Spring 2004 Technology Summit in New York City

PESC, in partnership with the US Department of Education’s Office of Federal Student Aid (FSA), is pleased to announce its Spring 2004 Technology Summit. The Summit will be held April 1, 2004 in the heart of New York City. Our Web Services workgroup, Single Institutional ID workgroup, Standard Student Authentication Workgroup, and Standards Forum for Education will meet consecutively in one general session and will kick-off with a presentation by Steve Griffin, COO of IMS Global Learning Consortium, Inc.

FSA is holding its Annual Spring Conference Monday, March 29 through Wednesday, March 31, 2004; and will also convene its Software Developers Conference on that Wednesday as well. For more information on the Annual Spring Conference and Software Developers Conference, please visit http://edeworkshop.ncsppearson.com/Spring.htm.

The tentative agenda for PESC’s Technology Summit looks like:

8:30 – 9:00am Welcome and PESC Update
9:00 – 10:00am Overview of IMS Global Learning Consortium
10:00 – 10:15am Break
10:15am – 12:15pm Standards Forum for Education
12:15 – 1:45pm Lunch on your own
1:45 – 3:00pm Standard Student Authentication
3:00 – 3:45pm Single Institutional ID workgroup
3:45 – 4:00pm Break
4:00 – 5:00pm Web Services
Minimum PC Requirements for Financial Aid

The following notice was drafted by Jeff Baker from the US Department of Education and posted on IFAP.ed.gov in mid December.

Notice Regarding Minimum PC Requirements:

We are aware that there may be some confusion in the community regarding proposed new minimum electronic standards for school participation in the Federal student aid programs. While it is our intent to formally publish new minimum desktop PC standards that schools must meet, we have not yet done so. We are currently in the process of finalizing a revised set of minimum PC requirements. Additional testing is being performed to ensure that the PC requirements are sufficient for our student aid systems when using Extensible Markup Language (XML) technology.

As with previous required minimum PC requirements, the new standards will be officially announced to the community with a substantial amount of lead-time for their adoption, thus acknowledging various budgetary schedules and cycles. We expect to make our announcement of the new standards within the next two to three months with an adoption date by schools of January 1, 2005.

We apologize for any concern that was created through a release of preliminary information that was repeated via various list-serves over the Internet. Our new PC minimum requirements will be officially communicated to the community as an electronic announcement via IFAP.

Summit, From Page 1

The Sheraton New York Hotel and Towers will host our Spring Technology Summit. Located at 811 7th Avenue on 53rd Street in New York, NY 10019, it is located in midtown Manhattan, just steps from the excitement of Broadway theatres, historic Carnegie Hall and world-class shopping on Fifth Avenue. A discounted rate of $175 + 13.25% tax and a $2 per night occupancy tax (single/double) has been arranged for attendees and is available through March 5, 2004. After that date, reservations cannot be guaranteed at this discounted rate. Please call 212-581-1000 or 1-800-223-6550 for reservations and use the group name “Department of Education Electronic Access Conference” and group code “C9E87.”

To register for the Spring 2004 Technology Summit, please complete the registration form and attach a $50 check if a PESC member or affiliate. Non-membership attendees, please attach $150. All registration forms must be either faxed to PESC at 202-872-8857 or mailed to PESC, One Dupont Circle NW, Suite 520, Washington DC, 20036. For those looking to pay by credit card, please contact Ane al-Sayyed in PESC’s offices at 202-263-0296 and she will process your charges.

A special message for prior attendees about the Spring 2004 Technology Summit: In past years, PESC held its meeting in February. Due to conflicts with NCHELP’s Electronic Standards Committee meetings being held in January 2004 and with AACRAO’s SPEEDE Committee meetings being held in February 2004, we’ve moved the February meeting accordingly.
Registration is Up - **1st Annual Conference on Technology & Standards**

The Consumer Bankers Association (CBA), the Education Finance Council (EFC), the National Council of Higher Education Loan Programs (NCHELP), and the Postsecondary Electronic Standards Council (PESC) are pleased to announce that registration for our 1st Annual Conference on Technology and Standards is now available. Please visit [http://www.standardscouncil.org/conference-main.asp](http://www.standardscouncil.org/conference-main.asp) for General, Hotel, and Registration Information. Our Conference Program Committee is currently developing all concurrent and general sessions and the agenda should be available shortly. Our Committee includes:

- Brian Allison of USA Funds (representing NCHELP)
- Terri Amatuzzi of Community College of the Air Force (representing PESC)
- Steve Biklen (representing CBA)
- Jerry Bracken of Brigham-Young University (representing PESC)
- Dave Hawn of Wells Fargo (representing CBA)
- Paul Hill of the US Department of Education (representing PESC)
- Bob King of Citibank (representing CBA)
- JC Lin of Iowa Student Loan Liquidity Corporation (representing EFC)
- Adele Marsh of AES (representing EFC)
- Judy Martin of NCHELP
- Jim Olick of Rhode Island Student Loan Authority (representing EFC)
- Mark Putman of NCHELP

The conference will be held May 3-5, 2004 in the Washington DC metro area. This new partnership signifies an effort by all four associations to focus on technological issues important to their respective memberships under one efficient venue. Technical staff and upper management responsible for technology decisions will find this a timely and valuable conference.

This conference also includes the support and participation of the American Association of Collegiate Registrars and Admissions Officers (AACRAO), the US Department of Education’s Office of Federal Student Aid (FSA), the IMS Global Learning Consortium Inc., and the National Association of Student Financial Aid Administrators (NASFAA).

This year, the Marriott Crystal City will host our conference. Located at 1999 Jefferson Davis Highway in Arlington VA 22202, it is conveniently located within minutes from the Ronald Reagan Washington National Airport (DCA). The hotel is also connected to Crystal City, which includes an underground Metro Stop (Blue and Yellow), and many shops, stores, restaurants, and cafes (both under and above ground) are within walking distance.

Should you have questions or concerns, please contact Ane al-Sayyed, PESC’s Membership Coordinator at alsayyed@StandardsCouncil.org or by phone at 202-263-0296.

We look forward to seeing you in DC in May!
Interview with  

Dave Moldoff  

Senior Vice President, Solutions Architecture and Infrastructure  
SCT

Mr. Moldoff serves as senior vice president, solutions architecture and infrastructure for SCT. In this capacity, he works to fulfill the vision of the e-Education Infrastructure strategy by designing and building a technology plan that spans the J2EE and .NET platforms.

He is responsible for SCT’s technology roadmap and research and development efforts, as well as Web Services, XML messaging, data and application communication architecture.

- Describe SCT the company in terms of its function, age and offices, both regional and headquarters.

SCT, started in 1969, is a provider of software solutions for Higher Education institutions. SCT’s software solutions focus on the following six solutions: administrative, academic, portal, collaboration and community, content management, information access and business intelligence and integration.

Our headquarters are located in Malvern, PA. We also have offices throughout the United States and in Canada and the United Kingdom.

- How many clients does SCT have?

SCT has more than 1,300 higher education clients worldwide, representing more than 8 million learners.

- Are schools turning to providers, such as SCT, more often than building their own systems?

Yes.

- Giving the current complexity of IT systems do you feel that homegrown systems are dying breed?

The percentage of home grown systems has been dropping year after year since the late 70’s and 80’s when application software solutions were coming on the market from companies like SCT and Information Associates, which was later acquired by SCT in 1992.
Still, there are many institutions that embark on homegrown solutions or building/deploying best of class loosely coupled systems by bridging a number of discrete products from one or more vendors or even building their own modules to fill gaps in their needs. No one vendor has all the products and services to span the needs of an institution across all functions and events managed within today’s complex educational environments.

Schools today, have to deliver on many functional expectations brought on by the mass commoditization of computing power, at the same time their budgets are constrained and resources tapped. SCT offers a range of product line or solution suites. We also offer best of class products that can be integrated into an institution’s infrastructure using loosely coupled event driven technologies.

We are driving our solution strategy following some common architectural principals supporting software reuse, integration (presentation, process, method and data synchronization) and business processing leveraging best practices and evolving standards around Web Services. As a result of the broad development and availability of many products serving institutions from SCT and many other vendors in the Higher Education eco-system, the development and implication of standards has evolved to become a very high priority for SCT and the clients we represent.

- How many trading partners/vendors does SCT have? How does the company manage these separate entities?

We have over 200 partners and separate entities. We have one team devoted to managing the business relationships called Business Development and another team, called the Integration Competency Center managing the technical implications and needs of our partner community.

- What role do you personally fulfill with PESC?

I am on the Board and my focus is on helping PESC develop into an umbrella organization that can bring together the disparate standards bodies pursuing different facets of administrative and academic applications, develop a unified catalog or place for vendors to refer and drive adoption of those standards in a wide community of vendors and clients lowering the complexity and cost of integration for the eco-system, resulting in better services to the entire community.

- What is SCT’s role with PESC?

SCT is a founding member and supporter of PESC.

- SCT recently announced that it is being acquired by SunGard Data Systems. What lead to this acquisition? What are the pros and cons for both your and SunGard’s customers and partners?

SunGard Systems and SCT have entered into a strategic agreement where SCT will become a wholly owned business unit focused on Higher Education in February; assuming shareholders approve the agreement, which I believe is expected. Both Boards have approved of the strategic marriage.

When I joined SCT, we were a small cap public company focused on a variety markets including Government, Utilities, Manufacturing and Higher Education. We altered our business strategy and divested Government, Utilities and Manufacturing divisions to focus all our management and resources on Higher Education.

SCT built this strategy over two years in phases complemented by acquisitions of my company (ABT), and Sallie Mae’s Student System Business and Campus Pipeline. SunGard approached SCT on the strategic acquisition to grow their Public Sector division complimenting their existing business.

Given the research both companies performed prior to the agreement, I believe we are a good fit for each other. The combination will place SCT in a much larger company, reducing the common pressures of public companies facing quarterly results instead of focusing on a much longer horizon.

SunGard is a Fortune 500 company built on diversity. It is very experienced in managing a diverse business model with a compliment of companies serving over a 100 market segments. SunGard grows revenue and margin by acquisition and investing in their business units. What I like most
about this new opportunity is the entrepreneurial culture of both companies will serve clients, employees and partners as SCT continues to do what it does best, which is focus on Higher Education.

**What are the biggest challenges we face with regard to IT? Are we doing enough?**

IT's biggest challenge is to align and bridge the business strategy and their operational focus with technology that provides flexibility and performance, working within the limits of their capital and human resources. There are many assumptions underlying most systems today, often invisible from management.

IT can’t take a rip and replace method, overcompensating for fixing one set of problems, while introducing a new set of challenges. The complexity and stress to support today’s IT infrastructure is increasing with no sign of easing. I believe IT has to realize the benefits of supporting partnerships and addressing how their institution matures using technology in stages based upon leadership, knowledge sharing and collaboration. This is more a people business now than ever.

Bottom line, I think IT has to be organized and manage as part of the business, not just a support function. IT should be managed as a strategic asset and competitive differentiation.

**When preparing to release a new product or upgrade an existing product, do you perform “human tests,” in which actual potential users interact with the program and provide feedback?**

There are multiple levels of ‘testing’ and ‘feedback’ for the development and evolution of our products. We do perform ‘human testing’ and ‘automated testing’ on all products. Over 70% of our staff, have experience coming out of Higher Education. So, in our Student Systems area for example, we have former registrars on the development teams.

Once a product is ready for release, we usually perform a beta release or controlled release to a small subset of clients who we have developed an agreement with to put the software through use tests that reflect the real world. Often, these tests render results that can delay a product or release launch.

**What can we look forward to in 2004 from SCT? From PESC?**

From SCT, we have many new and improved product releases coming out over the next year including new versions of Banner, Plus, PowerCAMPUS, Luminis and Matrix. SCT has developed a meta data model shared across our product lines. This will enable us to build common Web Services and simplify how partners can integrate with SCT’s core products. We hope to align our data dictionary with PESC over the next several years.

We will introduce our new Enterprise Data Warehouse supporting Performance Management and Business Intelligence applications. One key new focus is the delivery of a flexible balanced scorecard for management, enabling them to customize their digital dashboards from their web portal. We are also adopting and using the PESC XML transcript as a means to support institution-to-institution student data exchange, which will increase the speed of evaluating student admissions to offering improved advising. We are also working on some large Portfolio and Assessment projects that will believe will mature into new opportunities to develop further data standards.

From PESC, I hope we continue moving to consolidate standards content into a web-based catalog members can easily access. We have to finalize our workgroup processes and begin scheduling regular forum reviews of submitted standards by member organizations. I hope to initiate the development of several Web Services between members demonstrating how collaboration will be a win/win for everyone. I also am working to increase the PESC membership by bringing in new associations and companies representing a diverse set of interests. I think PESC is crucial in gaining adoption of standards and represents a means whereby competitors/partners can pursue common objectives on a level playing field.

*Note: Attached to this edition of The Standard is a white paper by Mr. Moldoff on the economics of interoperability.*
Data Transport Business Workgroup Overview

By Kim Shiflette, USA Funds

Purpose: The purpose of this group is to recommend a business direction for “Data Transport” and define the business requirements for that process that can be used across multiple business sectors supported by Guarantors, Lenders, Schools, FAMS vendors and FSA.

Participants: The group is composed of representatives from Lenders, Schools, FAMS vendors, Guarantor and FSA representing a wide variety of business processes within their organizations.

Background: Below is a high level synopsis of the current state of “data transport” in the higher education community that led to the formation of this group:

- With the advent of Common Record: CommonLine XML process, the NCHELP’s Electronic Standards Committee (ESC) needs a standard way to send real-time information. The current standard for sending data in a real time mode within ESC is the High Performance Channel Protocol (HPCP). The current protocol or set of standards has not been widely adopted and the only reference implementation is Meteor.

- FSA current transport process is closed and can only be used to transport FSA business related data.

- FSA has begun the process of evaluating its needs to standardize transport across all business applications as part of their Data Strategy Framework.

- Financial Aid Management Systems vendors have expressed an interest in the development of a common transport process for both batch and real-time requests that could be used for all business processes (ex. CR:CommonLine, CR:COD, Transcripts, etc.).

- SCT is currently evaluating their various methods of exchanging data across all business applications and plans to consolidate down to one new process for exchanging data.

- Recently, PESC finalized the Transcript schema and plans to release this document to the education community. This group is looking for a transport method to recommend to users of the XML Transcripts. Users of the Transport process will include schools and FAMS vendors.

- The current standards utilized by the Higher Education industry do not support the needs of all users and require the support of multiple transport solutions. Due to the size of CR documents, e-mail is no longer a practical solutions for transporting data. Additionally, timeliness, manageability and sequence of the data are all current issues being experienced with e-mail transmissions.

- FTP requires technical knowledge and support to be adequately implemented and maintained. Many smaller institutions do not have the ability to implement or support FTP transport solution.

Current Efforts of the Workgroup:

In August 2003, this workgroup requested the NCHELP’s Electronic Exchange Advisory Team (EEAT), continue work on the High Performance Channel Protocol as a proposed common transport option. The High Performance Channel Protocol is a collection of software components that provide a
secure, efficient, open methodology for moving data (batch, real-time, near real-time).

- The current protocol specification is designed to be a layer on top of SOAP. The EEAT is recommending an alternative approach to use SOAP as the basis of the transport.

- SOAP is a lightweight protocol for exchange of information in a decentralized, distributed environment. It is an XML based protocol that consists of three parts: an envelope that defines a framework for describing what is in a message and how to process it, a set of encoding rules for expressing instances of application-defined data types, and a convention for representing remote procedure calls and responses.

- The benefits to adopting a SOAP transport protocol are speed, extensibility and standards conformance, tool integration and simplicity.

- The EEAT is planning the development of reference implementations for Apache, IIS, and Netscape web servers. They expect this effort not only to serve as a proof of concept, but also to yield a transport product or the basis for one to any who want to use it. This product will be generic enough to handle all of the transport-layer details and therefore will save each entity the trouble of developing their own. Of course, work will still be needed by each to link this layer to their business application. But having the transport layer completed at least in prototype form, should make the effort much more manageable.

Summary: The current landscape of the industry offers a unique opportunity for the higher education community to promote a common data transport standard. Many in the higher education industry are either looking to develop a transport process (FAMS vendor and schools) or streamline and consolidate transport by the adoption or creation of new transport process (FAMS vendors and FSA). The industry can be proactive and develop a standard that can meet the needs of multiple business sectors within our industry. Or it can be reactive, as each sector develops its own solutions for data transport. Since we all share a common points of interaction, the schools and FAMS vendors, the Data Transport Business workgroup was formed to develop a common solution for data transport with representation from each of the major players in the education industry.

Organizations looking to join this workgroup, or for more information contact Kim Shiflette directly at kshiflet@usafunds.org.

New Members

PESC welcomes the following new organizations to its membership:

**IMS Global Learning Consortium**
PESC contact is Ed Walker, CEO.
www.IMSGLOBAL.org

**Florida State University**
PESC contact is Rajiv Kaushik, Assistant Director.
www.FSU.edu

**Law School Admission Council**
PESC contact is Bruce Bachman, CIO.
www.LSAC.org
The Department of Education announced last month that it has created a website to help college students avoid becoming victims of identity theft, according to a Chronicle of Higher Education article. The website, located at http://www.ed.gov/about/offices/list/oig/missused/index.html, offers popular advice about protection of social security numbers and credit card statements, as well as addresses and hot lines for investigative bodies and fraud departments that deal with identity theft.

SunGard Data Systems Inc. will purchase SCT, according to an agreement reached last month. SCT will be an operating unit of SunGard Public Sector and Nonprofit Systems, and will continue to be led by Mike Chamberlain, SCT’s president and chief executive officer. The transaction is expected to be completed in the first quarter of 2004, assuming approval of SCT’s stockholders and other customary conditions. Additional information about the transaction and the two companies involved can be accessed at www.sct.com/Education/corp_nm_pr2003-12-10.html

In 2010 alone, 100,000 new software vulnerabilities will be discovered, which is equivalent to one new bug every five minutes. Security incidents worldwide will reach nearly 400,000 a year, or 8,000 per workweek, according to a CIO.com article. On the other side of the coin some experts believe that before any of that can happen
there will be a major incident that brings the whole process to a grinding halt, restarting quickly with a new and improved ways of writing code, protecting information and transferring data. In “The Future of Security,” found at www.cio.com/archive/121503/securityfuture.html, the author paints a tragic picture of security today as well as what it will take to fix it.

- According to a New York Times article, Intel, Nokia, Samsung, Toshiba and Matsushita, are working on new system for protecting digital music, video and software from illicit file sharing. The consortium claims it has found a way to limit copying of intellectual property in hand-held devices, while at the same time allowing users to share files on a limited basis or permit file-sharing for promotional purposes.

- Through a series of articles by a group so diverse that it includes the voices of Newt Gingrich and the Dalai Lama just to name a couple, CIO.com explores how technology is affecting...well everything. In “Technology: Its Impact on Everything,” today’s leading thinkers examine technology with respect to health care, financial markets, war, exploration, kids, education, employment trends, civil liberties, religion, sports and more. The articles can be accessed at http://www.cio.com/archive/092203/index.html.

- Companies, users, and government agencies recently collaborated on four separate interoperability demonstrations of OASIS Standards and specifications at the XML 2003 conference in Philadelphia. Through a number of scenarios, the practical usage of ebXML, UBL, WS-Reliability, and XACML were shown. For a list of the demonstrations or additional information, www.oasisopen.org/news/oasis_news_12_10_03.php.

- Oracle recently announced that its HR management system will use the HR-XML standard for data exchange. If accepted industrywide, the standard, developed by the HR-XML, will allow resumes from any source to interface with HR applications, recruiting software and online recruitment services. The standard may also get a boost from Microsoft, which already has incorporated XML schema in its Office products. Visit http://www.infoworld.com/article/03/12/08/HNoracle_1.html for more information.

- While Apple currently holds a 2 percent lead over Dell in the number of computers currently in K-12 public schools, Dell holds a 37 percent to 30 percent lead over Apple in the “intent to purchase” category, according to a Quality Education Data, survey conducted last year.
Spring 2004 Technology Summit
Sheraton New York Hotel and Towers

Registration Form
April 1, 2004

Attendee Full Name

Title and Organization

Street Address

City, State and Zip

Phone     Fax    E-mail Address

REGISTRATION FEE

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THE ECONOMICS OF APPLICATION INTEROPERABILITY

e-Education Infrastructure White Paper Series

SCT SOLUTIONS ARCHITECTURE
The Economics of Application Interoperability
Forward Thinking

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Background

The economics of application interoperability is driving the transformation of IT within Higher Education. Over the past several decades, the demand for automation has led to the acceptance of heterogeneous applications deployed by departments serving the increasing demands for information access, improved productivity and the pursuit to increase the effectiveness of constituent services directly affected by a functional area like student recruiting, fund raising, accounting, physical plant, or disparate applications like a health center, research, museum, radio station, child care, or theater. Depending upon the maturity of applications and the IT infrastructure, higher education institutions spend anywhere from 30% to 50% of annual IT expenditures on application interfaces and integration in pursuit of application interoperability.

You must be wondering, if institutions would just replace their disjoint applications with an off the shelf ERP suite, would this not reduce the need to support integration across heterogeneous products? What if the institution just mandates the use of one homogenous system for all users? The problem is not that simple. ERP today, even the most advanced suite of modules offers to provide less than 40% of the enterprise functional needs.\(^1\) No vendor can do it all. Even the largest ERP vendors will admit this and offer bolt-on applications and partners to fill in the functional gaps. In addition, the cost to customize and extend the core suite is very extensive, risky and prone to resource limits and time.

Higher education institutions have been dedicating more and more resources supporting integration across the boundaries of applications because the number of base applications and complexity has mushroomed as each institution attempts to address their universe of users and departments with varying methods of integration. Integration can imply different ways to serve the complex needs of seeing data, having access to it, supporting the stages of working with the data and managing the behaviors of data validation and business logic. Applications can integrate from the presentation, work flow, data synchronization and the methods utilized to manage data supporting a work product, service or object.

Application integration is defined as “making independently designed application systems work together.”\(^2\) Applications or a set of applications are usually designed to be self contained with a common data model, consolidated business logic and set of functions designed to serve a discrete set of business processes. Each business process represents a pattern of practices requiring the means to collect, validate, calculate, and store the results using automation to perform routine functions. From a business perspective, an application is a set of business processes that have alignment with the purpose of institutional activity divided into a series of steps delegated as responsibilities and duties in pursuit of a charter. The application also includes archiving, setup, records management, reporting, analysis and information retrieval for measuring the who, how, what, when, why and content gathered by the business processes.

Application Interoperability is the means to bridge traditional IS applications with a variety of integration options to support enterprise work flow spanning departments, data synchronization between two or more applications, presentation integration offering a unified user experience, and the means to tie business processes together that is held within ‘application containers’. Tying applications together is not a simple endeavor because issues of data ownership, rules of authority, and data definitions may differ. In addition, the technology stack may differ creating technical barriers.

Stand alone applications are also called best of class as a reflection on the goodness of fit at the functional level, rather than fitting the enterprise requirements which would include various levels of integration. The emphasis of a best of class application has been to serve the department or set of application users without regard to the complex issues raised when attempting to make an application integrate with the rest of the enterprise. It

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\(^1\) Gartner Symposium ITXpo– Application Integration Scenario, San Diego, CA, March 23-27th 2003 Page 6

\(^2\) Gartner Symposium ITXpo– Application Integration Scenario, San Diego, CA, March 23-27th 2003 Page 2 defines a broad definition of integration including the variety of methods vendors have attempted from batch to request/ reply web services.
ignores the cost of redundancy in favor of user productivity. Supporting bridges that were not in the original functional scope of an application would obviously deplete the focus on the application’s purpose and benefits and increase the costs by about 30%.

If integrated with other enterprise applications, resources would have to be applied to support the links outside the department or set of users it is designed to serve. As a result, isolating the functional scope enables the development and deployment of resources to focus on the direct benefits of the application for the special group of users and reinforces their success. When IT reinforces the level of user satisfaction for one department or set of users by deploying best of class applications, it inadvertently increases the demand by other departments and users to attain the same benefits serving their needs in a like manner.

The IT practice of deploying best of class applications and permitting integration avoidance is often the main reason why standalone applications succeed over more ambitious ERP projects where management desire to rip out disjoint applications and replace it with a common architecture. Application segregation thus, reduces complexity and project costs in the short term, increases discrete user satisfaction with their application, but has a long term impact felt when the enterprise moves to connect disjoint applications with a variety of initiatives including a Data Warehouse, Business Intelligence and Enterprise Work flow. This often results in growing departmental conflicts, defensive postures reinforcing the best of class application benefits versus the drive to serve the overall goals and objectives of managing costs within the enterprise.

The tough issues brought on by the segregation of the application business logic, data models, rules of authority and ownership are often driven by short term objectives serving a perspective of the benefits, rather than the whole organization. Departments drive to implement Enrollment Management Systems, Advancement Systems, Housing Systems, Student Life Systems, Course Learning Systems and other departmental solutions separate from the legacy or core applications because they (the centralized Information System) don’t serve their needs well. The compromise to implement best of class applications moves the cost of avoidance over future years when collaboration and the drive to improve services grows as a result of competitive pressures, shrinking budgets and the management desire to improve institutional productivity and performance.

The strategic imperative for executive and technical management is the shift the emphasis from individual best of class applications and their justification for purpose and fit toward a larger recognition of the need for a loosely coupled coalition of open applications designed to operate and execute compound functions supporting the end-to-end business practices. The enterprise integration platform (or enterprise nervous system) takes on the role of managing how applications designed by different people, employing different technology, and containing internal rules governed by the application container’s business logic, need to fit into the enterprise. In other words, the enterprise integration platform is a framework supporting the deployment of heterogeneous applications improving their manageability by governing the rules of plug and play, and offering to support the variety of bridges needed to span the types of interfaces needed.

The reason for the shift of emphasis is linked by the economic drivers. Applications and all the intelligence built-in (data, logic and workflow) are containers often developed independent of other applications employed due to application complexity (reinforced by managing application scope). The main reason why applications are successful is to limit the scope of requirements and to deploy a solution targeted to address only a set of problems, often ignoring the interfaces and touch points outside the baseline scope.

The limiting scope of applications is creating the increased costs of integration or lack thereof. Since each application manages from within their scope, enterprises integration spanning applications requires transformation, cross walking data, timing, code values and attribute descriptions. Often, when applications are acquired, integration is an after thought. ‘Best of class’ applications can serve a department well, but fail to address many of the bridges required to support the enterprise movement of data and business process. Deploying many applications often results in an increase in redundant data and an increase in operating costs to
maintain the redundancy. The enterprise either pays in labor costs or pays for additional interfaces and steps built to address some of the touch points between applications.

Reducing the redundancy of data within an enterprise and the drive to reduce the problems of application heterogeneity have been the primary drivers to centralize core applications sharing a common database, tables, business logic and rules, reducing the need to synchronize data and to integrate the business processes that span functions within an application suite presumed to be integrated. This has taken the form of integrated commercial ERP suites built in the 80's and 90's. The premise has been, the more we can get from the core suite of ERP applications we deploy from one vendor, the less we have to support in cross application integration. But, the application richness and limits of the core set of applications comes with compromises. Most ERP suites are not designed for Higher Education specifically. The functional breadth and complexity to handle the variety of needs within a suite of applications, the maturity of the feature set and the richness of the integration within them still address a small portion of the enterprise needs functionally. In addition, the complexity of customization and closeness of fit; have seen massive project failures during the implementation and deployment of such suites as a result of missed expectations and massive budget overruns.

Every IT organization evolves and supports interoperability at different stages of maturity across applications shifting their focus from the benefits gained by deploying an isolated application to recognizing the benefits to improve productivity across application boundaries. Productivity often is the economic driver because it invites the opportunity to shift resources to better serve constituents and to lower the operating support costs managing touch points between applications.
The Higher Education Ecosystem

Higher Education is a world wide community that can be viewed as a Macro Ecosystem. From the Macro perspective, institutions cooperate and share initiatives through associations, consortiums, regions, collaborate on research, share faculty, and support teaching and learning with a variety of activities governed by outside agencies including financial aid, student loans, academic publishing, athletics, grants and contracts. Federal and State Education Departments are also part of the Macro Ecosystem supporting a broad array of institutions with funding, regulations and requirements. Often, these organizations share aggregation of data and the movement of data throughout the Ecosystem to support their activities. From the Macro perspective, we can summarize that within the United States, every institution has to handle a set of requirements that often is common among many institutions, yet pursued by local resources.

When we view each institution on a local level, we can see a Micro Ecosystem made up of supporting organizations from vendors, sponsors and partners. These organizations work to support the teaching and learning activities from the local level. Often, they cooperate on marketing, administrative and academic activities that require the exchange of data at the transactional level. Software applications are acquired and deployed in a local instance and configured to serve each individual institution and the departments they are designed to serve. The movement of data in and out of the local systems is often disjoint and lacks the standards necessary to automate the interactions across the enterprise. There are hundreds of software applications that can be acquired and deployed to support the academic mission.
What does Integration mean?
Integration is one of those words that reflect many meanings. Often it reflects different aspects on how systems are built, who built them and how tightly coupled applications are across the enterprise. It can reflect how systems support enterprise work flow, the movement and sharing of data and the completion of steps required to support enterprise business processes.

Often, integration describes the method of interfaces between independent applications. We describe application interfaces as a means to couple one application to another by using programmatic means to move data back and forth between the application databases. So, in summary, application interfaces are built between applications to move data. There are many ways to move data: batch copy/load, replication, point to point messages published and consumed by applications, utilization of API’s exposed in applications, and web services with request and reply messages.

We can describe enterprise integration as a means to support application architecture that offers plug and play across components, seamless data synchronization across applications, presentation access, and combined work flows that allow users to span applications with a single sign-on with authentication and identity management. So, in summary, Enterprise Integration offers a unified framework to support the enterprise wide application environment, embracing standard application communication and abstracted methods to support users without the barriers of security, variations in user interface and work flow.
**What does Interoperability mean?**

To begin with, interoperability is the goal of integration. For this reason, we (the vendor community) must all continue to evolve our software components to offer the means to satisfy integration and interoperability (at the data, process, and presentation layers of our application systems and those of our partners). Creating an environment to support the diverse array of applications in Higher Education is a challenge. It is the responsibility of every vendor serving this market to adopt standards across the application layers, which will enhance our ability to integrate and support application interoperability. We are driving our resources to enhance our client/user experiences, to realize the benefits of automation to improve customer goodwill and address the pressures of tight budgets and limited resources by reducing the integration support costs.

As individual users, we see integration as a means of information access spanning the application boundaries and databases within the enterprise to fulfill our purposes. As users, our role defines application access, the application components available to us and the rules of access (view, insert, update and delete). It assumes we have a means to render applications across the enterprise with a common user interface. Application access means users need to understand the operational elements and can perform the tasks to achieve their purpose using them.

Starting with single sign-on, application integration enables users to spend more time within the applications doing what they need to do rather than manage getting around the barriers of entry one application at a time. Unified access adds complexity and the need for identity synchronization across the application systems. It means the enterprise needs a means to manage authority to create, update and delete records across applications, not just within one application.

The expectation of one core system, with a single database managing all aspects of the enterprise including security, has for all intents and purposes become an obsolete concept as a large set of loosely coupled applications with independent data structures have supplanted the centralized single database concept. This has increased the need for methods of integration and conversely, increased the costs to maintain the interfaces.
while the demand for new applications does not seem to be slowing down as we pursue new ways to improve service, access and productivity. The lines have blurred between back office administrative functions and academic applications built to support learning, research and teaching requiring new bridges across these applications as users gain access to the increasing population of tools. Today, enterprise wide systems are comprised of many components, some home grown and some third party products in addition to the core ERP application modules. Library, Book Store, Parking, Medical Services, Housing, Security, Athletics, Counseling, Facility Management, and many other sub systems have been deployed, on the most part independently from the core ERP system.
**Why does it cost so much to support integration?**

In Legacy systems, most application modules are linked by shared data structures. Sharing data structures is not necessarily complex. Complexity derives from the number of applications that access the data structures, the number of data tables and the interface needed to perform business processing across the enterprise bridging discrete applications.

There are various forms of interfaces supported across the application layers (presentation, data model, business process and method) which derive different benefits for users and IT. The cost to integrate disconnected applications needs to address the one or more of the four layers. In doing so, the need to understand how business logic is executed becomes very evident. When applications are closed, it makes this part of the integration very difficult.

A typical Legacy system may have thousands of data tables, which accommodate the need for many interfaces. Complexity is added when a shared data table is altered, impacting other application modules sharing access to the changed data table. The cost to accommodate changes in this model is high due to hard coded dependencies and tightly coupled links between applications. As one application changes, all applications that touch the system need to be validated to make sure the data changes have been applied to the integration processes built-in.

![Tightly Coupled, Point to Point](image)

Tightly coupled, point to point applications can also be called spaghetti and meatballs. The number of touch points and the interfaces required to support enterprise business processing across disjoint applications creates a messy infrastructure of code developed and deployed to contain the traffic of data.
The Aggregate Cost of Integration

When we evaluate the Macro and Micro economic costs of integration, we can reveal some interesting insights. From the Macro economic level, if we assume the average annual IT budget is around 4% of annual expenditures\(^3\), we can estimate the total annual expenditures on IT in the United States to be $4 Billion since the total annual operating expenditures in Higher Education is estimated to be around $100 Billion\(^4\) in the year 2000. This means across the United States, a whopping $2 Billion is spent on application integration, interfaces and the effort to maintain the work processes across disjoint systems.

Imagine if the industry can save 10%, 20% or even 25% on the cost of integration? How would students and faculty benefit? What could Higher Education do with the funds saved? Would we see lower tuition? Would institutions improve other more strategic endeavors? The diagram below on the left shows a sample of five integrated applications tied together with a set of bridges. The more we add applications to the infrastructure, the higher the costs are to tightly couple the applications for the purpose of supporting a common presentation layer, data synchronization between the applications, business processing that spans the boarders of the applications and the methods to execute business logic for validation and processing of normalized data segments.

From the Micro economic perspective, if an institution spends $10 Million on annual IT expenditures, we would expect it to allocate approximately $5 Million on application integration, interfaces and the effort to maintain them.

\(^3\) Find the reference

\(^4\) Find the reference
Maturity Model
The maturity model depicts the adoption of integration techniques given the resources and investment of each institution. There could be more than five levels in this model. But, for purposes of this paper and discussion, we will summarize how the stages of adoption and the infrastructure determine the level of interoperability experienced by users. It is assumed, an institution has an enterprise system of disjoint applications running on heterogeneous equipment and has a local and external network connecting computers and servers using TCP/IP or some other network protocol. Even with an ERP system deployed successfully, which promises to reduce the number of interface points inside the common modules, an institution must still address how important integration is across all the applications shadowing the ERP system in order to support interoperability.

The first level in the model reflects the adoption of simple interfaces like batch extracts and loads. Batch processing would require operators to initiate and validate success. Job scheduling could help lower the cost. Many applications have built-in batch interfaces with pre-described formats like fixed format, comma delimited or tab delimited. X12 and the EAI interfaces would fall within this level.

The second level in the model reflects the development and deployment of tightly coupled interfaces or what some would call hard coded. These interfaces put and get records, cross walk the data attributes and execute the business logic required to validate the inserts and updates across the applications. This level of interface is much harder to develop and costs more to maintain, as a result of the knowledge required to develop and the likely changes that occur on either end of the interface. Some vendors have created Work Flow bridges that simplify some of these steps, but Work Flows have to be maintained as tightly coupled interfaces.

The third level of interoperability is achieved using common presentation methods or application portal. Applications can be initiated through a unified portal with a single sign on, offering users a launch point for executing their applications. Content from within the applications appear to be shared on web pages, can be channeled and in some cases, the actions performed on one application, will update and synchronize with point to point messaging or transaction queues. Adding a common portal and implementing channels is another
layer to support, which has its associated costs. The holy grail of the portal vision is to provide a seamless end-user experience with common user interface controls and behaviors making the applications easy to use. This requires vendors to adopt the application standards or the sophistication of the portal has to impersonate users by being a filter to render the standard user interface.

The fourth level in the model reflects the adoption of Web Services using XML payloads to send requests and replies between applications. The business logic is behind the Web Services and enables validation and processing. Web Services can also offer self-describing views that can be channeled and rendered on any device using a common browser with style sheets. The standards of Web Services have evolved since 1996. And, many Application vendors are exposing their business logic, events and rules through published Web Services.

Finally, the fifth level of the model depicts the adoption of an enterprise messaging platform to support application messaging through a hub and spoke architecture. This is an Event Driven architecture offering real-time integration supporting data synchronization, content consumption, work flow and execution of business logic outside applications, rather than within application containers. A message hub with advanced queuing is the center of the enterprise messaging platform. Each application connects to the hub with an adapter built on a foundation of support for common tasks. The adapter is what actually publishes and listens for messages, independent of the application and runs in its own thread independent of other application tasks.

The fifth level is the most efficient and scalable architecture to buffer the need to know how applications work. Publish, Request, Sync and Reply messages are sent by one application to the enterprise much like email between co-workers. Some are broadcast to a single worker while others are sent to many. The enterprise message platform has to have the smarts built in to handle the security, levels of authority and distribution of messages. Application vendors or authors would ‘message enable’ their modules to publish requests and listen for transmissions targeted for their consumption. This level of integration requires the use of a common message protocol and the ability to transform messages in real time across the enterprise message platform. Like Web Services, XML would be the basis of what is communicated. Standard message formats would be
published in XML message sets. And, these message sets can be extended with localized elements, if warranted.

There is no right or wrong level of integration. Each level builds on the knowledge and investment of the prior. This means, one level does not replace all the previous forms of integration. The higher the level though, the more options an institution has to leverage to save costs and resources.
The Transformation from Network to the Enterprise Nervous System

Most institutions have implemented local area networks that move data and files from computer to computer and computer to server. The network is simply a highway for bits to travel. The network layers offer file sharing, access to the world wide internet and directory services.

Gradually, institutions will begin facing the need to deploy their own enterprise nervous system as part of the IT Infrastructure designed to manage the communications between applications hosted locally and external systems outside the enterprise infrastructure. Much like the adoption of email, institutions will benefit from improving application collaboration. Costs to interface and maintain the interfaces will be greatly reduced as the costs are moved away from the responsibility of IT to the author of the application.

The new enterprise nervous system will be based upon a meta data model describing the enterprise objects, methods and processing rules for applications.

The roles of applications are changing in today’s enterprise systems. They are no longer the sole container of work flow, business logic and data storage. The use of Enterprise Warehouses, Operational Data Stores and now the Enterprise Nervous System will govern how applications perform their functions.
Conclusion
Integration is much more than moving data from module to module. The four levels of integration and the promise of application interoperability should be an important element in the selection and deployment of applications. Heterogeneity and discrete applications won’t go away anytime soon. What institutions can do to cope with and in fact lower the TCO of ‘best of class’ is adopt and implement an enterprise nervous system to support the framework, protocol of application communications and the extensibility warranted given the life cycle of the applications that must ride on top of the platform.

Integration is costing institutions upwards of 50% of the annual IT expenditures. Deploying a scalable, reliable, secure, and high performance implement integration platform can save institutions a significant amount of stress and cost over the life cycle of their adopted applications. Shifting the emphasis of integration to a plug and play environment will help the entire ecosystem of higher education by removing the barriers of integration and lowering the need to allocate resources to develop interfaces. Which in turn means we should drive for the development and adoption of common standards across the enterprise system with the partners and vendors supporting institutions with software products? Applications integration is where our focus should be. Standards will of course evolve, but as long as they are versioned and change is managed through the integration framework, I believe we can make a real dent in the cost allocated to supporting integration and improve interoperability for constituents.