

ELECTRONIC SOFTWARE DISTRIBUTION SYSTEM

2005 COMPUTERWORLD HONORS CASE STUDY

EDUCATION & ACADEMIA

A UNIVERSITY DEVELOPED AN ELECTRONIC SOFTWARE DISTRIBUTION SYSTEM TO EFFICIENTLY DISTRIBUTE SOFTWARE TO STUDENTS, FACULTY, AND STAFF. THIS SYSTEM PRESENTS THE USER WITH A LIST OF AVAILABLE SOFTWARE AND TRACKS DISTRIBUTION IN ORDER TO ENSURE LICENSE COMPLIANCE. [20055370]

SUMMARY

The University of Pittsburgh developed an electronic software distribution system in to efficiently distribute software to students, faculty, and staff. This system presents the user with a list of available software and tracks distribution in order to ensure license compliance.

APPLICATION

Academic licensing programs have afforded unique opportunities to colleges and universities not only to affordably put valuable operating system, business productivity, and specialized engineering, statistical, mathematics, and other types of software into the hands of their faculties and staff employees, but to make these products available to students. Software publishers have increased student license program offerings in an effort to reduce piracy but more importantly, to ensure that students have used their products before they enter the workforce and serve as the impetus for software buying decisions at much higher corporate software prices.

Distributing software within a large multi-campus educational system is challenging because license terms and conditions vary substantially from one publisher's contract to another's. Product selections are usually different depending on the end user of the package. The programs and funding sources for software also present many challenges that businesses do not face.

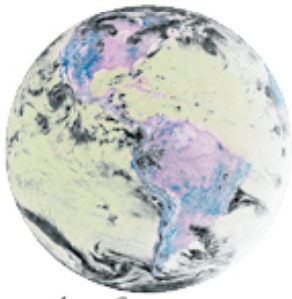
Prior to the implementation of an electronic software delivery system, the University distributed software primarily on CD-R media. The software distribution office received gold masters for each application or product suite and duplicated media for distribution as needed. At its peak, the University's central software distribution office produced more than 45,000 copies of licensed software media per year. Some University contracts permit only electronic distribution of software. The proliferation of distance education programs presents additional challenges to media-based software distribution that are eliminated by distributing software electronically.

Electronic software distribution has always been a goal within the University's central IT organization. As soon as enterprise license agreements were implemented at the University, server-based software distribution methods were devised. Software for IBM-compatible computers was distributed largely from Novell NetWare®-based file servers. UNIX workstations were used to deliver UNIX platform products, Macintosh™ servers for Apple products, etc. The user community was reluctant to adapt to electronic receipt of software because the access schemes included temporary passwords to accounts on server. The process was highly manual, difficult to manage, and as the volume of software available continued to increase, the problems became worse.

Prior to developing the enterprise software distribution system, the University evaluated outsourced software services and found that none provided the flexibility needed to manage the complex business rules in place. Some software is made available to the entire University community at no cost to the user. Other software is available to departments on a fee-per-license basis. Still other software is available at no cost to students, but fees are charged for departmental use. A faculty program also exists through which software titles are available that are not available through any of the other programs on a concurrent-use basis and at no cost to the faculty member.

The goal of the electronic distribution system was to make available to any University user the software packages that are available to him or her at no cost. The intent was that the system would be able to determine the user's role and provide a detailed listing of available software titles based on that role and permit the user to download software accordingly. In order to ensure that the University remains in compliance with its license agreements, the system maintains records of each download. User authentication ensures that software is distributed only to individuals actually affiliated with the University of Pittsburgh

The Electronic Software Distribution project (ESD) was created to deal with these issues. The goal was



A Search for New Horizons



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Chairman of the Chairmen's Committee

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to design a system that was easy to use, could enforce the business rules of the University, and could be created upon a highly scalable infrastructure. With these goals in mind, the project team was divided into three sub-teams to address system infrastructure, business rules, and the user interface. The ESD infrastructure relies on numerous common technologies leveraged against one another to provide the reliable, flexible, and high performance environment necessary to support the project. The main campus location is serviced by a three-tiered server farm consisting of three pairs of Dell PowerEdge servers running Microsoft Windows 2000 Advanced Server. The web tier utilizes Microsoft Internet Information Server 5.0 with the requests being balanced among individual web servers through Microsoft Network Load Balancing.

The middle tier houses the 296 software packages that are distributed electronically. Occupying some 250 GB of disk space, these packages are stored on a XIOTech Magnitude storage area network. The middle tier is made highly available through the use of Microsoft Cluster Services.

The database tier utilizes Microsoft SQL Server 2000 Enterprise Edition and is made highly available using Microsoft Cluster Services. Due to the volume of software available for distribution and limitations on inter-campus network bandwidth between the University's main campus in Pittsburgh and its four regional campuses located across western Pennsylvania, distribution servers were installed at each regional campus. The regional campus distribution servers host a two-node Microsoft Cluster Server that runs all three of tiers. All users, regardless of location, connect to the system using a single URL. Application logic determines the user's location and transparently redirects them to the closest distribution point.

Due to the broad range of client operating systems in use on student, faculty, and staff machines and because users connect to the network in a variety of ways, the project team decided to offer each application in three different ways. Remote users with broadband connections can download one large archive of the software. Users who have slower or unreliable connections can also download these large archives but can elect to download the application in multiple segments. Those users directly connected to the University's network through a wired office or residence hall port can choose to "Install over the Network." This runs a Java applet that mounts a remote CD image so that the application can be installed across the network without the need for extraction and temporary space. Many users have found this option to be the easiest to use and as a result, this has become the preferred method for on-campus users.

A critical component of the application is the enforcement of business logic including rules governed by software license agreements with vendors. Each application has its own set of distribution rules. Some applications are available only to students or teaching faculty while others are available to anyone affiliated with the University. Some contracts limit the number of times an application may be downloaded by a single user. These restrictions are enforced by the web application. The authorization to permit a user to download each application is dynamically performed by comparing the distribution rules to the user's attributes stored in the University's central, LDAP-enabled directory. All transactions are logged. These logs include the user identity, location, and the software that was accessed, along with the date and time of each access.

The entire web tier application was developed in-house by the University of Pittsburgh using a combination of ASP, COM+ and Java technologies.

BENEFITS

University of Pittsburgh students, faculty, and staff have access to a user-friendly means of downloading licensed software at any time, from any location permitted by vendor contract. The user sees only the listing of software packages that he or she is eligible to use under University software license agreements and the system determines the most appropriate size and format to complete the download or installation. The unification of the interface to the servers installed at each campus location frees the user from long wait times caused by attempting to transmit very large files over intercampus network links.

The system's ease of use has led to a high adoption rate within the University community, resulting in a corresponding decrease in the distribution of electronic media. This protects the University by helping to lower the risk of unauthorized software distribution. The ability to flexibly incorporate distribution rule logic such as eligibility to access software, download limits, and geographic download restrictions helps to ensure that the University remains in compliance with its numerous and widely varying software license agreement terms and conditions.

IMPORTANCE

This project demonstrates the innovative use of a wide variety of technologies ranging from server clustering, to application logic that applies authentication and authorization based on an individual user's affiliation with the University.

ORIGINALITY

Technologies from outside vendors exist to manage the distribution of software, either through commercially available software products or outsourced services. These services, however, are generally focused on commercial software license sales and are transactional in nature and are therefore difficult at best to adapt to the University's unique software distribution needs. The University's electronic software distribution system utilizes commercially available technology wherever possible but is uniquely tailored to the challenges that an academic institution faces in the delivery of software. On its release, this was the most well-developed software delivery application focusing on end-user access to applications at any college or university.

SUCCESS

The University's user-friendly implementation of this service has resulted in a steady annual increase in the rate of software downloads. Since its inception, there have been more than 250,000 individual downloads totaling approximately 15 Terabytes of data. Due to the wider availability of software at no cost to students and faculty, these have been the most significant users of the system.

DIFFICULTY

The most daunting task facing the project team was the translation of software contract terms and conditions to business rules that could be programmed into the system and matched to eligibility criteria including student, faculty, or staff affiliation and for faculty, whether or not the individual is eligible for software available only to teaching faculty. The complexities of rules that may include geographic distribution limits, download count restrictions and other more arcane limitations required careful planning in order to ensure that the final application was sufficiently flexible to accommodate these and any new, different kinds of restrictions.