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Zeus Malware: Threat Banking Industry

Unisys Stealth Solution Team

White Paper

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Primarily a crimeware kit, Zeus is used by cyber criminals across the Globe, and is designed to steal users' online banking details as well as other important credentials. Today, Zeus is estimated to account for some 44% of the banking malware infections and has impacted an estimated 3.6 million computers in the U.S. alone. Its victims include more than 960 different banks with the latest reports indicating that it has infected almost 90% of Fortune 500 companies.

Zeus is estimated to have caused damages worth US$100 million since its inception. Alarmingly, up-to-date anti-virus programs are effective at blocking Zeus infections only 23 percent of the time. It is clear that traditional anti-virus software alone cannot be used to combat Zeus. Companies need to consider radical innovations in security to ensure protection from online fraud and to maintain customer goodwill.

This paper provides visibility into the intrinsic risk that Zeus has over the banking industry and how Unisys can help avoid the threat through its security portfolio.

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Introduction

"Nordea Bank loses $1.14 million in online fraud" – iTWire (Jan 2007)

"Heartland Payment Systems says malware breach cost $12.6 million" – ZDNet (May 2009)

"Conficker worm affects millions of users worldwide" – New York Times (Apr 2009)

"ATM malware in Eastern Europe lets criminals steal data and cash" CNET news (June 2009)

These are just a few instances of banks and financial institutions being affected by malware (short for malicious software). With the rise of widespread broadband Internet access, malware has now emerged as the primary vehicle for organized cybercrime. As noted in Symantec's annual report for 2009, the number of detected malware samples in 2009 grew by 71 percent as compared to 2008. Most malwares are now geared towards making profit and enabling financial gain. This has led to an increased attack on banking and financial systems. As a result, the total monetary loss related to online fraud has soared from[1] US$265 million in 2008 to US$559.7 million in 2009. The worst affected is the SMB sector (small and medium business) which, per the FBI, has lost US$40 million since 2004 courtesy online banking scams.

A recent survey of over 500 US-based SMB organizations[2] revealed that approximately 55% of the SMBs experienced a fraud attack in the last year with over 50% experiencing multiple incidents. Of these, 58% of the incidents involved online banking. Alarmingly, 87% of the victims failed to fully recover lost funds, recovering only 44% of the losses on average. A separate study of 50 SMBs, which fell prey to online banking Trojans in 2009, revealed that they lost US$157,000 on average.

The spread of malware has not been restricted to the SMB sector or the US alone. Losses from online banking fraud in the UK rose 14% in 2009 year-over-year to reach a total of £59.7million.[3] The bulk of the rise was due to an increase in the number of criminals infecting online bankers' computers with malware capable of gathering a person's online banking details, thus allowing fraudsters to steal money from their account. Such fraud has increased exponentially since 2007, when the Zeus malware was first detected.

The Zeus malware is one of the most pervasive and damaging banking malware known to date. It is primarily observed to be used for financial gain by stealing online credentials such as online banking, email, FTP and other passwords, although it is also capable of taking complete control of a compromised computer. Zeus was first used in 2007 to steal information from the United States Department of Transportation, but has evolved over time. The ease of use of Zeus has made it an ideal tool for even novice hackers to easily steal banking-related information from an individual, or customer-related data from a server. Being freely traded in underground forums, it has become widely prevalent and is now being distributed by multiple, unrelated parties.

Zeus reached record numbers in May 2009 with more than 5,000 variants. It has essentially earned the 'bestseller' status among malware with such wide variants. The Zeus malware alone is estimated to have caused damages worth US$100 million since its inception. Actual figures may be much higher since currently no government entity tracks and reports on the number of victim organizations and the amounts lost. Trend Micro recently reported discovering a new Zeus variant targeting major consumer banks in Italy, England, Germany and France.

1 Source: "2009 Internet Crime Report" released by the Internet CrimeComplaints Center (iC3)

2 Survey conducted by the Ponemon Institute and Guardian Analytics

3 Source: "New card and banking fraud figures" released by the UK Cards association

Impact of Zeus

Financial Damage

According to security company Trusteer, Zeus alone accounts for 44% of all banking malware infections. Many cases involve SMBs (see box below) who have had huge amounts transferred out of their accounts without their knowledge.

Little & King LLC, a small promotions company based out of Merrick, N.Y, lost $164,000 in fraudulent wire transfers in Feb 2010, after one of its computers was infected by the Zeus malware. The firm now faces bankruptcy since it has run out of funds for working capital.

Cyber criminals based in Ukraine stole $415,000 in July 2009 from the coffers of Bullitt County, Kentucky by unauthorized wire transfers, using Zeus and the victim's own Internet connection.

Smile Zone, a Springfield, Missouri based dental practice, lost $205,000 in March 2010 after being affected by Zeus.

In most cases of financial loss due to malware, banks try to reverse the fraudulent transfers and are at least able to partially recover the funds (see box below), but the chances of that succeeding diminish rapidly after the first 24 hours following unauthorized activity. Businesses do not enjoy the same protections afforded to consumers hit by online fraud, as banks do not offer insurance against fraud to business customers.

Port Austin, Michigan-based United Shortline Insurance Service Inc fell victim to the Zeus trojan and lost nearly $150,000 in March 2010. Luckily its bank, the Bay Port State Bank, was able to recover about half the money.

Eskola LLC, a Tennessee-based roofing firm and Orange Family Physicians, a medical practice in Virginia, lost $130,000 and $46,000 respectively to Zeus in January 2010. While Eskola's bank recovered around $100,000, Orange Physicians' bank could recover only $6000.

The cases detected so far are probably just the tip of the iceberg; most victims are unwilling to disclose their identity or the full extent of their financial losses, fearing implications for their businesses.

[4] Source: Report by RSA' FraudAction Anti-Trojan division

Damage to Goodwill

The recent months have seen a flurry of malware-related lawsuits. Victims of online fraud are now suing their banks to recover some of their losses (see box).

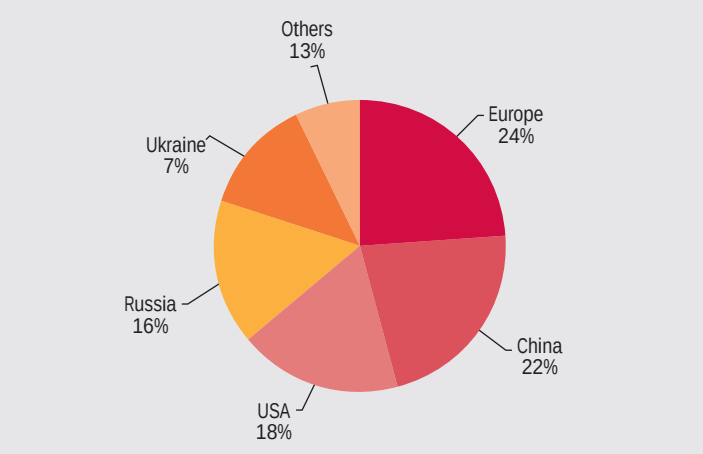
In Illinois, a couple whose bank account was robbed of US$26,500 has been allowed to sue their bank, Citizens Financial Bank, for its alleged failure to implement the latest security measures designed to prevent such compromises. The outcome of these cases is still awaited.

Banks are currently under no legal obligation to reimburse business customers for losses suffered due to malware. Such incidents, however, cause a huge loss of reputation and bad publicity for the bank, in addition to loss of confidence among customers who transfer their accounts to other banks. Since trust is fundamental to banking institutions, such incidents lead to decreased growth for the affected banks. Customers also begin to migrate away from the cost-effective online banking channels, leading to increased costs for the bank.

Scale of Infection

Though it is difficult to trace exactly how many systems have been affected by Zeus, it is estimated that around 3.6 million PCs are infected in the US alone. Research indicates that as of April 2010, 88% of Fortune 500 companies have been affected by this malware.[4]

The most recently detected large Zeus botnet is the so-called Kneber botnet. In February 2010, the US-based corporate security company NetWitness reported the detection of Zeus-infected computers in 2,500 organizations in 196 countries worldwide. A total of 76,000 infected computers were detected.

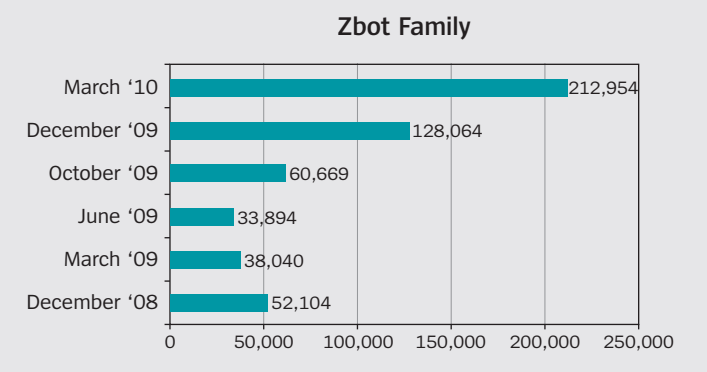


As of October 28, 2009 Zeus had also sent out over 1.5 million phishing messages on Facebook. From November 2009, Zeus spread via e-mails purporting to be from Verizon Wireless. A total of nine million of these phishing e-mails were sent.

Per the Microsoft Malware Protection Center, the number of Zeus infections has increased when compared to last year. The figure below illustrates the same:

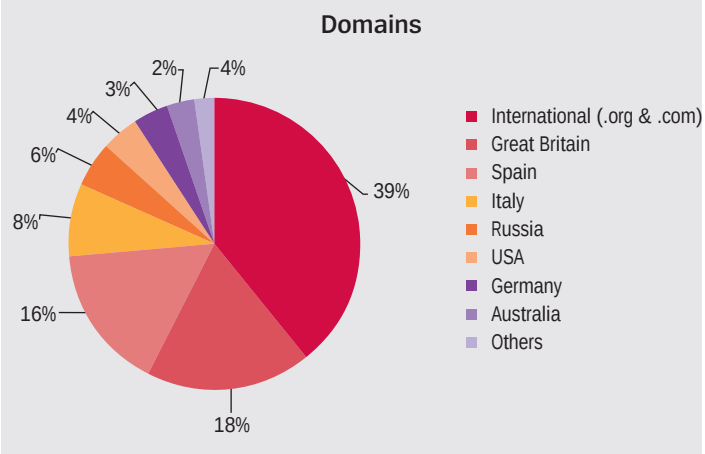
Out of the 11 international domains that Zeus targets, 8 are banks offering internet banking services to its clients and the other 3 are commercial internet service providers.

Running Zeus from any location is exceedingly possible. More often or not, malicious users place their servers with European, Chinese, North American and Russian providers as they offer well developed hosting services. Zeus records the location of the host when the bot checks into the command and control server.



Zeus targets certain top level domains; the most commonly targeted domains are international domains (.org and .com) which belong to large multinationals.

The following chart clearly depicts the top domains that are targeted by Zeus:



Top 5 victim countries affected by Zeus are:

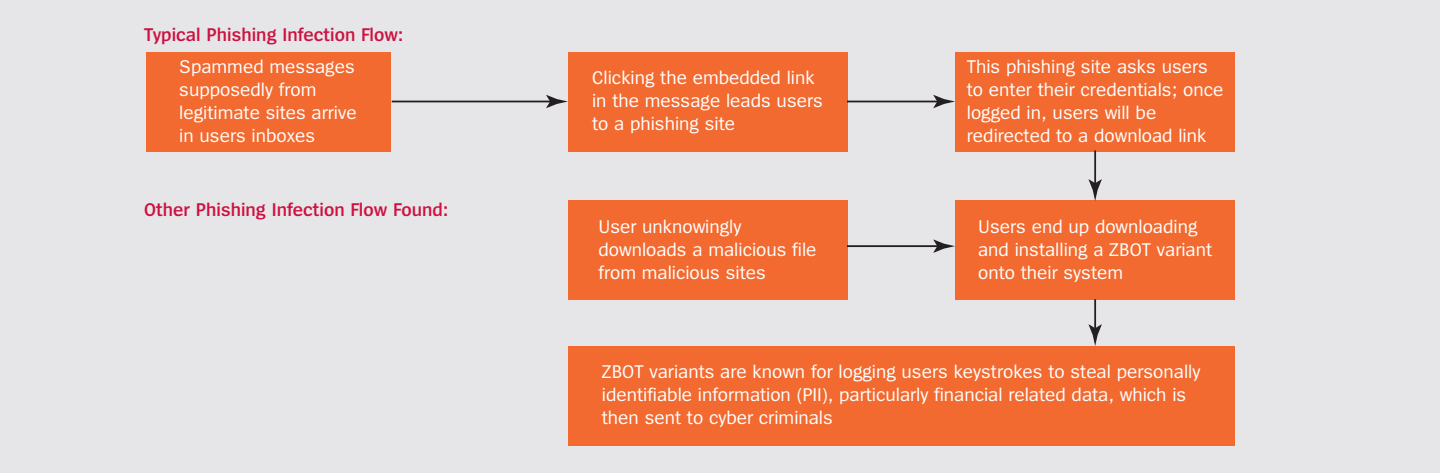
Country Name	% Machines Infected
Egypt	19%
Mexico	15%
Saudi Arabia	13%
Turkey	12%
United States	11%

How Zeus Works

The primary purpose of Zeus is to steal online

Malware is designed to infiltrate a computer system without the owner's informed consent. While malware was initially written for pranks, experiments or vandalism, it is now primarily used to perpetrate online fraud. Zeus is a specific kind of malware known as a 'botnet'. A botnet is a collection of software agents designed to run autonomously and automatically. Malware writers are now increasingly using botnets to affect as many machines as possible and use a 'bot master' to control the group remotely, if required. Other notable botnets apart from Zeus are Storm, Conficker, Mega-D, Pushdo and Srizbi.

Zeus is likely to have originated in Russia or Eastern Europe and has now entered the underground cybercriminal community as a commodity. Zeus is also known as ZBot, PRG, Wsnpoem, Gorhax and Kneber.



Zeus primarily targets machines running Microsoft Windows XP (SP2/SP3). Windows Vista machines have also been found to be infected. The primary purpose of Zeus is to steal online credentials. This is done by techniques such as keystroke logging, capturing screenshots, or advanced methods such as HTML injection into web pages and exploiting browser vulnerabilities. Zeus gathers a variety of system information along with passwords and encryption certificates and sends this to a command-and-control server. The server can also send a configuration file to the bot,, specifying a list of actions to be performed.

The Zeus crimeware kit can be purchased for as low as US$700 and provides a ready-to-deploy package for hackers to distribute their own botnet. The package contains a builder that can generate a bot executable and Web server files (PHP, images, SQL templates) for use as the command - and -control server. ZBot is a generic back door that allows full control by an unauthorized remote user. However it is primarily observed to be used for financial gain by stealing online credentials such as online banking, email, FTP and other passwords.

Latest Developments in Zeus

- Zeus is now exploiting features in Adobe Reader to launch malicious attacks.
- Zeus 1.6, which is the latest version of Zeus in market, is targeting Firefox browser
- With the explosion of social networking across the globe, Zeus is now using social networking sites to send out its phishing messages to users; for instance, last year it sent out close to 1.5 million messages to Facebook users. If a user opened that message there would be a Trojan that would be installed on their system

The Traditional Malware Control Approach vs. Zeus Malware

The results of the survey conducted by Trusteer, a security company, on close to 10, 000 machines are quite astonishing. Zeus is able to penetrate close to 55 percent of systems which have up-to-date antivirus. Up-to-date anti-virus programs are effective at blocking Zeus infections only 23 percent of the time.

The above table clearly shows that the traditional assumption that the system is free from any virus attack, if there is an antivirus installed on it, does not hold true in case of Zeus.

What is even more alarming is that Zeus is now reported to have successfully undermined the two-factor authentication put in place by many banks. Even the use of biometrics may not be helpful (see box below). This makes it clear that multiple-factor authentication simply cannot prevent fraudulent activity if the user is operating from a compromised environment in the first place.

A New Hampshire-based IT consulting firm, Cynxsure LLC, employed a fingerprint scanner for authentication to mitigate risks from password-stealing malware. However, Cynxsure still ended up losing nearly $100,000 in February 2010. Zeus trojans include a feature called “form grabber” that effectively steals the fingerprint authentication data before the web browser can encrypt it.

It is now understood that, to reduce the risk associated with being exposed to powerful malwares such as Zeus, just installing and updating antivirus software may not be sufficient. Companies need to look at radical innovations in the security field and adopt new technologies to ensure that their machines never get compromised. This will go a long way to protecting them from any kind of online fraud, and help them maintain customer goodwill.

	General Population	Zeus Infected
No Antivirus found	23%	31%
Antivirus found but not up-to-date	6%	14%
Antivirus is up-to-date	71%	55%

Conclusion

Zeus today has earned a reputation as the most dangerous malware for the banking industry. This is primarily because of the vast number of toolkit versions readily available, as well as the features it possesses, to thwart the traditional antivirus solutions. The ease of use that Zeus provides makes it ideal for even an amateur hacker to easily steal online banking and other credentials for financial gain. Zeus is now being used by cybercriminals to steal personal information and even people's identities.

With Zeus having infected almost 90 percent of Fortune 500 companies, and causing huge financial damages to around 2400 companies in 196 countries worldwide, it is unarguably among the top malwares that exist today. Though antivirus companies are struggling hard to provide the right solution for a Zeus free environment, the malware continues to evolve and thwart their efforts.

It is clear that the conventional methods of malware control have not succeeded against Zeus which has, therefore, managed to cause an estimated damage of more than US$100 million since its inception. This is primarily because conventional methods are not fully effective if the user is operating from a compromised environment in the first place.

At Unisys, we assess, design, develop, and manage mission-critical solutions that secure resources and infrastructure for governments and businesses. Our approach integrates resource and infrastructure security, creating the most effective and efficient security environment possible and freeing our client to focus on best serving its citizens and customers. Keeping this in mind, Unisys has developed the Secure Virtual Terminal solution for the banking industry to address security risks such as Zeus. The Secure Virtual Terminal device simply needs to be plugged into the USB port of any laptop or desktop computer to transform it to a trusted online banking terminal. When the online banking session is completed, the device can be removed and the computer returns to normal. This simple and easy-to-use solution, based on Unisys' patent-pending Communities of Interest (CoI) technology, can go a long way towards eliminating the threat from Zeus and other malware. For more information, please contact your Unisys representative or visit us at www.unisys.com.

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Or visit our website at: www.unisys.com

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