Educational Technology on Demand: It's About Time!

Northeastern University is responding to a challenge from students to give them access to university services and software from anywhere, on demand

By **Bob Weir, Rick Mickool,** and **Leslie Hitch**

Today's incoming freshmen, born in 1988, have never known a time when the Internet and personal computers were not ubiquitous. They expect "what I want, when I need it, wherever I happen to be, on whatever workstation I have available." Many industries already meet this demand—entertainment (legal or pirated), cable TV, digital video recorders, and financial services. The term "on demand" is often used for this constant availability, including in numerous industries and venues where it accurately describes these expectations, yet colleges and universities have lagged behind in ubiquitous delivery of services.

This article introduces Northeastern University's initiative to create ubiquitous delivery of university services for students, faculty, and staff. Northeastern On Demand will offer both the academic and administrative campus computing experience without the limitations of place, time, or workstation, with the only common link being the Internet.

Northeastern On Demand

In the summer of 1998, during the recruiting process for vice president of Information Services at Northeastern, students challenged candidates on a number of fronts, including the overarching request to access university services and software from anywhere. They wanted services delivered via the Internet in campus labs and residence halls, in off-campus apartments, at their employer's location when on co-op duty, or at their parent's homes. In 1998, these demands not only seemed farfetched but, given the technologies of the day, virtually impossible to deliver either at scale or for a reasonable cost. Fast-forward eight years. Technologies available today, when combined with the desire to deliver a unique, personalized, and customizable environment to each constituent, hold the promise to deliver higher education technology on demand.

The Northeastern On Demand initiative, partially deployed as of this writing (May 2006), aims to untether the campus community from campus-based technology. Our objective is to deliver the tools and applications necessary for faculty, staff, and students to do their work and to store, retrieve, and share that work wherever they are and on whatever workstation is available.

Three foundational components are required to meet the objectives for Northeastern On Demand: a strong enterprise portal, including robust authentication services; a desktop application delivery capability; and Web-based storage. Based on that framework, we have sought out and are integrating current and emerging technologies.

Enterprise Portal—myNEU

The backbone of Northeastern On Demand is myNEU, a mature enterprise portal not unlike those created by other major institutions. myNEU is powered, primarily, by the Luminis tools from SunGard SCT.

More than 95 percent of Northeastern's 18,000 undergraduate students, the majority of our graduate students, and a growing number of faculty and staff use myNEU each day. Services provided span registration, financial management, co-op job search and placement, dozens of automated administrative processes, access to the library, and access to the Northeastern online learning environment—all under single sign-on. From acceptance through matriculation, students use the portal for the bulk of their business with the university.

myNEU is distinguished by the level of personalization available to users and the authentication services supporting it. Underlying myNEU are sophisticated, integrated databases containing the individual information for each member of the myNEU community. The databases are linked to, and updated by, our enterprise student, human resources, and financial systems. For students, this information includes discipline, cohort, status, course, registrations, and so forth. For faculty and staff, this information includes role, discipline, department, course/section rosters, advising calendar, and so on. This identity and information management capability is key to delivering personalized, secure information and transactions.

Desktop Delivery—myTools

A new application we call myTools, known commercially as Softricity, differentiates Northeastern On Demand from other remote access solutions. This application took us into new technological territory through a streamed, virtualized application-delivery model.

In a large and diverse university, workstation and software availability often become problematic. Expense and heterogeneous workstation requirements result in faculty, staff, and students having a broad variety of workstations that must be supported without the benefit of standardization. Additionally, the desktop software required varies widely by discipline, role, enrollment, and preference, such as the multiple types of statistical software packages preferred by individual faculty members even when teaching different sections of the same course.

During our exploration period, we found current technologies for delivering desktop applications unsatisfactory because they were not scalable or could "break" an individual's machine all too easily. Citrix and other server-based delivery would not scale to our needs. Workstation ghosting or imaging technologies are destructive, since they all start with the equivalent of "format the hard drive." Direct software installation is overly complex (the famous "DLL Hell") and inflexible in terms of supporting multiple versions of a given package on a single workstation. Additionally, many vendors strictly limit use of their software on personal machines. myTools delivery permits an individual to access the specific software required, on any workstation, while leveraging the university's site licensing.

With Northeastern On Demand, the software required by an individual (based on their role, discipline, enrollments, and so forth) will be dynamically delivered to any available Internet-connected workstation through streamed delivery. When a customer selects a software package from his or her personal menu on the myNEU portal, the Softricity technology on Northeastern servers streams a virtual PC environment onto the workstation and then streams a "virtual copy" of the requested application into that environment. From the user's perspective, the application operates exactly as if it were installed on the workstation; in fact, it executes using the workstation's resources. When a user working on a public workstation, such as at a library or Internet cafe, finishes using the application, saves his or her work to myFiles (Internet-based file store—see the next section), and logs off myNEU, the environment and access to the applications are deleted, preventing a subsequent user from accessing the prior user's applications or data.

The process works just as well on an individual's personal computer. Use of the virtual software is authorized for a predetermined period of time, including when the workstation is not connected to the Internet (disconnected use). Once the user reconnects their personal workstation to the Internet, the clock is reset. Work can be saved to myFiles or to the person's hard drive.

For example, assume the engineering department has purchased specialized software, licensed for all engineering faculty and for a concurrent number of electrical engineering majors. Typically, such specialized software is only accessible in specialty computer labs. With Northeastern On Demand, an engineering faculty member or an electrical engineering major can log onto myNEU and be identified, through attributes coded though the registrar and other systems, as authorized to access this specialized software. The student can use the software for a specified period (usually a semester), as often and for as long per session as necessary. The software itself remains on the campus server. Should the student drop the course requiring the software, access to the software is revoked. This capability has far-reaching possibilities for teaching and learning (see the section on classroom integration below).

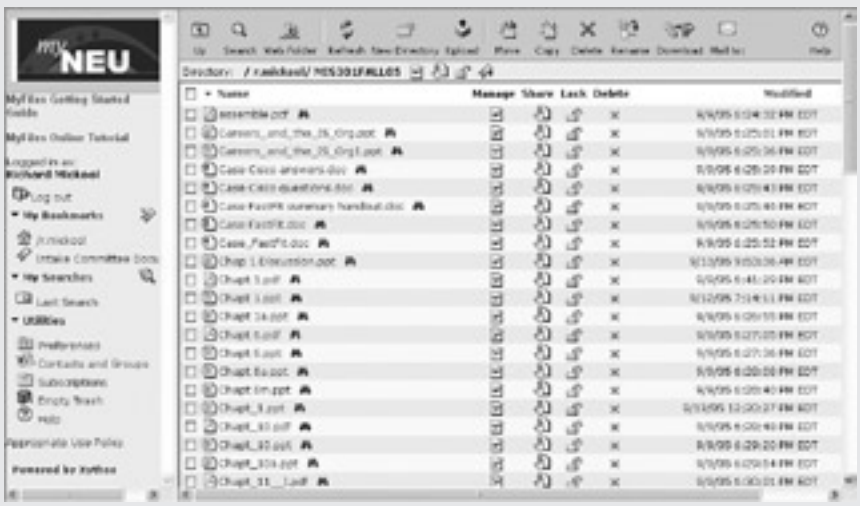
Storage—myFiles

The last component of Northeastern On Demand is myFiles, a storage and collaboration capability that makes it easy to store and retrieve work done on myTools applications anywhere, at any time. Since it launched last fall, students and faculty have quickly adopted myFiles to support everything from class projects to major interdisciplinary grant proposals.

With myFiles, each member of the community has a personal storage space equivalent to a virtual hard drive to store and share work. Each student receives up to 1 gigabyte, and each faculty and staff member receives up to 2 gigabytes. This storage, which is mapped like any physical hard drive, resides on Northeastern's EMC enterprise storage complex. It is available anywhere a user can access the Internet and log onto myNEU. The access software, supplied by Xythos Corporation, presents the storage in standard disk/folder/file conventions. An example view of the myFiles interface appears in Figure 1.

Figure 1

myFiles Sample Interface



myFiles supports not only storage needs but also collaboration in and across institutions and organizations by enabling an individual to authorize others to access stored work at the disk, folder, or file level with read-only or read-write capability. For others within the myNEU community, a user simply designates the other person's myNEU user ID. For those outside the myNEU community, a user can authorize an individual through security certificates. In both cases, the individual who owns the space in myFiles can change or deny access to anyone else at any time.

Classroom Integration—myCourses

While the three components of Northeastern On Demand (myNEU, myFiles, and myTools) are valuable individually, perhaps the most compelling value we anticipate is the personalization, integration, and mobility the service can bring to the academic experience. We are currently working on myCourses, an integration of all the information, materials, and tools necessary for faculty to teach and students to take a specific course.

A student registered for a particular course and section will receive the information and technology required for the course in a single, integrated environment available literally anywhere and on any workstation. This information will include the time and location of the class, the syllabus and presentation materials for the course, the software tools the faculty member has specified to complete the coursework, and online, sharable storage for class work. Figure 2 shows a possible myCourses screen for a class on graphic design.

The myCourse capability provides ease and ubiquity of access to complex and often expensive tools and data for students (and faculty and staff), whether in their homes or on the other side of the world. It also has significant pedagogical implications. Students will be able to "play" with the application, for example enabling the College of Criminal Justice to rethink course delivery and encouraging broader, more experimental and experiential use of these tools. myCourses will also streamline software delivery for hybrid and distance courses, enabling adult continuing and professional students to access the university computing experience without setting foot on campus.

To ensure the desired accuracy, we are carefully integrating information from our student, faculty, and employee systems

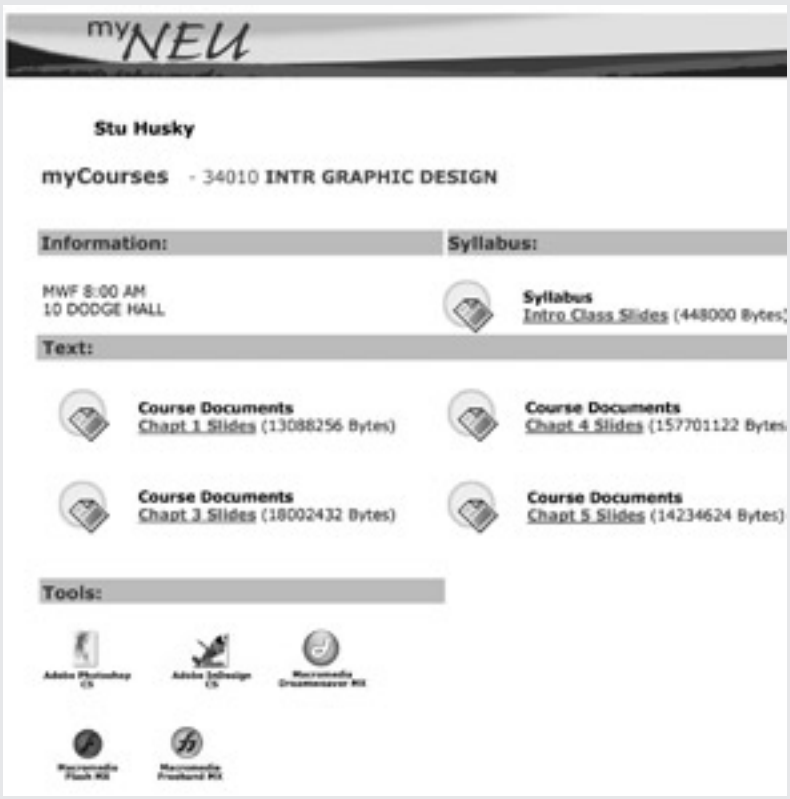
Challenges

We are addressing a number of challenges concurrently while continuing to explore various solutions. One is identity management, where a customer's role, status, and other attributes must be accurately and dynamically managed. Having raised a customer's expectations through personalization and service delivery by role, we consider it unacceptable to deliver the wrong experience (for example, a physics student receiving access to a health science course in which he or she is not enrolled). To ensure the desired accuracy, we are carefully integrating information from our student, faculty, and employee systems. So, for example, a student's Northeastern On Demand experience changes should he or she add or drop a course in the registrar's system.

Another challenge is customer support. Globe-trotting community members need always available support. Given the expense of full support, On Demand technology must be both trouble-free and easy to use in order to minimize support calls. The support team also needs to support customers when no customer experiences (or screens) are the same due to personalization. This is a major paradigm shift

Figure 2

myCourses Sample Interface



for our customer support teams, and we are reviewing cost-effective ways to deliver this support.

At Northeastern, scale and heterogeneity pose major challenges. With 20,000 undergraduate and graduate students in hundreds of departments and majors, the complexity of supporting personalized delivery is significant. Add to that supporting more than 4,000 faculty and staff, over 5,000 continuing education students, and, eventually, 160,000 living alumni, and the need to deliver Northeastern On Demand at scale for an affordable cost becomes imperative.

A final challenge we'll mention is that providing a personalized, fully integrated On Demand experience requires unprecedented integration across the various functions, teams, data, and communication within Information Services and with our customers. That is perhaps the biggest learning curve in making the promise of On Demand a reality.

A Work in Progress

As of this writing, two components of Northeastern On Demand (myNEU and myFiles) are fully deployed, although they continue to evolve. We are currently using myTools to distribute more than 100 different software packages into our on-campus student computing labs.

myTools, initially deployed on campus, will be deployed off campus over the summer of 2006. In fall 2006, we will run two full pilots, one academic and one administrative, in preparation for full deployment during the 2006–2007 academic year. In the meantime, we are establishing the critical investments, metrics, success factors, and so forth needed to deliver the On Demand vision. We plan to share that experience, in detail, with the higher education community via presentations, articles, and white papers throughout the 2006–2007 academic year.

Whether via cell phones, entertainment devices such as iPods, or computer workstations, the demand for On Demand technology services is rapidly expanding as the campus community becomes aware of the initiative's features. The ability to access the specific technology each of us needs at any time, anywhere, and on any workstation is no longer just a student desire—we all strive to be more effective and more engaged in an increasingly connected world. On Demand delivery promises to reduce complexity and cost while maximizing customer use and productivity at Northeastern. *e*

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