Electronic Kiosk Project:
Distributed Access to E-Mail and Web Browsing

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1. ABSTRACT

Electronic kiosks provide an alternative avenue of access to the University of Pittsburgh's electronic communication network. These limited-use devices allow students to enter PittNet, redistributing the historically heavy use of e-mail and web browsing from the Campus Computing Labs to strategically placed kiosks in public settings throughout the University of Pittsburgh campus. Electronic kiosks are capable of managing e-mail transactions and delivering full-featured web browsing in an authenticated environment.

There are currently nine kiosks in operation. The anticipated deployment over the next three years is projected to be 100 kiosks. The next phase of the project involves deploying 10-15 units.

The presenter will describe the rationale for deploying electronic kiosks throughout the University of Pittsburgh campus. Data will be presented that builds the case for alternatives to computing lab devices for access to e-mail and web browsing. The platform evaluation process will be detailed, including the factors that led to the decision to use recycled Intel devices for the electronic kiosks.

Keywords
e-mail, web browsing, total cost of ownership, recycle.

2. BACKGROUND

Electronic communication has become an essential part of student life on university campuses. More than ever, students and faculty are communicating with each other via e-mail. Faculty are using the Web as a resource for, and supplement to, their classroom instruction. Kenneth C. Green's 1998 Campus Computing Survey found that more than 44% of college classes used e-mail and nearly 25% used the Web for distribution of class materials and resources.

Significant improvements in network access have not yielded a corresponding reduction in the demand for seats in the Campus Computing Labs. Ethernet port installation in the Residence Halls has reached nearly 5,600 through the ResNet program and more than 52% of these ports are connected and utilized. The most recent expansion of the dial-up pool has pushed the number of modems to more than 750 devices. Campus Computing Lab usage has continued to expand to the point of near total saturation. As recently as 1995, peak periods of usage were associated with mid- or end-of-term exams and projects. Present conditions indicate that the Campus Computing Labs reach saturation during the first week of each term and remain at or near capacity until the term break. Standard monitoring of application loading indicates that two of the top three activities are web browsing and access to University e-mail clients (see Appendix A). As the aforementioned survey reported, the University's core activity, education, is relying on electronic communication to a much greater degree than ever before. There is every reason to believe that these technologies will be rapidly integrated into the curriculum. The University's computing environment should encourage and foster this process. However, it is clear that web browsing and e-mail access do not require the computing power currently invested in the Campus Computing Labs.

Increased demand for access to electronic communication in the Campus Computing Labs, coupled with advances in PC technology, present both a challenge and an opportunity for exploring alternative solutions to the current model for student computing on the University of Pittsburgh campus. This project will focus on providing students with access to electronic communications via distributed stand-alone kiosks.

3. PROJECT GOALS

3.1. Reshaping Access to Electronic Communication

Electronic kiosks will provide an alternative avenue of access to the University's electronic communication network. These limited-use devices will allow students to enter PittNet, redistributing the historically heavy use of e-mail and web browsing from the Campus Computing Labs to strategically

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placed kiosks in public settings throughout the University of Pittsburgh campus. The electronic kiosks must be capable of managing e-mail transactions and delivering full-featured web browsing in an authenticated environment. Emphasis should be given to IMAP mail clients such as Mulberry and other browser-based e-mail clients.

The Electronic Kiosks Project is charged with the following goals:

- provide students with secure access to e-mail and web browsing at stand-up kiosks,

- identify a solution that will reduce e-mail and short-duration web browsing in the Campus Computing Labs,

- distribute the devices in areas of high student density, and

- identify a solution that will reduce the total cost of ownership,

4. HISTORY OF THIN CLIENT E-MAIL STATIONS ON THE UNIVERSITY OF PITTSBURGH CAMPUS

4.1. Late 1998 - Early 1999

An earlier deployment (spring 1999) placed three Sun JavaStations in the William Pitt Union (WPU). These devices continue to be operational, but provide limited web browsing and do not permit the use of graphical IMAP compliant e-mail clients such as Mulberry. A user survey was conducted shortly after the deployment of the JavaStations. The results of that survey can be found in Appendix A. JavaStations were initially believed to be a low-cost solution for distributed access to electronic communications on campus. Although well received initially, the JavaStations have required more support than originally anticipated. Additionally, the product's evolution appears to be divergent from our requirements. Various aspects of the JavaStations advantages and disadvantages are discussed below.
The project leader has spent significant time evaluating the impact of the current three-machine Java station solution in the William Pitt Union. Obstacles to further deployment of JavaStations are listed below.

- Limited Computing Services and Systems Development expertise with the platform. Only one analyst understands the entire setup at this point in time.

- Complicates the student computing environment unnecessarily. CSSD should limit the number of different platforms we deploy and support.

- A separate server is required on each subnet where Java Stations are connected. This significantly raises the cost of this option (Total Cost of Ownership as well as Total Cost of Implementation).

- Additional servers on the network increase security risks. The current JavaStation server in the WPU has been "hacked" in the past.

- Performance of currently installed JavaStations (in the WPU) has been unacceptable. This was primarily due to misconfiguration of supporting servers and software. Configuration of servers and software is overly complicated.

- The JavaStations take 2-3 minutes to reset themselves between users. As a result, the devices are not a quick method for accessing e-mail and the web.

- JavaStations present a high degree of complexity in a Single Sign-On environment. Custom software was required to integrate Java Station user authentication with Kerberos. Novell Directory Service (NDS) may require a similar effort. Development can only be done in Java language.

- JavaStations have a limited capability to track usage. In the current implementation, we can only track when a student used the JavaStation or logged on. We cannot track how long the device was used, which software was launched, or any other data that might be critical when evaluating the impact and usefulness of the JavaStation.

- Presents an unfamiliar user interface (different from the Campus Computing Lab environment).

- E-mail access is available only through Pine Mail on Unix via a telnet session. This limitation does not represent a technological innovation, especially in light of the broad use of graphical IMAP compliant e-mail clients.

- The JavaStation Web browser has very limited functionality. The browser does not support SSL, which makes services such as the Online Student Information web site inaccessible. This limitation forces users to select against the use of a JavaStation. Netscape Navigator (common in the Campus Computing Lab environment) is not supported on JavaStations.

4.2. Late 1999 - Early 2000

A second prototype installation of e-mail kiosks was installed in early 2000 at the newly renovated 10th floor Benedum Engineering Hall Campus Computing Lab. Six recycled P-5 166 Intel-based devices were installed in a stand-up configuration for the purpose of providing easy access to a limited number of services, primarily e-mail access and web browsing. This approach uses an older platform with limited features to provide access to services that are network centric and generally shorter in duration when compared to a full featured lab machine. The devices will offer an abbreviated version of the standard Campus Computing Lab software image, limiting users to e-mail access and web browsing. Advantages to this approach are listed below.

- Consistent user interface for students, including graphical e-mail clients and Mulberry,

- Authentication is identical to Campus Computing Labs,

- A large number of Intel-based devices can be connected to a single server,

- Development of an abbreviated version of the standard Campus Computing Lab image is a natural extension of the existing development effort,

- Statistics and reports are generated in a fashion similar to the Campus Computing Labs, and

- Steady supply of recycled Intel-based platforms.

5.   RECOMMENDATION

The two prototypes provided an opportunity to test two different solutions and to comprehensively evaluate the impact of each approach. In addition to the original goals, several of the most critical considerations include the following:

- The e-mail kiosks must utilize a desktop image that is familiar to the students and does not present another variation for the Development and Support staff to contend with.

- Aesthetic issues, especially in areas such as the WPU and the Commons Room of the Cathedral of Learning, will need to be factored into the final appearance of the kiosks.

- In order to reduce the complexity of support and the capital costs, the final solution for the initial campus-wide deployment should require no server or only a single server.

- Physical security of the kiosk enclosures must be ensured.

Based on our experiences and the feedback from student users, we recommend that the project move forward using the recycled Intel platform approach. Kiosks enclosures will be purchased new and installed in locations based on the recommendations gathered from the Student Government Board and the Student Activities Organization. The anticipated deployment over the next three years is projected to be 100 kiosks. The next phase of the deployment involves deploying 10-15 kiosks and replacing the platforms in the three kiosks in the WPU with recycled Intel devices (see Appendix B for project plan).

6.   BUDGET ESTIMATES

The project plan identifies one IBM Netfinity server at a cost of approximately $8,000 as required for the project. Other project costs include port and AC power installation, software licensing and the cost of the kiosks enclosures.

The Intel-based platforms will be recycled ($0 cost) from the Campus Computing Labs as new PCs are upgraded. To date, 12 recycled Intel-based devices have been identified for the next deployment. Keyboards with integrated pointing devices will be purchased for all kiosks at a cost of approximately $100 each. Preliminary estimates indicate that kiosks enclosures costs will be in the range of $2,000- 3,000 per unit. Sample kiosks will be shipped for review prior to purchase.

FY 2000 budget funds will be used for the next phase (10-15 kiosks) of the deployment.

7.   SUSTAINABILITY

The IBM Netfinity server will be serviced and maintained in an identical fashion to the current Netfinity servers used to support the Campus Computing Labs. That service is currently provided by staff from the Development group of CSSD. Although the desktop image is expected to remain quite stable, client desktop maintenance will also come from the CSSD Development group. We expect to use a proactive approach to client device failure by employing a responder that will alert us to problems at a particular kiosk. As the number of kiosks increases beyond 15-20, part-time student staff should be hired to support the effort. The nine kiosks currently installed on campus have not suffered any adverse damage or vandalism in the past 11 months. We will learn with experience what failures or damage can actually effect the kiosk enclosures. The kiosk project relies on a somewhat steady stream of recycled Intel platforms. As recycled kiosk machines fail, they will be replaced by machines from a small reserve of recycled Intel devices. If our Campus Computing Lab machine replacement cycle were altered, that would impact the rate of expansion of the kiosk project.

8.   PROJECT PLAN

The E-mail Kiosk Project Plan has the following six major tasks:

- Identify Project Goals

- Formation of the Project Team

- Architecture, Plan and Design Specification

- Identification of Resources and Requisition of Capital Items

- Development, Testing and Implementation

- Post Project Analysis and Report

Time to completion of the Development, Testing and Implementation Tasks is approximately 172 days. Total duration of the next phase of the project, including the Post Project Analysis and Report is projected at 202 days. Following the Post Project Analysis and Report, additional kiosks will be purchased, built and installed at the rate of approximately 30 per fiscal year, through FY 2003.

9. ADDITIONAL DEVELOPMENT AND DESIGN

Following the post project analysis and report, development time will be devoted to an additional kiosk feature. The team will investigate the feasibility of adding a stand-alone, non-authenticated and non-network dependent application that will serve as an interactive screen saver. This screen saver might provide images of the University of Pittsburgh campuses and a map of the Oakland campus. Early discussions suggest that a media player file that runs locally could meet this request. Development time will be built into the next phase of the plan.
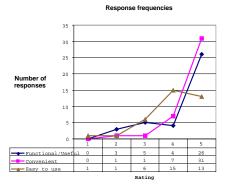
APPENDIX A

Campus Computing Labs - Top three applications used during February 2000

Application	Total Time Used	Total Time in Use (Hours)
Netscape (all	205,401	104,193
MS Word	80,711	49,534
Mulberry	18,284	20,320

APPENDIX B - SUMMARY OF JAVA STATION SURVEYS - ADMINISTERED APRIL 1999

1) On a scale of 1 to 5, one being poor and five being excellent, please rate the email kiosks on the following:

	1	2	3	4	5
Functional/ Useful	0	3	5	4	26
Convenient	0	1	1	7	31
Easy to use	1	1	6	15	13

Response frequencies

	1	2	3	4	5
Functional/Useful	0	3	5	4	26
Convenient	0	1	1	7	31
Easy to use	1	1	6	15	13

2) Do you think that Computing Services and Systems Development should expand this service to include other locations such as in the lobby of the Towers or other residence halls?

Yes   35   No   1

Suggested locations:

Location	Frequency
Cathedral of Learning	11
Towers	8
Forbes Quad	6
ULS	4
Langley	3
Chemistry	2
Benedum Hall	1
CC Labs	1
Clapp	1
Forbes Hall	1
Music	1
Thaw	1
Each Department	1
All major lobbies	1

3) Would you use a kiosk instead of going to a public computing lab?

Yes   35   No   2

4) Do you plan to use a kiosk again?

Yes   36   No   0

5) Do you have any suggestions for this service?

Comment	Frequency
Keyboard problems	5
Establish a time limit	4
Faster machines	4
Better Help/instructions	3
Install more kiosks	3
Keypad problems	2
Access to secure servers	2
Ability to print	1
Access to Student Info	1
Image is different than lab desktop	1
Mulberry	1
Need space for books, etc.	1
Telnet	1
This is a good idea	1
X-windows	1

6) Do you have any other comments regarding the e-mail kiosks or computing on campus?

Comment	FREQUENCY
Use time limits at kiosks	7
Service is good	5
Kiosks are good, cool or neat idea	5
Get rid of Macs	2
Long lines and crowded labs	2
Add more machines	2
Better keyboards on kiosks	1
Clean terminals	1
Kiosks are long overdue	1
More campus phones	1
No help at DL Lab with a file attachment	1
Too many broken PCs	1