Proposal Document
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Introduction

Over the last few years, the education industry has seen a dramatic movement in the area of content standards, testing standards, and technology standards. A number of organizations such as the Institute of Electrical and Electronics Engineers (IEEE), the Instructional Management System (IMS) Global Learning Consortium, and the Aviation Industry CBT Committee (AICC) are actively engaged in creating industry-wide education technology standards. Additionally, Federal and State Governments, and Local School Districts are actively engaged in mandating laws which outline education testing standards for all national, state and district educational institutions. As the education industry moves into the 21st century, so too has the technology infrastructures of the schools evolved. The technical expertise and sophisticated technology environments that were once only available to the private sector are now becoming commonplace in today's schools and learning institutions.

In the past, the EduSystems product line continued to stay ahead of the competition by providing superior educational content and dependable lab equipment. One product offering which initially set the company apart from its competitors was the ECMS or Electronic Classroom Management System. Sophisticated for its time, the Visual Basic application (which runs on the Microsoft Windows operating system) allows instructors the ability to schedule, grade, and manage students and class programs from the instructor's desk. This innovative product allowed Paxton/Patterson to retain a competitive advantage over the competition for several years.

However, over the last three years Paxton/Patterson has experienced increased demand for technology based services. Paxton/Patterson's competition; while still having less sophisticated content has gained market share by supplementing their content and equipment with quantity instead of quality, thereby flooding the market with new technology based features and services. This in effect, has created a features "arms" race between competing training companies. As one company provides new features, such as instant messaging or distributed courseware, another company will follow suit and technically "one up" the competition by adding new features and services of similar functionality. This cycle of "one upping" has resulted in haphazardly developed product lines which rely on mismatched, five year old technologies, and application designs that were not intended to do what the competitor is currently offering. In most cases the competitors' product lines do not appear to have the infrastructure to support the education industry for the long term.

Having identified this trend, Paxton/Patterson had decided to avoid the initial feature rush. Rather, Paxton/Patterson focused on fine turning the product line content and lab components while carefully watching for influential industry trends and technology services which would positively benefit Paxton/Patterson's customers. In the short term, Paxton/Patterson has judiciously developed new features and services within the existing ECMS technology infrastructure as a stopgap to meet client needs with minimal investment.

However, this preventive strategy has begun to become a liability, and over the last year the Paxton/Patterson executive team has felt increasing demand for sophisticated technology based services. It is the opinion of the proposal team that in order for Paxton/Patterson to remain competitive in the evolving education industry, the EduSystems product line must evolve. This proposed evolution would not only meet, but surpass the current baseline technology services offered by Paxton/Patterson's competition.

This proposal provides a strategy and development plan for realizing this goal.

Document Overview

This document will provide a detailed look at the proposed design and development plans for the creation of the Edusystems ADMIN System. This document is separated into seven main sections.

Section One will provide a project overview and project objectives which are the driving forces behind the design of this proposal.

Section Two will provide a high level overview of the hardware design of the ADMIN System and the functions and services that are the basis of the system design.

Section Three will provide the information design strategy for the system. This will contain diagrams and descriptions of what the students and instructors will see and use within the system.

Section Four will provide the creative design strategy for the system. An outline of the creative approach and strategies will be described.

Section Five will provide the technology design strategies and is the primary focus of this document. This section will outline in detail the system design, functions, and services required to support the business case, information design, and technology/industry standards required for the system to add value to the industry.

Section Six will provide timelines and development strategies for how the system will be built over the development timelines.

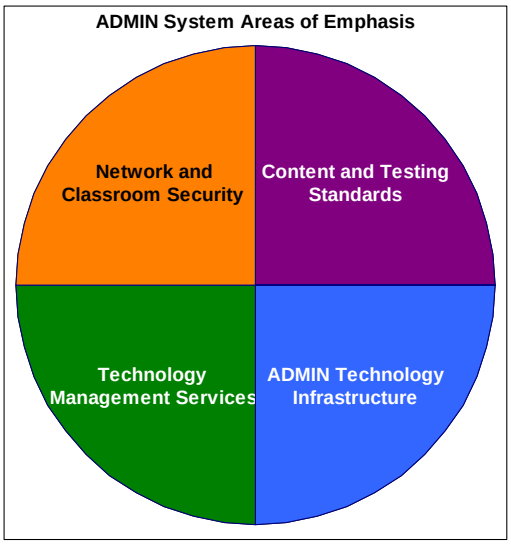
Section Seven will provide the budgets and final cost estimates for implementing the development timelines.

Project Overview

Five years ago, Paxton/Patterson created the EduSystems product line which contained beautifully designed educational content, top-notch lab equipment, and innovative class management tools. The product line has been well received by the educational community and Paxton/Patterson has enjoyed numerous awards and industry recognition for the quality of the product offerings.

The goal of this development project is to continue this successful momentum by updating the instructional content design and evolving the technology infrastructure of the product line to support the new technologies and technological demands of the 21st century school environment. The educational industry has radically changed over the last ten years. A revolution of new ideas, theories, and strategies has blossomed as the information age becomes a reality.

The original ECMS system was designed to support one instructor in one lab in a closed technology environment. By comparison the ADMIN System will be significantly more sophisticated and complex. Although more complex, the benefits of the new system outweigh the concerns of complexity.



- The ADMIN System will provide content and testing standards with services to create and manage new content created by Paxton/Patterson development staff and the school instructors.

- The ADMIN system will contain a sophisticated rules-based engine for integrating national, state, and local school district testing standards. This will be correlated by a sophisticated question database which will provide status reports, standards compliance reports, and many more.

- The ADMIN System will conform to current network security infrastructures and will provide sophisticated security that will constrain students to specific folders or only allow the student access to one single file or application, or nothing at all. And all security will be accessible with a click of a button from one centralized location.

- The ADMIN System will be designed using industry standard technologies and development paradigms, which will ensure portability, modularity, and technology standards compliance not only with the school's technology infrastructure, but also with the education industry as a whole. This will be achieved by creating the ADMIN system as a Web Service, a technology service which is provided using Internet based technologies with centralized processes, data, and security into one modular technology infrastructure. This will mean that the student, instructor, and administrative personnel will access all functions and services through a secure browser-based interface. It is important not to confuse browser-based with web-based as none of the new material or existing content will be accessible through the internet. Rather it will provide the interface to all services using a web browser but will not be accessible outside of the school network.

Project Objectives

- To create a robust, modular, application framework and technology infrastructure that will support content, testing, and technology standards within the education industry.

- To create a system to enable the EduSystems product line to remain competitive for five years before requiring an investment to update the product line infrastructure.

- To create a system which will lower the cost of investment for future product infrastructure updates.

- To create a system which will combine national, state, and district level testing standards into one statistical and rules-based package.

- To create a system which will allow the creation and management of new template based content. Content which is created by Paxton/Patterson development staff and school instructors.

- To create a system which will support legacy Authorware content and new HTML, Word, and PowerPoint based content.

- To create a system which will use industry standard technologies to export and import student, class, testing, and report data to and from external systems.

- To create a system which provides robust features and services while still being user friendly and easy to use.

System Design

High Level System Design

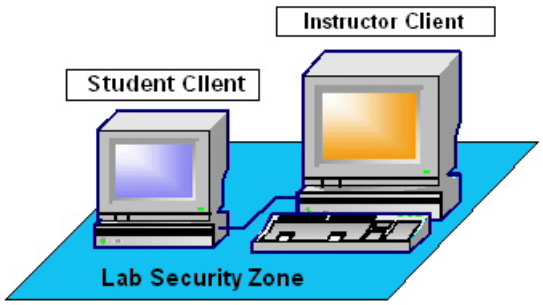
The physical hardware architecture of the ADMIN System will be considerably more complex and secure than the ECMS architecture. The ECMS was designed to allow multiple student clients direct connection to the instructor's client (which also doubled as the ECMS server). The technologies used to accomplish this task were functional but not scalable nor secure enough to meet the increasing demands of customers and school IT personnel.

The ADMIN System is designed to support multiple student clients, multiple labs, multiple instructor clients, and even multiple specialty clients such as wireless PDAs. The design supports added security for three to even five security zones.

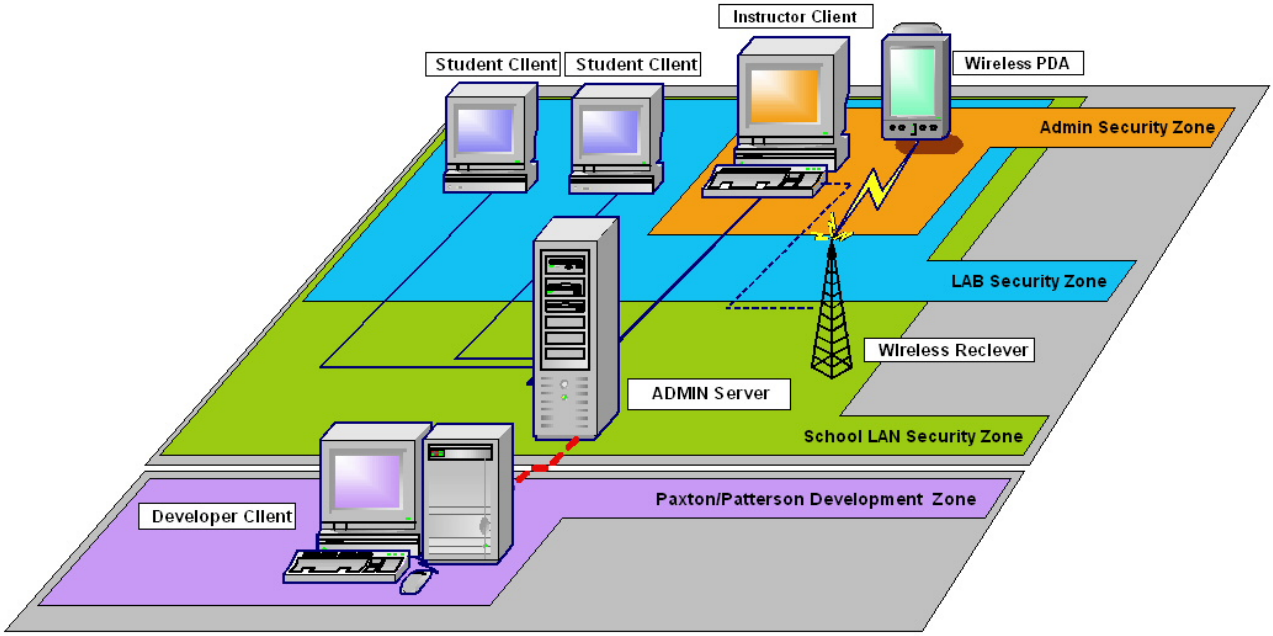
Security zones are environments with the capability to define security levels, and to establish security parameters and policies for specific networks, computers, applications, and services. This allows IT directors, Class Instructors, and Paxton/Patterson personnel to define levels of access to ADMIN features, server hardware configurations, class records, and preferences.

The key benefit of the new hardware design is diversification of the system into multiple components. This allows for easy maintenance and customization of the system during and after installation and can be expanded or reduced based on the customer's needs.

ECMS Hardware and Security Scheme



ADMIN Hardware and Security Scheme



High Level User Roles

The system is designed to allow different individuals access to the ADMIN system based on the individual's purpose or role within the system, this is called a user role. The role a student plays in the system is significantly different to that of an instructor. The ADMIN system is designed to treat each user role differently by providing content, features, and services based on the user role.

This section will provide an overview of the types of user roles that will use the system and also the hardware client each user role will use to connect to the system.

Standard Users

Standard users consist of one user role:

Student Client

- **Students**

Students access class and program information from the student client. The student can also review their program progress, review grades, take tests, and research training subjects in addition to viewing instructional content in Authorware, HTML, Word, and PowerPoint.

Power Users

Power users consist of the following:

Instructor Client

- **Instructors**

Instructors are level one power users. The instructor manages classes, programs, and student information through the Instructor client. The instructor is the only power user which uses the optional Wireless PDA Client to review student comprehension, take pictures of finished course work, and conduct rules-based evaluations of student progress.

Instructors can review both class and individual student progress, review and give grades, setup and prepare tests, and research training subjects in addition to viewing instructional content in Authorware and creating and managing HTML, Word, and PowerPoint content.

Wireless PDA Client

- **School IT Personnel**

School IT Personnel are level two power users. School IT Personnel will have direct access to the ADMIN server to administer network connectivity, server performance and maintenance.

School IT Personnel will use the instructor client to administer user accounts, conduct data management, security management, and services configuration.

ADMIN Server

Super Users

The super user role is used by Paxton/Patterson development staff to configure all aspects of the ADMIN System. This role would access all of the clients and the ADMIN server during initial installation, during routine updates and upgrades, and for specific customizations or alterations to the system while in the field.

Developer Client

The following list bellow outlines the types of Paxton/Patterson development staff which would use the super user role.

Development Groups

i. Content Developer
ii. Report Developer
iii. Test Developer
iv. Service/Feature Developer Engineer
v. Installation/Configuration Engineer

The Super User role would use the following clients:

- **Student Client**
- **Instructor Client**
- **Developer Client**
- **ADMIN Server**

The developer client has features and services for configuring, managing, and manipulating system services and functions for pre-populating class records, or setting up configuration and licensing functions. For example: the developer client would allow the super users to configure national, state, and local school district testing questions and set which questions are mandatory and which are not. The questions which are mandatory are not configurable by the instructor and maintain the integrity of standards compliance for the ADMIN System. Another function is registering which lab programs will be run within the system, and how many lab clients are licensed to connect to the ADMIN System. The developer client is the master configuration and management tool for Paxton/Patterson staff. At no time would a customer have access to the client or the features and services that it provides.

Information Design

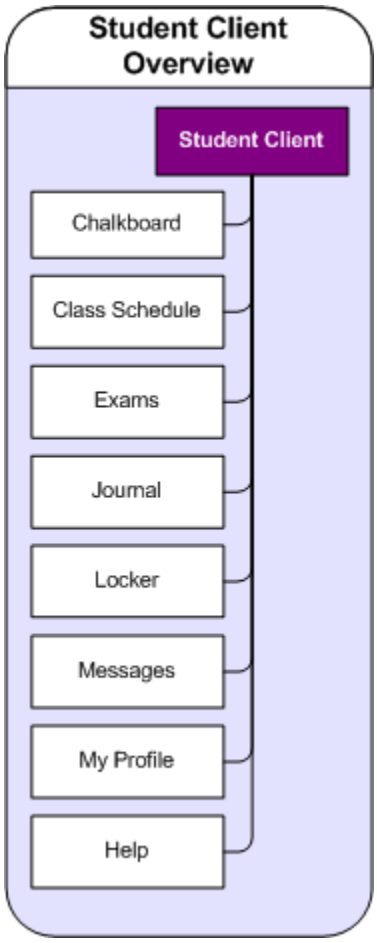
This section will provide an outline of each unique user role which will use the ADMIN System. Each user role will have a detailed walkthrough of the features and services they will use within the ADMIN System.

The following is a list of the specific user roles which will be detailed for this document.

- Standard Users
  - **Students**
- Power Users
  - **Instructors**
- Super Users
  - **Paxton Patterson Developers**

Students

Students access class and program information from the student client. The student can review their progress within the Lab program, review grades, take tests, and research training subjects in addition to viewing instructional content in Authorware, HTML, Word, and PowerPoint.



Chalk Board

The chalk board is a digital dashboard providing a summery of the students activities for the day. The purpose of the chalk board is to provide an overview of what the student will do for the class day and related information, such as Web sites, and instructor defined reference material. This may include a description of the next section in the training program the student is going to take to a list of upcoming tests and exams.

Class Schedule

The class schedule will provide a listing of the classes the student is assigned to and what dates they will be expected to take the courses. Also, the class scheduler will provide a directory of classes that will provide a listing of courses for each class day and a course description for each course. From within any location in the scheduler the student can go directly to the courses they have been assigned to by using the course viewer (CDM or Content Document Manager). For more information on the CDM please refer to the Technology Design section sub-section Student Client.

Exams

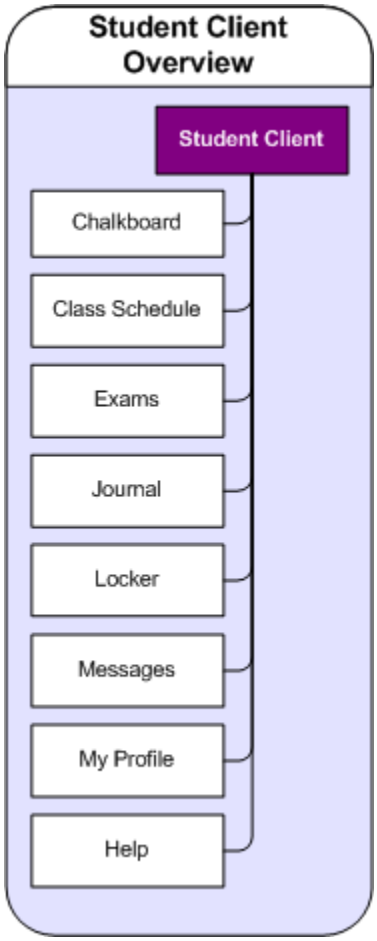
The exam section is a listing of the exams, test, and pop quizzes the student will or has taken over the course of the class schedule. Students will have the opportunity to prepare for tests, view past scores, and see where they stand in the course by reviewing their report card. Also, the student can take a test directly.
It is important to note that the student can access an exam or test in two ways. First, the student can go directly to a test or exam by going to the exam section and selecting the test from the list of tests for each course. The second way to access a test is as the student views training content in the CDM, which will direct the student to the test or exam.

Journal

The journal section provides a presorted listing of notes taken during the course of a lab program. The student can review, create, and edit notes as they progress through a lab program.

Locker

The locker section provides lockers for students to store Lab project files within. The advantage to a centralized locker is the student can move from multiple computers and labs while still having access to all of their work and not having to deal with moving the content from computer to computer. Also, the instructor can review checked in assignments in one location.



The locker service also provides documentation and course assets in a course shelf where all course assets are available to all students using the ADMIN System. Students working together on a project would have their project files shared (or replicated) automatically for that class day. Also, students could share their assignment notes with other classmates or project groups. This would allow for instructor-assistants to direct classmates on a part of a course. The instructor would monitor shared assets and make sure students are not sharing test answers for course work amongst themselves.

Also, the student has access to the global shared lockers. Shared lockers are instructor defined lockers which would have document templates, program files, or required documentation for a given project or for general class use. The student would only have the ability to view and download documents.

Messages

The messaging section provides a centralized location to send messages to the instructor in the event the student requires assistance or personal requests. The messages are sent to the instructor identifying the student client within the lab that the request was sent from. This allows the instructor to either respond to the student through a message or take care of the issue personally.

My Profile

The My Profile section provides specific information about the student. This includes student contact information, user account (username password), lab program history, and testing and exam history. The student can request to change their password and update their contact information.

Help

The help section provides guides and a walk-through on how to use the student client features and services.

Instructor

Instructors will access the ADMIN System using the instructor client. The instructor client will have access to services which are very similar to the student client. However, there are specific differences between the two. For example, the instructor can manage multiple classes, programs, and student information. Instructors can review both class and individual student progress, as well as manage grades, setup and prepare tests, research training subjects, and view instructional content in Authorware. The instructor can also create and manage HTML, Word, and PowerPoint content for inclusion into training content.

The instructor client is separated into two key areas. The first area provides tools and information which would be used on a daily basis while running the Paxton/Patterson Lab programs. The second area, which is entitled ADMIN Administration provides functions and services to customize the ADMIN System from test questions to course content.

Chalk Board

The chalk board is a digital dashboard providing a summary of the instructor's activities for the day. The purpose of the chalk board is to provide an overview of what the instructor will do for the class day with related information, such as web sites, and Paxton/Patterson defined reference material and lists of course documentation. This may include a description of the next section in the training program the instructor is scheduled to perform. The chalk board might also have notices such as LAB Module updates from Paxton/Patterson, and reminders of upcoming exams or tests.

Unlike the Student Client the instructor can setup specific notices to appear for individual students, This would allow the instructor to add new links to web sites, or links to custom content. The instructor can set up custom notices to appear for a specifc student, or on a specfic day, or a specific section of a lab, and for the whole life of a Lab Project.

Classes

The classes section provides several features for viewing and managing Lab programs and class information. The class schedule provides a listing of the classes by period, date, student, LAB Project and LAB Instructor. The instructor can review LAB Projects by browsing the LAB Catalog which has a course description, program requirements, a list of required equipment and materials, estimated program length, and statistics on current programs running.

Similar to the student client, the instructor can launch the course information into the course viewer and experience the course just like the students. The class schedule also provides an overview of which students are scheduled to take each module within a program. At any time the instructor can select a student from the course list, which will take them to the student's section for review of the student profile.

Please note that schedules are not maintained in this section. Please refer to the scheduler section for more detail on the ability to administer program schedules.

Students

The students section is used to review and manage student records. The student browser provides a directory of student records which facilitates quick sorting and lookup of all student records. Once a student record has been identified the instructor can review the individual student within the student profiler. The student profiler contains all information about a student including: Student identification, user access accounts, exam history, previous and currently scheduled Labs, and individual student reports on compliance to testing standards. The ability to view the student's locker, chalkboard, journal, and messages is available at any time in which the instructor may see fit to do so.

Grading

The grading section is used to review, grade, and schedule tests, pop-quizzes, and exams. Normally, when a Lab Program is scheduled within the scheduler, a series of standard tests and exams are pre-populated for the project. The instructor can add additional tests, pop-quizzes, and exams as they see fit. The instructor can select from a series of pre-created testing templates. If the instructor wishes to create a new test the instructor would be directed to the ADMIN administration section to create a new testing template. Otherwise, all test collection, tallying and reporting is automatic.

Reports

The reports section provides detailed reports on every aspect of the ADMIN system, from student tardy records to student exam averages. The reporting section currently has two primary reporting areas. The first provides status reports on Standards Compliance for national, state, and district curriculum and testing standards. Please note actual reports may vary depending on the options purchased by the customer. The section reports section is focused on Lab projects and the averages of students within them.

Messages

The messages section provides an interface to directly contact a student at a student client, or broadcast Lab wide messages. The system is designed to single message responses and notices only, online chat is not supported.

Journals

The journals section is similar to the student journals with the exception that the instructor can review all student journals. The instructor first uses the journal directory to find the student journal they wish to review. Once a student has been identified the instructor can review student notes by profile, Lab project, or project section. At any time the instructor can send requests or Notes to the student to either add more notes or remove inappropriate material such as test answers or profanity. If the student does not obey the request the instructor can remove the notes as they see fit.

The Locker Room

The locker room provides the instructor the ability to view all student lockers. The locker directory allows the instructor the ability to sort all lockers by Lab program, class, grade level, or by student profile in alphabetical order. Once the instructor selects a student profile the instructor can review the locker contents, add or remove shelves, and items within a locker.

Similar to the students the instructor also has a personal locker for storing class related documents and files. Also, the instructor can create shared folders which are accessible by all students within the lab.

The Scheduler

The scheduler section provides tools for creating, editing, and removing program schedules. The instructor can create a new schedule by first selecting the lab program that will be used. Then selecting what month they want to start the lab, what class periods on what days. The second step is to select the students which would attend the program. The system provides several options for organizing and scheduling individual students by preference and program history. After the students have been organized a program schedule would be assigned to one or more instructors. If more than one instructor is managing the program the system then conducts a third level to schedule when each instructor would manage the program.

Aside from creating and manipulating program schedules the instructor can browse past, current, and future schedules. During the browsing mode, the instructor can drill down and review the program description and review the students within the schedule.

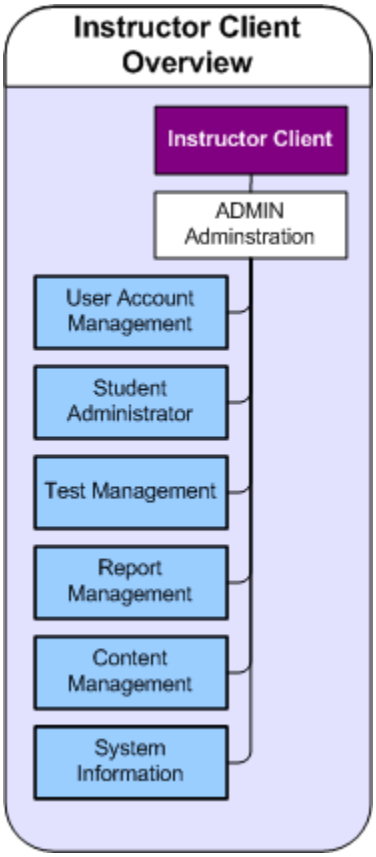
My Profile

The My Profile section provides specific information about the instructor. This includes instructor contact information, user account (username password), which lab programs the instructor taught and when, and class success statistics on testing and exam standards. The instructor can change their password and update their contact information.

Help

The help section provides guides and a walk-through on how to use the student and instructor client features and services.

ADMIN Administrator



The ADMIN Administrator for the instructor provides a sub-set of features and services for administering user accounts, student information, test templates and testing standards, report management, and content management.

A detailed description of each section will be provided in greater detail in the next user role description (Paxton/Patterson Developer). Instead this section will outline what aspects of the Administrator services are different from the Developer user role.

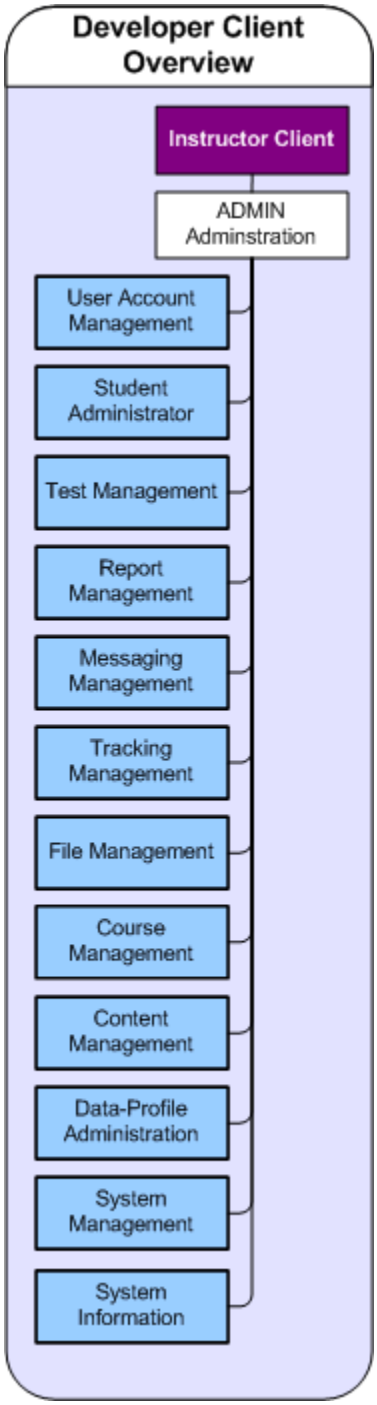
The instructor can create and manipulate new tests and educational content. The instructor cannot alter existing material provided by Paxton/Patterson. For example: Paxton/Patterson and 3rd party authors will have an official standards compliant set of questions and answers instructors are prevented from altering to ensure that student results are gathered in accordance with national, state, and local standards. If the instructor could alter the questions the authenticity of the standards compliance would be in question. The instructor can, however, add additional questions to the tests and exams, as they deem necessary.

The basic rule of not editing existing material also applies to program content. The instructor cannot edit existing content, but the instructor can add additional content. The content manager provides an interface for the instructor to select from a series of predefined locations within Lab program content to insert new content. This could include, a series of HTML pages, a Word document, or a PowerPoint. This allows the instructor enough flexibility to add new course content without jeopardizing the educational quality of Paxton/Patterson's EduSystems product line.

For a more detailed description of the features and services provided within the ADMIN Administrator please refer to the next section.

Paxton Patterson Developers

The developer user role is a super user account to create, manipulate, administer, troubleshoot, and remove all functions, services, and systems within the ADMIN system. The developer user role has access to all of the clients and server administration tools. The primary purpose of the developer user role is to develop new services, set up and maintain the ADMIN product line.



User Account Management

This section is used to manage user accounts. User accounts include user roles and system clients. This series of functions deal with user access to the system and identifying the type of user role for customization of the end clients.

Student Administrator

The student administrator is used to manage student records from a data management standpoint. This series of functions are used to import, clean, and export student records.

Test Management

The test management section is used to manage test information these include questions and answers, which are correlated with the standards administrator and course management.

Report Management

Report management is used to manage report templates and report data objects. The system is used to register a report, the information the report is to report on, and who can see the report. The report group manager is used to create standard groups of users who can see a series of reports. For example, the instructor and school personnel will see a standard set of reports on student performance. The group manager defines the default list of reports. This allows for the modular addition or removal of a series of report templates to each school depending on the school district's needs.

Standards Administrator

The Standards Administrator is used to add, edit, and remove three levels of standards. A standard rule contains a name, description, id or standard identification code, and a rubric range (1-5 with description for example). The standard rule is then correlated with individual questions and answers in test management and distinct course sections within course management.

Messaging Management

Messaging management is used to register and manage messaging clients on the network.

Tracking Management

Tracking management is a testing and performance tool used in conjunction with ADMIN system services to ensure functions are working and running at optimal efficiency. The tool would be used during development and for debugging in the field.

File Management

File management is used to configure and customize the file management system used within the ADMIN system. Locker management as well as resource management of assets used for course content.

Course Management

Course management is used to create and map course progress and linear timelines using content from content management and the content loaded on the student client. The source information is correlated with the testing and standards managers.

Content Management

Content management is used to import, export, edit, and remove content from the system. Content would be used as part of a course, as supplemental material, or as pointers to external content.

Data-Profile Administration

Data-Profile Administration is used primarily during the installation of the Administration system. It is also used to import and export data to external systems. It is a data management tool for administrating the import of all elements used within the system, such as student records, content objects, report data, testing data, file policies and user profiles. This all-purpose tool provides the means to communicate and transfer data to other system formats.

System Management

System management is used to manage low-level services within the ADMIN system. It is used to setup and configure system features and functions as well as to register the client licenses (student and instructor clients for example) for access to the system. Additionally, system management is used to manage the registration of system components and default parameters used by all system functions and services.

System Information

The system information section provides a standard report of the whole system from registered client and system services to total LAB projects running in the system. This tool is used for quickly assessing the system configuration and options installed for development staff and customers.

Visual Design

The following section will provide a critical look at the creative strategies, which will be employed within the ADMIN System.

Overview of the creative direction

ADMIN main interface

The creative direction will focus on designing a clean interface, which embraces the look and feel of the EduSystems product lines. The design will primarily focus on a simple, clean look and feel which is dominated by the presentation of education content and ADMIN information. Minimal imagery will be used to ensure that the design does not appear to look like a distinct EduSystems product.

The design will employ a fluid template based design, which will provide consistency both in the use of the product and in the production. This strategy will play a key roll in developing color themes within the student client.

Testing and CDM interface

The testing and CDM interfaces will be designed to have a look and feel that seamlessly mimics the EduSystems Lab the test will be running within. The goal is to design distinct interfaces for each lab running through the system, and during the transition from Authorware content to the browser-based testing, the interface will have the same look and feel.

Outline visual design requirements and constraints

The following requirements will influence the design of the interface:

- The student client will require the interface color scheme to change based on the LAB program being used.
- The interface will require a consistant look and feel that will take graphical influences from the EduSystems Corporate Standards.
- The visual design of the tests will have the same look and feel as the lab in which it is running within.
- The visual design must be clean and easy to use.
- The visual design should use minimal imagery, as the EduSystems Lab Programs will be the primary focus of the ADMIN System.

Technology Design

The ADMIN system design is separated into four primary development efforts

Effort one: System Services and Functions
The effort involves the design and development of specific technology solutions for each end client and the ADMIN Server.

- System Services and Functions
  - Student Client
  - Instructor Client
  - PDA Client
  - ADMIN Server

Effort two: Network Services
The effort involves the development of computer security and monitoring.

- Network Services
  - Security
  - Desktop monitoring

Effort three: Authorware Content Migration
The effort involves the conversion of Authorware content to support the ADMIN design

- Authorware Content Migration
  - Authorware Function Removal
  - Authorware tie to display Shell

Effort four: Video Conversion and Management
The effort involves the conversion and management of the Paxton/Patterson video library

- Video Conversion & Management
  - Video Library conversion to AVI or MPEG

System Services and Functions

The sum of the development efforts for building the ADMIN system are not solely focused on the ADMIN server itself. Each client will require specific research and development to properly access the ADMIN system.

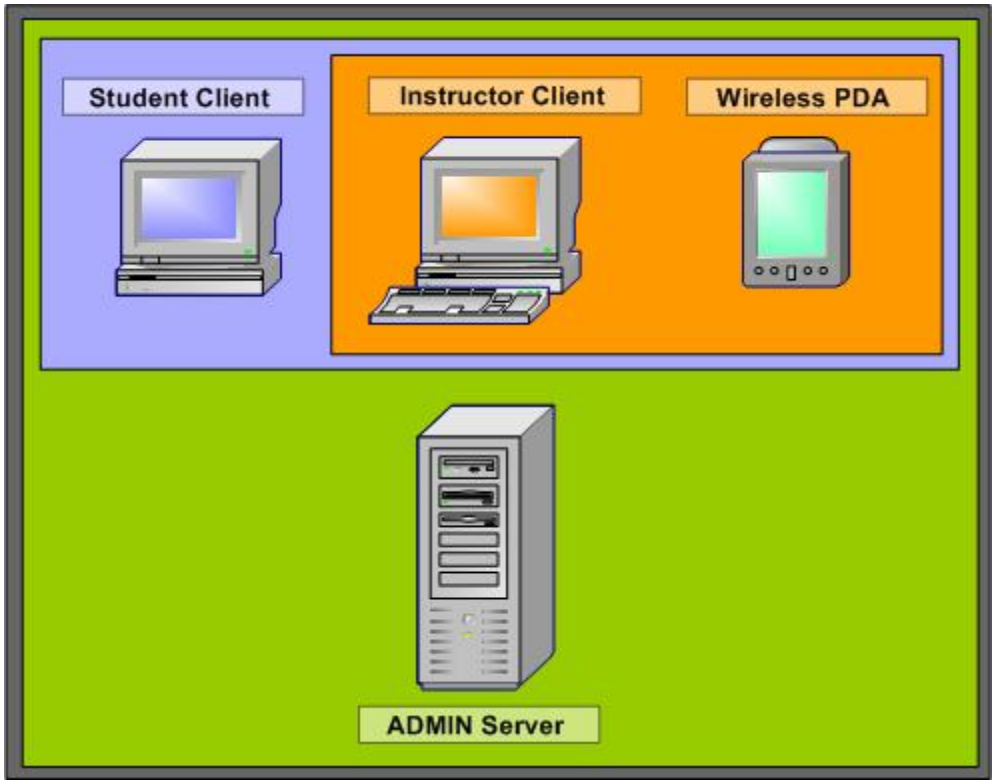
The Student client will be designed as a "fat client" using an application shell to integrate the legacy Authorware content, encoded video libraries, and browser-based ADMIN Client into one seamless user experience.

The instructor client will be designed as an extended "fat client". It will have the base functionality of the student client with the addition or more sophisticated management and monitoring tools.

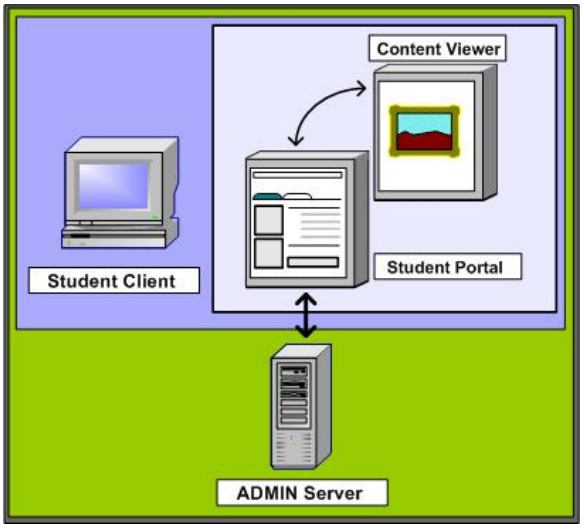
The Wireless PDA will be an optional companion tool for the instructor. The PDA will provide assistance in grading, testing, and attendance management. Research and development will be conducted into synching the PDA through a cradle in the event that a network connection is lost. The design team will also need to design the wireless network architecture to support the PDA.

The final development effort will be the creation of the ADMIN server and the functions and service required to enable the clients and server to run correctly and efficiently.

The following sections will provide detailed design and application strategies for developing each component of the ADMIN System.



Student Client



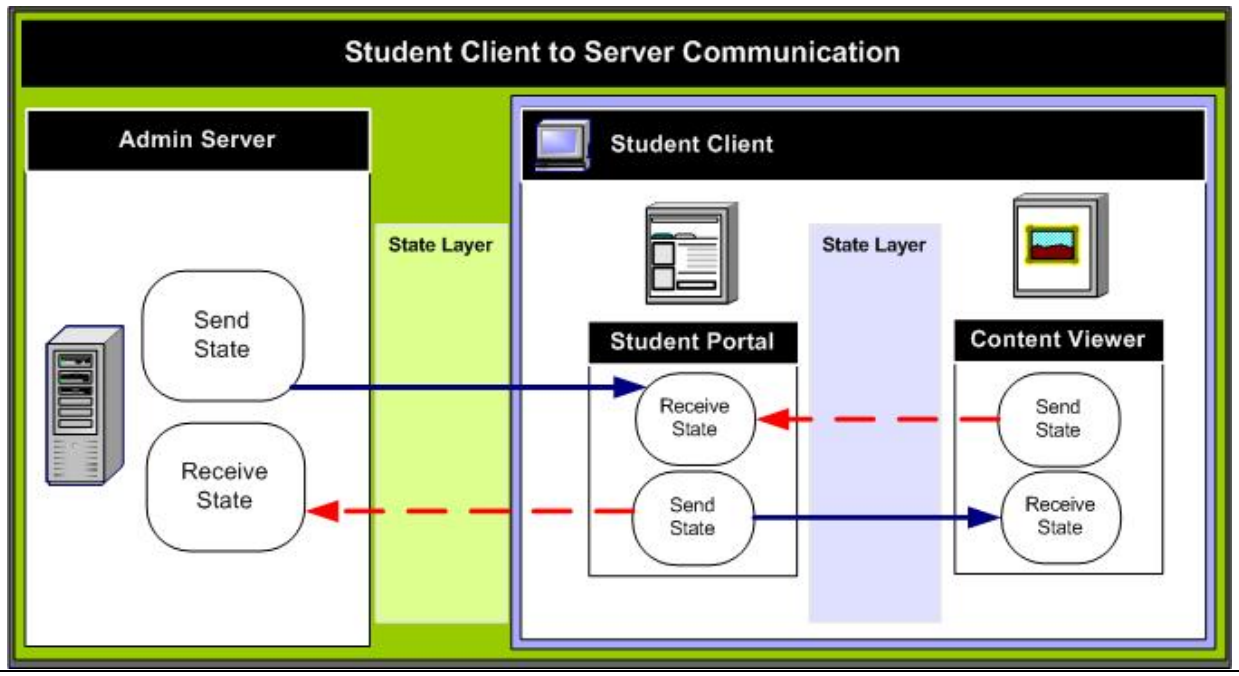
The Student client will be designed as a "fat client" using an application shell to integrate the legacy Authorware content, encoded video libraries, and browser-based ADMIN Client into one seamless user experience.

The client is designed into two distinct experiences. The first is the student portal, which is a browser-based interface to the ADMIN system. The second is the CDM or Content Delivery Manager. The CDM is a universal viewer used to view legacy Authorware content, take tests and exams, browse the internet, view html, word, and PowerPoint documents and view videos from the Video Library.

Communication Paradigm

There are distinct technology challenges with designing the student client specifically because of the need to support legacy Authorware content. A three-tier technology design will allow for the Authorware player to talk to the ADMIN server. The following diagram illustrates the process for managing the state of the Authorware Client. The term "state" refers to where within the training content the player is and what the player is currently doing. The event model for communicating between the Authorware Client and the ADMIN server is as follows:

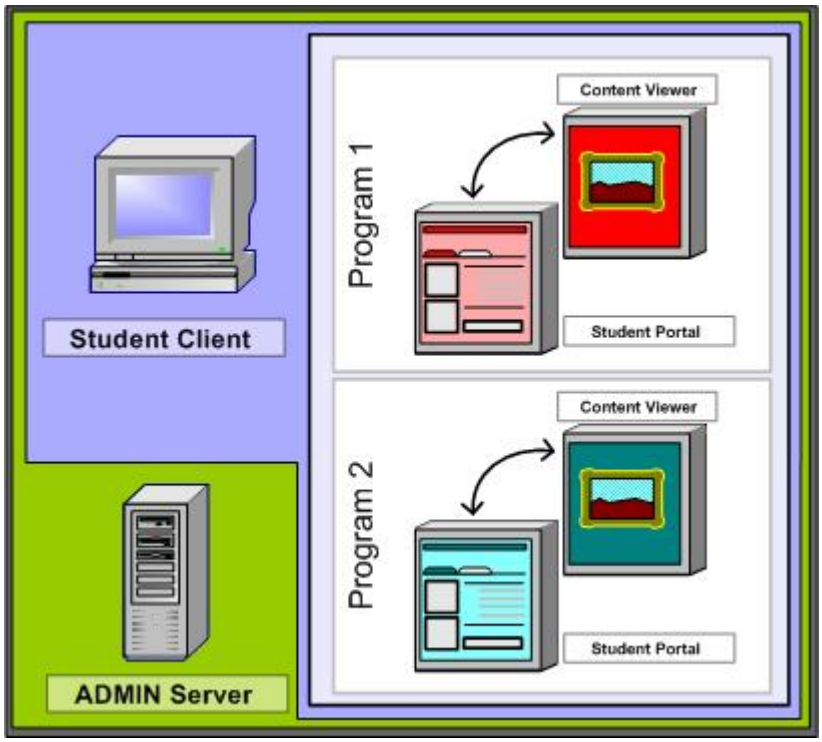
1) The Student sends a request to view a training module.
2) The Admin Server processes the request and sends the state to the Student client to launch the Content Viewer
3) The Student Portal receives the request and launches the content viewer
4) The Content viewer loads and launches the requested training content
5) As the student moves through the content the communication process continues to update the server on the location of the student within the content.



The state based management of the Authorware client to the ADMIN server it critical for tracking student progression through the external content. Also, maintaining the state of the student allows for the dynamic inclusion of instructor defined content.

Color Themed Student Portal

The second aspect of the student client is designing a "theme-able" interface which will change based on the Lab Program. The themed interface is a unique requirement for the student client only as the primary concern is ensuring that the experience between the content within the content viewer is similar in look and feel to the student portal.



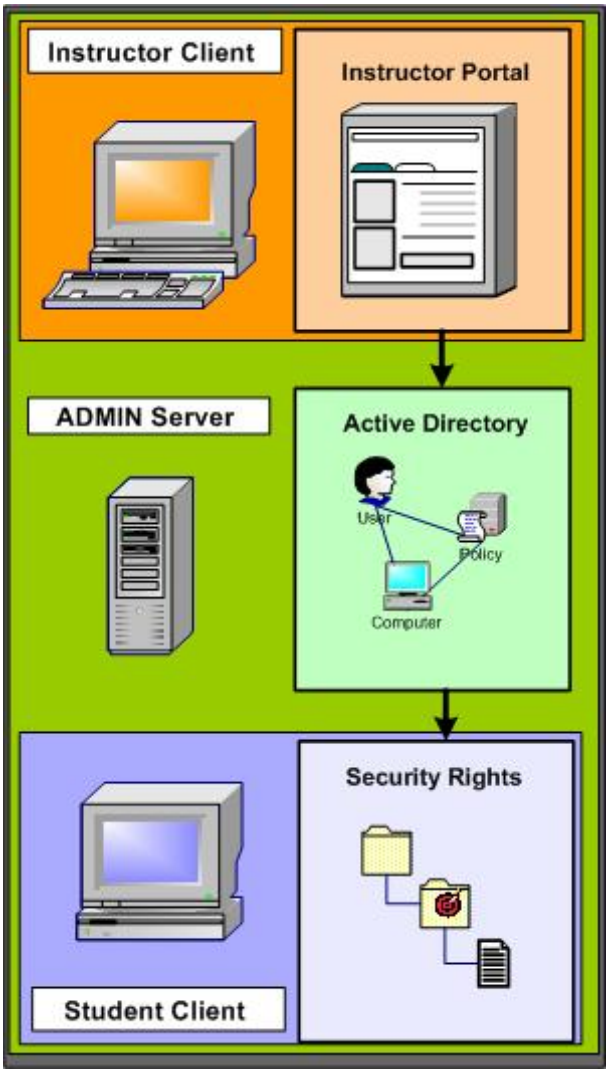
The diagram to the left illustrates the basic concept of how color themes will be applied to the graphical interface of the student portal. The ADMIN server will determine which color scheme to use based on the type of LAB module set to run for a specific class period.

The lab program that is assigned to the student for the class period defines the color theme used. When the Student logs into the system the ADMIN Server queries the database to determine what program the student is assigned to and loads the appropriate color theme.

In addition to creating a communication paradigm and themed student portals, the student client will also require the installation of a monitoring client, and installation procedures for setting up the student portal client, loading and connecting Authorware content, and installing messaging services.

Instructor Client

The instructor client will be designed as an extended "fat client". It will have the base functionality of the student client with the addition or more sophisticated management and monitoring tools.



Application, Folder, and File Permissions Security

The instructor client will provide the ability to load security profiles based on Lab programs or define custom security polices. Because the ADMIN System will be deployed running Windows 2000 Server the system can take advantage of a technology entitled Active Directory. Active directory is a Microsoft implementation of a technology called LDAP. The Active Directory service is hard-wired into the security policies of Windows 2000 server, Windows 2000 Professional, Windows NT workstation and Server, and Windows XP standard and Pro.

The design team has theorized that using the instructor portal the instructor would schedule a lab. Once the lab has been scheduled, the ADMIN System would automatically change the permissions on the target Lab machine by turning access rights on and off based on the applications, directories, and files required to complete the LAB.

The diagram to the left illustrates this concept.

- Instructor and P/P technology group interface through web client
- Manipulate AD with PHP through LDAP protocol
- Use Active Directory (LDAP tie to NT permissions)
- NT permissions set directory, file, and application permissions on target student client.

The design team's strategy abstracts the rather daunting ask of using Microsoft's Policy Manager to manually administer individual computer security policies. Instead the instructor can use a user friendly interface for creating reusable security policies for each lab computer and lab program.

Additional Reference Material:
Learn more about Active Directory:
http://www.microsoft.com/windows2000/technologies/directory/ad/default.asp

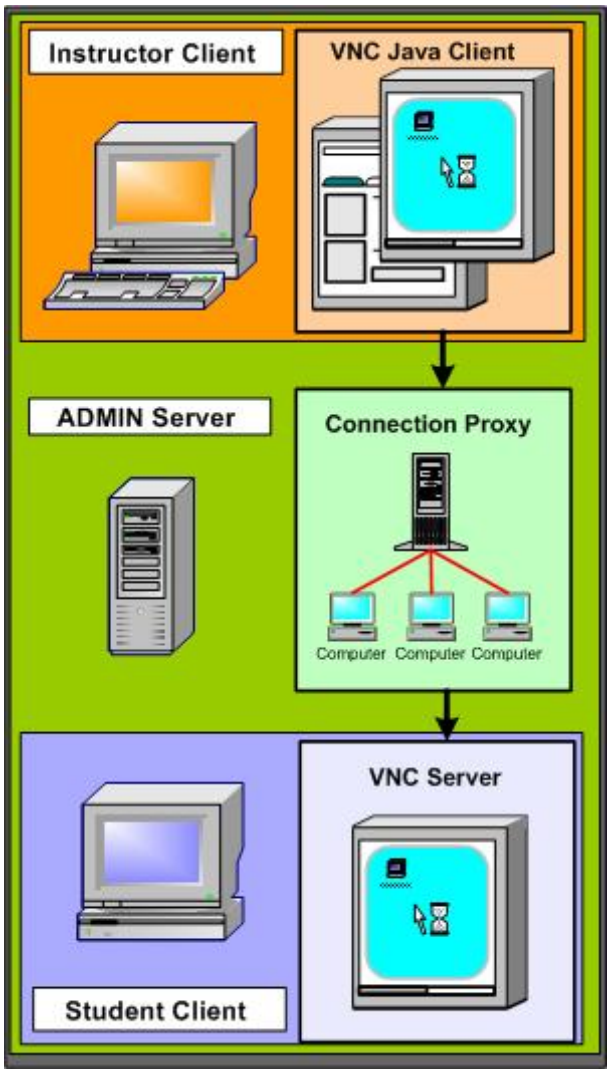
Learn more about the standard features provided in Windows 2000 Server:
http://www.microsoft.com/windows2000/technologies/

Learn more about PHP:
http://www.php.net/

Virtual Desktop Monitoring and Administration

The next feature provides the ability to monitor, and control student clients.
The design team has two strategies for implementing this feature. The first relies on 3rd party software to piggyback on the student client and instructor client. The 32-bit visual basic application would run in the background of both clients and would require the instructor to launch the application while during a class.

The second strategy provides the same functionality as the first, with the added bonus of seamlessly integrating the monitoring and administration of the lab machine in a browser based environment.



The specific technology the design team is reviewing is entitled VNC and is an open source remote monitoring and administration client. The software has been in development for over five years and has an installed user base of over 50,000 servers and clients world wide running on over 23 different operating systems and server configurations.

For more information about the open source application please review the following URL:

http://www.uk.research.att.com/vnc/

Here are a few quick facts about the VNC technology

- Use VNC virtual desktop to monitor and administer remote servers
- 4 operating systems support the server
- 23 operating systems support the client
- Has encrypted password security
- Has large world-wide development community support
-

Scenario one: The instructor logs into the instructor portal and loads the lab for the next class. Instead of going to each lab computer and setup specific routines or applications, the instructor would go to the lab explorer, and select the lab machine he wishes to administer from a menu of lab computers. A browser window appears loading up a java client to the server. The instructor logs in and sets up the computer for the next lab session.

Scenario two: During the course of the lab session the instructor is assisting students on Lab station 1. He then has to return to his station to fix a student record error. Instead of getting up to assist the student with the problem the instructor would load up the VNC client and watch the student as they attempt to use the software. At any time the instructor can take over and correct the student all from his desk.

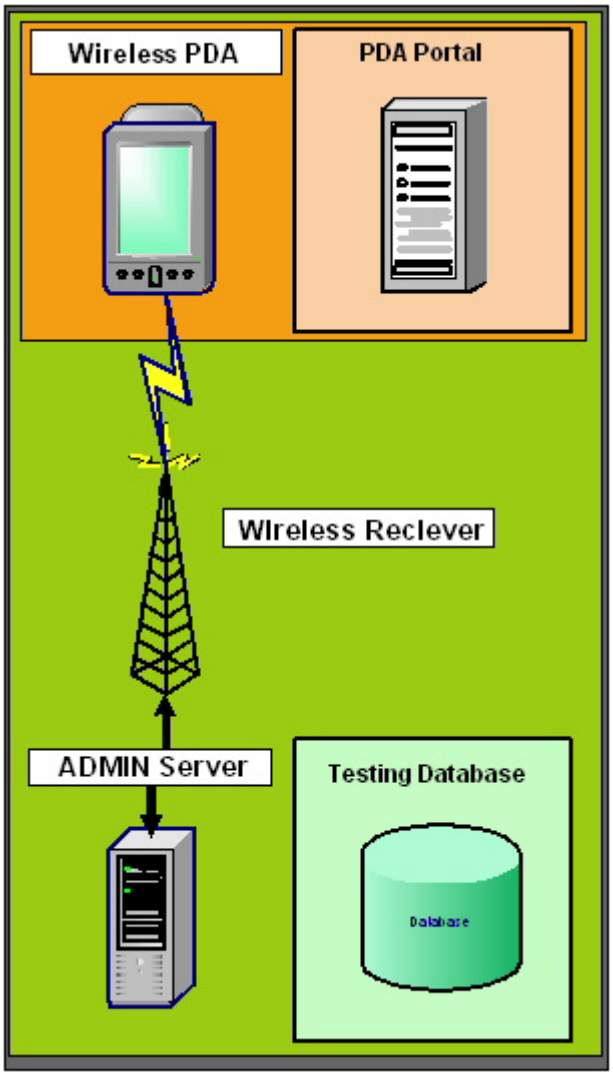
PDA Client

The Wireless PDA will be an optional companion tool for the instructor. The PDA will provide assistance in grading, testing, and attendance management. The design team is currently researching two different solutions for the PDA Client. The first is providing real time administration and management of student grading and test information via a wireless LAN connection to the ADMIN Server.

The second solution involves storing test and review information locally on the PDA and synching the PDA through a cradle to the network. This option is used in the event that the instructor is out of the range of the wireless receiver or no wireless network is available.

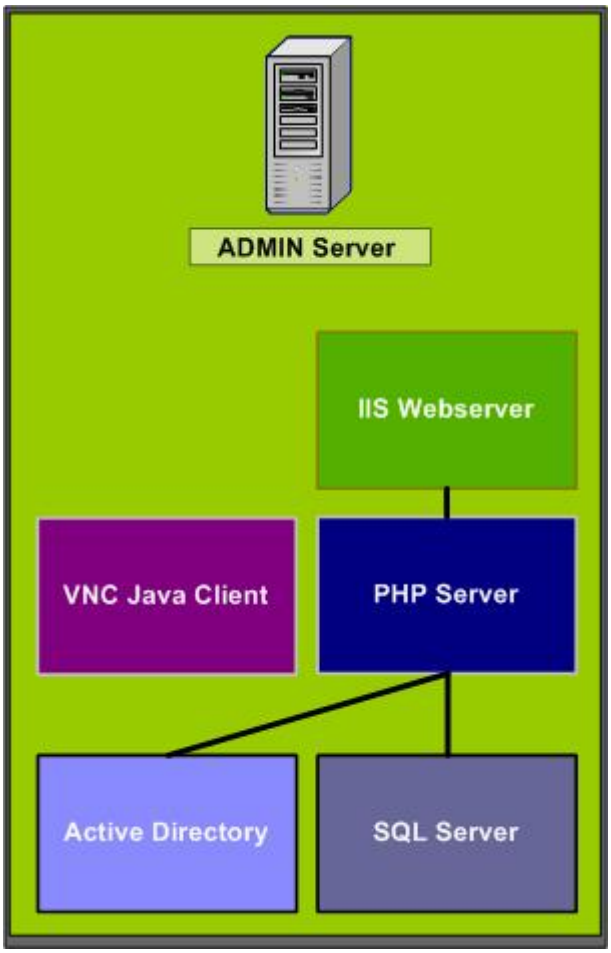
In the opinion of the design team, the wireless "always on" design will be the desired situation, because it will allow the instructor to receive instant messages for help while on the lab floor as well as statistics and reports regarding student progress remotely.

The second solution although justifiable will require further research and development to realize.



ADMIN Server

The ADMIN Server is designed using industry standard technologies and services. The design of the ADMIN server systems will support modular development, incremental design and fail safe systems to provide a stable, robust application platform.



The ADMIN Server will be designed using six primary technologies. The web browser and VNC Java client will provide the primary interface to all system functions and services. Interface development and design will be developed using the standard technologies supported.

These may include:
- HTML
- DHTML
- XML
- Java (JavaBeans, servlets, ect)
- Flash

The services will be designed to support multiple web server configurations and will be designed to migrate to different server platforms based on the strategies and needs of Paxton/Patterson.

The default server is:

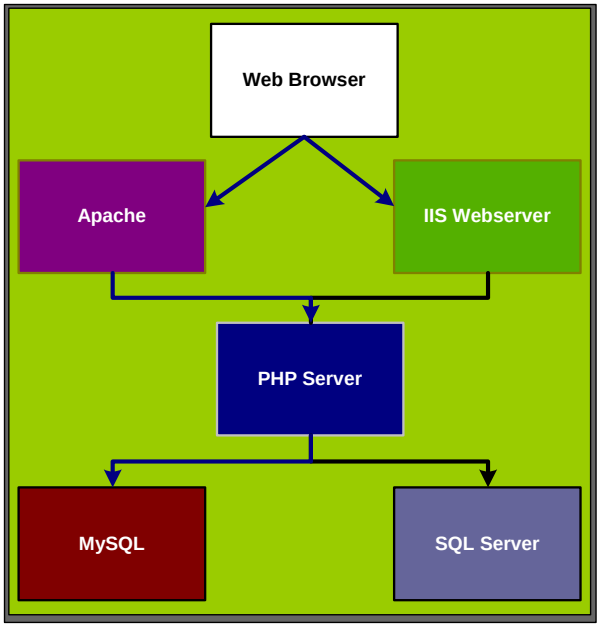
- Microsoft IIS 5.0 Web server

The middleware technology which will integrate the web server to the database and other operating system functions is:

Middleware programming language:
- PHP scripting language running on the PHP server

The Database and LDAP servers will be:

- Active Directory (LDAP)
- SQL Server (Database Server)



The diagram to the left illustrates how using PHP will allow for middleware migration to other server platforms should the need arise to have the server run on Linux.

The diagram on the next page provides a high level look at all of the functions and services which will be maintained within the ADMIN Server system.

ADMIN System Breakdown

Services Level

Class Portal

- Chalkboard
  - Today's Schedule
  - Take a look!
  - Messages Overview
  - My Classes
  - Chalkboard Manager
- Classes
  - Class Schedule
  - Class Directory
  - Course Profile
    - Course Viewer
    - Course Students
    - Course Reports
- Grading
  - Exams
  - Grade Exams
  - Exam Creator
- Reports
  - Averages
  - Standards Compliance
  - Student Reports
  - Report Creator
- Journals
  - Journal Directory
  - Category Managment
  - Note Managment
- Students
  - Student Directory
  - Student Profile
  - Search for Student
  - Student Manager
- The Scheduler
  - Create Schedule
  - Schedule Directory
- Locker Room
  - Locker
  - Manager Locker
  - Share locker
- Messages
  - Instant Messages
  - Message Boards
  - Message Manager
  - Notification Manager

Help

- Frequently Asked Questions
- Glossary of Terms
- Online Guides

My Profile

- Manage Profile
- Manager Access

Infratructure Level

Data-Profile Administrator

- Import User Profile
- Export User Profile
- Import Student Profile
- Export Student Profile
- Import Student Record Packet
- Export Student Record Packet
- Import Test Profile
- Export Test Profile
- Import Tracking Profile
- Export Tracking Profile
- Import Test Record Packet
- Import Report Profile
- Import Report Record Packet
- Import Messaging Packet
- Export Test Record Packet
- Export Test Record Packet
- Export Report Record Packet
- Export Messaging Packet
- Import File Policies Profile
- Export File Policies Profile
- Import Tracking Record Packet
- Export Tracking Record Packet

System Management

- Module Security Manager
- Viewer Client Manager
- Service Manager
- Database Manager
- System Registration Manager

System information

- Service License Registration
- Server Services List
- Server Course List
- Server Asset Statistics

File Management

- Locker Admin
- File Policies Manager

Content Management

- Content Type Admin
- Content MetaStructure Admin

Tracking Management

- Collection Service
- Tracking Admin

Report Management

- Report Template Admin
- Report Forcasting Admin

Test Management

- Test Type Admin
- Test-MetaStructure Admin

Messaging Management

- Instant Messaging Policies Manager
- Message Board Manager

System Level

Communication

- Inter-Client Adapter
- Input Data Adapter
- Output Data Adapter

Security

- User Account Management
- Student Security Management
- Module Security Management
- Viewer Client Management
- Service Management

Data

- Update
- Remove
- Add
- View

Media

- Update
- Remove
- Add
- View

Development Strategy

The CMD Interactive group employs a specific methodology in developing solutions for our clients. The use of this methodology ensures that we identify and design the appropriate solution to meet our clients' needs, while also maintaining project flexibility and production efficiency. Each of the development phases has specific milestone deliverables that serve as review checkpoints for the project, and also as the foundation for subsequent phases.

Phases of the methodology:

- RFP/Proposal phase: Assess a work opportunity, and provide a proposal if appropriate. Proposal includes a summary of project objectives and scope, and implies a high-level solution. A broad range of budget estimate is provided.
- Requirements phase: Determine the business case, goals, objectives, and audience for the project, and the specific requirements. Find out the "why" of what will be built. This phase usually costs 10%-15% of the total budget.
- Solution phase: Determine the features and functions that will meet each of the requirements. Find out "what" will be built. A preliminary schedule and more refined budget are presented. This phase usually costs 10%-15% of the total budget.
- Design Specification phase: Determine the specific details of interactivity, look & feel, and functionality; final schedule and budget. Document the "how" of what will be built. This phase usually costs 20%-25% of the total budget.
- Production phase: Develop the project deliverables, based on the Design Specifications. This phase usually costs 25%-35% of the total budget.
- Delivery phase: Ensure that quality assurance is applied and client approvals are obtained. This phase usually costs 15%-20% of the total budget.

Additionally, this document outlines many different features and services of the ADMIN system. Our preliminary assumption is that we will develop the ADMIN system from the standpoint of modularity. The system will consist of a variety of modules that will "plug in" to the core system architecture. As such, the development team will be made up of specialists responsible for the individual modules. This approach will allow us to develop the system rapidly by allowing multiple developers to work simultaneously on smaller pieces of the system, and also allow for functional modules to be added as necessary in the future. To achieve this, the core architecture will need to be developed and documented in the Solutions and Design phases according to generally accepted best practice before core programming can commence during the Production phase. Also, due to the nature of this project we recommend development of functional prototypes during the Solutions and Design phases to validate our recommendations.

Development Timelines and Budgets

We have discussed a delivery date of March 28, 2003 for this project. To reach this date, the timeframe for each phase will need to be as follows:

- Requirements Phase – 1-2 Months
- Solutions Phase – 1-2 Months
- Design Phase – 2-3 Months
- Production Phase – 3-4 Months
- Delivery Phase – 2-3 Months

Following is a breakdown of cost per feature set for developing additional functionality for the ECMS. The core functionality, which represents, the existing features of the ECMS, is our base deliverable. Additionally, we have estimated the development costs for additional sets of features based on feature requests made by Paxton/Patterson. We have grouped similar features into feature sets based on the similarity of back end services required to support the features.

Feature Set	Probable Case Dev Cost	Best Case Dev Cost	Worst Case Dev Cost
Core Functionality	$519,000.00	$467,100.00	$570,900.00
Student Content Manager	$105,600.00	$95,040.00	$116,160.00
This budget item represents all of the functions required to create the "document manager" for students. This set of functions would allow students to save information to specific areas that are locked and managed by the teacher. Without these functions, the system would work as it does now (or similarly) where students will simply save documents "wherever".			
PDA Functionality	$63,360.00	$57,024.00	$69,696.00
This represents all the functions required to create "remote" PDA grading as outlined by Gary (grade entry, notes entry, synchronization, etc.).			
Enhanced Reporting	$63,360.00	$57,024.00	$69,696.00
The ability to create "customized" reports and reports based on different sort or filter methodologies (show all questions relating to a specific standard, filter out all questions that don't apply to a standard, sort the list of information in date order, etc.) The budget range of this item is pretty broad based on what will be required.			
Creation/Manipulation of Test Types (other than multiple choice)	$58,080.00	$52,272.00	$63,888.00
This gives the teacher the ability to use, create and manipulate non-multiple choice questions, such as "drag and drop", "matching" or even "fill in the blank" style. The actual number of test choices we give will need to be determined as part of the project development.			
Student "Bookshelf" functions	$42,240.00	$38,016.00	$46,464.00
This applies to broad student features found on the student machine, such as "my tests", "calendar", and the "chalk board". Effectively any student-based reporting beyond the basic "login" and "items required check-off list" is included in these functions.			
Messaging Functions	$42,240.00	$38,016.00	$46,464.00
This includes all the code and interfaces required to do teacher to student and student to teacher messaging. This applies to "instant messages", "warnings" and student/teacher requests.			
Test Customization (test weighting, question sets, etc.)	$42,240.00	$38,016.00	$46,464.00
This represents the ability for teachers to manipulate when and how a test question will be given to the user. For example, always have this question, randomize this question as a part of a larger set, etc. Also, to give "weighting" to a question (Question A is harder and more important – so therefore worth more "points"). Additionally this budget item includes any code that would be required to "flag" questions that teachers will want to get warnings on… example – a teacher might want to be warned if several students miss a specific question or even get an immediate warning if students get this question wrong.			
School administrator reporting	$42,240.00	$38,016.00	$46,464.00

functions

This budget represents the programming required to do reporting that crosses "between" classes. This includes generating reports based on historical information, charts based on class performance, incorporation of notes from several teachers, etc. In addition, a portion of this budget is required for "export" functions to use student data in other applications.

Apply Multiple Standards	$36,960.00	$33,264.00	$40,656.00

Unless this budget item is taken into account, only 1 set of standards can exist/school. If more than 1 standards set may apply (such as local, state and science or something) this additional budget will be required to enhance the database and data entry functions further than the "base level" of 1 set of standards. This budget also includes the ability to integrate new standards more efficiently (import standards).

Ability for teachers to add multiple document types	$31,680.00	$28,512.00	$34,848.00

This budget item is a little subjective, but gives the teacher the ability to insert documents beyond PowerPoint into the content (the exact amount of document types TBD). This could include word documents, images, web pages, acrobat or even possibly video (inserting it directly instead of embedding it within a PowerPoint).

Total	$1,047,000.00	$942,300.00	$1,151,700.00

This document represents the conclusion of our RFP/Proposal phase, and outlines a high-level design of the Paxton/Patterson ADMIN system. It consists of summation and development of preceding CMD and Paxton/Patterson documents and meetings spanning the time from 2/02-4/02. It will be the foundation of subsequent documents, including the Requirements Document, Solution Document, and Functional Specification Document.