GAO
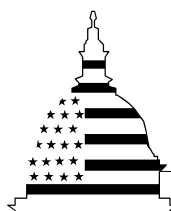
May 2005

FILE SHARING PROGRAMS

The Use of Peer-to-Peer Networks to Access Pornography

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GAO-05-634

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Highlights

Highlights of GAO-05-634, a report to congressional requesters

FILE SHARING PROGRAMS

The Use of Peer-to-Peer Networks to Access Pornography

Why GAO Did This Study

Peer-to-peer (P2P) file sharing programs represent a major change in the way Internet users find and exchange information. The increasingly popular P2P programs allow direct communication between computer users who can access and share digital music, images, and video files. These programs are known for having the functionality to share copyrighted digital music and movies, and they are also a conduit for sharing pornographic images and videos. Regarding these uses of P2P programs, GAO was asked to, among other things

- Determine how many P2P programs are available to the public and which are the most popular P2P programs.

- Determine the ease of access to pornographic files on popular P2P programs and the risk of inadvertent exposure.

- Describe how P2P program filters operate and determine their effectiveness.

- Determine how the effectiveness of filters offered by P2P programs compares to filters provided by leading Internet search engines.

In commenting on a draft of this report, DHS officials agreed that that our report accurately represented the work performed by the Cyber Crimes Center.

www.gao.gov/cgi-bin/getrpt?GAO-05-634.

To view the full product, including the scope and methodology, click on the link above. For more information, contact Linda D. Koontz at (202) 512-6240 or koontzl@gao.gov.

What GAO Found

According to three popular file sharing Web sites, 134 P2P programs are available to the public. Of those programs, Warez, Kazaa, and Morpheus were among the most popular, as of February 2005.

Pornographic images are easily shared and accessed on the three P2P programs we tested—Warez, Kazaa, and Morpheus. Juveniles continue to be at risk of inadvertent exposure to pornographic images when using P2P programs.

Two of the three P2P programs—Kazaa and Morpheus—provided filters intended to block access to objectionable material, but the effectiveness of the filters varied. Warez did not provide a filter. The filters provided by Kazaa and Morpheus functioned differently: Kazaa filtered words found in titles or metadata (data associated with the files that contain descriptive information), while Morpheus required the user to enter the specific words to be filtered. Kazaa's filter was effective in blocking pornographic and erotic images in our searches, but the Morpheus filter was largely ineffective in blocking pornographic content associated with words entered into the filter. (See figure.)

The filters for the three leading Internet search engines—Google, Yahoo, and MSN—also varied in their effectiveness. MSN's filter was as effective as Kazaa's filter in consistently blocking pornographic and erotic images, while Google's filter was not as effective. Similar to Morpheus' filter, Yahoo's filter was largely ineffective in blocking pornographic and erotic images.

Results of P2P Searches Using a Word Known to be Associated with Pornography

Source: GAO analysis of C3 research specialist's classification of images.

Contents

Abbreviations

P2P   peer-to-peer
ICE   United States Immigration and Customs Enforcement
C3   Cyber Crimes Center

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United States Government Accountability Office
Washington, D.C. 20548

May 25, 2005

The Honorable Tom Davis
Chairman, Committee on Government Reform
House of Representatives

The Honorable Mark E. Souder
Chairman, Subcommittee on Criminal Justice, Drug Policy
   and Human Resources
Committee on Government Reform
House of Representatives

The Honorable Charles Pickering
The Honorable Joseph Pitts
The Honorable John Shadegg
House of Representatives

Peer-to-peer (P2P) file sharing programs represent a major change in the
way Internet users find and exchange information. Increasingly popular
P2P programs, such as BitTorrent, Gnutella, LimeWire, Morpheus, Warez,
and Kazaa allow direct communication between computer users who can
access and share digital music, images, and video files. P2P programs are
known for having the functionality to share copyrighted digital music and
movies, and they are also a conduit for sharing pornographic images and
videos.

As requested, we reviewed various aspects of P2P networks. Specifically,
our objectives were to determine

* how many P2P programs are available to the public and which are the
  most popular P2P programs, in terms of users;

* the ease of access to pornographic files on popular P2P programs and
  the risk of inadvertent exposure;

* whether advertising on P2P programs contains adult-oriented material
  that can be easily accessed by juveniles;

* how clear and conspicuous the warnings are that pornography,
  including child pornography, is accessible through the use of P2P
  programs;

- how P2P program filters operate and their effectiveness;

- how the effectiveness of filters offered by P2P programs compares to filters provided by leading Internet search engines;

- other tools that are available to block pornography on P2P programs; and

- the corporate owners of Warez, Kazaa, and Morpheus file sharing programs, as well as obtain corporate information for the subject corporations, including the country of incorporation.

To address our objectives, we obtained information from resources that provide data about publicly available P2P programs, including user and download data. We performed unfiltered searches on three P2P programs—Warez, Kazaa, and Morpheus—using search words known to be associated with pornography and innocuous search words that juveniles would likely use. We also assessed advertisements that appeared on the P2P programs to determine if they contained easily accessible, adult-oriented services. We reviewed information that was presented while installing P2P programs to determine how clear and conspicuous warnings are that pornography is accessible through the use of the programs.

Further, in order to determine how P2P filters function, we reviewed literature and instructions provided by the programs' manufacturers. We performed filtered searches on the three P2P programs using known and innocuous search words, and we compared the results with the unfiltered searches. We also performed filtered and unfiltered searches on leading Internet search engines—Google, Yahoo, and MSN—using known and innocuous search words and compared the results with the P2P program searches. Lastly, we conducted an Internet literature search to identify tools available to block pornography and to identify the corporate owners of the three P2P programs.

We conducted our review from January through March 2005 in Fairfax, VA, and Washington, D.C., in accordance with generally accepted government auditing standards.

On April 5, 2005, we briefed your offices on the results of this review. This report transmits the slides from that briefing. These briefing slides, including details of our scope and methodology, can be found in appendix I.

In summary, our briefing made the following points:

- According to three popular file sharing Web sites[1], as of March 2005, there were 134 P2P programs available to the public to download. According to organizations[2] that track the number of users on P2P networks and the number of times P2P programs have been downloaded, Warez, Kazaa, and Morpheus were among the most popular as of February 2005.

- Pornographic images were easily shared and accessed on the three P2P programs we tested—Warez, Kazaa, and Morpheus. In addition, juveniles continue to be at risk of inadvertent exposure to pornographic images when using P2P programs. For example, when searching Kazaa using a word known to be associated with pornography, 65 percent of the 31 images downloaded were adult pornography, 19 percent were nonpornographic, 13 percent were adult erotica, and 3 percent were child pornography. When searching Kazaa using an innocuous word, 46 percent of the 13 images were cartoon pornography.

- The P2P programs we tested contained advertising for adult-oriented services that could be easily accessed by juveniles. For example, three of the four advertised adult-oriented services on Warez (two gambling and one dating) had age restrictions that could be easily circumvented.

- The three P2P programs did not display any warnings indicating that pornography, including child pornography, was accessible through these programs. However, the Distributed Computing Industry Association[3] has efforts under way to encourage P2P programs to include warnings about the risks of exposure to pornography.

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[1] Zeropaid.com, http://www.zeropaid.com/php/top_prog.php (downloaded March 4, 2005), Download.com, http://www.download.com/3120-20_4-0.html?titlename=&author=&desc=file+sharing&qt=&ca=&os=&daysback=&li=&dlcount=&dlsize=&swlink=false (downloaded March 4, 2005), and Slyck.com, (http://www.slyck.com/programs.php?cat=2 (downloaded March 22, 2005).

[2]Slyck.com and MediaDefender track the number of users on P2P networks and Download.com tracks the number of times P2P programs have been downloaded.

[3]The Distributed Computing Industry Association is an organization that represents sectors of the distributed computing industry such as, file sharing companies, digital rights management companies, and file sharing consumers.

- Two of the three P2P programs—Kazaa and Morpheus—provided filters, but the effectiveness of the filters varied. Warez did not provide a filter. Kazaa filtered words found in titles or metadata (data associated with the files that contain descriptive information). Kazaa's filter was effective in blocking pornographic and erotic images in our searches. For example, Kazaa's filter blocked all pornographic and erotic images on all known and innocuous search words. Conversely, Morpheus required the user to enter the specific words that the user would like to filter. Morpheus's filter was largely ineffective in blocking pornographic content associated with the words entered into the filter. For example, when searching on known word "X" and entering the known word "X" into the filter, we were able to download 13 images, of which 9 were adult pornography, 3 were adult erotica, and 1 was nonpornographic.

- The filters for the three leading Internet search engines—Google, Yahoo, and MSN—also varied in their effectiveness. MSN's filter was as effective as Kazaa's filter in consistently blocking pornographic and erotic images, while Google's filter was not as effective. For instance, when searching Google using a known search word, we were able to download 79 images, of which 11 were adult erotica. Similar to Morpheus' filter, Yahoo's filter was largely ineffective in blocking pornographic and erotic images. During the filtered searches, Yahoo's filter did not block a substantial number of pornographic and erotic images on two of the known word searches and did not block erotic images on the third known word search.

- According to the product manufacturers, there are a variety of filtering tools available that can block pornography on P2P networks.

Lastly, Kazaa is owned by Sharman Networks, Ltd., and is incorporated in the South Sea island of Vanuatu in Asia. Morpheus is owned by StreamCast Networks and is incorporated in California in the United States. We were unable to obtain corporate information on Warez.

We provided a draft of this report to Department of Homeland Security (DHS), Immigration and Customs Enforcement, Cyber Crimes Center (C3) officials. In an email communication, the C3 acting section chief for child exploitation agreed that our report accurately represented the work performed by the Center.

As agreed with your staff, unless you publicly announce the contents of this report earlier, we plan no further distribution of it until 30 days from the date of this report. At that time, we will send copies of this report to the Secretary of the Department of Homeland Security and other interested congressional committees. In addition, the report will be available at no charge on the GAO Web site at http://www.gao.gov.

Should your offices have any questions on matter discussed in this report, please contact me at (202) 512-6240 or by e-mail at koontzl@gao.gov. Other key contributors to this report were Michael Alexander, Neil Doherty, Mirko Dolak, Nancy Glover, Teresa Neven, Shannin O'Neill, and Jena Sinkfield.

Linda D. Koontz
Director, Information Management Issues

Briefing Slides

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The Use of Peer-to-Peer Networks to Access Pornography

Briefing to

Congressional Requesters

April 5, 2005

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Outline of Briefing

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Results

Agency Comments

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Attachment 2: List of Available Peer-to-Peer Programs

Attachment 3: Results of Searches on Peer-to-Peer Programs and Internet Search Engines

Attachment 4: Tools to Protect Users on Peer-to-Peer Programs

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Introduction

Peer-to-peer (P2P) file sharing programs represent a major change in the way Internet users find and exchange information. The increasingly popular P2P programs allow direct communication between computer users who can access and share digital music, images, and video files. Some of these P2P programs include BitTorrent, Gnutella, LimeWire, Morpheus, Warez, and Kazaa.

P2P programs are known for having the functionality to share copyrighted digital music and movies, and they are also a conduit for sharing pornographic images and videos.

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Objectives, Scope, and Methodology

Objectives

As agreed, our objectives were as follows:

1. Determine how many P2P programs are available to the public and which are the leading P2P programs, in terms of users.

2. Determine the ease of access to pornographic files on popular P2P programs and the risk of inadvertent exposure.

3. Determine whether advertising on P2P programs contains adult-oriented material that can be easily accessed by juveniles.

4. Determine how clear and conspicuous the warnings are that pornography, including child pornography, is accessible through the use of P2P programs.

5. Describe how P2P program filters operate and determine their effectiveness.

6. Determine how the effectiveness of filters offered by P2P programs compares to filters provided by leading Internet search engines.

7. Identify other tools that are available to block pornography on P2P programs.

8. Identify the corporate owners of Warez, Kazaa, and Morpheus file sharing programs. Obtain corporate information for the subject corporations, including the country of incorporation.

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Objectives, Scope, and Methodology

Scope and Methodology

To address objective 1—determine how many P2P programs are available to the public and identify the most popular P2P programs—we obtained data from three popular resources that provide extensive lists of publicly available P2P programs: Zeropaid.com, Download.com, and Slyck.com. We confirmed the availability of each program by initiating installation for each P2P program listed on Zeropaid.com, Download.com, and Slyck.com. We obtained user data from Slyck.com, MediaDefender, and download data from Download.com, in order to identify the three P2P programs that were among the most popular.

To address objective 2—determine the ease of access to pornography on the three most popular P2P programs (Warez, Kazaa, and Morpheus) and the risk of inadvertent exposure—we worked with an intelligence research specialist at Immigration and Customs Enforcement's (ICE) Cyber Crimes Center (C3).[1] We performed unfiltered 5-minute searches for six keywords: three keywords known to be associated with pornography and three innocuous terms that juveniles

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[1] The Cyber Crimes Center is recognized nationally and internationally as a leader in the investigation of international criminal activities conducted on or facilitated by the Internet.

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Objectives, Scope, and Methodology

would likely use (a popular teenage singer/actress, a popular cartoon, and a popular movie character).

Of the files that the search returned after 5 minutes, the C3 research specialist classified all images that we were able to download within 30 minutes. The classification categories we used were as follows:

- adult pornography—the visual depiction of an adult (a person 18 years of age or older) engaged in sexually explicit conduct

- child pornography—the visual depiction of a minor (a person less than 18 years of age) engaged in sexually explicit conduct

- adult erotica—sexually arousing images of adults that do not depict sexually explicit conduct

- child erotica—sexually arousing images of children that do not depict sexually explicit conduct

- cartoon pornography—the cartoon depiction of sexually explicit conduct

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- cartoon erotica—the cartoon depiction of sexually arousing images that do not depict sexually explicit conduct

- nonpornographic—images that are neither pornographic nor erotic

To address objective 3—determine whether advertising on P2P programs contains adult-oriented material that can be easily accessed by juveniles—we assessed the first ten advertisements that appeared on each of the three popular P2P programs to determine whether they offered adult services (for example, gambling and dating services) and, if so, whether they provided mechanisms intended to block minors from using the adult services.

To address objective 4—determine how clear and conspicuous the warnings are that pornography, including child pornography, is accessible through the use of P2P programs—we reviewed all the messages, license agreements, and warnings that were presented during the installation process of the three P2P programs and looked for statements that specifically stated that adult and child pornography was accessible through these programs.

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Objectives, Scope, and Methodology

To address objective 5—describe how P2P program filters operate and determine their effectiveness—we first determined how the filters function by reviewing literature and instructions provided by the programs' manufacturers. Next, we performed filtered searches using the same three known words and the same three innocuous words that we used to determine the ease of access to pornography in objective 2. In order to determine the effectiveness of Morpheus's filter, we entered each of the three known words into the filter and then we searched on each word. The C3 research specialist classified all images (using the same classification categories used in objective 2) that downloaded within 30 minutes. Then, we compared the results of the searches to the results of our searches in objective 2 to determine how many pornographic and erotic images had been blocked.

To address objective 6—determine how the effectiveness of filters offered by P2P programs compares to filters provided by leading Internet search engines—we referred to Neilsen//NetRatings, a service that provides Web site ratings. It indicated that Google, Yahoo, and MSN were the most frequently used search engines at the time of our review. Next, we performed unfiltered and filtered searches on the three known words and the three innocuous words used in the previous objectives.

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Objectives, Scope, and Methodology

The C3 research specialist classified up to the first 100 images as adult pornography, child pornography, adult erotica, child erotica, cartoon pornography, cartoon erotica, and nonpornographic. Then, we compared the results of the unfiltered searches to the results of the filtered searches to determine how many pornographic and erotic images had been blocked on the search engines' searches. Finally, we compared the results of the search engines' searches to the results of the searches from objective 5 on the P2P programs.

To address objective 7—identify other tools available to block pornography on P2P programs—we conducted an Internet literature search and our primary source was GetNetWise.[2] We did not test the efficacy of these tools.

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[2] GetNetWise is a project created by Internet industry corporations and public interest organizations to help ensure that Internet users have safe and rewarding online experiences.

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Objectives, Scope, and Methodology

Finally, to address objective 8—identify the corporate owners of Warez, Kazaa, and Morpheus and obtain corporate information for the subject corporations, including the country of incorporation—we conducted research using sources such as Lexis-Nexis,[3] Dunn and Bradstreet,[4] and Whois.source.[5]

We performed our work between January and March 2005 at Immigration and Customs Enforcement's Cyber Crimes Center, Department of Homeland Security, in Fairfax, Virginia, and at GAO headquarters in Washington, DC. Our work was conducted in accordance with generally accepted government auditing standards.

[3] Lexis-Nexis is a news and business online information service that contains comprehensive company, country, financial, demographic, market research, and industry reports.
[4] Dunn and Bradstreet reports that it maintains a large business database containing information on over 64 million businesses worldwide, including 13 million in the United States.
[5] Whois.source allows users to search all current, deleted, and expired whois domains.

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Results in Brief

According to three popular file sharing Web sites,[6] 134 P2P programs are available to the public. Of those 134 programs, Warez, Kazaa, and Morpheus were among the most popular.

Pornographic images are easily shared and accessed on all three of the P2P programs we tested. Juveniles can be inadvertently exposed to pornographic images when using P2P programs.

The P2P programs we tested contained advertising for adult-oriented services that could be easily accessed by juveniles.

The P2P programs did not display any warnings indicating that pornography, including child pornography, was accessible through these programs.

[6] Zeropaid.com, http://www.zeropaid.com/php/top_prog.php (downloaded March 4, 2005),
Download.com, http://www.download.com/3120-20_4-0.html?titlename=&author=&desc=file+sharing&qt=&ca=&os=&daysback=&li=&dlcount=&dlsize=&swlink=false (downloaded March 4, 2005), and Slyck.com, (http://www.slyck.com/programs.php?cat=2 (downloaded March 22, 2005).

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Results in Brief

Two of the three P2P programs—Kazaa and Morpheus—provide filters, but the effectiveness of the filters varies. Warez, however, does not provide a filter. Kazaa filters words found in titles or metadata (data associated with the files that contains descriptive information). Kazaa's filter was effective in blocking pornographic and erotic images in our searches.

Morpheus requires the user to enter the specific words that the user would like to filter. Morpheus's filter was largely ineffective in blocking pornographic content associated with the words entered into the filter.

The filters for the three leading Internet search engines—Google, Yahoo, and MSN—vary in their effectiveness. MSN's filter was as effective as Kazaa's filter in consistently blocking pornographic and erotic images, while Google's filter was not as effective in consistently blocking pornographic and erotic images. Similar to Morpheus' filter, Yahoo's filter was largely ineffective in blocking pornographic and erotic images. During the filtered searches, Yahoo generated a substantial number of pornographic images on two of the known word searches and generated erotic images on the third known word search.

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Results in Brief

According to the product manufacturers, there are a variety of filtering tools available that can block pornography on the P2P networks.

Kazaa is owned by Sharman Networks, Ltd., and is incorporated in the South Sea island of Vanuatu in Asia. Morpheus is owned by StreamCast Networks and is incorporated in California in the United States.

In their oral comments on a draft of this briefing, Immigrations and Customs Enforcement, C3 officials, including the C3 section chief for child exploitation, generally agreed with our results.

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Background

P2P file sharing programs are a major change in the way Internet users find and exchange information. Under the traditional Internet client/server model, the access to information and services is accomplished by the interaction between clients (users or requesters of services) and servers (the providers of services, usually Web sites or portals). Unlike the client/server model, the P2P model enables consenting users—peers—to interact directly and share information without the intervention of a server. A common characteristic of P2P programs is that they build virtual networks with mechanisms for routing message traffic. Attachment 1 provides a detailed description of P2P file sharing programs.

In February 2003, we reported that child pornography could be easily accessed and downloaded on P2P networks.[7] The National Center for Missing and Exploited Children has stated that P2P technology is increasingly popular for disseminating child pornography.

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[7] GAO, *File Sharing Programs: Peer-to-Peer Networks Provide Ready Access to Child Pornography,* GAO-03-351 (Washington, D.C.: Feb. 20, 2003).

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Background

We also reported that, when searching and downloading images on P2P networks, juvenile users face a significant risk of inadvertent exposure to pornography, including child pornography. Searches on innocuous keywords likely to be used by juveniles produced a high proportion of pornographic images: 34 percent of the images returned were adult pornography; 14 percent were cartoon pornography; 7 percent were child erotica; and 1 percent was child pornography.

P2P programs have added filtering capabilities to their programs to provide users with the ability to block access to objectionable material (such as pornography) when searching for files. Filtering software can usually be controlled by an authority (such as parents). It has parameters such as pornography, drugs, and music that can be set by an authority to block access to objectionable material by keyword, usually for the benefit of children. It is important to note that filters are not 100 percent accurate, since they block content based on keywords found in a file's metadata (descriptive information about a file) rather than on the actual content of the files.

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Objective 1 Results

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Objective 1—Determine how many P2P programs are available to the public and which are the most popular P2P programs in terms of users.

According to three popular file sharing Web sites,[8] as of March 22, 2005, there were 134 P2P programs available to the public to download; 123 programs were free and 11 required a fee. We were able to initiate installation on all 134 P2P programs. Attachment 2 provides the list of these P2P programs.

Since user trends for P2P programs are constantly changing, it is very difficult to definitively identify which of the P2P programs are the most popular. However, according to organizations[9] that track the number of users on P2P networks and the number of times P2P programs have been downloaded, Warez, Kazaa, and

[8] Zeropaid.com, http://www.zeropaid.com/php/top_prog.php (downloaded March 4, 2005), Download.com, http://www.download.com/3120-20_4-0.html?titlename=&author=&desc=file+sharing&qt=&ca=&os=&daysback=&li=&dlcount=&dlsize=&swlink=false (downloaded March 4, 2005), and Slyck.com, (http://www.slyck.com/programs.php?cat=2 (downloaded March 22, 2005).

[9] Slyck.com and MediaDefender track the number of users on P2P networks and Download.com tracks the number of times P2P programs have been downloaded.

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Objective 1 Results

Morpheus were among the most popular programs as of February 17, 2005. At that time, there were more than 2.5 million users of Kazaa and 1.5 million users of Warez; we were unable to obtain the number of users of Morpheus.

However, Morpheus has been downloaded many more times than most P2P programs: as of March 2005, it had been downloaded more than 131 million times.

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Objective 2 Results

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Objective 2—Determine the ease of access to pornographic files on popular P2P programs and risk of inadvertent exposure.

Pornographic images are easily shared and accessed on all three popular P2P programs. When searching on three words known to be associated with pornography, we were able to easily find and download pornographic images on the three programs. For example, from Kazaa searches for a known word, 31 images downloaded, of which 20 images were adult pornography; 1 was child pornography; 4 images were adult erotica; and 6 were nonpornographic.

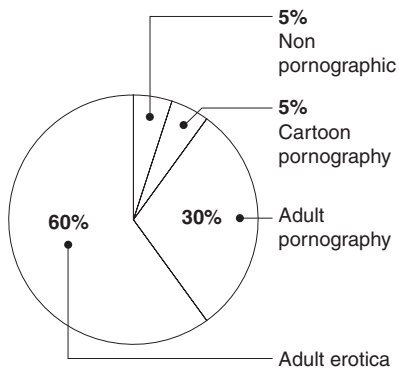Figure 1 shows the results of one of the known word searches.

Attachment 3 displays the results of all three known word searches on each P2P program.
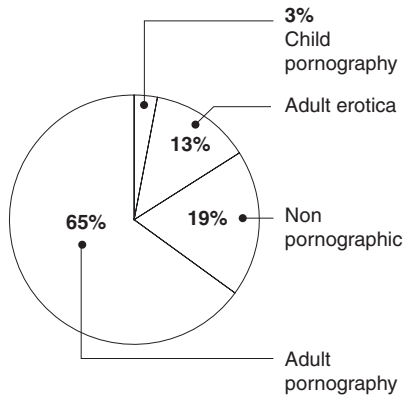
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Objective 2 Results

Figure 1: Results of P2P Searches Using First Word Known to be Associated with Pornography

Warez (20 images)
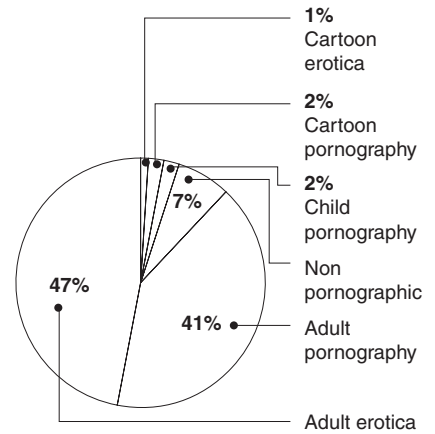
5%
Non pornographic

5%
Cartoon pornography

30% — Adult pornography

60%

Adult erotica

Kazaa (31 images)

3%
Child pornography

Adult erotica

13%

65%   19% — Non pornographic

Adult pornography

Morpheus (84 images)

1%
Cartoon erotica

2%
Cartoon pornography

2%
Child pornography

Non pornographic

47%   7%   41% — Adult pornography

Adult erotica

Source: GAO analysis of C3 research specialist's classification of images.

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Objective 2 Results

In addition to allowing pornography to be accessed by a known word search, Warez provides chat rooms that enable users to directly share entire folders of files with one another, including pornographic files. Many of these chat room discussions are sexually oriented.

While Morpheus also offers chat rooms, it does not allow users to access each other's files directly. Kazaa does not contain chat rooms.

As we reported in our last review on file sharing,[10] juveniles can be inadvertently exposed to pornographic images when using P2P programs. When we searched for files using three innocuous terms likely to be used by juveniles (a popular teenage singer/actress, a popular cartoon, and a popular movie character), all three P2P programs produced pornographic images. Figure 2 shows the results of our innocuous word search on the name of a popular cartoon show.

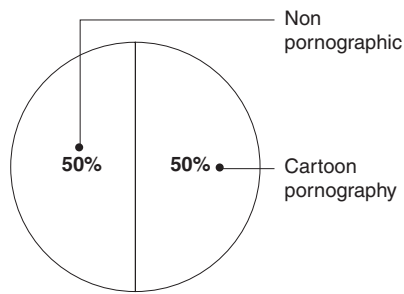Attachment 3 displays the results of all of the innocuous word searches.

[10] GAO, *File Sharing Programs: Peer-to-Peer Networks Provide Ready Access to Child Pornography,* GAO-03-351 (Washington, D.C.: Feb. 20, 2003).

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Objective 2 Results

Figure 2: Results of P2P Searches When Searching the Name of a Popular Cartoon Show

Warez (14 images)
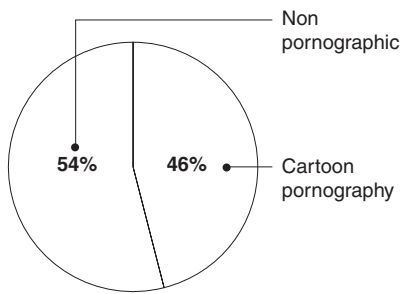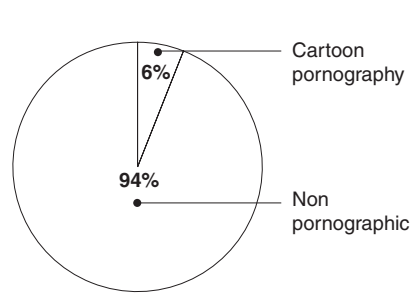
Non
pornographic

50%   50% — Cartoon
pornography

Kazaa (13 images)

Non
pornographic

54%   46% — Cartoon
pornography

Morpheus (31 images)

6% — Cartoon
pornography

94%

Non
pornographic

Source: GAO analysis of C3 research specialist's classification of images.

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Objective 3 Results

Objective 3—Determine whether advertising on P2P programs contains adult-oriented material that can be easily accessed by juveniles.

Advertisements for adult-oriented services (i.e., gambling and dating services) were available on two of the three popular P2P programs. Of the 10 advertisements on Warez that we analyzed, 4 advertisements were geared toward adult services (3 gambling, 1 dating). Of the 10 advertisements on Morpheus that we analyzed, one advertisement was geared toward adult services (gambling). Of the 10 advertisements on Kazaa that we analyzed, none were geared toward adult services. Figures 3 and 4 show the results of our research on adult-oriented advertisements.

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Objective 3 Results

Figure 3: Adult-oriented Advertisements

Warez (10 advertisements)

Kazaa (10 advertisements)

Morpheus (10 advertisements)

Neutral
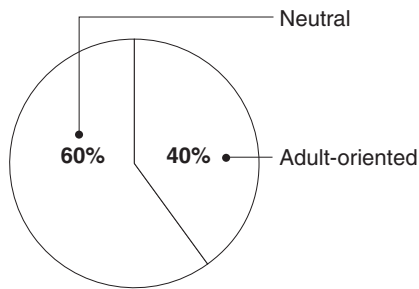
60%   40% ● — Adult-oriented

None of the 10 advertisements
contained adult-oriented
material

● — Adult-oriented
10%

90% ● — Neutral

Source: GAO analysis.

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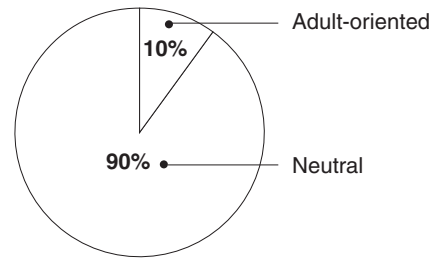
Objective 3 Results

Services offered by four of the five adult-oriented advertisements can be easily accessed by juveniles.

- Three of the advertised adult services on Warez (2 gambling and 1 dating service) can be easily accessed by juveniles, since they can easily circumvent the services' age restrictions by reporting an age over 18.

- Similarly, the one adult service advertisement on Morpheus (gambling) was also accessible by juveniles, since reporting an age over 18 easily circumvents this service's age restrictions.

One of the advertised gambling services on Warez limited juvenile accessibility by requiring a credit card.

Figure 4 shows the results of our analysis. Figures 5 and 6 are two examples of the adult-oriented advertisements that we found on the P2P programs.

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Objective 3 Results

Figure 4: Accessibility of Adult-oriented Advertisements

Warez (4 advertisements)

Morpheus (1 advertisement)

1 • ——— Not
accessible
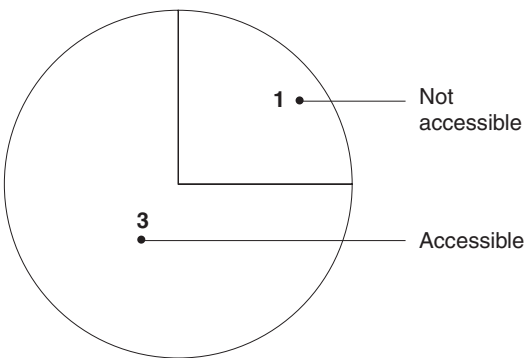
3 • ——————— Accessible

**Only one adult-oriented advertisement
was accessible**

Source: GAO analysis.

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Objective 3 Results

Figure 5: Warez Dating Advertisement

Source: Warez.

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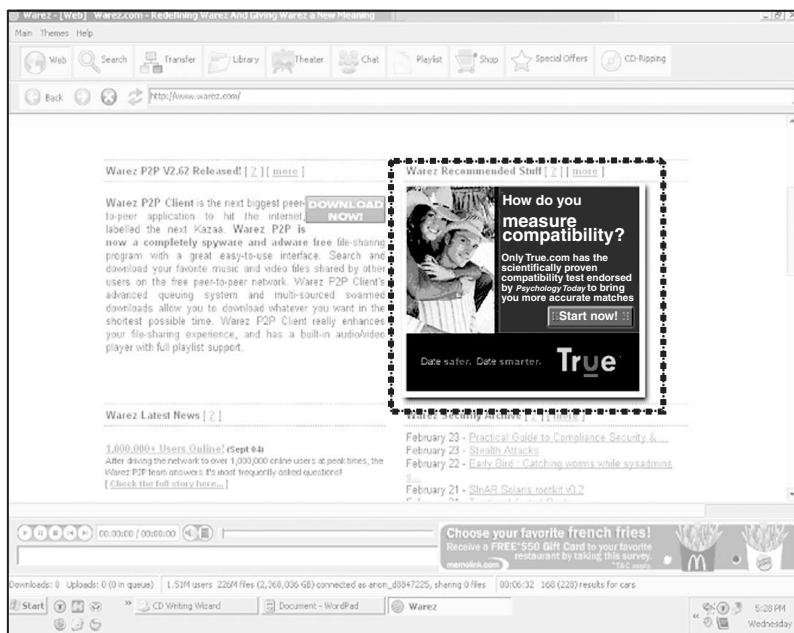
Objective 3 Results

Figure 6: Morpheus Gambling Advertisement

Source: Morpheus.

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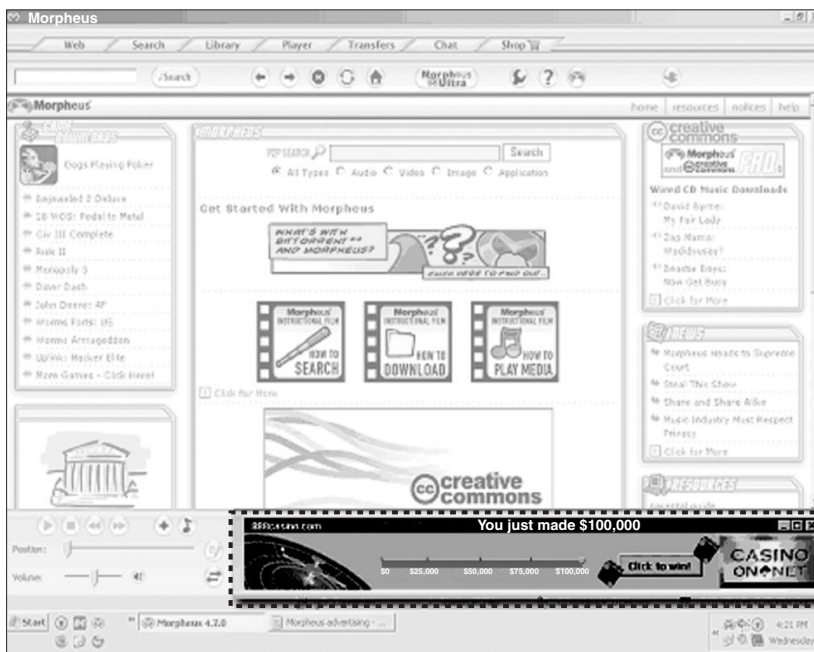
Objective 4 Results

Objective 4—Determine how clear and conspicuous warnings are that pornography, including child pornography, is accessible through the use of P2P programs.

During the installation of the three P2P programs, no warnings were presented indicating that pornography, including child pornography, was accessible through the use of the P2P programs.

The Distributed Computing Industry Association has efforts under way to encourage P2P programs to include warnings about the risks of exposure to adult and child pornography on their applications. A few P2P programs are currently working with the association to add such warnings to their applications, including Kazaa, Grokster, and TrustyFiles.

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Objective 5 Results

Objective 5—Describe how P2P program filters operate and determine their effectiveness.

Two of the three popular P2P programs that we accessed—Kazaa and Morpheus—provide filtering capabilities, which are intended to block access to objectionable material such as pornography. The third program that we accessed, Warez, did not offer a filtering option.

Kazaa's filter is based on matching words in the file's title or metadata against a set of keywords embedded in the filter that Kazaa has associated with the three filters.

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Objective 5 Results

Kazaa includes these three filtering options:

- Offensive content—filters any search results where the metadata includes keywords that could potentially be used to describe offensive material.

- Adult content—filters any search results where the metadata includes keywords that could potentially be used to describe adult material, plus all keywords from the offensive content setting. Adult content is the default filter.

- Images and video—filters any search results that are in standard image or video format.

On Kazaa, users can also add specific search terms into the filter's list of blocked terms. Figure 7 is an image of Kazaa's filter feature.

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Objective 5 Results

Figure 7: Kazaa Filter

Kazaa Options ✕

| Privacy | Skins | Anti-Virus | Personal Website |
| My Kazaa | Sharing | Advanced | Filter | Firewall |

Family Filter
Set the filter level for adult related material.

Filter : Adult content ▼

No filter
Offensive content
Adult content
Images and videos

☐ Passwor

Miscellaneous
☐ Filter file types that can potentially contain viruses
☑ Filter files I cannot download due to firewalls
☑ Filter bogus music and video files

Blocklist
Add words to this list that you want to filter, they should be comma separated, for example: drugs, sex, rock and roll

[   ]

| OK | Cancel | Apply |

Source: Sharman Networks.

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Objective 5 Results

Kazaa's filter was effective in filtering out all pornographic and erotic images on all of the known word searches and the innocuous word search. As previously discussed in objective 2, when searching Kazaa for a word known to be associated with pornography without a filter, we were able to successfully download 31 images. According to the C3 research specialist's classification of the images, 65 percent of the 31 images were adult pornography; 3 percent were child pornography; 13 percent were adult erotica; and 19 percent were non-pornographic. When searching the same word with the adult filter on, the search returned no files, thus filtering 100 percent of pornographic images. Figure 8 shows the results of Kazaa's filter when searching for a known word.

Attachment 3 presents the results of all three filtered known word searches on Kazaa.

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Objective 5 Results

Figure 8: Results of Kazaa Filter Using First Search Word Known to be Associated with Pornography

Filter off (31 images)

Filter on

3%
Child pornography

Adult erotica

13%

19% Non pornographic

65%

Adult pornography

No files returned from search

Source: GAO analysis of C3 research specialist's classification of images.

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Objective 5 Results

When searching for an innocuous word—the name of a popular cartoon show—we were able to download 13 images (6 cartoon pornography and 7 non-pornographic). When searching the same word with a filter, we were able to download 12 images, none of which contained pornography. Figure 9 shows the results of Kazaa's filter when searching for this innocuous word.

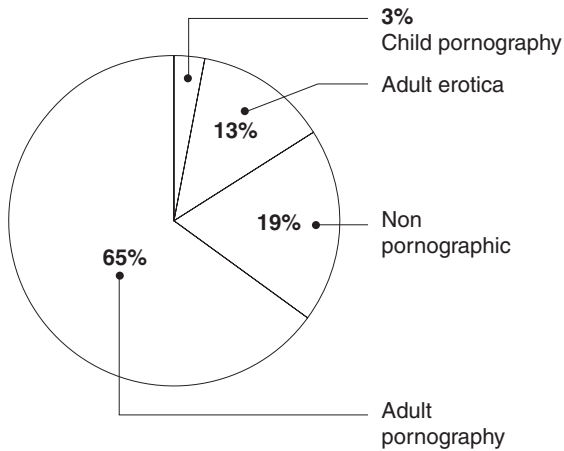Attachment 3 presents the results of all three filtered innocuous searches on Kazaa.

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Objective 5 Results

Figure 9: Results of Kazaa Searches of Popular Cartoon Show

Filter off (13 images)

Filter on
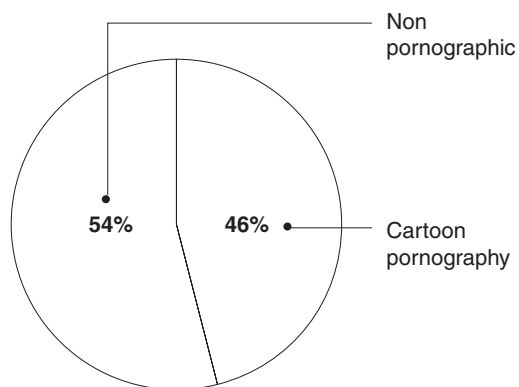
Non
pornographic

54%

46%

Cartoon
pornography

**None of the 12 images was
pornographic or erotic**

Source: GAO analysis of C3 research specialist's classification of images.

In addition, Kazaa provides the option of establishing a password to protect the user's preferences from being changed. However, the password protection can be easily circumvented by un-installing Kazaa and re-installing it to remove the password protection.

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Objective 5 Results

Morpheus requires users to create their own filter sets: users enter specific words into the block list that are intended to filter and block files that contain those words. Figure 10 is an image of Morpheus's filter feature.

Figure 10: Morpheus Filter

Source: Morpheus.

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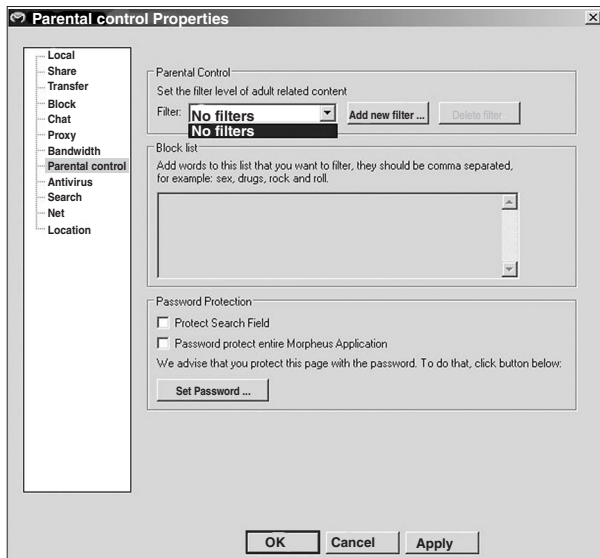
Objective 5 Results

We determined that the Morpheus filter was largely ineffective in blocking pornographic content associated with words entered into the filter. For instance, when searching on known word "X" without a filter, we were able to download 63 images; 42 were adult pornography, 16 were adult erotica, and 5 were non-pornographic. When searching on known word "X" again and entering the known word "X" into the filter, we were able to download 13 images, of which 9 were adult pornography, 3 were adult erotica, and 1 was nonpornographic. In addition, the overall effectiveness of this filter is dependent on the user's ability to identify keywords associated with objectionable content, such as pornography.

Attachment 3 presents the results of the three filtered known word searches and the three innocuous searches on Morpheus.

Morpheus provides users the option to password protect the filter setting. However, like Kazaa's filter option, Morpheus's password protection can be easily circumvented by un-installing the program and re-installing it to remove the password protection.

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Objective 6 Results

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Objective 6—Determine how the effectiveness of filters offered by P2P programs compares to filters provided by leading Internet search engines.

The filters for the three leading Internet search engines—Google, Yahoo, and MSN—vary in their effectiveness. We determined that MSN's filter was as effective as Kazaa's filter in consistently blocking all erotic and pornographic images during the known word searches as well as in the innocuous word searches.

Google's filter was not as effective. It blocked all pornographic and erotic images on the filtered innocuous searches and on two of the known word searches; however, when filtering the third known word, Google generated 79 images, of which 11 were erotic.

Similar to the Morpheus filter, Yahoo's filter was largely ineffective in blocking pornographic and erotic images. While it blocked pornographic and erotic images on the innocuous word searches, Yahoo's filter did not block a substantial number pornographic and erotic images on two of the known word searches and did not block erotic images on the third known word search.

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Objective 6 Results

Figure 11 displays the results of one of our known word searches and attachment 3 presents the results of the filtered and unfiltered known and innocuous word searches on the three Internet search engines.

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Objective 6 Results

Figure 11: Results of Internet Searches Using Second Word Known to be Associated with Pornography
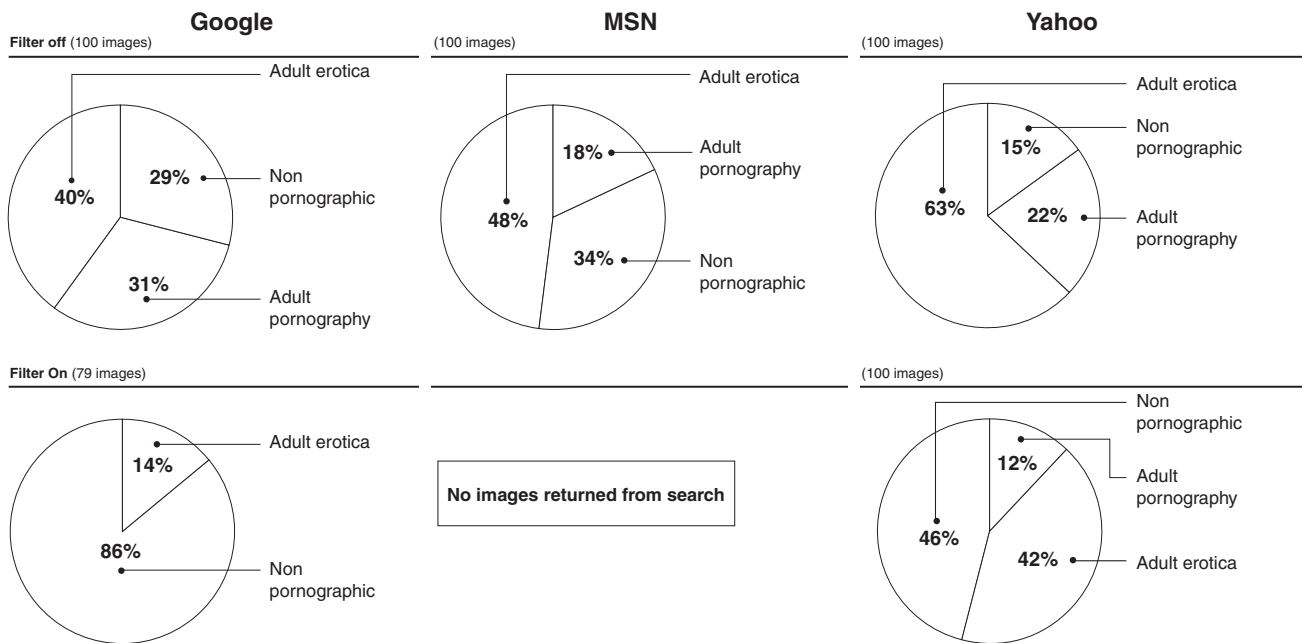
Google

Filter off (100 images)

Adult erotica

29% — Non pornographic

40%

31% — Adult pornography

Filter On (79 images)

14% — Adult erotica

86%

— Non pornographic

MSN

(100 images)

Adult erotica

18% — Adult pornography

48%

34% — Non pornographic

No images returned from search

Yahoo

(100 images)

Adult erotica

15% — Non pornographic

63%

22% — Adult pornography

(100 images)

Non pornographic

12% — Adult pornography

46%

42% — Adult erotica

Source: GAO analysis of C3 research specialist's classification of images.

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Objective 6 Results

Yahoo was the only application among the Internet search engines and the P2P programs in which the filter could not be easily circumvented. As previously mentioned, while Kazaa and Morpheus allows users to password protect their preferences, a user can simply re-install a new version of the program to circumvent the filters. MSN and Google do not allow users to password protect their preferences. Yahoo's filter, however, allows users to establish a password to save and lock their filtering preferences.

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Objective 7 Results

Objective 7—Identify other tools that are available to block pornography on P2P networks.

A variety of filtering tools are available that are separate from filters offered by the P2P programs. According to the manufacturers, these tools allow parents to establish which P2P programs can and cannot be run on the computer and can prevent pornographic images from being displayed on the computer.

In addition to the filtering products, other tools are available that cannot directly block pornographic images, but can provide additional mechanisms to limit the accessibility to pornography on P2P programs. These tools include monitoring tools and time limiting tools.

• According to the manufacturers, monitoring tools record computer activity and the access users have to the Internet. These tools can record the P2P applications that have been downloaded, the searches that have been conducted, and the files the user is sharing. Some of these monitoring tools can send, for example, parents an e-mail report of the computer's activity.

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Objective 7 Results

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- According to the manufacturers, time limiting tools limit the time spent on the computer and/or on the Internet and the time of day the computer can be accessed. For example, according to the manufacturers, time limiting tools can allow a parent to program the times when their child can access the Internet.

Attachment 4 lists products that offer filtering, monitoring, and time limiting capabilities.

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Objective 8 Results

Objective 8—Identify the corporate owners of Warez, Kazaa, and Morpheus. Obtain corporate information for the subject corporations, including the country of incorporation.

Kazaa is owned by Sharman Networks, Ltd. Sharman is incorporated in Asia in the South Sea island of Vanuatu. Sharman headquarters is in Australia and has management services in Europe.

Morpheus is owned by StreamCast Networks (formerly called MediaCity). StreamCast is incorporated in the United States in California. StreamCast's parent corporation is Stirling Bridge, which is incorporated in Oregon.

We were unable to obtain corporate information on Warez.

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Agency Comments

We provided a draft of this briefing to and discussed its contents with Immigrations and Customs Enforcement, C3 officials. In their oral comments, the C3 officials, including the C3 section chief for child exploitation, generally agreed with the results in the briefing. They also provided clarifying information that we incorporated into this briefing.

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Attachment 1
Description of Selected File Sharing Networks

There are three main models of P2P networks. The first model is a centralized model that is based on a central server, or broker, that directs traffic between individual registered users (see fig. 12).

The broker model was used by Napster, the original P2P network. It facilitated mass sharing of copyrighted material by combining the file names held by thousands of users into a searchable directory that enabled users to connect with each other and download MP3-encoded music files. The broker model made Napster vulnerable to legal challenges and eventually led to its demise in September 2002.

The second model is the decentralized model, which is based on the Gnutella network. In the decentralized model, individuals find and interact directly with each other (see fig. 13). In both the centralized and the decentralized models, users share complete files with one another. The decentralized model is not dependent on the server/broker model that was the central feature of the Napster service, so these networks are less vulnerable to litigation from copyright owners.

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Attachment 1
Description of Selected File Sharing Networks

More recently, a third model has emerged—BitTorrent. In this model, users simultaneously download segments of files from many different users to obtain complete files. The more often users download and share segments of a file, the more quickly the file will download. Applications using this model include Morpheus and eDonkey2K (see fig. 14).

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Attachment 1
Description of Selected File Sharing Networks

Figure 12: Centralized Peer-to-Peer Model

When Bob submits a request for a particular file, the broker displays a list of matching files belonging to users connected to the network. Bob can then select the desired file from the list and open a direct link with Alice's computer, which currently has the file.

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Attachment 1
Description of Selected File Sharing Networks

Figure 13: Decentralized Peer-to-Peer Model

Ted starts with a networked computer equipped with a decentralized file-sharing program. Ted connects to Carol, Carol to Bob, Bob to Alice, and so on. Ted's search request is sent to all members of the network. If Alice, for example, has a file that matches the request, it transmits the file information back to Ted, who will then be able to download the file from Alice's computer.

Ted   Downloading file X.   Alice

Alice has   Who has   Who has   Alice has
file X.   file X?   file X?   file X.

Carol   Who has file X?   Bob
                         Alice has file X.

Sources: Mark Bontrager, Bob Knighten, Art Explosion (clipart).

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Attachment 1
Description of Selected File Sharing Networks

Figure 14: BitTorrent Model

1. Tracker tells each user where the requested parts of the file are located by sending the address of the requesting computer to all users and the Seed.

2. Seed sends part of file to each user and address of where files are sent to tracker.

3. Users then share parts of files with all other users until all users have all parts of the file.
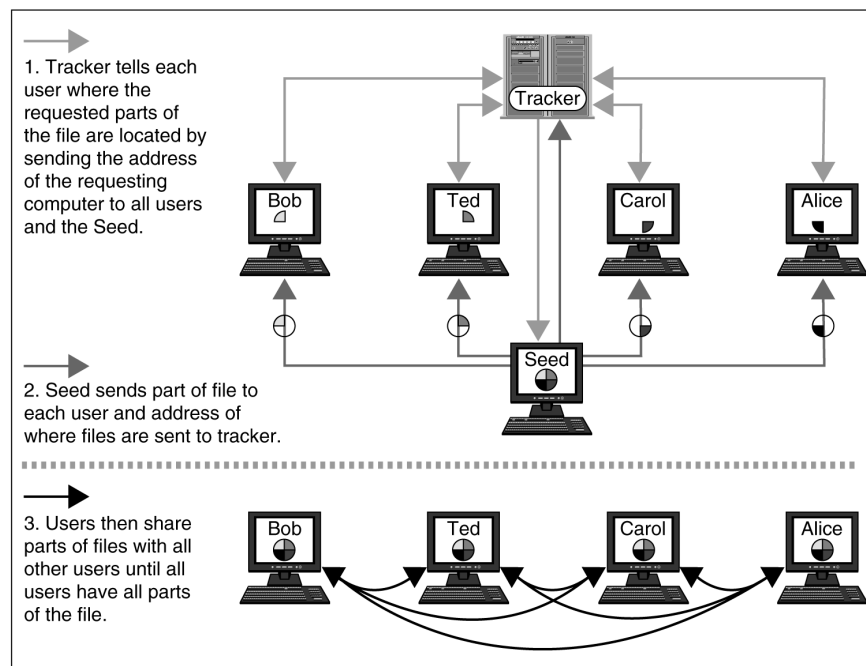
Sources: GAO, Art Explosion (clipart).

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Attachment 2
Peer-to-Peer Programs

Name	Free	Fee	Name	Free	Fee
Acquisition		√	eDonkey	√	
AlienIdol	√		eMule	√	
amule	√		eMule Plus	√	
ANts	√		Epicea	√	
Apollon	√		eXeem	√	
Arachnid		√	eXeem Lite	√	
Arctic Torrent	√		ExoSee	√	
Ares Galaxy	√		FileCroc	√	
Ares Lite	√		Filetopia	√	
AudioGnome	√		Flash! Torrent	√	
Azureus	√		FolderShare	√	
Baobab	√		Freenet	√	
BCDC++	√		FreeWire	√	
BearShare	√		FreeWire (International)	√	
BearShare Lite	√		G3 Torrent	√	
BitBuddy	√		Gluz	√	
BitComet	√		Gnewtellium	√	
BitLord	√		Gnoozle	√	
BitTornado	√		Gnucleus	√	
BitTorrent	√		GreatDimensions	√	
BitTorrent Lite	√		Grokster	√	
BitTorrentExperimental	√		Grokster Pro		√
Blubster	√		Grouper	√	
BT++	√		Gtk-Gnutella	√	
Burst!	√		iMesh	√	
Cabos	√		iSwipe	√	
Crazaa	√		iTunes		√
DC Elite	√		JavaShare	√	
DC++ - BCDC++	√		JetiAnts	√	
Deepnet Explorer	√		JoeGalaxy.NET	√	
DICE	√		Kazaa	√	
DigitalPlay	√		KaZaA Lite	√	
DKMessenger		√	KazaaGhost	√	
Drumbeat		√	KCeasy	√	

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Attachment 2
Peer-to-Peer Programs

Name	Free	Fee	Name	Free	Fee
Kiwi Alpha	√		Pinky		√
Lan2P	√		Piolet	√	
LimeWire	√		Poisoned	√	
LimeWire (Classic)	√		PTC	√	
Lopster	√		pysoulseek	√	
Iphant	√		Qnext	√	
MacFreenet	√		RaidenFTPD	√	
Mammoth	√		RevConnect	√	
MediaSeek	√		Rockitnet	√	
mldonkey	√		Shareaza	√	
MLmac	√		Sigster	√	
Morpheus	√		SolarSeek	√	
MP3 Galaxy	√		Soulseek	√	
MP3 Kult	√		StrongDC++	√	
MP3 Music Search	√		Swapper.Net	√	
MP3 Plus	√		TAZ-E	√	
MusicMatch		√	Tesla	√	
Mute	√		The Circle	√	
MyNapster	√		Torrent Search	√	
Myster	√		TorrentStorm	√	
Network Auralization for Gnutella	√		TorrentTopia	√	
NapMX	√		TrustyFiles	√	
Napster		√	TrustyFiles Personal File Sharing	√	
NATural IP SOHO Client		√	Turbo Torrent	√	
NeoNapster	√		VAMP Media Center	√	
NetFav	√		Warez	√	
Nicotine	√		WinMX	√	
Nova	√		Winny	√	
Nova Torrent	√		XBT Client	√	
OneMX	√		XFactor	√	
Ospray OpenNap Client	√		XoloX	√	
P2P Music Jukebox		√	Yet ABC	√	
Phex	√		Zultrax	√	

Source: GAO analysis of data from Zeropaid.com, Download.com, and Slyck.com.

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Figure 15: Results of P2P Searches Using First Word Known to be Associated with Pornography
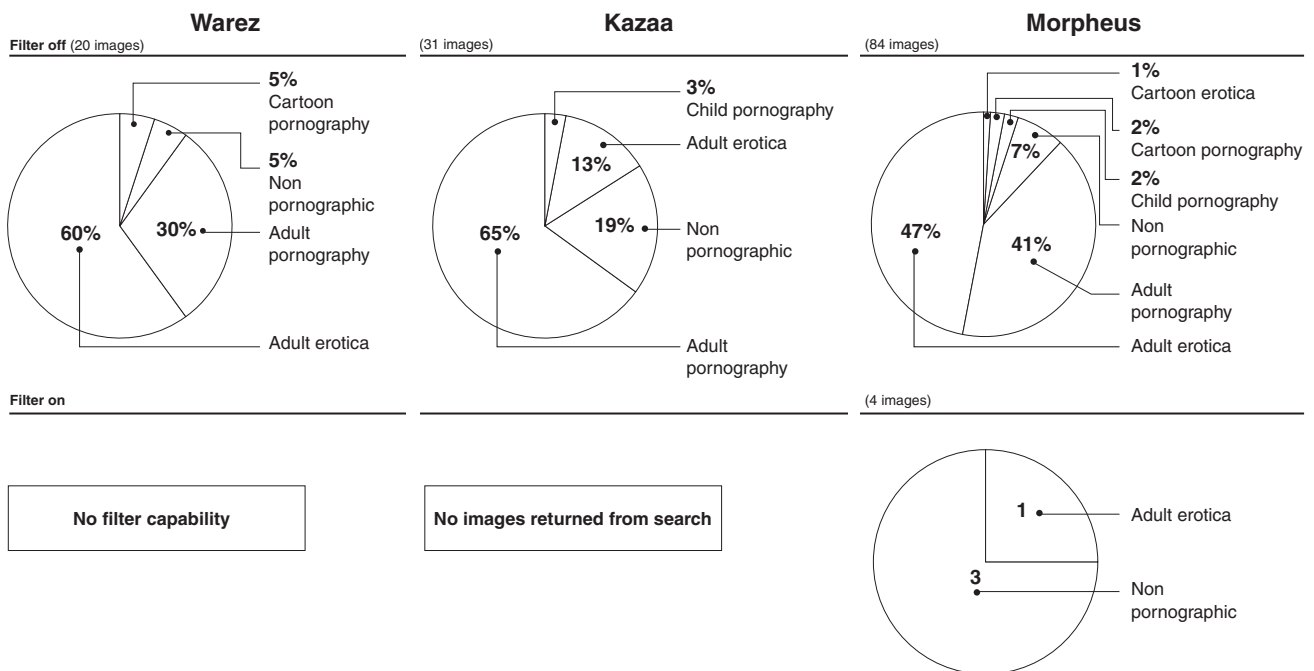
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Attachment 3
Results of Word Searches

Figure 16: Results of P2P Searches Using Second Word Known to be Associated with Pornography

Warez	Kazaa	Morpheus

Filter off

Warez:
All 4 images were adult pornography

Kazaa (9 images):
- Adult pornography — 6
- Non pornographic — 3

Morpheus (63 images):
- Adult pornography — 8%
- Non pornographic
- 67%
- 25% — Adult erotica

Filter on

Warez:
No filter capability

Kazaa:
No images returned from search

Morpheus (13 images):
- Non pornographic — 8%
- 23% — Adult erotica
- 69%
- Adult pornography

Source: GAO analysis of C3 research specialist's classification of images.

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Attachment 3
Results of Word Searches

Figure 17: Results of P2P Searches Using Third Word Known to be Associated with Pornography

Warez — Filter off
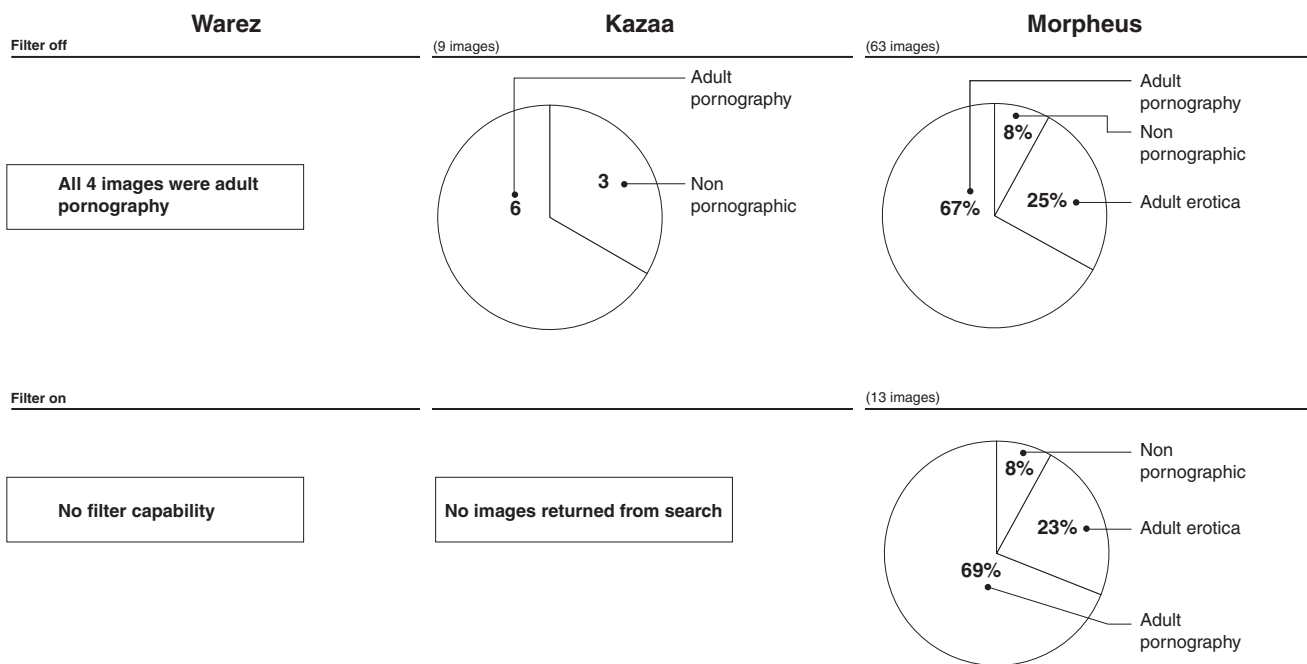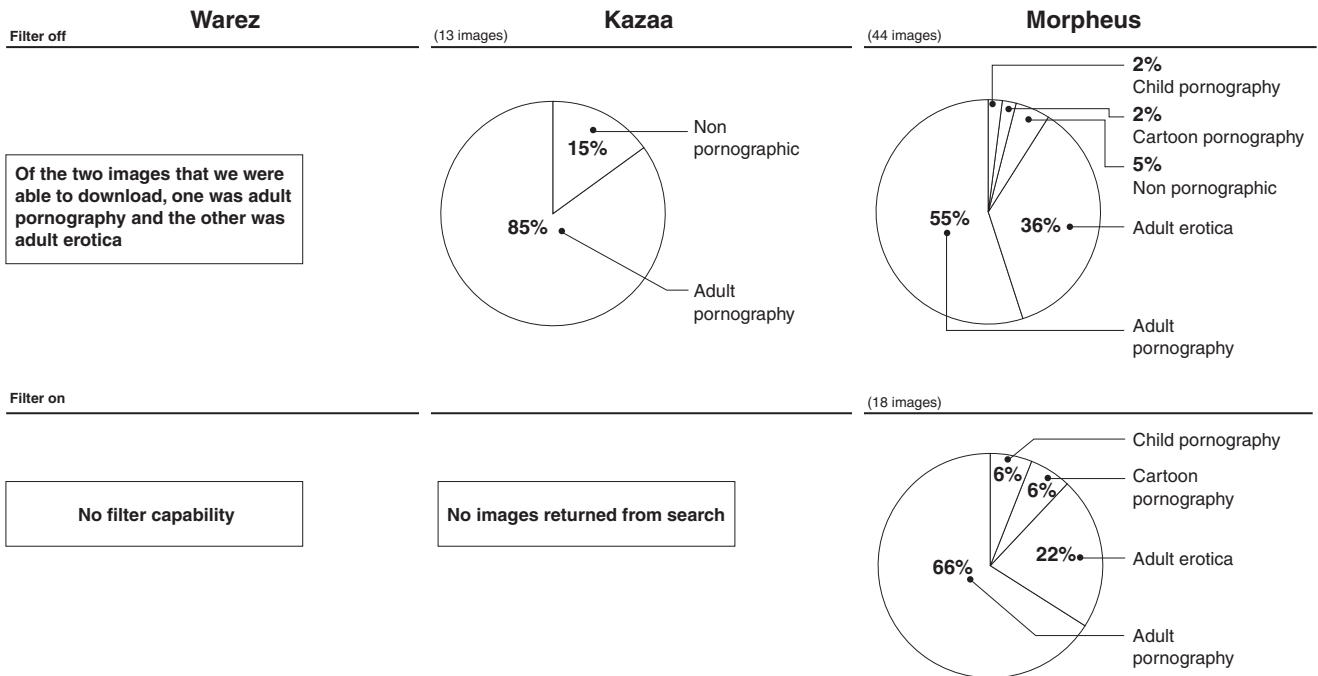
Of the two images that we were able to download, one was adult pornography and the other was adult erotica

Kazaa (13 images)

- 15% Non pornographic
- 85% Adult pornography

Morpheus (44 images)

- 2% Child pornography
- 2% Cartoon pornography
- 5% Non pornographic
- 55% / 36% Adult erotica
- Adult pornography

Filter on

No filter capability

No images returned from search

Morpheus (18 images)

- 6% Child pornography
- 6% Cartoon pornography
- 22% Adult erotica
- 66% Adult pornography

Source: GAO analysis of C3 research specialist's classification of images.

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Attachment 3
Results of Word Searches

Figure 18: Results of P2P Searches Using First Innocuous Word

Warez	Kazaa	Morpheus

Filter off (20 images)   (17 images)   (20 images)

Non pornographic

Non pornographic

Non pornographic

Adult erotica

12%

5%
Adult pornography

35% — Adult erotica

65%   **35%** — Adult erotica

88%

60%   **35%** — Adult erotica

Filter on   (13 images)

Non pornographic

Adult pornography

15%

No filter capability	None of the 12 images was pornographic or erotic

54%

31% — Adult erotica

Source: GAO analysis of C3 research specialist's classification of images.

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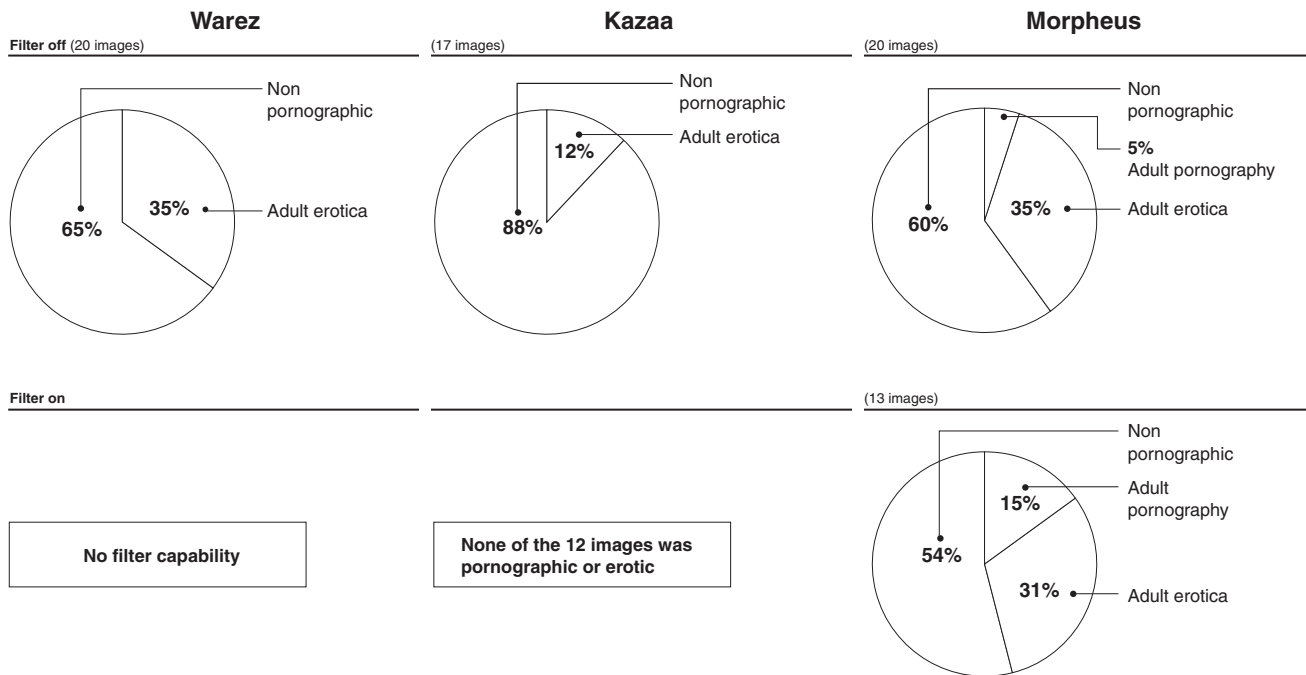
Attachment 3
Results of Word Searches

Figure 19: Results of P2P Searches Using Second Innocuous Word

Warez

Filter off (14 images)

Non pornographic

50%   50% — Cartoon pornography

Kazaa

(13 images)

Non pornographic

54%   46% — Cartoon pornography

Morpheus

(31 images)

6% — Cartoon pornography

94% — Non pornographic

Filter on

(53 images)

No filter capability

None of the 12 images was pornographic or erotic

Non pornographic

36% — Cartoon pornography

64%

Source: GAO analysis of C3 research specialist's classification of images.

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<div align="right">
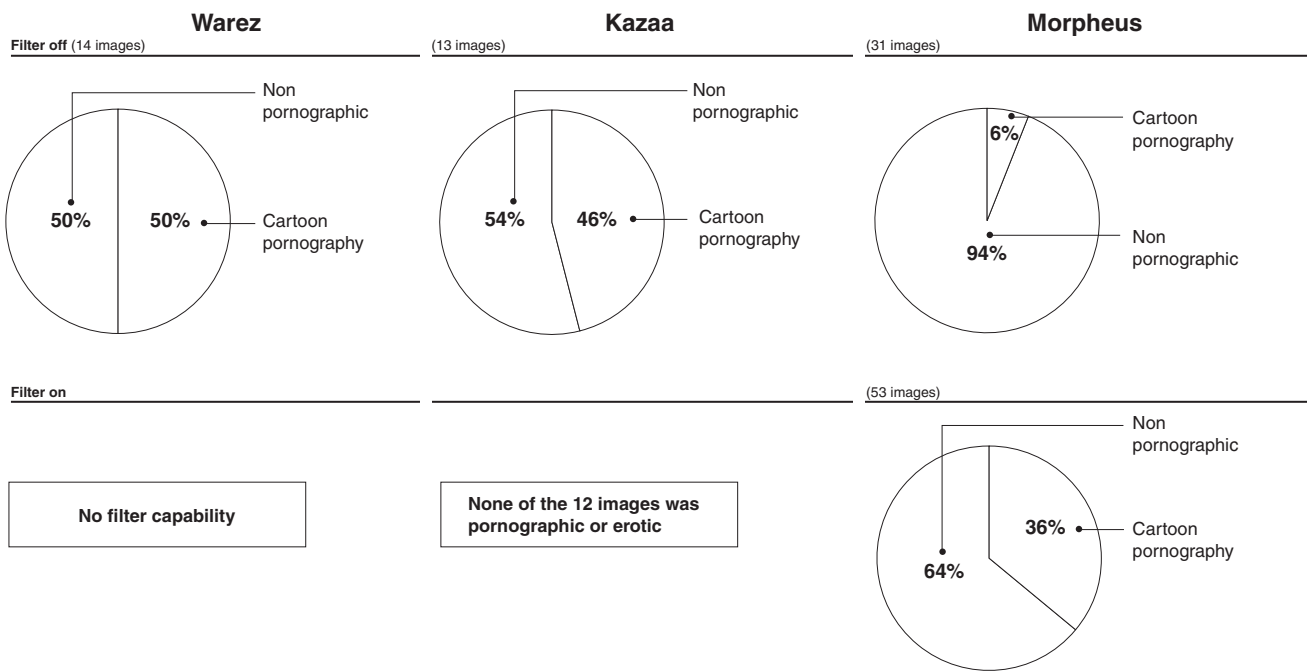
Attachment 3
Results of Word Searches

</div>

Figure 20: Results of P2P Searches Using Third Innocuous Word

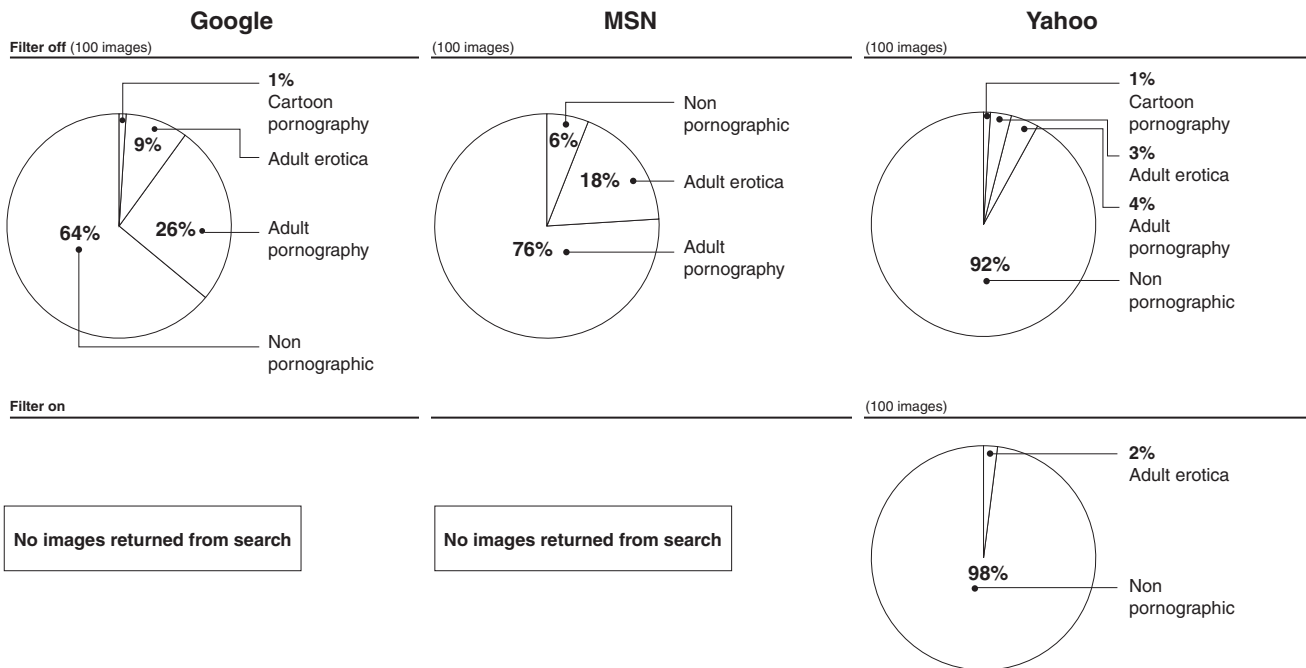| **Warez**	**Kazaa**	**Morpheus**
Filter off		
None of the 6 images was pornographic or erotic	None of the 10 images was pornographic or erotic	None of the 18 images was pornographic or erotic
Filter on		
No filter capability	None of the 21 images was pornographic or erotic	None of the 12 images was pornographic or erotic

Source: GAO analysis of C3 research specialist's classification of images.

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Attachment 3
Results of Word Searches

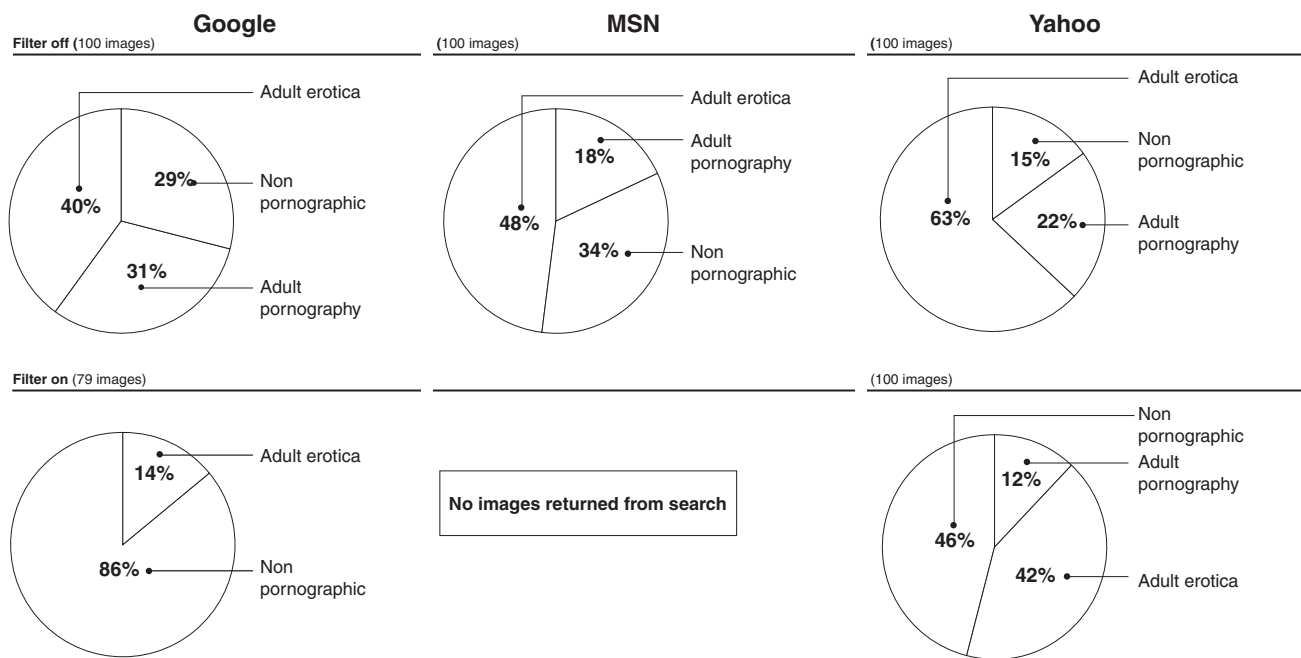Figure 21: Results of Internet Searches Using First Word Known to be Associated with Pornography

Google
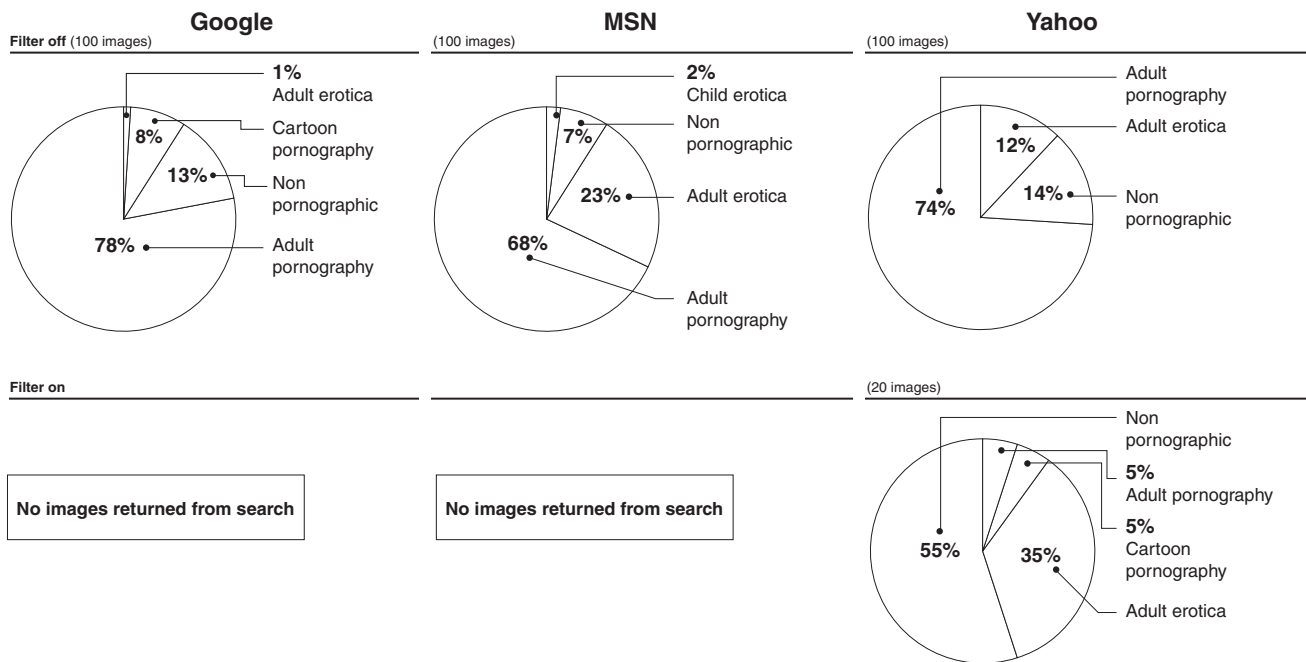
Filter off (100 images)

1%
Cartoon pornography

9%

Adult erotica

64%   26% — Adult pornography

Non pornographic

MSN

(100 images)

Non pornographic

6%

18% — Adult erotica

76% — Adult pornography

Yahoo

(100 images)

1%
Cartoon pornography

3%
Adult erotica

4%
Adult pornography

92%

Non pornographic

Filter on

(100 images)

No images returned from search

No images returned from search

2%
Adult erotica

98%

Non pornographic

Source: GAO analysis of C3 research specialist's classification of images.

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Attachment 3
Results of Word Searches

Figure 22: Results of Internet Searches Using Second Word Known to be Associated with Pornography

Google

Filter off (100 images)

Adult erotica

29% — Non pornographic

40%

31% — Adult pornography

Filter on (79 images)

14% — Adult erotica

86% — Non pornographic

MSN

(100 images)

Adult erotica

18% — Adult pornography

48%

34% — Non pornographic

No images returned from search

Yahoo

(100 images)

Adult erotica

15% — Non pornographic

63%

22% — Adult pornography

(100 images)

Non pornographic

12% — Adult pornography

46%

42% — Adult erotica

Source: GAO analysis of C3 research specialist's classification of images.

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Attachment 3
Results of Word Searches

Figure 23: Results of Internet Searches Using Third Word Known to be Associated with Pornography

Google
Filter off (100 images)

1%
Adult erotica

8%
Cartoon pornography

13%
Non pornographic

78%
Adult pornography

MSN
(100 images)

2%
Child erotica

7%
Non pornographic

23%
Adult erotica

68%
Adult pornography

Yahoo
(100 images)

Adult pornography

Adult erotica

12%

14%
Non pornographic

74%

Filter on

No images returned from search

No images returned from search

(20 images)

Non pornographic

5%
Adult pornography

5%
Cartoon pornography

55%

35%

Adult erotica

Source: GAO analysis of C3 research specialist's classification of images.

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Attachment 3
Results of Word Searches

Figure 24: Results of Internet Searches Using First Innocuous Word

Google

Filter off (100 images)

1%
Adult erotica

Non
pornographic

99%

MSN

(100 images)

2%
Adult
pornography

2%
Adult erotica

Non
pornographic

95%

Yahoo

(100 images)

Non
pornographic

Adult
pornography

10%

12%

Adult erotica

78%

Filter on

None of the 100 images was
pornographic or erotic

None of the 66 images was
pornographic or erotic

None of the 100 images was
pornographic or erotic
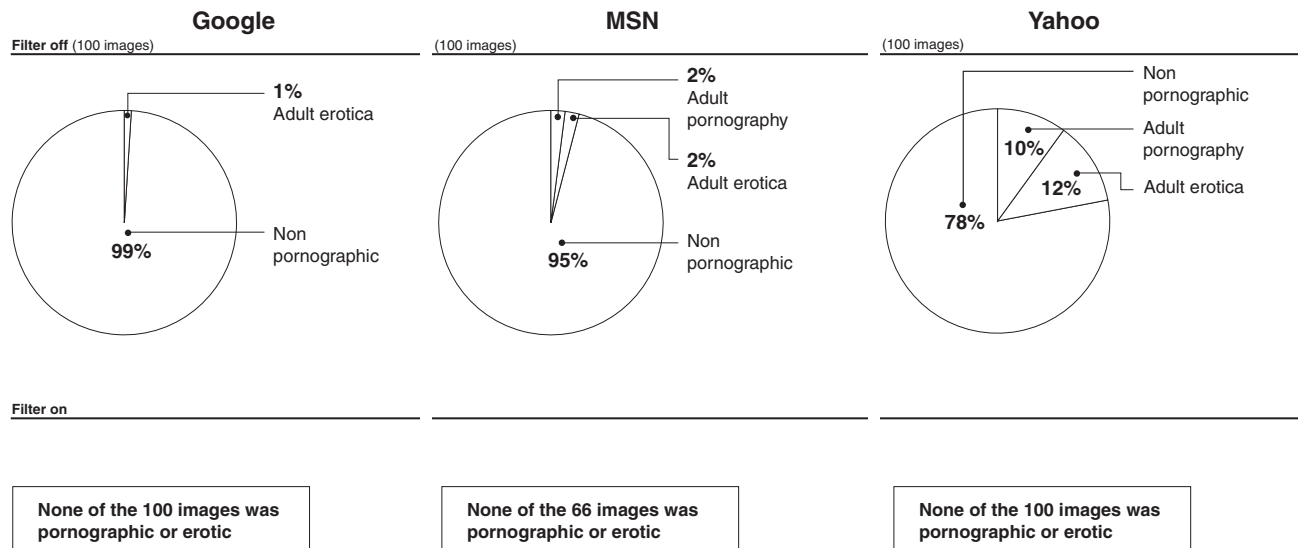
Source: GAO analysis of C3 research specialist's classification of images.

Note: Due to rounding, percentages may not add up to 100.

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Attachment 3
Results of Word Searches

Figure 25: Results of Internet Searches Using Second Innocuous Word
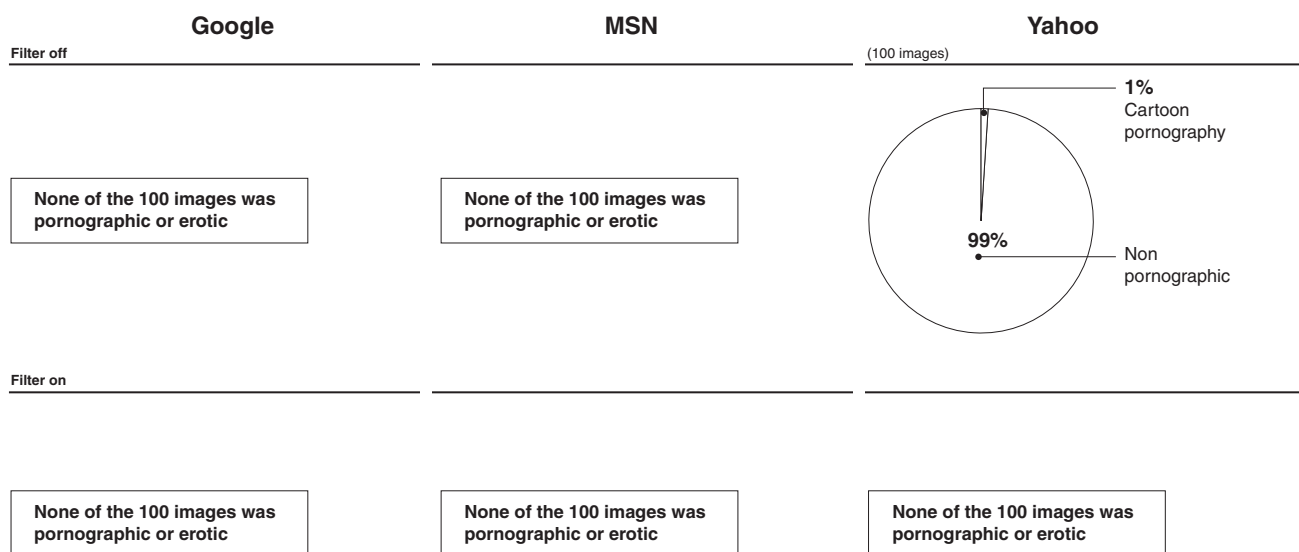
Google	MSN	Yahoo
Filter off		(100 images)

Google — Filter off

| None of the 100 images was pornographic or erotic |

MSN — Filter off

| None of the 100 images was pornographic or erotic |

Yahoo — Filter off

1%
Cartoon pornography

99%

Non pornographic

Filter on

Google — Filter on

| None of the 100 images was pornographic or erotic |

MSN — Filter on

| None of the 100 images was pornographic or erotic |

Yahoo — Filter on

| None of the 100 images was pornographic or erotic |

Source: GAO analysis of C3 research specialist's classification of images.

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Attachment 3
Results of Word Searches

Figure 26: Results of Internet Searches Using Third Innocuous Word

Google	MSN	Yahoo

Filter off

None of the 100 images was pornographic or erotic	None of the 100 images was pornographic or erotic	None of the 100 images was pornographic or erotic

Filter On

None of the 100 images was pornographic or erotic	None of the 100 images was pornographic or erotic	None of the 100 images was pornographic or erotic

Source: GAO analysis of C3 research specialist's classification of images.

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Attachment 4
Tools to Protect Users on Peer-to-Peer Programs

Program name	Monitoring capability	Filtering capability	Time limiting capability
Advanced Computer Monitor	√		
AOL Parental Controls	√	√	√
Blockster	√	√	
Computer Cop	√		
Cyber Patrol		√	√
CyberSnoop	√		√
Enologic Net Filter Home		√	√
ENUFF PC			√
EyeTimer			√
Guardian Monitor	√		
iProtectYou			√
Kidsnet Parental Controls		√	
ModemLockDown			√
Net Nanny	√	√	
Noah's Web	√	√	
Norton Internet Security		√	
Screen Shield		√	
Spector Pro	√		
SurfPass			√

Source: GAO analysis based on GetNetWise data.

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