

Investigation into Internet Portal Technology

Distributed Environment, Common Application
Framework (DECAF) Committee
An ITPG Committee

University of California, Santa Barbara

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Executive Summary

The purpose of this white paper is to communicate the overall definition of, need for, and a recommended approach to producing a University Portal. The DECAF Committee, made up of application service providers from various campus departments, has met on a twice-monthly basis, attended portal related conferences, met with other campus personnel, held conference calls with Gartner Group experts, and done independent research to come up with the information presented here.

A University Portal would provide students, staff and faculty (and potentially other audiences) with consistent, seam-less, adaptable, and secure access to University Information Resources and Business Processes. The need for a University Portal is driven by two things: 1) The current state of technology and its use in society that impacts UCSB's competitiveness and 2) UCSB's decentralized information services that create a difficult overall user interface with the organization as a whole. The fact is, today's users – especially students – expect more from an organization's Web page than information. They expect to be able to transact significant business, easily. While UCSB is offering significant on-line resources and services, it is currently doing so in a way that shows the decentralized nature of our organization – separate login functions for each site, distinct look-and-feel from site to site, and varying levels and methods for securing access.

The Student Centered Support Model, presented at the December 1, 2000 UC Task Force on Future Delivery of Student Services, described that today students transact business with Universities by three methods: 10% Self Service, 0% Generalist support, 90% Specialist support. Many Universities are moving to a model of 70% Self Service, 20% Generalist, 10% Specialist support, with greatly extended hours for walk-in and call center generalist services. To accomplish this, a shift in both the organization and information access and tools, must take place. This committee is investigating only the system integration and Internet technology aspects needed to increase the accessibility and security of self-service transactions via a WWW Campus Portal.

In addition to providing students (initially, and later staff and faculty) with an easier and more secure interface to the University, a portal can also provide some efficiencies for the information technology infrastructure. By consolidating, UCSB could enjoy some economies of scale in user account management. Centralization of a service such as Unified User and Security Management will require the University to look at business models associated with providing a centralized service in a flexible and affordable manner.

We recommend that UCSB implement an Internet standard solution for a University Portal, in keeping with the Best Practices in Higher Education. The solution should bridge the gap between our current legacy and web-based systems and an integrated student portal. The University Portal should provide the security infrastructure to allow students to sign-on once, gaining access to a multitude of UCSB systems, both existing and future.

To that end, we propose the creation of a technical working group, as a sub-committee to DECAF to perform the detailed technical research and design of a technical back-end architecture and approach to implementing a University Portal at UCSB. We will then be able to propose resources and staffing needed to lay the foundation for a unified portal for the campus, and present them to our chartering body, the IT Planning Group for further consideration.

I. Context

Today's technological and economic environment presents the University with a unique set of challenges and opportunities.

- The explosive growth of the Internet and E-Business has greatly altered the expectations of students, faculty, staff, and potential students and employees. These "customers" expect to be able to conduct their business with, and access the resources of, the University, *online through the Internet, around-the-clock, 365 days of the year*, in the same manner in which they would deal with any large organization.
- Customers (both external and internal) expect that in dealing with an organization through the online media, that the organization should present *simple and consistent methods* in which to conduct business and access online resources. Such simplicity and consistency in systems and procedures are also essential to providing better service with fewer resources.
- Customers should not be expected to be aware that resources and applications might be provided by different organizations within the University. These online resources should integrate together for a "seam-less" experience for the user. Customers have come to expect that these resources and applications should all be available from a single gateway or "portal" Web site that simplifies the navigation between these applications.
- Customers expect to be able to *customize and adapt* the interface to resources and processes to best suit their individual needs. Thus, customers expect that a portal Web site will not only be automatically tailored to present the appropriate resources to which they have access, but that they may also personalize it to their preferences.
- Customers have also come to expect *privacy and security* in their online dealings with organizations. As well, the University must be increasingly vigilant in securing and protecting its information assets. Customers will expect that all resources should be available without the necessity of maintaining multiple userids/passwords and without the need to log-in or authenticate to each application separately.
- The University finds it increasingly difficult to attract and retain quality staff. Consequently, there is pressure to *provide services more efficiently, and in a more "user-friendly" manner*. Additionally, it is becoming increasingly more difficult to obtain the technical talents in order to implement technology solutions.

Online Resource and Process Access at UCSB

Over the last several decades, UCSB has made many strides in automating many business processes and in bringing information resources online. Over the last half-decade, many of these processes and resources have begun to be accessible in the Web browser environment. Despite this progress however, access to online processes and resources remains highly fragmented, inconsistent, and with little or no common authentication and security. Students, faculty, and staff must traverse through a bewildering number of disjoint online systems, many with their different methods of authenticating the user. And faculty and staff in individual units find themselves re-inventing authentication and data access methodologies.

II. Vision

The application of Web Portal and Security Enabling technologies should allow efficient "self-service" access to the resources and business processes of the University in a manner that:

- Presents a Consistent user interface
- Allows Seam-Less Integration between applications and resources

- Is Customized and Adaptable to the needs and abilities of the individual
- Provides Security and Privacy common across all applications

Standards for Portal interactions, common authentication, and resource authorization should allow applications to integrate together without the need for each department to re-invent procedures and software for authentication and uniform resource access.

The application of these technologies should provide a solid and ubiquitous platform with which the campus may move forward in deploying applications to more efficiently serve its internal and external customers. These technologies should also allow the Campus to more effectively compete for resources and potential students and employees in today's information economy.

III. Benefits (Of a full scale Campus Portal)

Benefits to students

- Provides access to services around the clock
- Reduces complexity
- Reduces frustration
- Eliminates need to visit multiple offices
- Improves quality of information
- Provides ease of navigation to online services
- Provides a more secure platform for conducting business on line
- Supplies information in a meaningful context
- Gives students a sense of empowerment
- Enables administration to become more student centric

Benefits to faculty

- Provides a framework for linkages to instructional resources
- Improves communication with students
- Increases UCSB's competitiveness for top students

Benefits for campus administration

- Improves ability to provide service to students
- Increases efficiency and productivity
- Reduces paperwork
- Automates clumsy manual processes
- Reduces administrative costs
- Improves quality of information provided to students
- Improves communication with students
- Consolidates and standardizes processes
- Can reduce administrative overheads with streamlined processes

- Makes it more feasible to accommodate growth
- Counters student alienation from campus administration
- Meets student expectations for Web-based services
- Is congruent with new business architecture of the report *UC 2010: A New Business Architecture for the University of California*.

IV. Requirements

- Acquisition or development of an Internet Portal software platform to allow a consistent and adaptable interface to all Information Resources and Business Processes. This platform should allow customers to easily navigate through relevant resources, which can be tailored to their needs and abilities.
- Adherence to Software/Standards to allow trusted common authentication and the capability for a Single-Sign-On in order to allow access to all resources and applications. This benefits the consumer by improving simplicity and security, and benefits the providers by reducing the need to re-invent authentication methods and maintain user credentials.
- Use Secure Socket Layer (SSL) to secure communications between browsers and servers.
- Campus Standards for the usage and presentation of common data elements.
- Technical Resources to assist campus information providers (departments) in the adaptation of their resources and applications to fit within the Portal and Security framework.
- Changes to the Campus Business Model to acknowledge and embrace the requirements presented in this proposal.

V. Known Possible Solutions

There are many different ways to implement a campus portal solution, depending upon many factors including funding, management structure, technology jump, technical resources, political charter, and leadership. There is no one right answer. Each campus must evaluate these factors and determine the best path.

The DECAF committee is a collection of application service providers from across the UCSB campus, who have responsibility for systems that contain private information that must be secured and to which access that needs to be controlled. To that end, we intend to focus primarily on the Web, Application, and Integration services as defined below. It is our intent to evaluate and determine the best way to enable a technology infrastructure that will:

- Allow for secure and cohesive access to student administrative systems;
- Adhere to industry Internet standards; and
- Be hooked into and integrated with any future portal for any UCSB user population, as determined by others who have responsibility for the various groups on campus (e.g., students, faculty, alumni, staff).

There are also several approaches to evaluating and implementing a technology solution to meet the needs described above. Various campuses are choosing one of the following options

- 1) Each Department creates own separate systems, interfaces, and authentication
- 2) Internally Developed Solution, with campus-wide participation, over time, with standards.
- 3) Hire a Systems Integrator, to recommend technology and implement

- 4) Purchase software sub-components, Campus staff integrate
- 5) Purchase Portal software, and integrate jointly with Portal vendor
- 6) Outsource Portal hosting service, or use a free Portal with advertising business model

Many different campus organizations share the responsibility for the users, systems, and information that typically are integrated into a portal solution. Some campuses are doing piecemeal implementation of portions of Web portal technology, and others are on a fast timeline to pull it all together at once. With either approach, to integrate a campus-wide portal, a collaborative effort is needed. Some campus organizations can easily identify areas, which fall in their domain, and therefore, can assume responsibility for defining and implementing a solution for their areas. In other cases, a new way of working needs to be defined. For example, campus departments historically have assigned user accounts and granted access to systems, but with a portal project, a unified method of user account management should be defined and a new process to manage and maintain this information must be created.

Figure 1 in Appendix E shows the many technology layers that make up a Campus Portal. An evaluation of these layers and services on Campus shows that while campus network, operating systems, communication services, and legacy applications are stable, we lack the unified user management, application/integration and portal layers at the Campus level.

VI. Next Steps/Recommendations

- 1) Perform more detailed research and analysis:
 - Create a technical working group to discover, test and evaluate technical approaches to unified user management and security.
 - Coordinate with other groups on campus with the same needs and timeframe of need as Fall 2001. Define both short and longer-term technical approach to unified user management, authentication, and authorization based upon course registration.
 - Determine if the short-term approach above can be implemented immediately and if it can be the beginnings of a UCSB authenticated portal, meeting Fall 2001 goals.
 - Identify the resources, staff and funding needed to implement both short and longer-term solutions and present to the ITPG and ITB.
- 2) Prepare a detailed recommendation for campus investment in software and security architecture for longer-term solution.
- 3) Define ongoing administration and support requirements.

Appendix A. Definition of a Portal/Glossary of terms

Authentication: A security mechanism that allows authorized users to log-in to a secure web portal.

Authorization: A security mechanism that checks a set of attributes about a user, which define what functions or data a user is authorized to use.

Back Office Integration: The behind the scenes technical integration of transactional computing systems, to enable on-line transactions through the University portal.

Blackboard: A software vendor and product that offers on-line course development and management solution to faculty, the Level 3 version of which contains the elements of a campus-wide portal.

Cameos: Portal utility that displays commercial or institutional data in a real time data feed through an established channel with another computing system. (I.e. stock quotes, BARC account balance, etc.)

Channel: An established data interface that can be shared by multiple portal users, such as in a "chat" session, or a way to publish readily available information.

Corporate Web Portal: A Web site that provides proprietary, enterprise-wide information to employees, as well as access to selected public Web sites. It includes a search engine for internal documents as well as the ability to customize the portal page for different user groups and individuals.

JA-SIG: The Java in Administration-Special Interest Group is an independent organization of higher-education institutions using Java technologies to meet campus business needs. The purpose of JA-SIG is, first, to share member experiences as they build applications with Java, and second, to develop a common infrastructure upon which they can build shareable components. Included in the efforts of this group is a portal framework.

LDAP: Lightweight Directory Access Protocol – An Internet standard method to storage and retrieval of directory information. Often used to store information about users and the systems they are allowed to access via the Internet.

Personalization, Rules-Based: A portal service that uses information known about the user which is stored in back-office integrated systems to personalize the portal presentation based upon that information.

Single system sign-on: A Web portal security feature, which allows the portal users to sign-on once, and be granted access to multiple computing resources via a single portal.

SSL (Secure Sockets Layer): A security protocol that provides communications privacy over the Internet. The protocol allows client/server applications to communicate in a way that is designed to prevent eavesdropping, tampering, or message forgery.

University Portal: A Corporate Web Portal for a University. Users would include Students, Staff, Faculty, Alumni, and more. A Web based campus Intranet that facilitates simple, consistent community interactions.

User Customization: A portal utility that allows the user to customize their portal presentation according to their preferences. This can be in regards to background colors, motif, placement of items on the portal page, and choices about which portal services to display upon user sign-on.

Appendix B. List of systems which authenticate students

Authenticated Web Sites - Students	Access Method	Office of Record
Academic Departments		
- Letters & Sciences*	perm/pin	
- Course materials for selected professors	perm	
Alumni Association Job Search	userid & password	Alumni Association
BARC*	perm/pin	Billing, Accounts Receivable Collections
Career Track	first 5 digits of SSN	Counseling & Career Services.
Community Housing	perm/password	Housing and Residential Services
Communication Services Phone Bills	perm/pin	Communications Services
DARS*	perm/pin	Registrar's Office
GOLD	perm/pin	Registrar's Office
- Address Changes		
- Class Schedules (view)		
- BARC bills (view only)		
- Financial aid (view only)		
- Online registration*		
Graduate Admissions electronic applications	Randomly generated password/last 4 digits of SSN	Graduate Division
Graduate online commencement	Perm/last name	Graduate Division
Graduate exit survey	Perm/lastname	Graduate Division
Elections (Future?)		
Housing Application - Available to all class levels; mandatory for continuing students	perm/pin; PIN = last 4 digits of SSNs if PIN not yet assigned	Housing and Residential Services
LDAP*	userid & password	IS&C
OSL-Student Organization Query	Userid & password set by the student	Office of Student Life
Work Study Job Availability	SSN	Financial Aid
U-Mail/Uweb	userid & password	Instructional Computing

Non-authenticated Web Sites - Students	Access Method	Office of Record
Scholarship Applications/Status (Future)	TBD	Financial Aid

Other Web Sites for UCSB students	Access Method	Office of Record
PATHWAYS-Undergraduate Applications	Userid & password set by the student	University Office of the President
Graduate School of Education	GGSE assigned	

Appendix C. What Other Universities are doing

University of California, Berkeley

Berkeley has developed a report called "E-Business Issues for the University of California, Berkeley." There were three major portions of the report, including Portal Initiatives, Infrastructure Initiatives and Policy Issues. The draft report recommended several actions, including a redesign of the Berkeley home page and the development of an Enterprise Information Portal. The draft report is dated 1/6/2000, and a final report has not been published (<http://campus.chance.berkeley.edu/eberkeley/e-business-96.pdf>). The current status of the recommendations is unknown.

A search of the Berkeley home page does not reveal a "portal" per se, although a site called *Bearlinks* is called a portal in their directory. It does not have the distinctive features of a portal, however. It is just a page with links to all the student information systems.

According to the report, Berkeley was already moving ahead with a project to implement LDAP services. Additionally, they have implemented a pilot Kerberos project.

University of California, Davis

UC Davis recently piloted a portal called *MyUCDavis*, which was built in-house. *MyUCDavis* has many of the features of a portal described in this document. It offers customization, personalization, and limited single sign-on (via Kerberos). An early prototype of this system can be viewed at <http://sysdev.ucdavis.edu/myucdavis>. Students and faculty can use this site as their gateway to UC Davis-specific online services and information, as well as news, stock quotes, and other external information. The developers have set up the system so that departments throughout the campus can fairly easily change what is viewed on the portal about their department, allowing flexibility for those areas of the University which are more decentralized. In addition to traditional portal features, faculty may add course information to course descriptions, thereby communicating with all or only enrolled students about the class.

The initial portal project was developed for students and faculty. The plan is to develop another portal for staff, customized to their needs, but operating the same way as the original portal.

University of California, Irvine

UCI is proceeding with a prototype using JA-SIG framework. They will incorporate authentication (Kerberos) and some of their data warehouse applications. They have been disappointed by so many vendor offerings that they feel they would be better off building it by themselves using the JA-SIG architecture. They do not yet have full commitment to the JA-SIG solution. There will be an evaluation after the prototype has been built.

University of California, Los Angeles

MyUCLA

UCLA was one of the first universities we know of to institute a portal like product for students. It is called *MyUCLA*, and was built in-house. This site allows students access to their class schedule and other person-specific information in a standard format. The only personalization available is background style. However, the site does contain extensive information for students regarding courses, waitlists, registration status, booklists, appointments, a calendar, etc. The features are extensive, while the user interface has fallen behind the times. A new set of functions is being released for faculty to enter student grades via MYUCLA.

UCLA Portal Future

UCLA is in the process of writing up a paper regarding future portal work. It is unavailable to publish, as it is being reviewed. However, Karen Swartz, data architect at UCSB Student Affairs, provided a summary of the draft:

“The UCLA paper is a nice start to the portal development process, but they are really just beginning. They have identified the features of their desired portal - common look and feel, customization, etc. Their next steps are to inventory all their systems, decide on which to put first on the portal, evaluate the options for building the portal (in-house development, external open source (JA-SIG), and commercial solutions). They have started putting together what apps are the most useful for certain roles.”

Therefore, while UCLA was at the forefront of the “MyUniversity” trend, they are really just now embarking on a portal visioning and implementation process.

University of Washington

<http://myuw.washington.edu>

The University of Washington has implemented *MyUW*. The portal site offers customization and personalization. It also offers secure single sign-on, although the scope of its use is not clear (there are some systems that still require system-specific sign-on). The site was developed in Java. The site contains information for students regarding courses, registration status, booklists, calendars, news, account balances, and much more.

University of Michigan - Ann Arbor

<http://www.umich.edu/~myumich>

The University of Michigan (U-M) at Ann Arbor has begun pilot testing their new student portal, *my.umich*, with about 500 users. Initial services are aimed at U-M undergraduate students and include alumni, a customizable list of favorite sites, news, classifieds, a planner, and more. U-M service providers are encouraged to explore how they can use *my.umich* to improve access to their resources and enhance communication within their communities. Implementation of services and resources for prospective students, graduate students, faculty, staff, and others is planned for the future. Anyone with a “username” and UMICH password who is eligible for the Basic Computing Package at U-M will have access to *my.umich*. When *my.umich* is introduced, customization options will be limited. In time, as more resources and services become available and more people provide input about the features they value in the *my.umich* environment, customization options will be expanded.

University of Illinois - Urbana

Has apparently not implemented a campus-wide student portal. The Department of Human Resources Education has implemented a rudimentary student portal. The Department of Chemical Engineering has implemented an academically oriented portal.

University of Colorado - Boulder

CU Boulder has implemented a student portal, and is only now beginning to discuss it at high levels. Their IT staff has begun working with the JA-SIG portal product, but no plans have been made for a project. They will be developing a proposal for funding a portal project soon. (Per Minutes from IT Council meeting on 10/26/2000.)

University of Texas – Austin

<http://utdirect.utexas.edu/utdirect>

UT Direct is by far the most comprehensive Student Portal site in this write up. While for some reason it seems students cannot register for classes online, it also seems they can do virtually anything else (<http://www.utexas.edu/cc/newsletter/aug2000/utdirect.html>). The demo site (follow link above) while limited in functionality is very polished and paints an impressive picture of what students can do with this site. Apparently, the site will also be integrated with *Blackboard*, which they are piloting with around 20 professors this fall (2000).

Using UT Direct, students can do the following:

- Check grade history, exam schedule, schedule of classes, assigned registration times/dates
- Update biographical information (address, phone, etc.)
- View academic calendar
- Search course schedule and class availability
- Degree audits, “what ifs”
- View financial summary page with online credit card payment options
- Financial Aid status
- And... housing, scholarship applications, library services, course instructor surveys, class web sites, testing services...

This is all apparently done with a single sign-on, although since the demo does not take you into the actual system this was not verified.

University of Virginia

<http://www.itc.virginia.edu/students/home.html>

This site is labeled a “student portal.” However it does not have any of the features which distinguish a portal from any other web site (customization, personalization, single sign-on, etc.) The top of the page is where the user selects if they want to look at student, instructor, researcher, staff or technical staff information. Within each section, there is slight customization, but this is based on user selection of the section.

The University of Virginia is moving forward with student portal plans, per the minutes from 9/7/2000 IT Council Meeting:

Deb Mills announced that they now have a mock-up for the student web portal. They are still working on many variables regarding what will be available on the student portal. Student Council members have been involved in this process to date, and a focus group will be formed soon for further discussions. The pilot for this project may be ready in early 2001.

University of Wisconsin – Madison

The University of Wisconsin – Madison is piloting a student portal this fall (2000). The pilot participants are undergraduate biology majors. The portal has a customizable front page that students can customize (adding, deleting or moving modules). From this front page, they have access to email, as well as news and resources such as UW directory searching and an online dictionary. Within an “Academic” tab they see their class schedule and can follow links to see details about the class (if the class has a web site link). The Academics page is also configurable, and offers modules that are customized to the student based on (at least) major. There are Calendar, Library, Campus Life, Financial, and “My Records” tabs that are similarly

customizable. The "My Records" page contains contact information, DARS, grade history, expected graduation date. The student may choose between two color schemes (both consistent with school colors) for the page. On *My UW-Madison* the student cannot register for classes, change their address, or view their financial aid status (at least from within the portal).

Stanford

Associated Students and Stanford Student Enterprises have developed *My Stanford* (<http://my.stanford.edu/my/Public>). The site gives students links to news sources, local and school activities, academic resources and web tools that Stanford students might want to use. There are some customization features available through a campus-standard login. However, the portal does not give students access to core administrative or academic systems (except to the extent that links to other sites are provided).

There is no evidence on Stanford's web site of administration plans to build another student portal, or to expand this one created by students to access core systems.

Appendix D. Vendor Offerings and approaches

Vendors at Educause	Product	Description	Approach
EduCause WG NET@PKI	EduPerson	Aux. Object Class for Campus directories	www.educause.edu/eduperson (LDAP standard object definition to facilitate inter-institution authentication)
Internet 2	Core Middleware		www.internet2.edu/middleware
InfinNet	Campus Web Connect - Quick Connect Gateway	Java-based Enterprise server, allowing campuses to connect multiple databases concurrently. Implementation services, will analyze effort, and bid fixed price to integrate systems using Quick connect gateway.	www.campuswebconnect.com From Their literature - QuickConnect gateway can connect to multiple existing application systems simultaneously, combining the data onto a single Web screen. Interfaces easily with ERP systems, and to your institutions choice of Web Portal and Homepage, or may be used to build your own custom presentation interface.
IBS	JA-SIG	Java	The JA-SIG Portal is an open-standard effort using Java, XML, JSP and J2EE. It is a collaborative development project with the effort shared among several of the JA-SIG member institutions. The JA-SIG Portal is available as a reference implementation to any institution of higher-education at no cost.
ABT, Inc	Power Campus	Web modules provide secure access for Student/faculty services.	ABT Tailors administrative solutions for colleges by implementing PowerCampus in support of admissions, registration, student records, business and advancement offices.
Schlumberger	SmartCards	Manufacture/sell smart card technology and readers.	They will work with existing campus ID card folks, to create a smart ID card to store PKI certificate. Readers can be PCMCIA, Floppy disk drive, USB (future)

Digital Signature Trust		Licensed Certificate Authority	Similar to Verisign.
Brio	Brio Portal	Did not see it.	Niche player, according to Gartner
Campus Pipeline	Campus Pipeline	Tab based portal, integrate internal and external resources using JAVA, CORBA, LDAP, XML	www.campuspipeline.com Campus Web portal, has advertising in small sections on most pages, and to a much greater extent on the Go Pipeline part of the site.
Collegis	I-Solutions Center	Outsourced Web integration, portal, Web site, and e-learning services	www.collegis.com Portal Service Provider
Blackboard, Inc	Blackboard 5	Level 1 – Course Environment Level 2 – Add community area and services links (Portal) page Level 3 – add API's and LDAP/SSL/Auth/Portal	www.blackboard.com
Gartner Visionary Vendors	Product	Description	Approach
Viador	E-Portal Framework	Personalization, single-sign-on, APIs for application integration, security services. Selected by Dept of Education.	www.viador.com "Viador open authentication APO permits custom integration to 3 rd party authentication services like NT domain security, ADS, Novell, and other proprietary systems. Interface with LDAP 3.0 authentication servers
iPlanet	Internet Service performance Platform	Portal Services, Communication Services, Web Application/Integration services, Unified User management services	www.iPlanet.com Netegrity Siteminder, NS meta directory, NS messaging server, iPlanet Web server, Portal server, NS delegated administration, NS certificate management,
Computer Associates	Jasmine II	Was Sterling Software's Eureka Portal	www.ca.com JAVA, LDAP, XML, personalization, publish and subscribe, customization, search, security API for single sign-on stated in literature.

Plumtree	Corporate Portal	Open, scalable platform for access to information and applications	www.plumtree.com Personalized portal page, collaborative Portal Community, extensible Portal Plug-in modules, security SSL, LDAP,
IBM	Websphere and Lotus Domino K-station.	Does absolutely everything and more	www.ibm.com Gartner article states IBM's current offering has "inadequate functionality"
TopTier	EBusiness Integration Portal	Fast, easy access to data and resources through the enterprise.	www.toptier.com Personalized control, searching, point and click hyper-relational navigation protocol. No mention of SECURITY at all.

Student Systems w/own Portal & integration tools	Product	Description	Approach
Jenzabar			
SCT			
Peoplesoft			
Oracle			
Datatel			
CARS			

Appendix E: Features of a Portal Solution

Figure 1 below shows the many technology layers that make up a Campus Portal. An evaluation of these layers and services on Campus indicates that while campus network, operating systems, communication services, and legacy applications are stable, we lack the unified user management, application/integration and portal layers at the Campus level. A brief definition of these layers is also provided below.

Portal Services: These services provide the user an area to personalize and customize, so their portal experience can be tailored to their preferences, enabling students to show the information they choose to see, in a presentation format selected to best suit their needs. Portal software vendors provide tools to allow the user to select and arrange information. This is typically a software application that runs on a Web server, and can also be tailored to allow members of different groups to see information relevant to their group or role. Examples of group affiliations that would warrant presentation of different information are Students, Faculty, Staff, and Alumni. Within the "Student" group, there could be several roles as well, such as Undergraduate, Graduate, Education, Engineering, etc.

Communication Services: Numerous options exist to provide services through a Web-based portal. Some campuses offer a calendar and email service to the students. GGSE has begun to offer a calendar, email, and in the future, a "Netshare" application to provide public and private directory folders for use by all students and staff for file-sharing and publishing of information. This can also include Web community enabling software such as chat and BBS functions.

Web, Application, and Integration Services: This is the application security and "middleware" layer that is needed to allow secure access to transact business with University systems online. Several vendors offer a middleware layer, and they also usually offer integration services, to connect in the legacy systems and databases with the Web server to enable transactions and access to information through a Web based interface.

Unified User Management Services: To control access to, and appropriate use of the services above, the community of users must be given accounts for authentication and authorization. The typical management of users is done by creating an online directory of all users, and in it, storing:

- 1) What groups they belong to (roles, such as student, alumni, faculty...);
- 2) What systems they should be allowed to access (authorization);
- 3) Information to verify that the person is who they say they are (authentication); and
- 4) What information they can manage about themselves (delegated administration).

To determine how each type of user will interact with the services, policies must be developed and adopted that define how the organization will interact with and control access to the systems and information about the systems and users.

Operating Systems: The campus operating systems are managed by department system administrators, with their network connection and configuration adhering to and monitored by the OIT security administrator.

Campus Network: The Campus network backbone is in place and is being unified and upgraded by the Office of Information Technology.

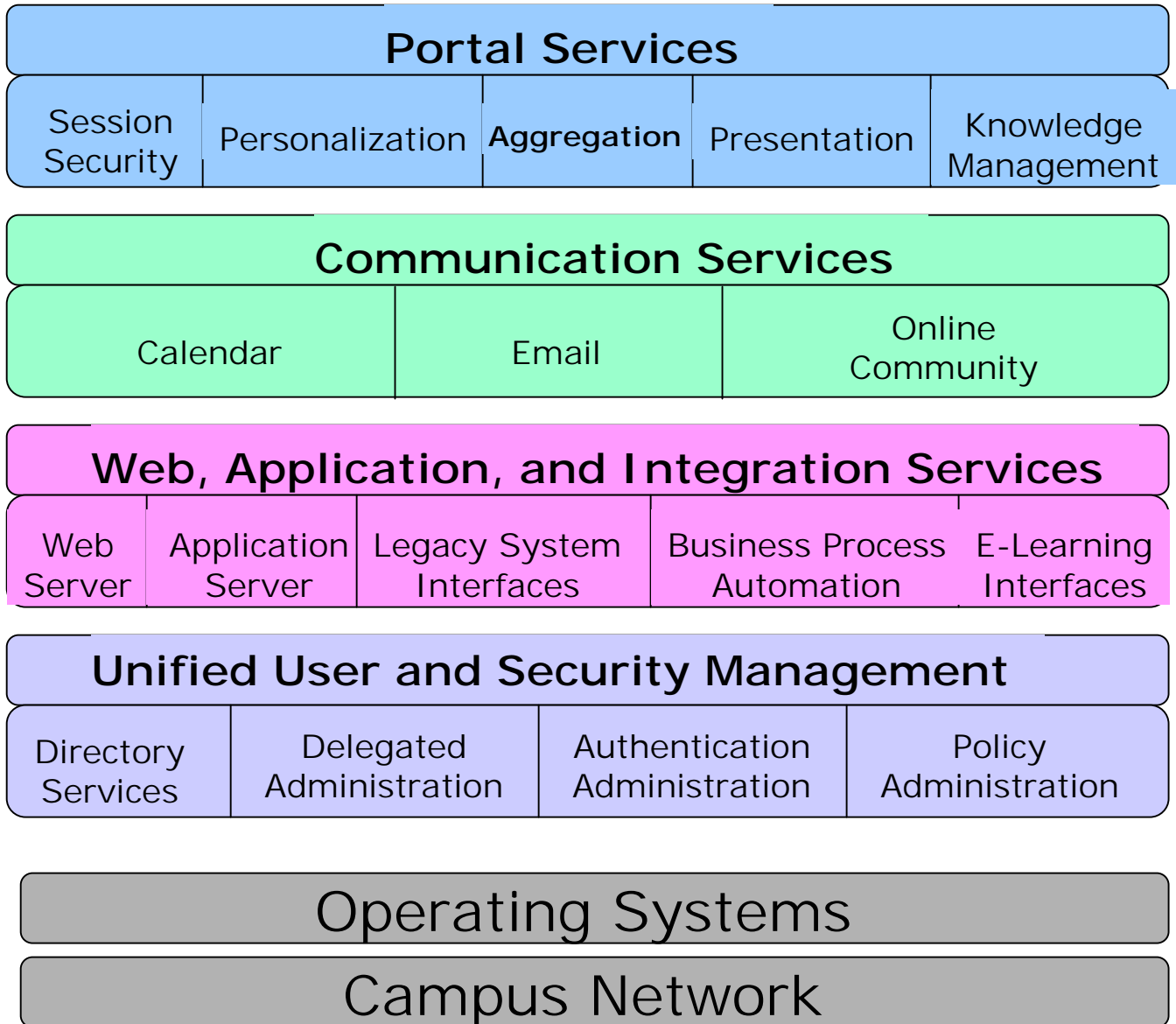


Figure 1