The Subcommittee's stated purpose for this survey is to help determine "best practices" with respect to unlawful use of copyrighted materials. The University of Michigan is eager to learn more about such best practices, and we look forward to receiving the full results of this survey from the Subcommittee. It might seem odd that such practices are being sought through a survey of universities targeted by some as having high levels of unlawful file sharing. However, we understand that universities such as the University of Michigan have been at the forefront of efforts to address this problem among our students, and we are particularly proud of the progress we have made in this area.

The survey instrument as written does not permit provision of context essential to understanding how the University of Michigan addresses this important problem. For that reason, we respond in narrative form. We cross-reference our commentary to the survey instrument as appropriate using parenthetical pointers (e.g., I-2-b) following the outline structure of the instrument provided by the Subcommittee. Note that the responses here represent the policies of the Ann Arbor campus, and although some policies and practices are also followed at the Flint and Dearborn campuses, this document should be considered relevant only to the Ann Arbor campus.

**Summary of Responses**

- **Education:** The University of Michigan has been engaged in aggressive educational efforts to inform students of their responsibility to follow the law and University policy related to respect of copyright. This practice has been in place since before the unlawful sharing of copyrighted material over peer-to-peer networks began. Most students engaged in unlawful sharing of copyrighted material over computer networks arrive at the University of Michigan already engaged in such activity. We try to change bad behavior after students arrive, and evidence shows that our efforts are having positive effect.

- **Enforcement:** The University of Michigan goes beyond the requirements of the law to enforce lawful conduct with respect to sharing of copyrighted material. In keeping with the tradition of copyright law, the university depends primarily on copyright holders to identify violations with respect to their works, and to inform us of infringement. In all such cases, complaints are logged and action is taken immediately. The primary focus of enforcement is educational, aimed at those who receive complaints and nearly all of whom are first-time offenders. There has been essentially no repeat offense from this group. More severe infractions, especially for repeat offenses, would face escalating penalties were they to occur.
• **Technology:** The University of Michigan is eager to pursue effective technological strategies that allow discrimination between unlawful and lawful activities on networks. None of the technologies investigated to date are capable of this, and implementation of these technologies would constrain lawful peer-to-peer file sharing that is already essential to the teaching, research and service missions of the university. The university will continue to work with the technology community on the challenge of creating technological solutions that allow us to address unlawful activity without damaging essential lawful activity.

• **Legal Alternatives:** The University of Michigan encourages students to take advantage of lawful alternatives for obtaining music and other copyrighted material for their own use. The university as a policy does not pay for the personal entertainment of students, and does not subsidize such entertainment in the residence halls or elsewhere. The university remains attentive to the offerings of companies that provide network-based access to entertainment materials, and is willing to participate in such programs if they fit the university’s mission and policies. To date, only one such partnership has been attempted, and it ended when the company providing the service withdrew from offering entertainment.

I. “Education: Communicating the Importance of University ‘Acceptable Use’ Policies.

The University of Michigan has a comprehensive set of policies related to acceptable behavior among its students. These policies address use of computing and networking services, including expectations regarding conformance with the law in all particulars. A copy of the university’s policies related to use of computing and networking services is provided in Appendices 1.01-1.05, with information about the dates of its adoption and updates and the process of updates (I-1, I-2-a). These policies make clear that students are to conform to University policy and the law as a condition of use of the computing and network services, and stipulate the kinds of penalties that can be applied for violations (I-2-b). These policies are communicated to students in multiple ways, including publication and elaboration on a University web site (Appendices 2.01-2.02), required reading and agreement with conditions of use upon initial account creation and (in some cases) prior to every use of the services (Appendix 3.01), periodic reminders to the entire University community regarding the importance of conformance with University policy and the law regarding these issues (Appendices 4.01-4.02), notices to individuals who have been identified as possibly in violation of copyright (Appendices 5.01-5.03), presentations and other symposia in which these issues are discussed and students made aware of University policy and the law (Appendices 6.01-6.06), and open discussion of these issues in University media (Appendices 7.01-7.56) (I-2-c).

The University of Michigan prides itself on its assertive efforts to educate our students in the virtues and responsibilities of citizenship, beyond normal classroom instruction in the academic and professional subjects of their educational goals. These efforts have been lauded as exemplary by Kim Allman and Geni Michaud of the Recording Industry Association of America in a presentation in 2005 to the Michigan House Committee on
Higher Education and Career Development (Appendix 8.01). Moreover, we recognize that the challenge of getting students to respect University policy and the law related to copyright is daunting and, possibly, growing. As noted in our cover letter, we cannot corroborate the claims by private market research firms regarding the extent of unlawful sharing of copyrighted materials due to college students. That said, we do not deny that the challenge among college students, including those at the University of Michigan, is real. One might argue—and we would agree—that any incident of policy and legal violations, including underage drinking, use of illegal drugs, and a host of other problems including copyright violation is one too many. The two important questions for an educational institution such as the University of Michigan are the nature of the specific challenge we are trying to address so that we can tailor our responses appropriately, and whether our educational efforts on such challenges are having any effect.

Our internal research on this topic reveals two important facts about the nature of the problem. One is that the vast majority of our students who do engage in unlawful sharing of copyrighted material arrive to the University of Michigan already engaged in such activity: they do not learn how to do it after they arrive. Most of our incoming students have personal computers, internet access, MP3 players, and the knowledge of how to get what they want from the World Wide Web. Our challenge is not to keep them from learning bad behaviors after getting here: it is to help them stop bad behaviors they brought with them. Another is that most of these incoming students understand full well that they are at odds with the law on these issues, in the same way they are at odds with the law on underage drinking and other misbehaviors. While we take care to inform students that unlawful sharing of copyrighted material is against University policy and the law, this is not the hard part of the educational process because most students already know this. Rather, the most important and difficult parts of our educational efforts are aimed at getting students to understand that unlawful sharing of copyrighted material in any form can have serious consequences, and that the chances of apprehension are significant. These are the two mechanisms of enforcement that have been proved in research to be effective at deterrence—a point elaborated upon in the next section on enforcement. In summary, our educational efforts are threefold: to let students know that unlawful sharing of copyrighted material is against University policy and the law; to inform them that there are mechanisms in use that can identify such unlawful behavior and tie it to specific individuals so that they actually can be caught in violations; and to make clear to them the penalties they might suffer for violations. This is precisely the same practice we follow with respect to all policy and legal issues involving our students.

As an educational institution, the University of Michigan is interested in the efficacy of our educational efforts, including those addressing unlawful sharing of copyrighted material. Given that most of the students engaged in unlawful file sharing arrive at the University of Michigan in that state, the most important measure of the effects of our educational efforts is whether such behavior attenuates over time as result of our efforts. Ideally, we would learn this positively identifying students who are engaged in unlawful behavior at an earlier point and tracking that behavior over time. There is no reliable method to do this: we have no effective unobtrusive measures that would allow us to identify such behavior, and it has not proved effective to ask specific students to admit
that they are personally engaged in unlawful behavior so we can track their behavior over time. In this regard, we face the same research challenges as market research firms and others who attempt to characterize the overall incidence and profiles of unlawful sharing of copyrighted material. We settle, instead, for proxy measures that we believe illustrate changes in behavior over time.

One proxy measure is to identify student behavior through established mechanisms (take-down notices and other notification that unlawful behavior by the student is suspected) and correlate those data with the student progress through their academic program. As shown below, the data indicate that the overwhelming incidence of unlawful behavior occurs among students at the earliest stages of their academic careers in the University – among freshman students, in particular, and to somewhat less extent among sophomores.¹ This is a circumstantial indicator that our educational efforts are having the desired effect, but it is nonetheless promising. The hypothesis we derive from this preliminary indicator is that most students engaged in unlawful sharing of copyrighted material arrive at the University already so engaged, and that exposure to the University's educational efforts helps to shift their behavior in a more lawful direction as they become full members of the University community. We are in the process of obtaining more detailed data on the effects of the educational protocol in our enforcement efforts (see the next section on enforcement). The data at this point suggest that students who have been part of this protocol are seldom repeat offenders, and that the vast majority of students receiving notice that they are suspected of being engaged in unlawful sharing of copyrighted material are first-time recipients. In a sense, it appears that the University of Michigan's education efforts are remediating the failure of earlier levels of student experience with education and socialization on such matters. We are continuing our research on this front, and look forward to sharing the results of our findings with those interested.

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Our effort to determine the effects of our educational programs is somewhat confounded by the changing nature of measurements applied to unlawful sharing of copyrighted material, particularly measurements used by agents outside the University of Michigan. These include both measures of incidents of copyrighted material available for sharing within specific accounts and the number of takedown notices received. We would very much like to depend on such measures as part of our own sense of the state of behavior and the effects of our educational effort, but this is difficult without knowing in detail how such measures are being made.

¹ Data are from 2005-2006 and 2006-2007, constituting a total of 1,242 identifiable infractions among the 40,000 students at the University. The table provides data on undergraduate student totals only. Less than 2% of incidents were among professional graduate students (eight first-year, four second-year, and three third-year), and less than 7% of incidents were among academic graduate students (about half among masters students and half among PhD students).
As noted in our cover letter, we have made limited progress in obtaining the details we need from these outside agents, so we cannot speak authoritatively on the issues. Based on our expertise as a research institution, we can say that the irregular nature of available data and lack of clear methodology confounds the efforts of all those who are trying to understand this phenomenon. For example, we have seen occasional and sometimes dramatic changes in the numbers we receive from outside agents for comparable periods of time. We can readily spot changes due to simple factors, such as the fact that 20,000 undergraduate students leave the campus for the summer, but more subtle changes are hard to interpret without more information on how the data are collected. It is possible that unlawful behavior increases or decreases dramatically across these comparable time periods due to cyclical patterns in the behavior or by actual changes in student behavior. But without assistance from the outside agents performing such measurements, we cannot know whether their numbers are accurate or why changes in the patterns appear. It would be very helpful to the overall discussion of these issues if all the parties involved—market research firms, content owners and providers, higher education institutions—would share their methods and data in the tradition of open scholarship. Otherwise, there is no way to establish facts on which we can all agree, and the discussion remains grounded primarily in opinion.

Looking forward, the University of Michigan will continue to focus its efforts on the educational dimensions of the challenge of unlawful sharing of copyrighted material, including the educational aspects of enforcement. We have already expanded our educational efforts, moving from a rather narrowly focused campaign against unlawful downloading and uploading in the early 2000s to a more complete campaign aimed at all copyright infringement at this time. Moreover, it appears we will have to expand our efforts yet again, given the data from market research NPD reported in the New York Times that the majority of unlawful sharing of copyrighted music does not take place over networks at all, but rather from social sharing and “ripping” of CD’s. As noted earlier, the phenomenon of unlawful sharing of copyrighted material is a condition of the times, not the result of what universities do or do not do.

Education is our primary mission. The University of Michigan cares deeply about the law and attendant dimensions of civic duty in civil society. We have our own police force that cooperates closely with other law enforcement agencies to ensure that the law is honored within the University of Michigan community. That said, our greatest contribution to the law, meaning both the rule of law as well as the creation of and adherence to the law, is the education of our students. As history clearly shows, University of Michigan graduates go on to become leaders at the local, state, national and international levels. Our mission is to prepare our students for such roles. We see the challenge of education regarding honoring of copyright law as part of a larger challenge of education regarding the duty of citizens to obey the law as written and to change the law through constitutional means when necessary.

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II. "Enforcement: Meaningful Implementation of University Anti-Piracy Policies"

The University of Michigan's policies related to unlawful sharing of copyrighted material are to be found in Appendices 1.01-1.05. The University responds to incidents of unlawful sharing of copyrighted material over networks in a uniform manner, even though two distinct classes of events must be handled. To keep clear the distinction between what the University is obligated to do under the Digital Millennium Copyright Act (DMCA) and what the University chooses to do over and above those obligations, we separate our description of procedure into two categories: response to take-down notices, and response to notification of intent to pursue legal action against infringement.

 Notices of infringement leading to take-down action formally come to me as the DMCA Agent for the University. Under the provisions of the DMCA, the University is required to act aggressively in response to complaints regarding copyrighted material unlawfully accessible through the World Wide Web. Failure to act puts us at risk of losing our "safe harbor" status under the DMCA. The University is technically not obligated to effect such action for materials that are simply residing on computers but that are not accessible through a web site, or that are being transported through peer-to-peer technologies. Nevertheless, the University does respond aggressively to such notices on a voluntarily basis because we believe it appropriate to honor the spirit of the DMCA (II-2).

 The responses to both kinds of notice are handled in the same manner. To ensure uniform and appropriate action, all such notices are automatically entered into a common tracking system called abuse@umich.edu that creates a traceable record (II-7). These notices are handled by the User Advocate office within IT Central Services. Any student identified by the notice is immediately sent a letter informing him or her of the complaint, and requesting that the student reply within 24 hours. The letter outlines available courses of action. The student can take down the offending material and reply that the material has been removed. The student can protest that there is no violation, whereupon the student will be put in direct contact with the source of the take down notice to resolve the matter. If the student does not respond within 24 hours, the offending material is removed by an appropriate network administrator, or if this is not possible, the account is shut down or the IP address to the computer is blocked. A student in this situation must re-apply for access, paying $25 and demonstrating that the offending material has been taken down.

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3 Identification is accomplished using log data that can link use of specific network resources at specific times (e.g., IP addresses, MAC addresses) to the individuals most likely to have been using the resource at that time. These logs are maintained for different lengths of time, depending on which part of the decentralized University IT infrastructure is administering the networks. Wireline logs in Housing are maintained for three years, which is probably the longest time. Wireless logs are usually maintained for much shorter periods of time, and vary by subunit. Policies related to retention are under review (II-9).
The purpose of this initial contact is to educate the student to make sure he or she knows about the importance of copyright and the University’s policies on the matter, and actions he or she can take to avoid unlawful activity. Some students receiving take down notices simply are not aware that they have been doing anything unlawful. For example, some have fully lawful content on their computer (e.g., their own CD’s downloaded into their MP3 player) but have inadvertently left open the “sharing” feature of some file sharing software so they were sharing this content without their knowledge. Other students have subscribed to content sharing services purporting to be legal but are in fact fraudulent, and have thus been unknowingly engaged in unlawful activity. Many, of course, know that what they were doing is unlawful, but they had no idea they could be apprehended. All such first offenders are instructed in the importance of adherence to the law and to University policy in these matters, as well as in ways to avoid becoming victims of fraud. And they are warned that the consequences of subsequent offenses will be more severe.

There are very few cases where students are apprehended a second time for these offenses. In the few cases that do occur, the student is not only notified of the offense, but the offense is forwarded to the appropriate authority. In the case of the Residence Halls, it is forwarded to the Housing Office, which gets in contact with the student. The student is informed of the severe penalties to which he or she can be subjected for such offenses, including (for example) loss of housing contract and ejection from the University’s residential system. The other authority is the Office of Student Conflict Resolution under the Vice President for Student Affairs, which handles serious disciplinary issues involving students. The student must also discuss the incident with the University’s lead attorney dealing with intellectual property issues. Again, the key focus is on making sure the students knows and understands the policy and legal issues and recognizes the consequences for violation. There is no mandatory penalty – that has not been necessary because the number of repeat offenses has been so few and the educational part of enforcement appears to be working well. Nevertheless, the penalties can range from stern to severe, including suspension or prohibition from using University computing or network resources at the stern end, to suspension or expulsion from the University at the severe end. Those penalties have not been necessary up to this point, but the University is prepared to administer them if necessary.

The other broad category of response to infringement occurs when the University is notified by an outside party that legal action against a student is planned. The University is technically not required to forward such notice to students under the DMCA, but we do so nevertheless as part of our policy of adhering to the spirit of the DMCA, and as a service to our students (II-2). This process is in some respects identical to that outlined above: a notice is entered in abuse@umich.edu to maintain a record of the event and to allow for tracking (II-7, 9). However, in this case the student does not receive a letter, but instead a telephone call from the University attorney who handles intellectual property issues. (In the event that a student cannot be reached by telephone, other means are employed to notify the student.) This telephone call goes far beyond notification: it includes explicit information on the legal nature of the action being taken by the outside

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4 This record is, at the moment, maintained for five years.
party. including any special conditions the outside party might be offering. For example, in some cases the notice of intent to pursue legal action might include an offer by the outside party to consider a settlement. This information is conveyed to the student, with information on how the student might follow up on the offer if he or she wishes to do so. The student is also informed of the likely consequences of various actions, including destruction of evidence (II-8-f). If the student wishes, the University’s attorney will also talk with parents or counsel for the student, and will refer the student to outside counsel if requested. There have not been many such cases (53 since 2003). We do not know what happened as a result of these notices. In a few cases these were “John Doe” notices that could not identified to specific individuals, but when individuals could be identified they were and the notices were delivered. In the few cases where the University has received a lawful order to provide information to allow a copyright holder to sue a student, the University complies fully with the order. (The foregoing paragraphs address all or part of the following elements of part II: 1; 2; 7; 8 a, b, c, d, e, f, g, h, i, j, k, and l.)

The University does monitor activity on its networks. Most of this monitoring is aimed at ensuring network viability in support of the University’s core missions (e.g., to maintain network reliability and security). As noted in the section on Technology below, there are at present no technologies that we are aware of that can discriminate between lawful and unlawful content residing in computer storage systems or moving about on the network. And, as discussed in the section on Technology below, there are lawful uses of peer-to-peer file sharing that are increasingly important to the University’s core missions. At best, monitoring of University networks for use of file-trafficking software, amount of bandwidth used in file-trafficking, number and character of network ports being accessed, access to specific IP addresses, bandwidth consumed by individual users, and amount of time individuals are connected to the network provides very little information to help the University gauge the level of unlawful sharing of copyrighted material. We do, in some cases, monitor such measures as part of ongoing network oversight and maintenance. Where feasible we draw inferences about the kinds of activities underway, and of course, if we have reason to believe that unlawful activity of any kind is taking place, we will make inquiries of the users involved. Often we find that there has been a security breach and that an outside party has established a file sharing utility on a University computer. These are immediately shut down, and the security holes patched. Were there technological means to monitor network use and discriminate accurately between lawful and unlawful uses, we would adopt them. As discussed in the section on Technology below, that is not currently an option. (This paragraph responds to II-6.)

The lack of technological means to determine whether given file sharing activity is lawful or unlawful is part of a larger problem in determining whether specific content is subject to copyright, under what conditions, and whether those conditions obtain in a given case.

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5 There is only one authenticated record of student performance at the University of Michigan – the official transcript – and it contains only grades recorded for enrolled classes and a small number of approved University honors. FERPA prohibits disclosure of information in the transcript as well as other information about a student’s experience at the University without approval of the student (II-8-m).
For example, the University of Michigan holds license agreements with a large number of publishers that allow authorized University of Michigan users to access and use copyrighted materials in pursuit of the University’s core missions. In some cases the license permits a student to print but not download such material. In others the license permits the material to be downloaded onto a University computer, but not onto a student’s own computer. It can be virtually impossible for the University to tell whether given content is lawfully held on a student’s computer because in some cases a student has unlawfully downloaded and stored on his or her computer material from outside the University’s network that would be lawfully stored on his or her computer had it been downloaded through the University’s network. This is an evolving realm of law and practice, and the University has no greater advantage to address such challenges than the commercial ISPs that serve the vast majority of Internet users in the United States. For these reasons, we cannot even begin to identify how many actual infringements of copyright are occurring among the 40,000 students at the University of Michigan (II-3). We educate our students about the nature of copyright, and that practice has desirable effects. But we do not pretend to have solved this problem. When we have the means to identify that particular material is unlawfully stored or shared, we act upon it. As has been the tradition under copyright law, the overwhelming majority of incidents in which we discover that copyright violations have occurred arise from notification from a copyright holder that the violation is taking place. Given that outside parties informing us of violations have usually declined to provide us with requested information regarding their methods for identifying unlawful use of their materials, we cannot even determine a method for calculating the fraction of actual violations represented by the complaints (II-3, 4, 5).

The best information we can provide about infringements comes from the record of incidents in the record-keeping system abuse@umich.edu. The table below provides the number of take down notices and the number of notifications of intent to pursue legal action received by the University of Michigan in the past five years (II-3).

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<td>Take Down Notices</td>
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<td>14</td>
<td>0</td>
<td>26</td>
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As noted above, these data arise almost entirely from copyright holders notifying the University about copyright violations. Superficially, one might draw conclusions about the trends in the data: for example, that the University was increasingly successful at curbing such unlawful activity between 2002 and 2005, only to see a major increase in 2006. However, this would be a serious methodological error for two reasons. First, it is impossible without understanding the methods of data collection to determine whether changes in rates are due to changes in the actual behavior of individuals (e.g., students unlawfully sharing copyrighted material) or changes in the methods of data collection themselves. We believe it unlikely that behavioral change accounts for much of the variance; other indicators that would be assumed to co-vary with these (e.g., incidents of other unlawful behavior by students) do not show similar patterns. It is much more likely that those searching for incidents of copyright violation of their own works, or who are
acting as agents of copyright holders, have changed their methods of search by selectively increasing surveillance of some institutions (e.g., the University of Michigan) or by improving the effectiveness of the search mechanisms and finding incidents that would previously have gone undiscovered. However, we cannot answer this question in a scientifically sound manner without access to the methods used in the studies over the years covered in the table above (II-3, 4, 5).

As explained in the Technology section below, the University is eager to pursue mechanisms that might reliably inform us as to the extent of and the specific incidence of unlawful sharing of copyrighted material. At present, there are no technologically viable means for doing this. In principle, one could implement technological measures that go into every user's computer storage and perform actions on the files stored there with the intent of discovering unlawful activity. But this is impractical (no one has yet come up with cost-effective ways of doing this, with the possible exception of the National Security Agency which is understandably reluctant to disclose its capabilities). For the University of Michigan such action would also be unlawful: as a state entity the University is prohibited on privacy and due process grounds from such search behavior.

III. "Technology: Leveraging Piracy Countermeasures to Reduce Exposure and Prevent Misuse of University Computing and Network Resources"

The questions asked in this section can be divided into two classes: deliberate reduction of network access and usability to deter unlawful sharing of copyrighted material (III-1, 2, 6), and implementation of technological strategies (usually through software) to suppress or interdict unlawful sharing of copyrighted material (III-3, 4, 5). We address these classes in order.

The University of Michigan is highly decentralized, and different units within the University are at liberty to follow somewhat different practices with respect to provision of network access. The University as a whole is served by a core network provision infrastructure operated by IT Central Services, or ITCS. From there, one might divide the major domains into three: the health care system (not discussed in this report); the student residence halls supported by Residence Computing, or ResComp; and the individual academic units – schools, colleges, research institutes, etc.

ITCS services constitute a "baseline" for the University's entire networking infrastructure. ITCS provides no network bandwidth limitations on wireline connections in/out of the University. ITCS limits all wireless connections, inbound and outbound, on a 24/7 basis using gateway constraints operating per device. ITCS operates a number of large laboratories of computers for student use on a walk-in basis. These computers are connected via wireline access, and bandwidth is not restricted. However, students cannot store any data on these computers, and to use them they must log in with their user ID. They are also in monitored public space. For these reasons, these laboratories are not conducive to use of peer-to-peer file sharing.
ResComp services the student residence halls, where the vast majority of computers that use the networks belong to students. Following the philosophy that ResComp is serving as a kind of ISP for the students, and that high-speed open access for student instruction and research is available through the laboratories provided by ITCS, ResComp does restrict bandwidth on a selective basis using Packeteer technology. Data traffic bearing the signatures of certain applications originating from the University of Michigan Residence Hall networks and destined for any location not on the University of Michigan networks are segregated from general network bandwidth, and re-routed through a common but restricted channel. This tends to reduce all peer-to-peer file sharing in the residence halls, at least with respect to large data files. This restriction does not constrain student ability to take advantage of the educationally important peer-to-peer technologies available in the University as a whole, though it does limit what they can do on their own computers in the residence halls.

Individual academic units can modify the ITCS baseline in their own service configurations. The Computer Aided Engineering Network (CAEN) that serves the College of Engineering imposes bandwidth restrictions on all wireline ports using Packeteer technology in a manner similar to that used by ResComp. This constraint is operating 24/7. Larger transfers can be arranged as needed. The Ross School of Business serves its students primarily through wireless connectivity. All IP addresses are NATed to restrict local peer-to-peer file sharing and to allow access only to public file sharing sites that require real IP addresses. Bandwidth is uniformly restricted in both directions on a 24/7 basis to a level below that offered by ITCS. There are other variants of such practice across the academic units, and they fall within the parameters of these examples. Generally, the campus networks implement as little port-blocking as possible, but selective ports are blocked for security purposes, such as those that have to do with pings, SNMP and certain ports related to Microsoft Windows that have been connected with Windows security problems, and ports connected with denial of service and “zero day” attacks (III-1, 2, 6).

These practices have been implemented primarily to address problems of excessive use of bandwidth for purposes that are unlikely to contribute to the University’s missions. It is possible that some of these practices have an effect on unlawful sharing of copyrighted material, but we have no evidence to suggest what effects they have had on this. We have anecdotal information to suggest that some students encountering bandwidth restrictions in university networks simply switch to one of the many readily-accessible commercial ISPs for their bandwidth needs. From what we can tell, there are virtually no efforts on the part of these commercial ISPs to address the problems of unlawful sharing of copyrighted material in the way the University of Michigan does.

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6 Examples of the kinds of signatures recognized are those of DCC, ESV, eDonkey, Furthernet, KaZaA, Napster v1, Soulseek, Winny, Ares, BitTorrent, Blubster, and Gnutella. The data used to identify these streams is “shallow” – drawn from packet headers; it is not deep analysis of packet content. Similar but less restrictive channeling is applied to packets from voice-over IP applications such as Skype and for file transfers using FTP.
An important feature of the University of Michigan computing environment over the years is that there has never been a policy distinction between students, faculty or staff with respect to access to technological resources. It has been the University's philosophy that all members of the University's learning community need access to information technology. This probably helps to explain why so many University of Michigan graduates have gone on to become global leaders in computing, communications and networking. It also helps to account for the fact that the University has been a leader in development of important information technologies that have been widely adopted. Examples include the Michigan Terminal System (MTS) that served (along with MIT's MULTICS System) for decades as one of the world's preeminent timesharing systems, the Lightweight Directory Access Protocol (LDAP) currently used in distributed systems globally, and many others. In addition, the University of Michigan played an instrumental role through the Merit Network organization in the creation of NSFNet, the mechanism by which the Department of Defense ARPANet was transformed into the Internet. The University has extraordinary technical depth in key academic units in the College of Engineering (e.g., Computer Science and Engineering), the Medical School (e.g., the National Center for Integrative Biomedical Informatics), and the School of Information, as well as in the University's many IT support organizations. The University of Michigan is a leader in developing, adopting, and deploying technological solutions for all kinds of purposes, including problems enabled by technological progress.

The University is eager to pursue technological strategies to reduce unlawful or otherwise problematic uses of computing and networking services. These are not limited to unlawful sharing of copyrighted material – they include traffic in other kinds of unacceptable content (e.g., pornography), fraud, threats to do bodily harm, denial of service attacks, unauthorized access to sensitive information, and so on. Should such technologies become available, we will implement them with all deliberate speed. We have paid particular attention to technological strategies that purport to limit unlawful activity without curtailing lawful activity. We receive advertisements for such products and services on a routine basis, and we examine all that seem promising. Unfortunately, these technologies have thus far not lived up to their advertising claims. We therefore do not employ any technological mechanisms that attempt to block, restrict or otherwise impede the unlawful sharing of copyrighted material (III-5). We also do not employ any technological mechanisms that attempt to block, restrict or otherwise impede the downloading or use of file-trafficking software (III-3; III-4). There are two important reasons behind the University's position on this matter, and both must be considered separately.

The reason the University has not adopted technological strategies to block, restrict or otherwise impede the unlawful sharing of copyrighted material is simply because no technologies known to us can discriminate between lawful and unlawful content. We

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7 These include Bill Joy (Co-Founder of Sun Microsystems), Larry Page (Co-Founder of Google) and Tony Fadell (creator of the Apple iPod), among many others.
8 With this the survey response to III-7 is completed.
have examined carefully the products and services that claim to be able to do this, and the
claims are either so closely circumscribed as to be useless as warranties, or they are
patently false. There is some promise regarding new technological strategies that look
for particular content “signatures” that are difficult to spoof or occlude, and we are
watching those with some hope. But thus far, our reason for not adopting the
technological solutions on offer is that they do not work as advertised.\textsuperscript{9}

Peer-to-peer file sharing is not unlawful, and there is no good reason to prohibit student
access to or use of software that enables peer-to-peer file sharing (II-8-e). The fact that a
given software utility is being used by some for unlawful purposes is offset by the fact
that such utilities are also being used for lawful purposes. We know of no peer-to-peer
technologies that are used exclusively for unlawful purposes. Moreover, peer-to-peer
technologies are rapidly becoming very important in the conduct of routine and legitimate
work in the University’s three core missions: teaching, research, and public service. It
would be very damaging for the University to curtail the growing use of these
technologies. We provide below three classes of examples where these technologies are
becoming central to the University’s mission.

\textit{Scientific Data Exchange:} Peer-to-peer technologies are of extraordinary importance to
contemporary scientific research. They enable the sharing of large data sets among
researchers, as required both by the traditions of open science and by many Federal
mandates as part of research funding. Some of the emerging data sets are enormous, and
peer-to-peer technologies are the only practical way to meet the need. In high energy
physics, for example, the most important project in a generation -- the Large Hadron
Collider (LHC) near Geneva, toward which the United States government has contributed
hundreds of millions of dollars -- will go on-line in the coming year. The experimental
apparatus will generate quadrillions of bytes of data to be shared among thousands of
collaborating scientists located around the world, thus enabling the “payoff” from this
multi-billion dollar investment. The LHC strategy for data distribution and management
uses the peer-to-peer infrastructure of BitTorrent for rapid distribution of essential
software files, and intelligent agents running on peer-to-peer infrastructure are used to
register services and to provide services from multiple nodes in the network. Another
example is from the rapidly expanding life sciences field of proteomics. The Tranche
system for data sharing (\url{http://www.proteomecommons.org/dev/dfs/users/howto-get-
data.html}) for dissemination of very large proteomic data sets is built on top of a peer-to-
peer system. It serves the entire proteomics research community and many large projects
such as the NIH National Resource for Proteomics and Pathways, the Human Proteome
Research Database at Johns Hopkins University, the Peptide Atlas at the Institute for
Systems Biology, and the NIH NCI Mouse Models Consortium, among many others.
Bioinformatics research is making extensive use of peer-to-peer technologies, and many
hospital-based IT systems are beginning to use these technologies.

\textsuperscript{9} This view is widely shared, and was summarized for the Joint Committee of the Higher
Education and Entertainment Communities following a meeting of the Technology Task
Force in October of 2006 regarding technologies for filtering content on campus
networks.
Education and Research Information Technology Infrastructure Support: Developers and distributors of free and open source software (e.g., http://www.fsf.org/licensing/essays/free-sw.html) such as the Linux operating system -- widely used by institutions of higher education -- commonly use peer-to-peer file sharing as a primary method of offering new releases to the public. Available alternatives would be far more expensive and burdensome, siphoning scarce resources away from teaching and other critical University missions. In addition, such peer-to-peer software dissemination strategies often permit much more flexible, effective and rapid installation and updating of critical software, including security patches and other enhancements. Peer-to-peer technologies are also proving to be helpful in computer security, especially network intrusion detection and prevention (http://ieeexplore.ieee.org/xpls/abs_all.jsp?arnumber=1231412). Finally, peer-to-peer technologies are emerging as one of the key components of so-called GRID computing strategies that allow distributed institutions and organizations to share computational resources, resulting in significant cost savings.

Instructional Uses: Instruction in fields such as literature and the arts is increasingly taking advantage of peer-to-peer technologies to make essential educational content accessible to students, and to allow students who are generating content (e.g., writings, musical compositions, choreography, performances) to share that content widely. Such content is released freely and openly by the copyright holders, often under Creative Commons or similar licensing structures, so no unlawful activity occurs. Moreover, there is enormous promise for peer-to-peer technologies in support of Open Educational Resources, which include infrastructure (e.g., course management software, c.f., http://www.sakaiproject.org) as well as content (e.g., open source course syllabi and accompanying instructional materials, c.f., http://ocw.mit.edu/) for widespread sharing among educational institutions. The Hewlett Foundation has recently issued a report explaining the promise of OER strategies to improve dramatically the productivity of higher education and to extend access to higher education far beyond current limitations (http://www.oerdues.org/wp-content/uploads/2007/03/a-review-of-the-open-educational-resources-oer-movement_final.pdf). Peer-to-peer technologies are also becoming important in use of multimedia content for instruction. The phenomenon of educational podcasting (c.f., http://epnweb.org/) has grown dramatically in the past 18 months, proving the great potential for such technologies in the learning process. This important innovation depends on being able to stream multimedia content over existing Internet Protocol networks, and has led to the development of IPTV technologies based on peer-to-peer technologies (c.f., http://www.iptv-industry.com/ar/2r.htm).

Were the problem of curtailing or eliminating unlawful sharing of copyrighted material as simple as installing a technological fix that stops the unlawful activity and permits lawful activity, we would already have implemented it. Unfortunately, the technology is not yet in a state to offer such a solution. We will continue to work closely with the technology development community to make progress on this challenge. We also note that we are not sanguine that a genuine technological solution will be forthcoming any time soon. Our experts in computer security -- a problem that is related in some respects to that of
unlawful sharing of copyrighted material – have informed us that behavioral and social problems enabled by new technology are seldom solved by merely technical solutions. Social and behavioral solutions are essential. Our primary social and behavioral solutions are education and enforcement, aimed at changing the incentive structures for students who might otherwise be tempted to engage in unlawful sharing of copyrighted material.

IV. “Legal Alternatives: Promoting Legitimate Services as Alternative Sources for Copyrighted Materials”

The University of Michigan as a matter of policy does not pay for entertainment of individual students from general fund sources (e.g., state support, tuition revenue). The general fund does contribute to entertainment that students are welcome to enjoy, such as University music, dance or theater productions. The general fund also contributes to the enablement of artistic creations by students that are shared with and enjoyed by others as a form of entertainment (e.g., musical recordings made in the University’s Digital Media Commons). In cases where entertainment via cable or satellite television programming is provided (e.g., in the student residences), access is paid from the fees collected for room and board as part of University Housing’s full cost recovery model.10 Such entertainment is not subsidized by the general fund. The policy is grounded in the principle that students should pay for their personal entertainment, which of course includes paying for music, films and other commercial, copyrighted entertainment (IV-2, 3).

The development of new business models for distribution of entertainment over networks holds a great deal of promise for reducing or eliminating unlawful sharing of copyrighted material. The University of Michigan encourages these new business models in a number of ways. We have a long-standing relationship with Apple Computer, and have pointed students toward iTunes as a legitimate alternative to unlawful sharing of copyrighted material since the service was first instituted. We were also one of the charter members of iTunes University. Since iTunes was launched, other successful services have emerged. Our web site points to all of the services we are aware of at a given time, and we ask that readers of the site inform us of new services as they become available. We promote use of such sites through several mechanisms. We point students to them on a routine basis as the issue of unlawful sharing of copyrighted material arises. We permit the companies that offer such services to advertise to students, and in at least one case (an experimental relationship with Cdigix before the company withdrew its entertainment downloading service), we allowed advertisements on the University’s course management infrastructure. The network service provider that supports the University of Michigan and many other public universities in the state – the Merit Network – subscribes to Ruckus, and makes that service available to us. We mention such services and point them during student orientation.

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10 The contract for cable television content (the University owns the physical network) has recently been renegotiated. For the next year the cost will be $299,000.
The University has considered many offers from companies to establish a special relationship, offering lawful content for downloading to students at discount prices. Most of these companies have proffered models where the university purchases an expensive subscription to enable its students have access to a digital jukebox. The challenge of this model is that it propagates the perspective among students that “music is free.” That is, students continue to be sheltered from the experience of paying for the copyrighted works they seek if we just purchase access for them. Other than the experiment with Cdigix and our current relationship with Ruckus, we found that most companies were less willing to work directly with the students as customers and so we have not entered into such a relationship. We remain open to this model, and are willing to pursue it if we find one or more companies that offer a service package that is desired by students, that conforms to our policies and that contributes to the effort to reduce unlawful sharing of copyrighted material.