Web-Based Technologies: Reaching their Ultimate Potential on Restricted Budgets

Salvador Báez-Franceschi
University of Houston
204 Science and Research Bldg. 1
Houston, TX 77204-5008
(713)743-1965

sbf@uh.edu

Karen Le
University of Houston
204 Science and Research Bldg. 1
Houston, TX 77204-5008
(713)743-1627

Kle3@uh.edu

Dr. Diana Velez
University of Houston
320 Student Svc Ctr 1
Houston, TX 77204-3023
(713)743-9005

dvelez@uh.edu

ABSTRACT
Academic institutions' dependence on web-based technologies to improve efficiency in class offerings, academic records, and office documentation is increasing at a rapid pace. The resource constraints of most academic institutions require that the technology be flexible, expandable, easily maintained, and cost efficient. The VNet platform suite directly meets these needs and provides capabilities far beyond those available in current products.

VNet is a modern web-based operating system and applications platform suite, which is presently being developed and implemented at the University of Houston. Besides serving as a central access point to available electronic campus resources, VNet also provides additional innovative services to students, faculty, administrators and staff.

VNet is thus changing the way the University community communicates and exchanges information by:

- centralizing information environment for administration and academic services,
- replacing obsolete and time-consuming paper forms with modern web electronic forms,
- allowing staff to archive all documents electronically for fast web retrieval,
- providing faculty real-time access to cost centers and remote management of financial accounts,
- making modern technology multimedia services such as streaming course lectures and news bulletin boards easily accessible, and
- establishing a secure and fast environment for development of new web applications.

Our target audiences include 1) large, modern academic institutions aiming to remain at the forefront of technology by utilizing the most user-friendly, cost-effective products in the market and 2) smaller institutions desiring to incorporate advanced technology in to their core activities on restricted budgets.

Categories and Subject Descriptors
H.2.4 [**Database Management**]: Systems – *Distributed databases, multimedia databases, relational databases, query processing, and transaction processing.*

H.5.3 [**Information Interfaces and Presentation**]: Group and Organization Interfaces – *organizational design, web-based interaction, and theory and model.*

General Terms
Design, Security, Standardization

Keywords
Management, web operating system, model, University of Houston, VNet, information technology, web services, restricted budgets, web-based technologies

1. INTRODUCTION
The University of Houston System is home to the most ethnically diverse student body among the nation's research universities. The Central Campus has approximately 35,000 students, 1,900 faculty, and 3,900 staff. Recognizing technology is changing the face of higher education, the College of Natural Sciences and Mathematics (NSM) and its partners (Technology Support Services and Office of Undergraduate Academic Development and Retention) adopted the mission to be at the forefront of major research universities in the use and development of information technology.

The decision to develop the VNet partnership came about two years ago. The Virtual Technology Center (VTC) was created to design and implement a strategic plan to achieve this ambitious goal. VTC could not afford to be dependent merely on existing technology. We needed to complement existing technologies with in house development and research. VNet thus became the centerpiece of this new Web technologies plan. VNet's main goal was to develop and implement a web-based paperless communication environment for students, faculty and staff.

Most academic institutions face mounting technical and fiscal challenges to stay at the forefront of technology. These challenges require the development of technology that is flexible,

expandable, easily maintained, and, of course, cost-efficient. VNet is able to respond to those concerns. In addition, a key requirement in VNet's design is an interface that is familiar to users and easy to learn. In short, the interfaces of our applications behave as standard operating systems.

2. WHAT IS VNET?

One of our primary goals is to enhance the information flow and access for both the administrative and academic communities in a manner that is easy and cost effective. To this end, we want a system with a shorter learning curve and lower support and maintenance requirements than high-end applications. Other web-based solutions in the educational market offer implementation costs in our budget range, but their features do not meet our requirements.

To be effective VNet has to be more than just a portal system. It also needs to be a system platform that is very similar in design, capabilities, and features to the Windows or Apple operating systems. The major difference is that all VNet applications are designed to run from the server, and they will mainly be accessed through a web browser. Hence, VNet is a "web operating system platform" with most of the basic capabilities a user may expect from a traditional OS. That is, it has a desktop, applications, development environment, and a built-in security system.

3. CAPABILITIES SUMMARY

- VNet connects to all major databases (Oracle, MySQL, Access, Sybase, Filemaker and others).

- The server side and client side are compatible with the most popular operating systems on the market (Windows, OS X and Linux).

- It has a secured and encrypted communication environment including a virtual file management system that allows higher file security.

- It is mostly based on open source applications that allow most of the built-in functionality of VNet to be available to developers for modifications.

Figure 1. VDesktop window view.

4. APPLICATIONS

VNet's fast and efficient application development environment has allowed us to create complex and unique applications in a relatively short amount of time. We have been able to include high-end features that are only available from prohibitively expensive commercial applications. Currently, we have 16 fully developed applications and others are under design.

VNet applications currently include: VDesktop (user customized web environment), VAdmin (admin management), VContacts (contact management), VCalendar (calendar and scheduling), VRecord (records tracking), VHome (web user file management environment), VHomepage (web page automated design), VClass (electronic course management), VReservation (room and equipment reservation system), VResource (electronic publishing), VPublication (publication and search engine system), VNews (news publication), VPurchase (purchasing management), VReport (report generation), VAdvising (tools for advisor record keeping and management).

4.1 VCLASS

VClass is an innovative academic tool. By using the *VClass* streaming feature, professors provide their students with video versions of their class lectures through the web without technical intervention by technical staff. In addition, professors have the ability to post any course related material such as notifications, notes, practice problems, and much more on the Internet with the click of a button.
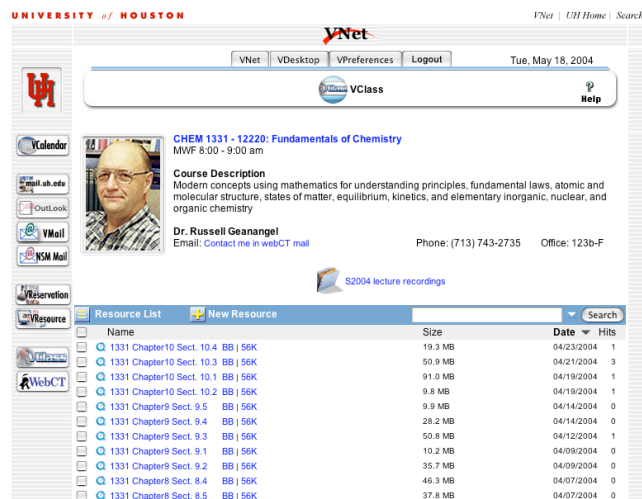

Figure 2. VClass course window view.

VClass also provides easy customization and management of course content as well as easy upload/download of electronic documents such as syllabi, text handouts, PDFs, audio and video file formats, and images. Students can review lectures or specific topics at any time or view real time notes or announcements posted by the instructor. Hence, *VClass* provides tools to simplify the process of distributing resources and information and increase the accessibility of such resources.
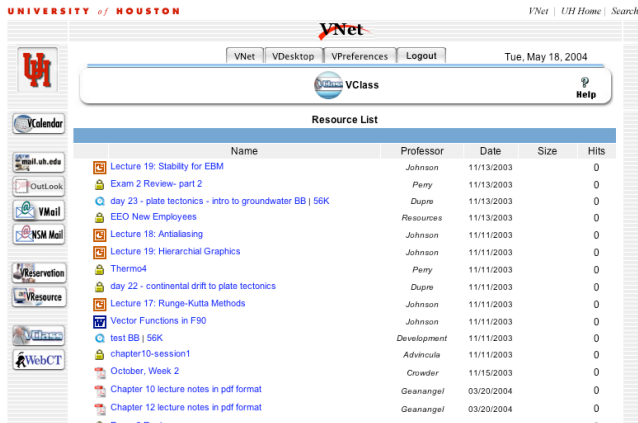
Figure 3. VClass resource list window view.

For professors, *VClass* provides all the tools needed to stream lectures without the need for extensive technical support-personnel or expensive equipment usually required by traditional streaming tools. Professors can record his/her visual and voice notes and publish them on the Internet in a matter of minutes. The traditional streaming publishing procedure requires complicated and time consuming file processing. It makes daily streaming lectures possible since it reduces a complicated process into a simple task. File upload to the server is an easy step that can be done on any web browser's window. Files are automatically processed on the server for streaming and published to the web.

4.2 VRECORD

VRecord provides the ability to archive, update, and retrieve records quickly and easily. Input methods can be web form submissions or scanned document attachments; yet the information is stored in a consistent format for easy retrieval and update purposes.
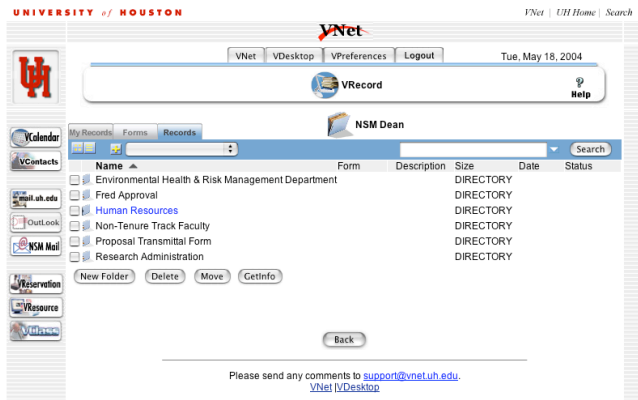

Figure 2. VRecord folder list window view.

VRecord also provides a view window with information on the user's academic and administration records and notifications of the processing status of previously submitted documents. In addition, *VRecord* can be used as a powerful tool to publish encrypted web forms instantly.

4.3 VCALENDAR

VCalendar condenses the overwhelming amount of information regarding appointments, tasks, and events into a manageable and easily accessible format. This application enables the user to sort

all the necessary and important day-to-day functions, to manage workflow, and to list daily tasks and campus announcements.
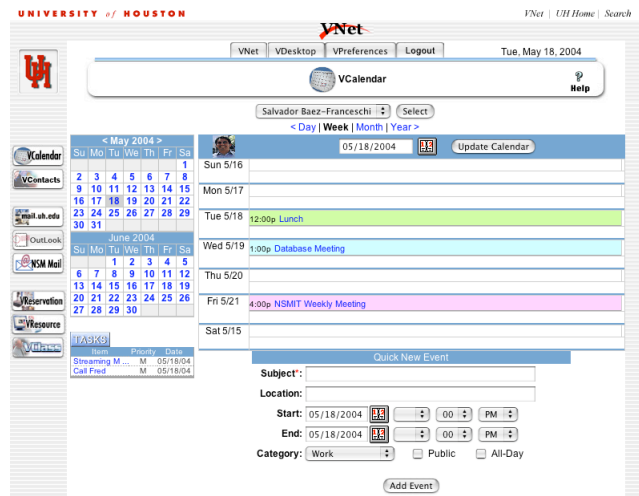

Figure 4. VCalendar week window view.

VCalendar also allows users to add events of other users or groups to their calendars. Intelligent features alert users about items of immediate attention, such as class registration due dates. It becomes the user's virtual point-of-contact with the University; the first place to go every day in order to sort out daily events and tasks. *VCalendar* has been thoughtfully engineered to be more than a personal organizer. It is an intelligent tool that communicates with other VNet applications. For example adding a reservation in *VReservation* triggers an automatic posting to *VCalendar*; signing up for an event will automatically add the event to the user's calendar. Since we don't have a per-user license fee we can afford to extend this service to all students, faculty, and staff.

4.3 VAdvising

VAdvising integrates several of the existing applications such as VCalendar, and VRecord. The application not only facilitates advising contact between students and advisors, but it also permits the creation of databases critical to student academic development planning and program. VAdvising has the ability to generate reports based not only on the data created by the user but also information from other databases; therefore, it provides faculty, academic programs managers, and administrators a quick, cost-effective means of generating assessments, institutional effectiveness reports, and other documents central to institutional strategic planning and student academic management.

As an advising tool VAdvising makes it possible for students to set up appointments with their advisors and to keep track of each session. The advisor has his or her own portfolio in which they manage their appointments, pull up a snapshot of the student's academic record from the student records system, see the student's request sheet which lists the issues to be discussed, and make entries into a journal in which the outcomes of the academic intervention for that session is recorded.
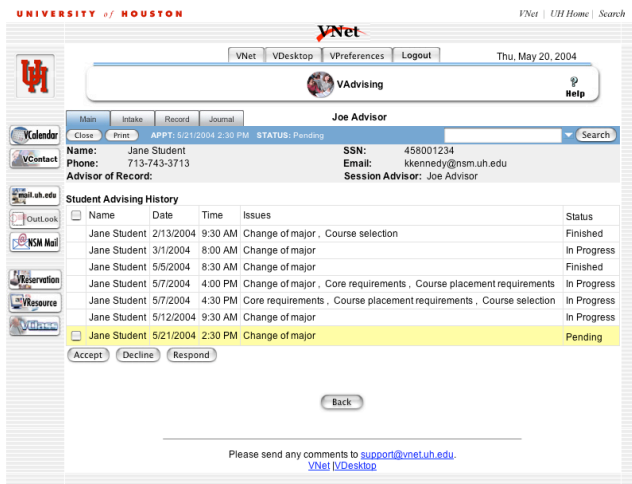
Figure 5. VAdvising week window view.

Information collected on these interventions then forms a unique database that marries the traditional student records information with the narrative data contained in the advisor's portfolio. This system is being provided to all colleges on the UH campus, with modifications that respond to the unique needs and disciplinary makeup of the colleges. Once adopted the system will make it possible to track a student's academic progress throughout their stay at the university. VAdvising is a valuable tool for providing quick, authoritative, and reliable academic intervention on behalf of all students no matter where they may reside on campus.

5. ADVANTAGES OVER TRADITIONAL OPERATING SYSTEMS AND APPLICATION PLATFORMS

- VNet applications run on most popular operating systems (Windows, OSX and Linux) without modifications.
- It allows simpler network access
- It has a higher level of scalability and security.
- Productivity enhancement offered by VNet enables our Institution to save time and money.
- Users and developers can now focus less on technical challenges and more on creative and business advancements.
- It has a shorter learning curve with reduced overall cost for data-intensive applications.

6. IMPACT OF VNET

- College of NSM web presence has increased dramatically. Total hits increased from approximately 2.3 million/year in 2002 to close to 14 million/year in 2003 (+600% increase). Total unique users increased from around 25,000 in 2002 to more than 110,000 in 2003(+440% increase).
- One of our initial VNet applications, *VClass*, has revolutionized the educational environment at UH. Since its

implementation, there has been an exponential increase in the number of faculty publishing course materials and some have gone as far as streaming classes on the Web on a daily basis. Students have benefited enormously! Research studying the effectiveness of VNet is currently being conducted at the University of Houston. The preliminary results indicated that streaming classes on a daily basis improved average test scores in science classes by 5-10% percent.

- Administrative applications such as VPurchase and VReport are helping research by simplifying the processing of preparing purchase orders for research supplies and equipment. Faculty can now approve purchases from anywhere in the world.
- Collaboration between departments has increased and duplication of technology efforts has decreased dramatically.
- IT funding from external resources to the College has increased substantially.
- VTC is identified at the University as a leader in technological development. Other colleges and academic programs within the campus are benefiting from these efforts.

7. CONCLUSION

Web technologies are changing and will continue to change the face of education. Reaching the ultimate potential of web technologies will provide institutions greater opportunities to enhance their educational goals and objectives, but this is not a simple task. It requires creative planning, departmental collaboration, and long term commitment from the institutional administrators.

Key to good planning is the ability to prioritize goals and establish deadlines. In addition, identifying and securing recurring funding for the projects should not be limited to just the early stages. It should be part of the ongoing operational responsibilities of the department managers.

External funding opportunities are essential in the funding and development strategy. Partnerships with the private sectors and other universities need to be part of any future planning strategy.

In order to expand the potential of VNet applications, a private company has been founded. In collaboration with UH, it will further develop a commercial version of VNet to bring one of the most innovative and cost effective web technologies to academic institutions across the U.S.

8. ACKNOWLEDGMENTS