Maximizing Collaboration and Content Centralization

By

James Grizzle and Brett Rexroat

Submitted to
the Faculty of the Information Technology Program
in Partial Fulfillment of the Requirements for
the Degree of Bachelor of Science
in Information Technology

University of Cincinnati
College of Applied Science

June 2009
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Professor Russ McMahon  Date

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Hazem Said, Ph.D. Department Head  Date
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I would like to thank Brett Rexroat for his tireless efforts concerning this project. Additionally, I strongly appreciate his effort to keep me sane and grounded to reality. I am sincerely grateful to my adoring girlfriend, Leslie Hiller. The countless late night trips to Meijer, providing me with meals when I refused to stop working and her strength and consideration concerning that we live together yet rarely spent time together. Additionally, without her knowledge in design and her creative ability, our project would not have won Best of Tech Expo: Best of Design and Presentation. I would like to acknowledge Professor Russ McMahon for his advice, the resources he provided and for introducing Brett and I to the SharePoint User’s Group. I would like acknowledge Professor John Nyland for introducing me to SharePoint and inviting me to speak to his Web Administration class during the SharePoint segment of that course. I would also like to express gratitude to Sean McDonough for writing SharePoint 2007: Disaster Recovery and giving his advice concerning the M3C implementation. I would like to thank my family for keeping me on task and for providing confidence. I specifically acknowledge my parents for their unyielding support and my grandparents for providing me a server to develop this project.

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Abstract

Maximizing Collaboration and Content Centralization (M3C) aims to transform the University Of Cincinnati Department Of Information Technology’s Web site from a static informational resource into a powerful tool for students, faculty, and the community. M3C uses the advanced functionality of Microsoft Office SharePoint Server 2007 to provide a central location for file storage, project collaboration, and information publishing. Administrative privileges are delegated to appropriate groups to minimize security risks and allow for quick publishing. M3C integrates directly into the existing network infrastructure to assist in compatibility and enhance security.
**Introduction**

The University of Cincinnati College of Applied Science’s Department of Information Technology is committed to providing the knowledge and experience needed to prepare students for the constant change and growth prevalent in the IT industry. Maximizing Collaboration and Content Centralization aims to implement several new and growing trends to provide the Department of Information Technology a Web site that allows students, faculty and community members to access, publish, revise and share information quickly, safely and accurately.

**Solution Description**

Maximizing Collaboration and Content Centralization (M3C) is in consideration to replace the current Department of Information Technology Web site. Users interact with the solution through a Web browser such as Internet Explorer 7 or Mozilla Firefox 3.x. Members of the currently implemented College of Applied Science domain, DITPRIME, can use their account to access additional custom functionality.

Rights and responsibilities are delegated to professors, students, visitors and administrators based on their needs. All users are able to create their own Web sites showcasing their achievements in IT, as well as collaborate with other students on projects and learning opportunities. Every page, list, library and document can have a dedicated workspace. The workspaces allow users to track changes, assign and view tasks, view calendars and share documents. Student groups such as the Information Technology Student Association (ITSA), Women in Information Technology (WIT) and Information Technology Learning Community (ITLC) as well as students creating Senior
Design projects are able to instantly update their Web site to provide up-to-the-minute information to group members as well as the entire IT community. M3C facilitates the versioning and publishing of documents, lists and sites. Versioning promotes editing information in steps, allowing changes to be tracked, backed up and restored. Each set of changes is assigned a version number. Small changes made to a document are saved as minor revisions and are numbered incrementally to the right of the version number decimal point (0.1, 0.2, 0.3). These revisions are only visible to owners of the document or users that the owner has given permission to contribute to the document. To signify a major change or milestone, a change may be published as a major revision. Major revisions increment the version number to the left of the decimal, while resetting the number to the right of the decimal to zero (minor version 1.34 updates to major version 2.0). Major revisions are also allowed to be shared with the public.

The current Web site is built around a traditional single administrator model. Only the administrator can create, modify and update the Web sites at a user’s request. This single point of control is shown in Figure 1.
Figure 1 represents how a single administrator role creates a bottleneck that limits the speed and update frequency of the site. The lag between steps makes it very difficult for dynamic content to be created and acts as a barrier preventing the Web from being used as anything but a reference to past data.

The M3C solution represented by Figure 2 shows individuals assigned the administrator role granting privileges to users based on their individual needs. Users are able to modify relevant Web sites based on options delegated by the administrators, allowing flexibility without sacrificing security.
An automated tutorial guides users through the process of creating their personal Web site. This site, called a My Site, is based on a master template which provides a professional, consistent look and feel that is compliant with University of Cincinnati branding standards (6).

Users are able to extend the functionality of their My Site by dragging and dropping Web Parts onto their page. According to Microsoft, “A Web Part is a self contained addition to a Web page used to add functionality without the need for users to know or learn web programming”(3).
If the hundreds of existing Web Parts do not fulfill a particular need, a customized solution can be developed using the Microsoft .NET programming environment. The functions served by Web Parts are only limited by the knowledge of the developer. Users are able to create, update and modify Web sites to share information at any time. Allowing users to control their Web experience allows the user sites to host functions greater than simple information presentation.

The current site is focused on presenting information only and does not attempt to provide a way to use the power and convenience of the internet to facilitate collaboration between students, faculty and the community. Figure 3 represents how files are stored without a central repository or versioning control.
Files are currently presented as static downloadable links. Students have no way of centrally managing their files and the current DIT system does not support document versioning to track changes made to files. Finding the most recent version can be difficult and consolidating files is a challenge.

With the M3C solution, users are able to use their sites to collaborate on projects, organize campus groups and store information in a single location accessible from anywhere with web access.
Another benefit of M3C is automatic versioning control, shown in Figure 4. Versioning control allows groups of users to work on the same document, saving and reviewing changes. Files can be rolled back to previous versions to preserve previous work.

![Figure 4: Central file storage in M3C solution](image)

Files can be shared between multiple people, published to a Website, emailed to anyone, downloaded, or edited directly in the browser. Figure 4 shows the standard Shared Documents interface. Many options are presented to the user in a quick and efficient format, allowing files to be found, edited and shared effectively. Figure 5 shows the advanced versioning options available to users.
Versioning allows users to track changes by commenting on revisions, record the person that made those changes, when the changes were made and provides the ability to revert to previous versions of the document. At every revision, users have the option to add comments about the changes made to a file. When a file is revised, the user must choose between a major and a minor revision.

All versions of this document are listed below with the new value of any changed properties.

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<thead>
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<th>Modified</th>
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<tr>
<td>Description</td>
<td>The First Project for T501</td>
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</table>

Figure 5: Version history of file in M3C solution
User Profiles

Visitors, students, faculty and administrators are the four major groups of users. Each type of user has specific goals and needs within the system. Presenting the information and options most relevant to each user group is critical to the adoption and success of the M3C solution. Figure 6 shows how M3C facilitates the needs of specific users in common tasks.

The eleven main tasks performed by users of the system are represented in figure six.
Visitors

Visitors are the default level of user and have the lowest level of access privileges.

Prospective students, potential employers, parents, alumni, members of the Information Technology industry and other viewers not enrolled as Information Technology students represent the visitor user type.

Potential students are frequent visitors to the Department of Information Technology Web site. According to the Director of Recruitment and Retention, Brad Tate, “They may be visiting the site to determine if the Information Technology program is a good program. They might be researching average class size, co-op placement, after graduation job placement, program requirements, or what resources would be available to them as students.” (18) With the M3C solution, they are enabled to find answers to their questions, view student testimonials, view student and professor My Sites, view current and past Senior Design projects, view past and current co-op opportunities and have the chance to experience the culture of the Department of Information Technology before ever stepping foot on campus.

Another type of visitor is the employer. This visitor may be a current employer or a potential employer. He or she may be interested in the school curriculum, past and current Senior Design projects, the My Sites of current students and professors, or the number of students in the program. This information has a “high visibility to increase the reputation of DIT students with employers and to entice new employers to take co-op students from the DIT program”, says IT Co-op Adviser, Maureen Shoemaker. (19)
Students

Current DIT students have many needs that are not addressed with the current Web site. Departmental news is slow to get published to the Web site. Student groups, Senior Design students and students taking classes that span more than one quarter, such as Computer Programming I, II and III do not have a reliable workspace due to the inadequacies of BlackBoard. Also, job postings are committed through email therefore there is not a reliable way to track companies, job offers and offers accepted. The M3C solution addresses these concerns by enabling and encouraging faculty to add news articles and update the Web site. Students are able to submit news articles for faculty review. My Sites and Individual student and team workspaces are encouraged to promote collaboration. A forum exists to allow students to view, ask and answer questions. There is a page dedicated to resources such as free online books, tutorials and blogs. A site has been dedicated to job postings to help track past and current jobs. Additionally, a page has been devoted to improving the freshman experience. Helpful information such as computer lab hours, available software on lab computers, software available for download, tutor hours, Information Technology Learning Community information and more has been centralized to help elevate stress from students new to the college experience. Finally, video and text-based tutorials are available to quickly help students accomplish tasks for the first time and to ensure a high rate of adoption.

Faculty

The M3C solution benefits faculty as well. They are able to view how many students are in the program and which students have a particular primary or secondary track specialization. Also, they are able to visit the forum to view, ask and answer questions.
Faculty also has the ability to create groups, add users to those groups and assign tasks to students and members of a group. Each faculty member has a dedicated My Site page to list faculty achievements, contact information, calendars and other information. The faculty also has dedicated video and text tutorials.

**Administrators**

Concerns of administrators are addressed by a central administration page that can affect individual pages, a site collection, or the entire SharePoint server farm all at once. Administrators are able to add, delete, or modify sites, add users, delete users, set permissions, moderate pages, restore a site to the default template, view development documentation, view tutorials, monitor logs, backup data and restore data.

**Design Protocols**

The M3C solution incorporates design elements that enable a hardware independent, scalable solution that integrates into current University of Cincinnati systems.
**Solution Network Topology**

The solution topology uses one physical server which hosts three virtual servers: the Web Front End Server, the Indexing Server and the Data Server. The virtual servers are linked to the DITPRIME Active Directory domain to authenticate SharePoint users. Additionally, DITPRIME links to the University of Cincinnati Exchange Server Farm for email services. The network topology of the solution is illustrated in Figure 7.

![Figure 7: Topology of virtual servers](image-url)
**Hardware**

The following hardware requirements were determined with the HP Sizing and Configuration Tool for Microsoft Office SharePoint Server 2007 (5). The configuration tool calculated hardware requirements based on average class size, projected use habits and the total number of Information Technology students. The hardware specifications are represented by figure 8.

<table>
<thead>
<tr>
<th>Hardware Requirements</th>
<th>Technical Reasoning</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 Quad Core 3.00 Ghz Xeon Processors</td>
<td>The hardware configuration for the M3C solution is based on a maximum of 100 simultaneous users. This allows four complete classes of students to access SharePoint resources without a substantial loss of performance. To effectively handle this load, two Xeon processors are necessary.</td>
</tr>
<tr>
<td>32 GB RAM</td>
<td>SharePoint Server requires a substantial amount of memory. Data indexing is also very memory intensive. Considering that all the data housed in the SharePoint environment is indexed, the server needs an adequate amount of memory to quickly execute queries for many concurrent users.</td>
</tr>
<tr>
<td>4TB Storage in RAID 5 array (2.7TB available)</td>
<td>The data is housed in a RAID 5 array. In RAID 5, the capacity of one physical drive is sacrificed for data redundancy. After formatting, 2.7 terabytes of storage are available to the system. This storage is allocated as follows:</td>
</tr>
<tr>
<td>150GB reserved for the system 300GB reserved for departmental needs 200GB reserved for faculty (approx. 5GB for full-time, 3GB for part-time) 300GB reserved for IT students (declared IT Major, approx. 1GB each) 200GB reserved for Senior Design Teams 200GB reserved for various teams 675GB reserved for indexing purposes 675GB for expandability</td>
<td></td>
</tr>
</tbody>
</table>
The hardware requirements specified in figure 8 are able to adequately provide for the department’s needs. The hardware requirements take growth and peak usage into consideration.

**Software**

M3C provides robust and flexible functionality by utilizing Microsoft SharePoint 2007 Server Standard Edition. SharePoint acts as the underlying framework of the M3C solution, unifying the web, file storage and organization components. Leveraging the abilities of SharePoint creates a solution that is easier for current and future generations to update and manage, while decreasing the time to market. SharePoint is an enterprise level application that will be supported by Microsoft for many years, “ensuring continuous security and compatibility updates” (7). Microsoft Windows Server 2008, Visual Studio 2008 and Microsoft SQL Server 2008 support the SharePoint implementation.

**Windows Server 2008 Standard**

The SharePoint Web site is hosted on a Windows Server 2008 system utilizing IIS 7.0. The data is stored on a separate Windows Server 2008 system utilizing Microsoft SQL Server 2008. A third Windows Server 2008 system is used as an index server to facilitate the quick transfer of information from the database to Web site and vice-versa. All three of these systems run virtually and have the ability to be deployed on any hardware platform running Server 2008. Server 2008 is the foundation of the three servers hosting the SharePoint solution. Server 2008 is Microsoft's new server class operating system which emphasizes performance, reliability, security and integration with cutting edge
Microsoft products. Windows Server 2008 includes Hyper-V which allows for native virtualization, load balancing and roll-over protection. “Hyper-V helps organizations to achieve optimal use of their hardware resources and provides the agility needed to adapt to changing IT needs.” (8) Virtualization allows applications to more efficiently use the resources available while mitigating the risk of service outages in the event of a single or double server failure. Built in backup utilities enables regular and secure data loss prevention.

**Microsoft Office SharePoint Server 2007 Standard:**
SharePoint is the cornerstone of this collaboration and content centralization effort. Office SharePoint provides a common framework and central management application for connecting people to their information in a managed and logical way. Microsoft Office SharePoint 2007 Standard Edition was chosen over Enterprise Edition because the benefits of the Enterprise Edition cannot be utilized by the Department of Information Technology in a way significant enough to justify the added expense.

**Visual Studio 2008 Professional:**
Visual Studio is a powerful and versatile development environment that couples with SQL Server and SharePoint easily. The programming potential is nearly limitless for the .NET Framework, creating the opportunity to expand the standard features of SharePoint into a customized solution for the University.
**MS SQL Server 2008 Standard:**
SQL Server enables SharePoint to store and retrieve data with complex relations quickly and efficiently. Leveraging the power of relational databases with the simplicity of SharePoint allows quick and reliable storage for the users' data.

**Site Hierarchy**

Figure 9 is a representation of how the user, student group and department sites are organized.

The College of Applied Science Department of Information Technology is not a self-contained unit. Since strong technical communication skills are critical to a student’s success in the IT industry, the Humanities and Media Department is closely integrated...
into the M3C solution. Improved communication and collaboration between IT and the Humanities and Media Department enables students to continually improve their communication skills up to and including their senior design project.

Solution Features

Figure 10 represents a portion of the many features available to implement on MOSS 2007.

<table>
<thead>
<tr>
<th>Feature Set</th>
<th>Currently Utilized</th>
<th>Planned for Future Implementation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Collaboration</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shared calendar</td>
<td>•</td>
<td></td>
</tr>
<tr>
<td>Contacts</td>
<td>•</td>
<td></td>
</tr>
<tr>
<td>Tasks</td>
<td>•</td>
<td></td>
</tr>
<tr>
<td>Announcements</td>
<td>•</td>
<td></td>
</tr>
<tr>
<td>Surveys</td>
<td>•</td>
<td></td>
</tr>
<tr>
<td>Discussions</td>
<td>•</td>
<td></td>
</tr>
<tr>
<td><strong>Document Management</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Document libraries</td>
<td>•</td>
<td></td>
</tr>
<tr>
<td>Check-in/checkout</td>
<td>•</td>
<td></td>
</tr>
<tr>
<td>Versioning</td>
<td>•</td>
<td></td>
</tr>
<tr>
<td>Recycle Bin</td>
<td>•</td>
<td></td>
</tr>
<tr>
<td><strong>Security</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Membership</td>
<td>•</td>
<td></td>
</tr>
<tr>
<td>Fine-grained permissions</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Distribution list management</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group policy management</td>
<td>•</td>
<td></td>
</tr>
<tr>
<td>Per-item security</td>
<td>•</td>
<td></td>
</tr>
<tr>
<td>Pluggable authentication</td>
<td>•</td>
<td></td>
</tr>
<tr>
<td><strong>Managing Information</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alerts</td>
<td>•</td>
<td></td>
</tr>
<tr>
<td>Search</td>
<td>•</td>
<td></td>
</tr>
<tr>
<td>Blogging</td>
<td>•</td>
<td></td>
</tr>
<tr>
<td>RSS Feeds</td>
<td>•</td>
<td></td>
</tr>
</tbody>
</table>
The chart above illustrates the functions that are be implemented in this solution, as well as several others that could be implemented after the solution is implemented.
**Design Elements**

The M3C solution leverages a single design scheme that encompasses the entire Web site. Providing users with a consistent look and feel within the solution makes training easier and user adoption quicker. The design uniformity is made possible by utilizing Master Pages, SharePoint Themes and cascading style sheets. The navigation, search functionality, help functionality, headings, text, tables, menus, tasks, calendars and lists have a unified theme and color scheme that strictly follows the guidelines of the University of Cincinnati Branding Initiative (21). The color scheme is be white, black, red, light gray and dark gray.

Each user has the ability to personalize their My Site by modifying which and where the individual Web Parts are located. Once a user has created a site, he or she immediately sees a restricted view of what he or she could potentially use on the site. The restriction is only temporary, so new users are not overwhelmed by the multitude of options available in SharePoint. The first time a user logs in, he or she is greeted by a section of the page devoted to training videos and a task list consisting of things to accomplish within the site, such as updating his or her profile, adding a calendar and joining a group. The final task in the task list instructs the user to add Web parts to increase the functionality of his or her My Site.

**Testing Plan**

The M3C solution was subjected to a rigorous testing plan. The M3C developers created test scenarios for the different users and groups to assess the functionality and workflows of the Web site. Each user group was tested individually for proper distribution of access
permissions and quality assurance. Each Web Part was evaluated to determine functionality and to ensure the Web Part aligns with the goals of the Department of Information Technology. To guarantee maximum compatibility, the Web site was tested on multiple Web browsers including, Microsoft Internet Explorer (IE) 6.0, 7.0, 8.0, Mozilla Firefox 2.x, 3.x and Google Chrome. This stringent testing scenario would have been impossible without a test case of users with varying experience in Information Technology. Fortunately, the Information Technology Student Association (ITSA) graciously volunteered to be the test case for the M3C solution.

ITSA has many members and functions within the organization. Therefore, ITSA was a perfect candidate to test the calendar, discussion board, group permissions, document library and workspace functionality of the SharePoint solution. The M3C developers created a test Web site and workspace for ITSA and the group is exceptionally satisfied with the solution.

The testing process eliminated discrepancies of user access, compatibility between browsers, improved the accuracy of business processes within the department and affirmed user satisfaction. The testing process was successfully completed and was integrated into every step of the development process. ITSA will continue using the solution after deployment.
<table>
<thead>
<tr>
<th>Risk Factor</th>
<th>Level of Risk</th>
<th>Risk Mitigation Tactics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Denial of Proposal due to budget constraints</td>
<td>Medium</td>
<td>The virtualized nature of the solution allows nearly any hardware configuration to be used</td>
</tr>
<tr>
<td>Low rate of adoption due to high learning curve</td>
<td>Low</td>
<td>Training videos, tutorials, help wikis and adding built-in user tasks are part of the SharePoint system to help students, faculty and administrators get started with SharePoint right away.</td>
</tr>
<tr>
<td>Low rate of adoption due to apathy or refusal of new system</td>
<td>Very Low</td>
<td>The rich feature set of SharePoint has many benefits to students and faculty alike. SharePoint has gained significant support throughout the faculty community in the Department of Information Technology. Effectively communicating the many benefits of SharePoint to the students and professors ensures that everyone has the opportunity to get the most out of this project.</td>
</tr>
<tr>
<td>Failure of Active Directory (AD) Servers</td>
<td>Very Low</td>
<td>It is possible to use the UC Central Login Service to authenticate instead of the Active Directory Server on campus. Due to the high level of network complexity and minimal risk, the cost of this risk strongly outweighs the possibility of failure.</td>
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</tr>
</tbody>
</table>
Survivability

The M3C site contains data that could be expensive or impossible to replace. The solution cannot be subject to the risk of going offline for any period of time. To help mitigate the risk of data loss, the data is physically stored on a RAID5 array. Data is spanned across several disk drives. If one disk fails, the information from that drive can be rebuilt from the other drives. To prevent the data from being coupled to the hardware, all servers providing SharePoint services are virtualized. Full backups of the SharePoint site occur weekly at 3:00am Sunday morning and incremental backups are scheduled nightly at 3:00am Monday through Saturday. Full backups are stored on an offsite location to secure data in the event a disaster should occur at the location housing the physical server. Full documentation is available to maintain the SharePoint site for the administrator who assimilates this project once it goes live. Documentation concerning setup of the physical and virtual servers along with documentation on how to restore backups is accessible in case a catastrophic event happens that destroys the physical server.

Security

The SharePoint Web site houses information that is sensitive in nature. To protect this data, extra precautions have been put into place to ensure data is accessible only to those who need access to that data. The user credential authentication mode is built into the DITPRIME domain. DITPRIME uses Kerberos for advanced security. The data is protected via 128bit AES encryption during data transmission from server-to-client and vice-versa. Administrative privileges are appropriately delegated by the site administrators.
Proof of Concept

In this section, an annotated example of the M3C solution is provided to assist in the understanding of M3C’s functionality. The screen captures are enhanced with red numbers encapsulated in a red circle attached to a mouse pointer. These points of attention are accompanied with supplemental information to describe the benefit it provides to the user.

Information Technology Student Association Homepage

Figure 11 shows the Information Technology Student Association homepage. This page is similar to all departmental and student group Web sites in the M3C solution. This page features a top navigational bar, a search bar, a side navigational bar – known as the Quick Launch bar, a picture gallery, the ITSA Mission Statement, the “I need to…” menu, ITSA Newsletter information and Recent News links.
Figure 11: Information Technology Student Association Web site

Visitors can view this page and the majority of information contained within the site. To interact with this site, a visitor must log in using the Sign In bar (1) represented in figure 11.

Figure 12 shows the ITSA homepage with an administrator, Brett Rexroat, logged in. Once he is recognized as an authorized user, the functionality adapts according to his set permissions. As mentioned earlier, site collection administrators can change the visibility of any page, list, library, or even individual Web Parts on a page according to a member’s set permissions. Notice the top bar now shows additional navigational options. The Members and Reports pages are now available for viewing. By default, all users logged into SharePoint can see the Members page regardless of their membership status of that group. The Reports page is only available to the executive committee members and administrators of ITSA.
Mission Statement

ITSA is dedicated to building a network of students interested in information technology, keeping up with technology trends, increasing awareness, encouraging involvement, strengthening leadership, and having fun.

ITSA Newsletter

The ITSA newsletter (also known as the Listserve) is essential to staying updated with the latest news in the IT major at the University of Cincinnati. There is many thing you will find in our newsletter other than meeting details; professors will post reputable job posting, student projects, needed help, school events, and scholarship information.

The ITSA newsletter is indispensable for IT-related majors. You can edit your subscription settings at the following link:

https://listserv.uc.edu/cgi-bin/wa.exe?A0=IND-ITSA

Figure 12: Logged on to ITSA Web site

Figure 12 also shows that the Sign In bar has been replaced by a User Status bar. Brett can view his My Site, saved links and user settings. He can also manage links, sign in as a different user, request access to the site, or sign out. Brett can manage the site in many ways by clicking Site Actions (2) on the User Status bar. Brett can edit the page, create a new page, create a new site, view site content, view reports, or modify site settings.

Publishing News Articles

Members of the site can publish news articles that have been approved by a faculty member. In figure 12, the News link on the Top Navigation bar (3) shows a drop-down list of the five latest news articles. Those same five news articles are also shown on the Quick Launch bar (3). When Brett creates a news article, these lists are refreshed to include the recently added news article.
In figure 13, notice an article description appears below the pointer when Brett hovers over the Retro Gaming Event article in the News drop down list (4). Brett can also navigate to the article via the News section of the Quick Launch Bar (4). Figure 13 shows the News page. The News page features the most recent news article, lists the three most current articles and also contains an RSS feed reader Web Part containing the most current news articles provided by Slashdot. The feed reader can be changed to show information from any RSS feed provider.
If Brett clicks the RSS feed icon (5), shown in figure 14, he is taken to the news feed page which lists all the ITSA news articles in chronological order, newest first. Any visitor can subscribe to this RSS feed to get updates from ITSA as they happen.

Figure 15 shows the Retro Gaming Event news article is a self contained Web page in the news section of the ITSA site (6). Creating a new page for each event allows the event to be directly linked to and easily advertised. Pages are easily navigated using the Bread Crumb Trail (7).
In figure 16, Brett creates a new news page by clicking Site Actions and then clicking Create Page (8).

Once Brett has clicked on the Create Page button, he is taken to the Create Page dialog depicted in figure 17 which allows the title, content and presentation of the site to be
On this page, Brett enters the Title (9), Description (10) and URL (11) of the article. Brett can also select the Page Layout of the article (12). Finally, Brett clicks the Create Button (13) to generate the page.
View and Create Events

Each department and student group publishes a calendar to inform visitors about upcoming events. Calendars are actually lists of information that also act as RSS feeds. Top level sites, such as the student government Web site that oversees several other sites including ITSA, can aggregate data from other calendars to form a single calendar compilation.

Brett accesses the Events Calendar by clicking the Events Button on the Top Navigation bar (14) available from any page within the ITSA Web site, illustrated in figure 18.

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Figure 18: Selecting Event from Top Bar
Brett has now navigated to the Events Calendar as shown by figure 19, where he can view all events in the ITSA site. He can view events by the day, week, or month. He can also view the Calendar as a list of items or as an RSS feed. He can click on an event for more details or to edit that event.

If Brett clicks the New Item Button (15), he is taken to the Events: New Item page to add a new event to the calendar.

The Events: New Item page, illustrated in figure 20, allows Brett to add a Title (16), Location (17) and Description (18) to the Event.
Figure 20: Creating a new Event

The event can be designated as an All Day Event, set the Recurrence of the Event and set up a Meeting Workspace for the Event. Clicking the OK button completes the New Event process (19).

View, Reply to and Create New Discussion Threads

The Discussion Board is a resource for members of a group to converse concerning current events and activities within a student group.

In figure 21, Brett clicks the Discussion Board page, which is available from anywhere within the ITSA Web site.
Brett has now navigated to the Discussion Board page as depicted by figure 22, where he can view any current thread by clicking on it. Brett clicks on the Next Event Thread (21) and navigates to the Next Event Thread page.
Figure 22: Viewing events

Figure 23 shows the Next Event Thread page. Brett can see the event description and can reply to the event (22).

Figure 23: Replying to message

Figure 24 shows the Discussion Board: New Item page, which appears when a member replies to a thread or creates a new thread. Brett can type in his reply and format it with the tools provided (23).
Brett then clicks the Ok Button to finish the reply and return to the Discussion Board page. Brett can now add a new thread by clicking on the New Button (25) as revealed in figure 25.
Brett is now ready to create a new thread. Figure 26 shows that he has navigated to the Discussion Board: New Item page where he can enter the Thread Subject (26) and Thread Body (27). He then formats the thread with the tools provided into the Edit Thread Body Web Part (27).

Once he has finished entering the thread details, he can click the Ok button (28) to complete the thread and return to the Discussion Board page.

**Members**

M3C provides users with a centralized location for managing members and groups. Members can be added, removed, or have their privileges adjusted within a group. The Members section is accessible using the Top bar or Quick Launch bar (29) displayed by figure 27.
After navigating to the Members section within a group, Brett is provided with a list of current members shown in figure 28. Clicking on the names of members shows contact information. Users with sufficient privileges are allowed to modify the members section by clicking on Site Actions (30).
Figure 28: List of members

Figure 29 illustrates the many features of Site Actions. To modify the Members list, Brett clicks on Site Settings (31), then People and Groups (32).

Figure 29: People and Group

The page’s theme changes to inform Brett that he is invoking administrator privileges for this site. Several new options are now made available. To add a new user to a group, click on New and then Add Users (33), as shown in figure 30.
The group’s add user page is now be visible, as shown in figure 31. Several users can be added simultaneously, allowing large amounts of people to be quickly added to a group with minimal time and effort (34). Entered text can be validated to ensure that names are spelled correctly and those people are members of the domain. After users are selected, permissions are assigned. Permissions can be selected as a group, preconfigured by the Administrator, or delegated individually (35). Finally, an email message can be sent to each new member alerting them of their membership (36).
Clicking OK (37) adds the selected people to the group and returns Brett to the People and Groups main page. A user can be removed by clicking on Actions and then on Remove User from Group (38) as depicted in figure 32. Brett is prompted for confirmation before deleting the selected members.
Brett is a M3C top level administrator in addition to a site administrator. This allows him to modify all information of members in a way similar to how users are allowed to modify their own information. Clicking on a member’s name within the Member list shows a member’s User information demonstrated by figure 33. To modify this information, click the Edit Item option (39).
Figure 34 shows the User information section. The user’s name is the only required field (40). An email address may be provided to increase the options for communication (41). A description of the user can also be added, allowing the use of rich formatting as well as pictures, tables and hyperlinks (42). Additional fields for organizing members’ information such as department, title and address (43). Clicking on OK (44) saves the changes.
Figure 34: User's information fields
My Site

My Sites allow users to organize personal information as well as publicly share selected information. Figure 35 shows James Grizzle accessing his My Site by clicking on the My Site link at the top right hand side of the screen (45).

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The ITSA newsletter is indispensable for IT related majors. You can edit your subscription settings here.

- Microsoft Karaoke Party
- Robo Gaming Event
- Unisoft
- Hidden Tournament

My Sites provide users many features for storing, organizing and sharing information. A convenient summary of available features is shown on the left side of the page, shown in figure 36 (46). New users are able to access a set of guides and tutorials that teach how to utilize the many features of M3C (47). One feature is a Web Part that allows links to be added and accessed for future reference (48). As well as links, personal documents can be stored directly in the My Site (49). Colleagues may be added to another Web Part, enabling access to the contact information of the students, professors and faculty most
frequently contacted (50). Documents intended for public view can be added to the
Shared Documents Web Part (51). In addition having their own personal My Site, a
personal blog is created for each user (52). Picture sharing allows multimedia expressions
of ideas and events (53). A summary of sites owned by the user is shown in the
SharePoint Sites Web Part (54).

My Sites, like many other parts of the M3C solution, are presented differently
depending on the type of user viewing them. Figure 37 depicts how James’ My Site
appears to site visitors.
Figure 37: Publicly viewable My Site
Figure 38 represents the James Grizzle’s My Site when viewed by Brett Rexroat. Brett can add James to his colleagues by clicking the Add to My Colleagues Button (55). He can see the Details of James Grizzle, including his Skills, Contact Information and Organizational Hierarchy (56). Brett can quickly access James’ Shared Documents from the Quick Launch Bar on the left side (57). Brett can view James Grizzle’s most recent Blog entry (58), link to the blog (59), or comment on the blog post (60).
Project Planning

Resources

Individuals interested in learning the features and administration aspects of SharePoint have a wealth of resources available. Microsoft SharePoint 2007 Unleashed and Microsoft Office SharePoint Server 2007 Administrator’s Companion were recommended by Professor John Nyland and Professor Russ McMahon and those texts are available to the M3C team. “Microsoft’s TechNet has sample code and solutions, forums, a knowledge base and online training (SharePoint Development).” MSDN Blogs hosts many professional SharePoint blogs from Microsoft MVPs. Microsoft also hosts the E-Learning Academy with free and paid courses to help tone a developer’s or administrator’s ability. James Grizzle has personally collected nearly 50 resources for SharePoint and hosts those resources at http://delicious.com/grizzljt/SharePoint (Grizzle). A cornucopia of resources is available to assist in deploying the best possible SharePoint Portal.
## Budget

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<th>Projected</th>
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<tr>
<td>MS SQL Server 2008 Standard</td>
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</tr>
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</table>

*Figure 39: Budget*

The budget in Figure 11 shows the cost associated with this project. The values in the center column represent the development cost, while the right column represents the cost of the project to a corporation – determined from Microsoft’s suggested retail value (5).
The timeline in Figure 12 shows the approximate order and time to complete each step of this project. Each step was an iterative process completed as a whole in a predetermined order.

**Project Deliverables**

- **Explore the ability to deploy a solution using the latest Microsoft software.**
  - M3C utilizes the latest releases of software to take advantage of the significant performance they offer over the previous versions. **Microsoft Server 2008, Microsoft Hyper-V, Microsoft SQL 2008, Microsoft Visual Studio 2008 and Microsoft SharePoint Server** has been available for less than a year, limiting the availability of reference materials.

- **Use Microsoft Windows Server 2008 with Hyper-V to implement three virtual machines.**
Microsoft Windows Server 2008 allows native virtualization via Hyper-V technology. Implementing M3C on virtual machines allows the solution to be hardware independent, scalable and more easily restored in the event of catastrophic failure.

- **To ensure virtual machine independence, configure the host machine to act as a virtualized network switch.**

  - Hosting three logical operating systems on one physical system is possible by virtually connecting them. Using the physical system to emulate a network switch makes the virtualization transparent to the virtual machines.

- **Deploy a Microsoft SharePoint Server Farm utilizing the virtual machines created with Microsoft Hyper-V.**

  - The choice to use three front end servers was determined by the recommendations of Microsoft SharePoint Unleashed. The virtual servers consist of one web front-end server, one index server and one data server.

- **Replace the current Department of Information Technology Web site with an Internet facing Microsoft SharePoint Web Portal.**

  - The current site does not promote collaboration. The M3C Web portal addresses the concerns of collaboration and works to make the site an integral part of the Department of Information Technology.

- **Create workspaces for individuals, project teams and student groups.**
The industry is beginning to implement workspaces to enhance communication and productivity through technology. Utilizing the same techniques in an academic environment as professionals use in the industry gives students access to powerful tools for holding and sharing information as well as an edge in their future careers.

DIT students, professors and student groups need a centralized space to hold and share information. Workspaces address that goal.

- **Enable user driven site creation for students and faculty.**

  - M3C empowers students and faculty to promote their achievements to the general public through direct control of their intellectual property. According to Professor Sam Geonetta, more than eighty percent of all career offers will come to be because of social connections. The M3C solution strives to improve the visibility of DIT students and professors to ensure the best job placement possible for the students after graduation.

**Recommendations and Conclusion**

The architects of Maximizing Collaboration and Content Centralization, James Grizzle and Brett Rexroat recommend a college wide implementation for the College of Applied Science. Additionally, due to the upcoming merger between the College of Applied Science and College of Engineering, we recommend implementing the solution across the unified college after the merger.
M3C can greatly increase the collaborative ability of any academic institution. For that reason, we strongly recommend SharePoint as a central document, workspace, and publishing medium. The M3C documentation is freely available to any academic institution seeking to implement SharePoint as a solution.

The solution provided by M3C dramatically enhances the Web experience of the Department of Information Technology. The solution promotes collaboration among students, professors, staff and outside entities such as employers or potential students. Also, the implementation of content centralization and document versioning ensures that documents are in the right place, searchable and can be retrieved or restored to a previous version if necessary. The addition of workspaces allows for teams to assign tasks, update calendars and publish information. This solution aligns with the goals of the Department of Information Technology and the department will see an immediate return on investment upon implementation.
Works Cited


18. Tate, Brad. Personal interview. 30 September 2008.