Current COE	Imaging systems are a mixed environment of systems * <i>The technologies currently employed generally do not conform to the EASI COE</i>
Target COE Direction	•No direction defined * <i>No technologies specified for future SFA use</i>



Distributed Computing Services

	<u>EASI COE Standards Compliance</u>
EASI COE	<ul style="list-style-type: none"> • Distributed time, distributed file system, remote procedure call and directory services (EASI/ED COE Document, pgs. 4-32 through 4-39)
DoD COE	<p>DoD Joint Technical Architecture version 3.0 Section 2.3.2.1.1.1.2, 2.2.2.2.1.11.1, 2.2.2.2.1.4.9</p> <p><i>* The EASI COE is consistent with the DoD COE in this area</i></p>
Current COE	<p><i>* Insufficient Data in Project EASI/ED Architecture Baseline Characterization Document for comparison</i></p>
Target COE Direction	<ul style="list-style-type: none"> • Parallel Sysplex for hardware availability on mainframe <p><i>* The technologies considered for future SFA use generally conform to the EASI COE</i></p>



Middleware Services

	<u>EASI COE Standards Compliance</u>
EASI COE	<ul style="list-style-type: none"> •Transaction processing and object services (EASI/ED COE Document, pgs. 4-41 through 4-44) OMG CORBA 2.1:1997
DoD COE	DoD Joint Technical Architecture version 3.0 section 2.2.2.2.1.11.2 OMG CORBA 2.3, June 1999 <i>* The DoD COE contains newer standards than the EASI COE</i>
Current COE	<i>* Insufficient Data in Project EASI/ED Architecture Baseline Characterization Document for comparison</i>
Target COE Direction	<ul style="list-style-type: none"> •Evaluation underway of Software Technologies Corporation (STC) E*Gate, Vitria BusinessWare, IBM/Neon MQSeries Integrator and MSI Solutions e-Web-IT, focusing on Object Request Broker (ORB), Common Object Request Broker Architecture (CORBA) and Enterprise Java Bean (EJB). <i>* The technologies considered for future SFA use generally conform to the EASI COE</i>

Network Services



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	<u>EASI COE Standards Compliance</u>
EASI COE	<ul style="list-style-type: none"> •Internet, electronic mail (e-mail) and file transfer (EASI/ED COE Document, pgs. 4-46 through 4-51) IETF RFC 2068:1997 – HTTP IETF RFC 1521, 1522:1993 – MIME
DoD COE	<ul style="list-style-type: none"> •DoD Joint Technical Architecture version 3.0 section 2.3.2.1.1.1.8.1, 2.3.2.1.1.1.1: IETF RFC-2616, -HTTP/1.1, June 1999. IETF RFC 2045-2049 MIME, November 1996 * <i>The DoD COE contains newer standards than the EASI COE</i>
Current COE	* <i>The technologies currently employed generally conform to the EASI COE</i>
Target COE Direction	<ul style="list-style-type: none"> •IIS for NT, Webview for mainframe * <i>The technologies considered for future SFA use generally conform to the EASI COE</i>

Software Engineering Services



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	<u>EASI COE Standards Compliance</u>
EASI COE	<ul style="list-style-type: none"> •Software development services and programming language services (EASI/ED COE Document, pgs. 4-53 through 4-55)
DoD COE	<ul style="list-style-type: none"> •DoD Joint Technical Architecture version 3.0 section 2.2.2.2.1.1 * <i>The EASI COE is generally consistent with the DoD COE in this area</i>
Current COE	<p>COBOL, COBOL II, Clipper, C, C++, Power Builder, Visual Basic, Assembler, JCL, DML, DYL-Audit, CULPRIT, Rexx, Nawk, PERL, EZC/DE2, Dbase, SAS, PL1, ASM-H, Oracle Developer, and PL/SQL (Project EASI/ED Architecture Baseline Characterization Document, pgs. 4-2 through 4-12)</p> <p>* <i>Some technologies currently employed conform to the EASI COE</i></p>
Target COE Direction	<ul style="list-style-type: none"> •CASE tools on mainframe (Coolgen), Symantec Visual Café (Java development), and Microsoft VisualStudio * <i>The technologies considered for future SFA use generally conform to the EASI COE</i>



User Interface Services

	<u>EASI COE Standards Compliance</u>
EASI COE	<ul style="list-style-type: none"> •Graphical user interface, character-based interface, interactive voice response, and special needs (EASI/ED COE Document, pgs. 4-57 through 4-64)
DoD COE	<ul style="list-style-type: none"> •DoD Joint Technical Architecture version 3.0 section 2.2.2.2.1.2, 2.3.2.1.1.1.4, 2.2.2.2.1.4.6.2 * <i>The EASI COE is consistent with the DoD COE in this area</i>
Current COE	<ul style="list-style-type: none"> •MS Windows, TN3270, TN3221, TN 3222, VT100, (Project EASI/ED Architecture Baseline Characterization Document, pgs. 4-2 through 4-12 and 5-3 through 5-18) * <i>The technologies currently employed generally conform to the EASI COE</i>
Target COE Direction	<ul style="list-style-type: none"> •HP-UX (version 11), OS390, Windows NT * <i>The technologies considered for future SFA use generally conform to the EASI COE</i>



Operating System Services

	<u>EASI COE Standards Compliance</u>
EASI COE	<ul style="list-style-type: none"> •Kernel operations, batch processing and internationalization (EASI/ED COE Document, pgs. 4-66 through 4-71)
DoD COE	<ul style="list-style-type: none"> •DoD Joint Technical Architecture version 3.0 section 2.2.2.2.1.7, 2.2.2.2.1.8 * <i>The EASI COE is consistent with the DoD COE in this area</i>
Current COE	<p>MVS/ESA, DOS/Windows-95, HP-UX, OS390, OS/2, O/S 400, Open VMS, MVS/XA, MVS/SP, AIX, Windows NT, Windows-98, Solaris, SunOS, NetWare (Project EASI/ED Architecture Baseline Characterization Document, pgs. 4-2 through 4-12 and 5-3 through 5-18)</p> <p>* <i>Some technologies currently employed conform to the EASI COE</i></p>
Target COE Direction	<ul style="list-style-type: none"> •OS390, HP-UX (version 11) and Windows NT (Service Pack 5). Currently HP K class machines are in use, a move to L and N class will support compatibility with Merced * <i>The technologies considered for future SFA use generally conform to the EASI COE</i>

Security Services



	<u>EASI COE Standards Compliance</u>
EASI COE	<ul style="list-style-type: none"> •Confidentiality, integrity and availability (EASI/ED COE Document, pgs. 4-72 through 4-78) FIPS PUB 46-2
DoD COE	<ul style="list-style-type: none"> •DoD Joint Technical Architecture version 3.0 section 2.6.2.6, 2.6.2.3.1.1.1, 2.6.3.3.1.1.2.6, 2.6.3.3.1.1.2.3 FIPS PUB 46-3 * <i>The DoD COE contains newer standards than the EASI COE</i>
Current COE	* <i>Insufficient Data in Project EASI/ED Architecture Baseline Characterization Document for comparison</i>
Target COE Direction	<ul style="list-style-type: none"> •BMC Control, Verisign, SSL, RSA Vsafe libraries and Checkpoint firewalls * <i>The technologies considered for future SFA use generally conform to the EASI COE</i>

System and Network Management Services



	<u>EASI COE Standards Compliance</u>
EASI COE	<ul style="list-style-type: none"> •Backup and recovery, fault management, performance and usage management, software distribution and configuration, and user and group management (EASI/ED COE Document, pgs. 4-79 through 4-86)
DoD COE	<ul style="list-style-type: none"> •DoD Joint Technical Architecture version 3.0 section 2.3.3.5 * <i>The EASI COE is consistent with the DoD COE in this area</i>
Current COE	<p>INFOMAN, NetView, OmegaMon, TMON, CA-ENF, CA-OPSMVS, CA-90S, CA-MI-Integrity, CA-Unicenter, Inventory Manager, Formworks Manager, CA-11, LandMark, DEC PS, Harvest, McAfee, MVS/ESA, FDR, FDR/ABR, Informix Backup, SLS, ARC Serve, AC/SRS, DFDSS, FDR/CPK/ABR/FDRREOR (Project EASI/ED Architecture Baseline Characterization Document, pgs. 4-2 through 4-12 and 5-3 through 5-18)</p> <p>* <i>Some technologies currently employed conform to the EASI COE</i></p>
Target COE Direction	<ul style="list-style-type: none"> •SAN to provide for system backups and HP OpenView for management * <i>The technologies considered for future SFA use generally conform to the EASI COE</i>

Communication Services



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	<u>EASI COE Standards Compliance</u>
EASI COE	<ul style="list-style-type: none"> • WAN and LAN communications (EASI/ED COE Document, pgs. 4-87 through 4-91)
DoD COE	<ul style="list-style-type: none"> • DoD Joint Technical Architecture version 3.0 section 2.3.2.1.1.2.1, 2.3.2.4.1, 2.3.3.1.1, 2.3.2.1.1.1.7 * <i>The EASI COE is consistent with the DoD COE in this area</i>
Current COE	<p>TCP/IP, DECNet, SNA, NAS, NetView, IPX/SPXF/SSP (Project EASI/ED Architecture Baseline Characterization Document, pgs. 4-2 through 4-12 and 5-3 through 5-18)</p> <p>* <i>The technologies currently employed generally conform to the EASI COE</i></p>
Target COE Direction	<p>Microsoft SNA server to provide MF Web deployment access</p> <p>* <i>The technologies considered for future SFA use generally conform to the EASI COE</i></p>



Recommendations

Overall Recommendations

- Update the COE consistent with the target architecture and place under architecture management as a component of the blueprint
- Address the technology gaps by developing transition plans and implementing the technologies

<u>COE Element</u>	<u>Recommendation*</u>
Data Interchange and Management Services	Develop a plan for the retirement of unsupported databases, such as Informix
Document Management Services	The mixed array of imaging systems, which are not all under ED control, must be transitioned to a unified and standardized platform.
Distributed Computing Services	Geographical diversity needs to be included in distributed computing services plans to contribute to high availability.

* Recommendations are relative to the EASI COE, but should ultimately be reflected in a new target architecture document.

Recommendations (cont.)



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<u>COE Element</u>	<u>Recommendation</u>
Middleware Services	Consider implementing the newer OMG CORBA 2.3, June 1999
Network Services	Consider implementing the newer IETF RFC-2616, Hypertext Transfer Protocol -HTTP/1.1, June 1999
Software Engineering Services	Develop transition plan for unsupported programming languages, such as Perl
User Interface Services	No recommendations

Recommendations (cont.)



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<u>COE Element</u>	<u>Recommendation</u>
Operating System Services	Consider planning for incorporation and deployment of Windows 2000 and HP-UX11
Security Services	Consider implementing the newer FIPS PUB 46-2 to 46-3, replacing DES with triple DES
System and Network Management Services	The existing use of CA TNG needs to be documented for transition to HP OpenView Consider adding application monitoring to HP OpenView use
Communication Services	No recommendations



Potential Quantifiable Architectural Standardization Benefits

<u>Benefit From Architectural Standardization</u>	<u>Link to 3 Main SFA Goals</u>	<u>How to Quantify</u>
Ease of use for customers	<ul style="list-style-type: none"> •Improve Customer Service •Increase Employee Satisfaction 	Fewer customer complaints resulting from disparate GUIs
Unified security	<ul style="list-style-type: none"> •Improve Customer Service •Increase Employee Satisfaction 	Fewer password related customer service calls and less time spent managing user accounts
Unified system administration	<ul style="list-style-type: none"> •Increase Employee Satisfaction 	Reduced system administration cost and time
Uniform data stores	<ul style="list-style-type: none"> •Reduce Unit Cost •Increase Employee Satisfaction 	Reduced time and effort to develop applications
Reduced training requirement for SFA staff	<ul style="list-style-type: none"> •Reduce Unit Cost •Increase Employee Satisfaction 	Reduced training time and expenses



Acronyms

COE	- Common Operating Environment
CORBA	- Common Object Resource Broker Architecture
DML	- Data Manipulation Language
DoD	- US Department of Defense
EASI	- Easy Access for Students and Institutions
ED	- US Department of Education
EDI	- Electronic Data Interchange
EJB	- Enterprise Java Bean
HTTP	- Hypertext Transfer Protocol
IETF	- Internet Engineering Task Force
JCL	- Job Control Language
LAN	- Local Area Network
MIME	- Multipurpose Internet Mail Extensions
OMG	- Object Management Group
ORB	- Object Request Broker
RFC	- Request for Comment
SAN	- Storage Area Network
SFA	- Student Financial Aid
SSL	- Secure Sockets Layer
TCP/IP	- Transmission Control Protocol/Internet Protocol
WAN	- Wide Area Network
VDC	- Virtual Data Center
VSAM	- IBM Virtual Storage Access Method