Subcommittee on Courts, the Internet, and Intellectual Property

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Written Testimony

I want to thank you for the opportunity to appear before the Subcommittee on Courts, the Internet, and Intellectual Property to provide you information regarding the education of resident students and a new approach to mitigating Peer To Peer (P2P) file sharing. With me is Mr. Rob Bird the architect of the Icarus software platform.

There are over 2 million students living in residence halls on campuses in the United States. Today, first year students are moving into residence halls where suites and apartment style living is becoming increasingly available. There exists greater studying and recreational facilities; contemporary dining accommodations; and larger rooms with more storage to name a few. However, one of the greatest additions to residence halls has been the high speed Ethernet connection.

The Ethernet connection in residence halls serves as its primary purpose to support the academic mission. Many institutions, including the University of Florida, utilize this high speed residential connection for on-line classes; accessing on-line services (i.e., class registration, room sign-up, ordering class textbooks, etc.); replaying video classes; accessing class syllabi; working on group projects, and the like.

We are seeing connection speeds that only seven or eight years ago were the slow dial up modems to now 10 MB, 100 MB, or 1000 MB (1 Gigabit) speeds. As a comparison, with a dial up modem it would take a person about 29 hours to download the two hour movie, *Star Wars*. With a Gigabit connection it takes about 6 seconds to download that same movie. The speed and efficiency of this technology is tremendous and will continue to gain in the future.

In the housing profession and as a member of the Association of College and University Housing Officers – International, we have two duties regarding the data

connections we provide to students in residence halls. First, we have a **duty to educate our resident students as to the acceptable use of their computer and the network**. Second, we have a **duty to be good stewards in maintaining the technological infrastructure** that we provide students in the residence halls.

Education

In educating the resident students, we know many of our housing operations across the United States have integrated the academic community within the residential setting. Institutions have residence halls with live-in faculty, "smart" classrooms, faculty offices, space for tutoring, space for academic advising, and the like. We see science-based (i.e., engineering, math, etc.); education-based (teaching, etc.); and fine arts-based (i.e., architecture, dance, theatre, etc.) residentially-based academic communities. These types of arrangements and others lead to increased grade points for residents, increased graduation rates, increased respect for faculty, and increased psychosocial development, to name a few. The education of our students does not only take place in the classroom environment. The classroom environment is now in the residential setting.

Accompanying the residential academic environment is the need for housing operations to assist in the education of resident students on acceptable uses of the technology available to them. In an on-going study (J. Haynes and N.W. Dunkel, 2004), we have found that of the institutions surveyed with high speed connections in residence halls, 92% actively or passively educate their residents on the acceptable use of their computer and the Internet.

There exist a number of different approaches to this education. The information that is shared with residents may be as simple as defining terms and providing answers to

frequently asked questions. The information may provide a general overview of the various aspects of a network and computer usage. At the University of Delaware students must take a responsible computing exam before they can obtain a network ID and password. The exam covers copyright resources, computer security, spam and harassing e-mail, bandwidth measurement, and commercial and charitable use. At the University of Hawaii in Manoa residents sign for the handbook accepting responsibility for reading and following the rules contained within. At the University of Florida residents register their computer on-line and electronically sign that they have read, understand, and will abide by the policies governing acceptable use.

We know that for some students reading the policies is all they will ever need. These students will accept the policies and make no attempt to circumvent the policies. For other students we need to be more active in our oversight and education.

Stewards of Technology

Housing professionals must be good stewards of the technological infrastructure provided to students. The information that follows provides a summary of the Icarus software platform developed by Mr. Rob Bird.

Introduction

The University of Florida Department of Housing and Residence Education's Mission Statement is to provide well-maintained, community-oriented facilities where residents and staff are empowered to learn, innovate, and succeed. As staff worked to develop a software program to mitigate P2P file sharing, discussion continued on how to simultaneously educate resident students while maintaining a network service free of illegal copyright sharing behaviors. This was a daunting task as most first year students

arrive to campus having practiced P2P file sharing at home during their high school years. According to students, during high school years very little education on illegal file sharing was provided either by their high school or by their parents and student behavior remained unchecked.

University of Florida housing staff wanted resident students to understand that when they arrive on campus a new level of personal behavior and responsibility on the use of their computer would be expected.

Icarus

Described as "an extraordinary success" (Sherman, 2004), Icarus is a massively concurrent, distributed processing engine designed to provide the power of collaborative grid computing to the enterprise network management and security space. This patent-pending system is based on the Java language. The Icarus engine has been built to act as an open-standards middleware processor, allowing applications, libraries and scripting languages to be harmoniously coordinated together to accomplish tasks across the enterprise or federation. It has extensive applications in distributed computing, security, collaboration and management. By applying this system, a comprehensive net has been constructed at the University of Florida to eliminate P2P and residential 'Dark Nets', while comprehensively addressing the educational needs of the students. In addition, Icarus integrates with the University's Judicial Affairs, trouble ticket and network management systems, solving all facets of the management problem. Icarus is currently licensed to Red Lambda Software (www.redlambda.com) by the University of Florida.

Department of Housing and Residence Education Network Architecture - Technical

The University of Florida Department of Housing and Residence Education computer network (DHNet) consists of Cisco switching equipment, and supports standards-compliant TCP/IPv4-services for its residents. The core network consolidates edge switches via Gigabit Ethernet connections. Each resident is supplied with a 1 Gigabit Ethernet connection, monitored and regulated by Icarus. Virtual LANs are deployed on a per-building basis to provide proper segmentation and encompass multiple levels of access granularity (Table 1). Specific services are subsequently provided to the resident depending on the source of access.

Table 1

Access Level	Requires Registration ?	Destination Restrictions?	Routed?	TCP/IP Services Provided?	DHNet web site role	Notes
Guest	No	Yes	Yes	Yes, private IP addressing	Network registration, computer configuration support and policy education	Allows access to HRE registration & information sites only
Restricted	Yes	Yes	Yes	Yes, private IP addressing	Judicial policy violation handling. Automatic recognition of restricted user	Allows access to University resources only
Quarantine	Special	Yes	No	Yes, private IP addressing; DNS redirection; local web services via 802.1q trunks	Distribution of tools, patches and updates. Automatic recognition of quarantined user	Allows access to local network quarantine resources
Black Hole	Special	Yes	No	No	None, no local or routed access provided	Provided to leave systems actively connected for security analysis
Normal	**Yes**	**No**	**Yes**	**Yes, public IP addressing**	**Network information, user forums, security, network policy and configuration information**	**Typical user**
Wireless Guest	No	Yes	Yes	Yes, private IP addressing	Wireless network registration, computer configuration support and policy education	Allows access to HRE registration & information sites only
Wireless Restricted	Yes	Yes	Yes	Yes, private IP addressing	Judicial policy violation handling. Automatic recognition of restricted user	Allows access to University resources only
Wireless Quarantine	Special	Yes	No	Yes, private IP addressing; DNS redirection; local web services via 802.1q trunks	Distribution of tools, patches and updates. Automatic recognition of quarantined user	Allows access to local network quarantine resources
Wireless Normal	**Yes**	**No**	**Yes**	**Yes, public IP addressing**	**Network information, user forums, security, network policy and configuration information**	**Typical wireless user**
Terminated	No Service	No Service	No Service	No Service	No Service	Last resort

Development and Deployment of Icarus

Beginning in December of 2002, the Department of Housing and Residence Education Network Services group initiated the development of a system to automate the enforcement of its computer security policy. The system that was created was known as Icarus.

Icarus was designed to meet three primary design goals. First, to create a fully-distributed processing framework that allows for the collection of information from a variety of disparate sources so that the data can be evaluated and acted on in a unified fashion. Second, to create a system that allows for the real-time identification, containment, and education of managed network users while striving to minimize the impact on their academic use. Third, to contribute to the community software environment through the advance of internet standards and technologies using BSD and GPL-style licenses.

Initial development of Icarus focused on three core tasks. First, it was necessary to build a system for identifying users and tracking hardware movement within the network while allowing for the flexibility required of a residential system. The initial system comprised three levels of access, and did not include a registration process for residents. While this system was adequate for private residence port authorization, it did not adequately support the use of public access ports, accommodate Icarus' protection on wireless networks, or provide a way to handle the containment of security outbreaks. This solution was also deemed inefficient due to its heavy reliance on SNMP. Later, this system was expanded to ten levels of access to address these additional operational requirements, and moved to leverage VMPS for superior access management. At this

time, the Icarus team released the first database-backed VMPS server to the open-source community. User registration was also added to more positively establish authorization without the use of network logon technologies, which are often cumbersome in "always-on" residential environments. Second, development was focused on containing P2P application use as an example of Icarus' ability to detect and react to complex network management situations. By combining data from a variety of tools, it became possible to take an automated multi-factor approach to application recognition. This approach allows Icarus to detect so-called "secure" encrypted P2P applications, and quickly react to both changing applications and policy requirements. This flexibility is accomplished by removing the reliance on a single application or appliance's ability to fully identify and contain unacceptable P2P use, virii, malware and other security challenges. Third, development was focused on creating an extensible GUI interface to allow the management of large Icarus 'clouds' or collections of cooperating Icarus peers. This system makes full use of open standards, and supports a federated management architecture to allow organizational collaboration without exposing organizational concerns.

Education of Resident Students

The education of resident students takes place passively and actively. The passive educational program includes:

(a) Distributing an acceptable network use brochure during the check-in process. This brochure contains information on the overview of the housing network; the fact that housing aggressively enforces its ISP policies; briefs the student on servers, copyrights, and the Digital Millennial Copyright Act (DMCA); provides information on the housing

network monitoring and service restriction process; provides answers to frequently asked questions; and information on how student computer behavior is a part of the University of Florida Student Code of Conduct.

(b) The placement of informational stickers by each housing data port. These informational stickers provide instructions to resident students on how to register on to the housing network.

(c) The residence hall staff have participated in a training session prior to student check-in. This training session provides them basic information to be able to answer many of the student questions regarding the housing network.

(d) The UF DHNet web site contains all the information regarding HRE Network Services. Students can read the information prior to their arrival at the University of Florida to understand what is expected and necessary when they register on to the housing network.

The active educational program designed by HRE is powered by ICARUS and supported by the UF DHNet and HRE websites. When Icarus detects user activity deemed unacceptable by policy, an appropriate series of actions are performed. In the case of a violation of the HRE P2P policy, for example, the user in question is sent a notification pop-up message to their machine, a notification email to their official University email account, and all the computer systems owned by that resident are promptly restricted to campus-only network access (Table 2). This restriction is in effect regardless of where the resident physically goes within the HRE network, preventing abuse by those using public access ports. Simultaneously, an entry is created in the DHNet violation system, HAMMER. A snapshot of the user's activity, including all

evidentiary data, is then added to the database, and correlated with past violations (if any). Residents are required to then visit the DHNet website in order to restore their access. When the resident visits the website with any of their computers, the page automatically recognizes them, and presents the resident with the list of violations. Instructions are provided for remedying each violation, and then a violation-dependent policy presentation is provided. Student violators are then presented with the terms of their restriction. It should be noted that the time counter for restriction does not officially begin until they have signed the on-line form with their University ID (access was still restricted before, however).

Table 2

Violation Level	**Duration of Campus-Only Restriction**	**Additional Requirements for Restoration**
1*	0 – Immediate restoration following completion of educational presentation	None
2*	5 days	None
3	Indefinite	Meeting with the HRE Coordinator of Judicial Affairs
*Special Handling Exception – Any resident with a prior DMCA complaint is automatically escalated to level 3 if the violation is sharing related in any way. Violators with new DMCA complaints are automatically level 3 for the purposes of ICARUS.		

Residents who ignore the restriction, and take no action, automatically have their network access terminated after 10 days.

Similar action scenarios exist for a variety of situations, from virus/worm quarantining, to the active notification about available operating system patches, to the active control of malicious activity.

Impact of Icarus

The impact of Icarus on P2P usage, and more importantly, behavioral trends, has been immediate and profound. The recidivism rate and first-offender rates have dropped

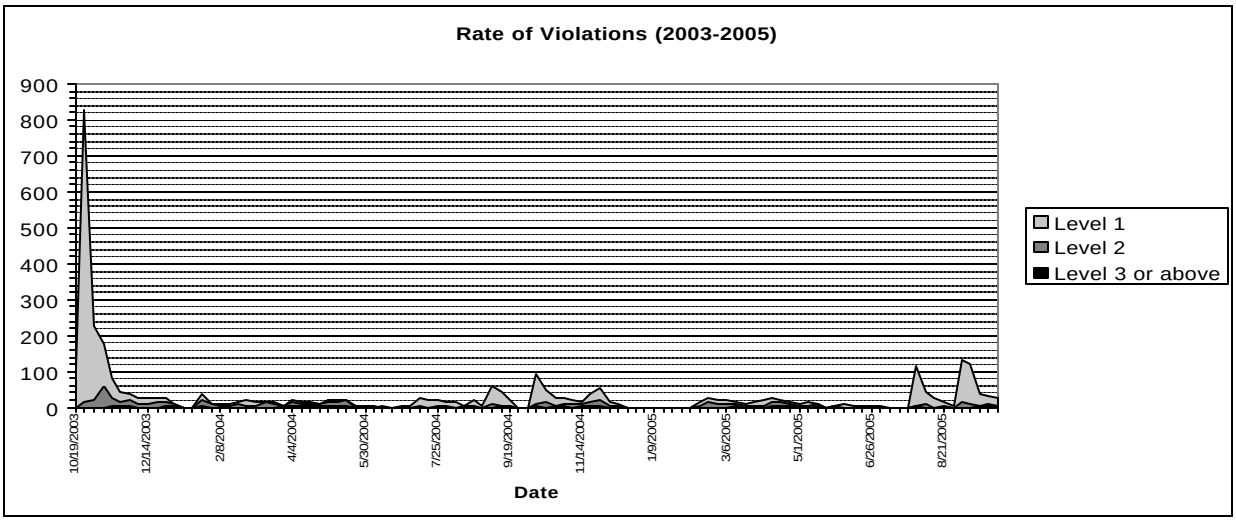
dramatically, and exhibited a downward trend, despite an increased number of residents over time, and the impact of mass quarantines due to Internet worm outbreaks. Furthermore, fewer residents even attempt to use P2P applications, showing Icarus' unique ability to sidestep the 'P2P arms race' and change students' perception by consistently integrating comprehensive education with enforcement (See Table 3).

Table 3

	2003-2004	**2004-2005**	**2005-2006**
Level 1	2052	948	342
Level 2	415	245	42
Level 3	56	44	10
TOTAL	**2523**	**1237**	**394**

Offender Rates*		**Recidivism Rates***	
Pre-Icarus			
% of residents using P2P prior to Icarus (Spring 2003)	54.67%		
Post-Icarus			
% of total residents commiting a 1st Offense	27.64%		
		% of 1st offenders that commit 2nd Offense	21.01%
% of total residents commiting a 2nd Offense	5.81%		
		% of 2nd-time offenders that commit a 3rd Offense	15.67%
% of total residents commiting a 3rd Offense	0.91%		
		% of 1st offenders that commit a 3rd Offense	3.29%

* Does not include 2005-2006 school year in progress to avoid skewing the percentages to lower values. Based on 12090 unique residents since Fall 2003



We are pleased to provide you with this information. Housing professionals do have a responsibility to educate resident students on the acceptable use of their computers and the network. There exists numerous opportunities for students to use technology with legitimate purposes. Educating students to these purposes is part of our responsibility and stewardship.

References

Haynes, J., & Dunkel, N.W. (pending). P2P resident education in the United States.

Joachim, D. (2004, February 19). The enforcers. *Network Computing*, pp. 40-54.

Sherman, Cary, President, RIAA (2004, September 3). College and record executives tell Congress steps to curtail music piracy. *Chronicle of Higher Education*.