Attachment C

Portals/Middleware White Paper

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Version 8- Pat Burns and Linda McNamara

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"As our campus Web sites grow and mature, and as we continue to add content and process, we are nearing the time when the Web will become a software model of the institution." [1]

This is a proposal to provide a vision for Middleware at Colorado State University. One might interpret Middleware as "e-deployment" encompassing enterprise-wide e-commerce, e-business, and e-learning at the University. Of course, this must be accomplished consistent with current databases and projects in the area of eServices (electronic services) while retaining distributed development.

This white paper is not a project proposal. Rather, the primary goal of this white paper is to elevate the level of dialogue about taking campus electronic information at the University to the next level. If there is sufficient support for the effort, and the budget request seems attainable, then the project proposal would be the next task upon which to embark. The project proposal would contain much greater detail in terms of project tasks, project timeline, and resources required including staffing and ongoing budget.

The Concept of Middleware

To date, much of information technology has been concerned with inter-connecting computers to networks. In the forthcoming decade, the emphasis will be upon connecting people quickly and easily to information. An important aspect of this will be to deliver services electronically directly to people. Currently, electronic services are delivered in the mode of providing web pages through which one can navigate to the appropriate areas – however, finding appropriate information on loosely organized, massive web pages is often a daunting task. To facilitate information transfer, the paradigm is changing to delivering personalized services directly to individuals. To receive services, users would have to log on to the portal, just as they do now to send and receive e-mail. This paradigm shift can be likened to "bringing the mountain to Mohammad," rather than requiring Mohammad to traverse to and then scale the mountain.

In addition, a variety of disparate databases have been matched and massaged in the past in legacy systems. Each database typically has a specific purpose, with the result that entries for individuals might exist spread across multiple databases. To address this problem, many universities elected to spend tens of millions of dollars in late 1999 to upgrade their campus administrative systems as they performed upgrades required to address Y2K problems. Because this was so expensive and difficult, it became generally recognized that a viable and much more economical way to have proceeded in the short term was for universities to build front-ends onto existing databases and consolidate existing databases as opportunity permits. However, the demand for increased functionality and web accessibility mandates that legacy systems be upgraded in a planned, deliberate fashion.

The function of connecting people to information is accomplished by "Middleware," so termed because it exists in the middle - between the individual and the information. As an example, consider the following web pages customized to the individual, currently referred to as "portals:"

For prospective students, web pages that might include:

- A form where the prospect can enter their e-mail address to receive information about CSU

- A campus "tour" of CSU, including still pictures as well as streaming video

- Links to various real-time web cameras at CSU

- A pointer to Financial Aid, with policies, procedures and instructions for applying for aid

- A pointer to programs of study in selectable majors, e.g. the prospect can select "Psychology," and be presented with information about the various degree programs in that major

- A schedule of events for prospects

For Freshmen, web pages that might include:

- A web page providing information on how to obtain electronic services, including e-mail accounts, space for home web pages, access the campus network from the dorms.

- A schedule of events for Freshmen orientation.

- A personalized course schedule including links to the home pages of instructors of courses in which the student is enrolled.

- A campus map highlighting buildings in which the student has classes.

- A schedule of events being hosted by the dorm in which they are housed.

- Web pages that change in time, that evolve over the first semester to issues of coaching and mentoring, including principles of time management, good study habits, etc.

For general undergraduate students, web pages that might include:

- E-mail links to their contacts (parents, friends, etc.)

- Links to course web pages.

- Links to areas of the library particular to their needs.

- Links to their calendar, and to others' calendars.

- Links to campus web cameras, illustrating the weather, available parking spaces, construction areas to be avoided, etc.

- Links to student government, including voting and polling.

- Assistance with preparing and maintaining a resume.

- Links to check grades, compute GPA's, provide the status of satisfaction of degree requirements, etc.

- Links to advising information.

- Links to registration, when their registration period arises.

- Links to their learning portfolios.

For graduating seniors, web pages that might include:

- Progress toward graduation, including graduation "checkpoints," etc.

- Links to order a cap and gown, provide information for diplomas, a schedule of graduation activities for their college, etc.

- A schedule of on-campus career interviews and corporate contacts in the student's area.

For faculty, web pages that include:

- Links to course web pages, including up-to-date student rolls.

- Links to areas of the library particular to their needs.

- Links to journals and publications to which they subscribe.

- Links to professional conferences being broadcast.

- Links to departmental and University events, including seminars, meetings, etc.

- Links to professional societies of which they are a member.

- In November, links to the Professional Development Institute (PDI) schedule, as well as subscription forms.

- Links to report network trouble or poor performance.

- Links to new research solicitations, as they emerge.

- Links to financial information on their research projects, with the ability to project forth to the end of the project.

- Links to their calendar, and to others' calendars.

- Links to advisees, and advising information.

There are also numerous possibilities of a similar nature to personalize information for graduate students and staff. A current focus is to allow individuals to customize their web pages to their individual needs and desires, by excluding some items on the standard template, and including others that are not.

Universities that have implemented portals include:

- Washington State: http://my.wsu.edu/

- SUNY Buffalo: www.buffalo.edu/aboutmyub/index.html,

- Minnesota: http://onestop.umn.edu/

- UCLA: http://my.ucla.edu/

- UC Davis: http://my.ucdavis.edu/

A number of other higher education institutions are in the early stages of portal development, including Princeton, Boston College, University of Maryland Baltimore County, Cal State Monterey Bay.

However, Middleware encompasses much more than portals. Middleware also provides security, authentication and authorization, defined as follows:

- Security – encryption of information between an individual's local computer and the remote computer that is being accessed.

- Authentication – ensuring the identity of the individual, accomplished via secure login and password.

- Authorization – After the individual is authenticated, authorizing electronic services the individual can receive, including providing a custom "portal" to information for that individual, as described above.

Portals are the visible results of Middleware, while security, authentication and authorization are the hidden, yet essential "glue" required to bind information to individuals. Much of the effort will rely on existing databases, which are the fundamental underpinnings of middleware. New databases will also be required to extend current capabilities. A massive and long-term effort will be required to accomplish this portion, and ACNS, IS and University Relations have been positioning themselves to embark upon this for the last year or so.

Relation to Existing Activities

The Middleware project would address increased expectations of students, based on experiences using commercial and competing university sites, for customized Web portals. This project would include a planning group to formulate a design of an "institutional information portal"[2] with customized views unique to the user - initially students, but later faculty and staff. *RAMWeb* and *visit.colostate.edu* are two existing University Web services that can loosely be considered portals.[3] However, they are implemented as separate databases and systems today. Generally, portals are broader in scope and function, and integrated. It is critically important to embark upon a planning activity on portals before many distinct and non-compatible "portal" solutions emerge.[4] It's not beyond the scope of possibility to envision that the library, colleges, or other units will be creating their own portals if a University-wide initiative does not Emerge (North Carolina State University for example has a portal MyLibrary, which looks innovative, but appears disconnected from any institutional portal initiative.)

A significant effort will be required to interact with existing and emerging campus databases. The process of "inverting" the University's web pages and databases to produce a portal relies fundamentally on the information existing in the database. This will require significant additional effort from Information Systems, as their databases will be accessed via the portal and development will require their active participation.

However, this effort in no way should be construed as a substitute for continuing to upgrade central services, particularly those provided by Information Systems, as this efforts relies fundamentally on access to those data bases. Recall that "middleware" sits in the middle – between the user and such databases.. Contrariwise, all upgrades to campus hardware and software should be accomplished with a view to integrating into the middleware environment, particularly the authorization and authentication functions.

Benefits to CSU

A Middleware project will result in vastly increased functionality for the University's "e" activities: e-learning, e-business and e-commerce. Students will demand the consistent interfaces and the customized services that come from deployment of Middleware, as they now demand access to advanced technology. Unquestionably, the University will need to implement Middleware to remain competitive with other universities. A Middleware activity will improve both efficiency and effectiveness comprehensively at the University.

Strategies for Progress

Strategies for progress include:

1.   Defining a Middleware project at the University level - All units involved in providing information and instructional technology services at the University, including IS, ACNS, UR, OIS and the Libraries, need to be involved in the implementation of the Middleware project. Additionally Admissions, Enrollment Services and Human Resources will be key players. We recommend that the current activity, loosely termed eServices which was formed to address campus-wide e-mail,[5] be elevated to the level of a Middleware project, with participation from all of these units. Based on issues the eServices groups have encountered, it is clear that there are broader planning issues at stake and that solutions for an electronic identity and email must fit into a larger "E" planning agenda. Participation of all of these units has definite advantages: 1) this will ensure that all units principally involved in providing Information and Instructional Technology support on campus are coordinating their activities, 2) this will allow resources, particularly staff resources, to be pooled and directed towards this project. 3) providing a comprehensive and uniform electronic identity for all at the University, 4) ensuring that multiple, redundant, disparate solutions are not implemented by different entities at the University, 5) ensuring that the solution is scalable and robust, 6) furthering increasing business operations (e.g. printing, publications, etc.) comprehensively at the University, .

2.   Establishing a project team and team leader. The first task for the project team would be project definition to encompass web portals, security, authentication, authorization, and progression toward an integrated, University Middleware implementation.

3.   The next step would be in defining project tasks, a project timeline, and a budget including ongoing staffing requirements. Particularly critical are the staffing needs in IS and ACNS to support such a project.

Middleware has emerged as a critical layer of the University IT infrastructure. The need for middleware stems from the increasing growth in the number of network applications, in the customization of those applications, and in the variety of locations from which we access those applications. The IT enterprise now requires coalescence of a set of basic data and services that heretofore encompassed multiple instances within the individual applications.

Addendum

The following excerpt from *The "E" is for Everything; E-Commerce, E-Business, and E-Learning in the Future of Higher Education* by Katz & Oblinger is provided as background for the Middleware Project. The next "big thing" in IT for higher education is <u>enterprise</u> IT and the Middleware Project is a first necessary step it getting there.

"Five key lessons learned that higher education institutions should incorporate into their strategic planning process:

1.   Link e-business objectives to critical business issues. Your rationale for e-business should be aligned with your institutional mission, strategies, and priorities. Simply put, "e-business" will become all business. If your institution's strategic objectives are to raise academic quality, reduce costs, increase student quality, or improve student service, e-business initiatives should be undertaken in support of those institution-wide strategic objectives.

2.   Focus on e-business as a business-driven project. E-business is more than a technology initiative; its impact will be pervasive and should be viewed as a mission-critical undertaking. Accordingly, the project sponsorship for an e-business project should emanate from the president, provost, or executive vice president's office to ensure that sufficient importance and institution-wide perspective are embedded in this endeavor.

3.   Acknowledge that culture and change are more complicated than the technology. Once you have determined your e-business objectives (aligned as appropriate with your institution's strategic objectives) and designed the undertaking as a business-driven project, developing an effective change management plan is the next critical activity. Instituting the technology--the infrastructure, applications, or interfaces--is relatively straightforward although resource intensive. Processes, policies, and organization will likely undergo a transformation. To do so effectively requires a formal change management plan replete with frequent communication of key messages to a variety of constituents.

4.   Do not treat e-business as just a way to communicate with customers; it will change the way you operate. If you view e-business as simply an interface, you will miss transformation opportunities. E-business is more than just enabling online transactions. It will lead to the substitution of network-based technologies and processes for physical locations, manual processes, or other expediting functions that necessitate human attention or increased costs but do not add actual value. These technologies transform an institution by altering customer service models, enabling personalization of services, providing services at any time, and establishing new relationships with suppliers and other key constituents.

5.   Ensure that business units take ownership, but make sure that central leadership, coordination, and development are also priorities. In colleges and universities, it is likely that the admissions office has initiated discussion with online admissions application vendors, the registrar has spoken with Campus Pipeline or similar vendor, the Director's of purchasing in accounts payable are intrigued by Commerce One's solution, and the advancement office is considering Harris On-line. Although initiative at the business unit level is necessary, unmanaged activities will ultimately distract institutional focus and resources. These individual process-specific decisions must be made only after carefully considering institution-wide objectives and priorities."

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[1] Institutional Information Portals, *Educause Review*, July/August 2000.

[2]Institutional Information Portals, *Educause Review*, July/August 2000.

[3] Portals in Higher Education: What are They, and What is Their Function?, *Educause Review*, July/August 2000.

[4] From Static Web Site to Portal, *Educause Quarterly*, Number 2, 2000.

[5] EServices Policy Committee: ACNS-Pat Burns, Linda McNamara; Admissions-Mary Ontiveros; Enrollment Services-Bill Haid, Steve Dahl; HR-Bill Liley; IS-Don Hesser, Vicki Johnson; University Relations-Tom Milligan; **eServices Technical Committee**: IS, ACNS, Admissions, Enrollment Services, University Relations.