

**Seven Things Malware Authors, Botnet Controllers
and Security Companies
Don't Want You to Know**

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#1 Cybercrime Is Big Business

Supply and Demand is fueling an underground shadow economy for stolen information. Cybercrime costs businesses and individuals about \$250 billion globally per year. Today cybercrime is more often associated with malicious code or “malware” and is most likely the top security threat facing all businesses and government agencies worldwide. Today information is being stolen and sold online in unprecedented levels and professionally written malicious code behind most of this data theft. If your organization has an online presence and conducts business using email, the Internet and sharing files, then your organization is a probable target. In fact, most organizations –unknowingly--have malicious code on their computers and servers to some degree or another. The problem is that the existing security defenses and anti-virus products are being bypassed at unprecedented levels.

Today’s cyberthieves are not amateurs. We’re not talking about viruses written by kids. Instead, these viruses are professionally written software by young adults who have grown up coding viruses as kids. These cyberthieves are married, and have their own children, mortgages and other responsibilities. Often, we see malware written by authors in Eastern European countries where the local average salaries are \$300-\$400 per month. This type of economy and low earnings potential leads many software developers into a life of malware development and cybercrime. Based on our research, some of the top hackers are making six figure incomes every month. This income is based on their hard work or “production”, more specifically, the quantity of compromised machines they have control over. We’re talking about professional software developers that design malware for organized crime to steal your information, store your information, communicate securely and stay undetected for a specified period of time.

This White Paper was written to help organizations better understand the malicious code threat, the cybercrime shadow economy that fuels it and the likelihood that you will be compromised if you aren’t already. Corporate board members and executives of all large organizations should understand that industrial and state sponsored espionage happens by way of malicious code that silently sneaks into the network and steals your information.

#2 Information Is Easy To Steal Online

Facts:

- Organized crime worldwide is using malware to steal and make money
- Professional malware bypasses layered defenses and host security solutions
- Malware is written by professionals
 - Professional Software Development Lifecycles
 - Advanced quality assurance techniques

Today, most large organizations have an enterprise defense-in-depth security strategy and policy in place from the perimeter to the desktop. However, these solutions are being bypassed and subverted regularly by new generations of malware written by highly skilled individuals and development teams working for organized crime and other entities. This major change started in 2006 and continues today.

Malware creates financial problems in the form of lost revenues, theft, and lost productivity. There are compliance issues making it difficult to adhere to government regulations such as:

- PCI
- HIPAA
- GBLA

Network Intrusions erode shareholder confidence and have lowered the stock price of organizations. There is also the potential for heavy fines and law suits. According to the Ponemon Institute which released its annual study on the cost of a data breach, the average cost is \$6.6 million dollars and \$202 per record. CIOs and CISOs realize that their investment in security cannot stay stagnant and still provide adequate risk management.

How can large organizations get control over these risks? Is there a solution to help management solve this costly problem? HBGary believes so. We've taken a different approach to the problem of malware detection by employing analysis at the lowest level possible, in physical memory where "no code can hide". We then go beyond detection to diagnose the threat by performing malware analysis, which provides the required intelligence that allows management and security teams to make rapid educated decisions about how to protect their networks and improve the overall security policy after a breach occurs.

#3 Cybercriminals Have An Advantage

Cybercriminals have an advantage today. Security technologies have not evolved the way that malware has over the last 20 years. If the healthcare industry was run like the malware detection industry, most of us would be dead today. The detection engines have not evolved like the computer viruses have. As a consequence the cybercrime economy is thriving while the global economy suffers. Cybercriminals have high quality resources and unlimited targets. Many traditional crime organizations are now moving into cybercrime for many reasons.

- Cybercrime has a much lower barrier to entry than do traditional crimes in the physical world
- Cybercrime is anonymous and impersonal
- It's a lot safer and easier to steal money with malware than it is to stage an armed robbery
- No chance of physical harm
- Very little chance of getting caught and almost no chance of prosecution in many countries

To understand the changing face of malware to crimeware, we first need to understand the change factors. First, there has been a shift in the attacker's motivations. No longer is the attacker some kid trying to earn street credentials by proving he can break into your systems as the "ultimate hacker." Security researchers working with malware developers are financially motivated by third parties (organized crime, governments, political activists, terrorists, and others) who pay top dollar for security vulnerabilities and stolen information. Instead, we're talking about bad guys data mining your advanced research & development, personally identifiable information, intellectual property, intelligence and government secrets, customer lists, and credit card numbers to make money.

FBI Assistant Director Shawn Henry told reporters, "Organized crime groups are drawn by the ease of reaching millions of potential victims." ¹ Corporate CEOs need to understand who they are dealing with and where the threat is coming from in order to determine their security options. Tracking these individuals is difficult. Given that many of the top malware producers are making significant six figure incomes, this is not surprising. There is money from foreign governments, organized crime, and state-sponsored attacks to cover up these attacks and to develop robust code that is revision controlled, bug free and very good at what it does. "Today, over two dozen countries have taken an aggressive interest in penetrating the networks of U.S. companies and government agencies."² It's important to remember that by gaining access to online information systems, the cybercriminal operates with several distinct advantages:

1. Higher Yield: lots of information on computer systems
2. Lower Target Sensitivity: takes weeks or months to discover a breach, allowing criminals to harvest information over longer periods of time
3. Easier Escape: when discovered, it's easy for cybercriminals to disappear

#4 Networks Are Vulnerable

A new attack trend started in 2006 and continues today in 2009:

- More Zero-Day attacks were released in 2006 than ever before
- The SANS Institute ranked Zero-Day malware as the #1 Threat for 2006³
- Security vulnerabilities shifted from public to private; exploits started to remain private too
 - Security researchers started selling their vulnerability research instead of releasing them publicly
- Researchers now sell their “bugs” underground and for hefty sums of money 100% year over year growth in the number of new malware released daily since 2006
 - Anti-virus providers admit the current detection approach cannot keep up with the rate of malware production⁴

Why are we in this mess? How did we get here?

Most organizations today use Microsoft Office (Word, PowerPoint, Excel, Outlook, and Outlook Express), Internet Explorer, Firefox, and Adobe Acrobat to run their businesses. These applications have become the prime entry points of malicious code. Attackers target these applications because millions of people use them and have proven to be highly vulnerable to exploitation.

The Two Most Common Attack Vectors for 2009 – How you will be compromised this year and next

1. Browsing the Internet - Today, you, your employees and your co-workers can easily get infected from harmlessly browsing legitimate Websites.⁵ In 2007, the Bank of India was attacked and serving malware for the Russian Business Network, a known cybercrime organization.⁶ Cybercriminals are hacking legitimate Websites and embedding hidden links to install malware through Web browsers. These attacks are referred to as “drive-by downloads” and exploit weaknesses in how the Internet browsers work. Most businesses rely on Microsoft Internet Explorer or Firefox for surfing the Internet. HBGary believes these are the most highly exploited browsers today.
2. E-mail: Spear Phishing and Spam: While Conficker.C was in the news during the second half of March 2009, there were many targeted spear phishing campaigns taking place. The spear phishing attacks took advantage of multiple Zero-Day attacks on Adobe Acrobat, Microsoft Word, Excel, and PowerPoint. It was almost as if Conficker.C was a smoke screen to mask the real Zero-Day attacks that were underway.

#5 Modern Malware Bypasses Multiple Security Layers

Cybercriminals pay professional software developers a lot of money to build undetectable malware. In order to produce this high quality code, the malware authors are utilizing best practices shared by top software companies in the world. A large amount of money must be spent on quality assurance testing based on the research HBGary has done. We've seen malware that runs on old operating systems from Windows 3.11 all the way through the 64-bit version of Windows 2003 Server. This research takes a significant amount of resources and effort to develop and test especially when you realize how many TCP/IP stacks the malware has to interface with. Their code doesn't crash either, which proves how mature it is.

Malware – The Basic Architecture and Design Goals

1. The Attack Vector – Method of getting access to the remote machine
 - a. This is known as the exploit and is not usually developed by the person that creates the Remote Access Tool (RAT) portion of the malicious code payload
 - b. This is exclusive of the backdoor or Remote Access Tool (RAT)
 - c. These are readily available via hacking toolkits that can be purchased online
2. The Remote Access Tool Kit (RAT) – Software that provides the features needed to accomplish various cybercrime operations.

Background:

- i. Attack vector is unimportant to this developer
- ii. Malware toolkits that automate this process are available online
- iii. RAT software is the backdoor into the system
- iv. RAT software provides the features needed to accomplish the cyber crime mission
- v. RAT's can be a blended threat

RAT Features & Capabilities:

- i. Invisible Startup routine
- ii. Bypass Anti-Virus
- iii. Bypass personal firewalls
- iv. Rootkit techniques to remain hidden
- v. Communication controls – encryption to prevent detection
- vi. Sniff passwords and login credentials
- vii. Screenshot capture
- viii. Audio capture
- ix. Keystroke logging
- x. Clean up routines; deleting logs, self destruction (poison pill)

Installation and Deployment Factors: This group of factors encompasses the goals and methods that malware authors use to install the malware on the computer. Some malware is persistent and should survive a system reboot. In order to do so, the malware will have to install a file on the file system and then have the program invoked automatically by a subroutine on the system. Some malware is non-persistent and will not be present and running after a system reboot. There are good reasons to utilize either installation and start-up method, based on the specific cyber crime operation. When performing malware analysis, the installation and deployment factors try to answer the following questions:

1. How and where does the malware install itself in the operating system
2. How does the malware spread to other hosts
3. How does the malware startup
4. How does it survive reboot

Defensive Factors: This group of factors encompasses the goals and methods of the malware to stay protected and not detected to accomplish the cybercrime mission. The list of Defensive Factors is quite long due to the fact that malware authors have evolved over the last 20 years. Many of these factors are employed at the same time for layers of protection.

Malware evades Anti-Virus detection

1. Changing the virus slightly so it will no longer “match” its’ signature
 - a. If the same malware is compiled three different ways you would need three different hashes or signatures to see it
2. Creating polymorphic viruses that encrypt parts of themselves or disguise them in order to get around the signature
3. Killing the Anti-Virus process

Malware bypasses Whitelisting

Whitelisting is an approach to combat malware and to block harmful programs. In theory, whitelisting may be seen as a great technique but, in reality, there are several issues security professionals need to know. First, MD5 hashes work on the disk, but don’t work in memory because an application at runtime gets reorganized every time it’s loaded into memory. Whitelisting works by having a list of good hashes with the assumption that you’re loading only good binaries for execution into memory. This is a good, partial technique and should be employed with a layered defense, but most fail to realize that once the “trusted” application is running in memory other code can be injected into that program’s memory space and do malicious things. The binary’s MD5 hash value on the disk will still match because only the process running in memory has been altered.

Malware can Bypass Personal Firewalls

Personal firewalls can be bypassed. For example, malware can load a kernel driver that attaches directly to the TCP stack and also the File system. This approach allows the malware to communicate over the network while, at the same time, hide files on the file system. This technique will often bypass both the personal firewall and the whitelisting application. Additionally, the malware may inject code into a currently trusted application. In many cases the Internet Explorer application is permitted to have outbound network communications by the personal firewall. The malware author is not required to make any changes to the personal firewall configuration in this case.

Malware uses anti-forensic techniques to bypass disk based forensic analysis

Malicious code in memory can be altered to not write any activities to the disk, or write falsified data to the disk in order to throw off traditional computer investigation software. Malware is now written to not write to the file system or disk. This malware will inject itself into existing processes and run until the machine is rebooted. In addition, kernel drivers are used that can attach directly to the file system and can hide files from security software like Anti-virus or Host Based IDS/IPS.⁷

These techniques have been around for over 4 years:

- a. Memory resident only
- b. Falsified data written to physical media

Techniques used to bypass Network IDS/IPS and URL/IP filtering systems

- a. Fast Flux & Domain Flux systems
 - a. Domains turn over multiple times each day
- b. Webmail exfiltration of data
- c. Encrypted communications and attachments
- d. Tunnel in existing HTTP traffic
- e. Traffic looks like advertisement tracking

Malware uses advanced patching and updating system

A single botnet can generate tens of millions of dollars per year and is run like a professional business. Botnets must stay operational, be reliable, and have redundancy and failover capabilities. The botnets like torpig/Sinowal that have been around for years started using enterprise-quality patching and updating system to keep the malware up-to-date and resilient against detection and removal. At anytime, the botmaster or controller can update their malware to bypass new signatures, start a new spamming campaign, or new encryption key for communication.⁸

#6 Malware Removal Is Not Always Possible

Contrary to what most people believe, there are many instances where signature files from an Anti-Virus vendor fail to remove and clean up the malware. Example: Large Entertainment Company case study.

“We are finding this tool (HBGary Responder Pro) very helpful. We are using it to validate that the processes put in place by our desktop support teams, to clean infected systems, is working. What I'm finding is that about 50% of the systems are reintroduced with active malware back into production. Oddly enough, our AV vendor is not catching any of these residuals infections. We are working with our AV vendor to figure out why this is happening.”

#7 Malware Is Costly To Business

According to a 2007 survey conducted by Computer Economics Inc (a technology research firm), the average company can expect at least five malware events per year and the number rises to 10 for companies with more than 5000 desktops. Malware is expensive in time, lost productivity, lost revenues, lost records, loss of reputation etc. According to the Ponemon Institute which released its annual study on the cost of a data breach, the average cost is \$6.6 million dollars and \$202 per record. Below is one Website that can help you calculate the cost of a virus or spyware outbreak.

<http://www.cmsconnect.com/Marketing/viruscalc.htm>

New Approach – HBGary Digital DNA – “A better way to detect malware”

HBGary believes it's only a matter of time before every network and computer is compromised. You shouldn't ask “why would my organization be attacked?” Instead, the better question to ask is, “why wouldn't my organization be attacked?” Most malware is designed to steal digital information and transport it to someone who can sell it. To best manage risk during an incident, organizations must develop an accurate mitigation strategy and the ability to change the security policy quickly. It's about getting the right information to the right people fast. HBGary solutions do just that -- provide the ability to detect, diagnose and respond with superior malware intelligence so management can make informed business decisions to best support the information security policy and strategy.

HBGary Digital DNA™ represents a groundbreaking step forward for effective malware detection and diagnosis. HBGary has been researching and tracking the malware issue for over six years, and has received grants from the Air Force and Department of Homeland Security to build a better way to detect and analyze malware.

Using a forensically sound approach, HBGary proved that by capturing a copy of memory or RAM (Random Access Memory) from a running computer system, we could analyze it with unprecedented visibility to identify what applications and code are running on the machine. This approach provides excellent malware detection and insight into the malicious code tactics. With memory analysis, the more the malware tries to hide the easier it is to find. Unlike traditional security solutions, the HBGary approach does not rely on or trust what the operating system reports is running in memory. This is because today's malware has evolved and is designed to circumvent the operating system and provide unreliable information. This is one of the main reasons current malware detection is failing.

The new approach HBGary has taken allows you to find information on running processes, hooks, packers, and encryption that cannot be seen by other host security solutions. For example: in order for a packed binary to execute, it has to unpack itself in memory; we see not only the binary, but also get information on the packer and dropper. Using our Digital DNA engine, we assess the behaviors we see inside the offline memory snapshot, like packing. We've developed a patent-pending method to describe code behaviors called Digital DNA. Digital DNA is behavioral based and the rule system is robust and mature. Because Digital DNA™ is based on behaviors, not signatures, it can easily detect multiple variants of the same malware. Over 50,000 new malware programs are released on the Internet daily. Of these, most are repackaged variants of the same source code or malware development kit, re-used over and over. Because of repackaging, MD5 checksums, virus signatures, and other schematic means to detect malware will fail to match on the repackaged variants. However, once the malware is actually executing on a victim computer, the original code and methods are available for inspection. Digital DNA™ examines the code at this level, within the offline memory snapshot of the computer.

For example, while there are easily over 10,000 key logging programs that attack Windows™, there are only about nine actual ways to sniff keystrokes on a Windows™ system. Digital DNA™ detects the method, not the malware. Any keystroke-logging behavior would be deemed suspicious, regardless of what program is doing it. This behavioral approach is extremely effective at detecting malware with no prior knowledge or signature required.

Obtaining Actionable Intelligence – Improving Security Policy

Today when malware is detected, eEnterprises have little actionable intelligence to determine the best course of action towards remediation. With little technical information about the malware, Enterprises attempt to mitigate the threat and are usually not successful. This is a very expensive option that leaves an organization exposed without knowing for sure if the infection has been cleaned properly.

The captured malware programs contain critical information that can be used to improve the security posture of the enterprise during an outbreak. Malware programs generally contain the following information:

- IP addresses of communication points or drop points for information
- DNS names of drop sites or web sites
- Full URL paths that can be easily used to create an IDS signature
- Information about what is being stolen; file extensions, passwords, etc.
- Registry keys used for installation and to survive reboot that can be used to scan for other infections
- Names of temporary files that can be recovered from the hard drive that may contain evidence, key logging data, or other information, revealing what has been stolen
- Names of files used for installation that can be used to scan for other infections
- Network protocol details that can be used to create an IDS signature
- Information that can be used to write a removal / cleaning script (usually registry values)
- Open TCP port information that can be used to run a network scan for other infections
- Specific password keys that were opened, for example Outlook or Internet Explorer, that reveal which user identities & authentication data have been compromised
- Windows network attack scripts, indicating that the infection may have spread over standard windows networking to other nearby machines
- Encryption keys used by bad guys
- Who wrote the malware
- Infection Methods
- Names of .INI or .INF files that may have been placed on network drive shares, and should be immediately searched out and removed or quarantined
- Specific indicators that the malware has infected USB thumb drives with an autorun.inf file

All of the above information, and more, can be obtained by performing runtime malware analysis. This is the information organizations have been missing, and need, to limit exposure and mitigate the risk while waiting for an anti-virus signature. It can be the difference between a 10 machine infection and a 10,000 machine infection, and provide tremendous cost savings during a breach or malware infection. Using Digital DNA™, the largest enterprises can now detect suspicious programs in memory that no other software can and also analyze them to provide a behavioral report of the software's capabilities. With Digital DNA, you always know what code is running on your networked machines.

Digital DNA™ integrated with McAfee ePO

The HBGary Digital DNA™ technology is part of the McAfee Security Initiative Alliance Program. This allows Digital DNA to be integrated into McAfee ePO as a third-party module. Once installed, the Digital DNA™ capability is built into the existing McAfee ePO agent. There is no need to install an additional agent.

Digital DNA™ can be configured to work multiple ways:

Deploy on demand

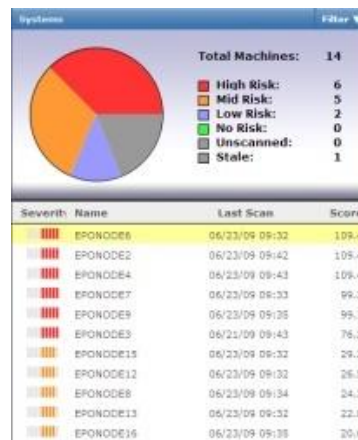
When a threat is suspected, deploy on demand can be used to validate if an infection is actually present. This can be used, for example, when a third party, such as a CERT team, informs the security staff about a potential break in.

To deploy a Digital DNA™ assessment, the ePO administrator creates a group to represent the ePO nodes that need evaluation. Many thousands of nodes can be evaluated at once. A single task is assigned to the group and the Digital DNA™ assessment will be completed in approximately one hour. Suspicious nodes are shown first and then an analyst can determine from the Digital DNA™ if a malware infection has occurred or if other software has been installed. If an infection is detected, the analyst can perform response actions to start the recovery process.

Proactive protection

If the customer wishes, they can deploy Digital DNA™ to the end node and have it scan once a day or once a week. These options are all configurable. Since most malware will remain resident after infection, this model will alert the Enterprise of any new infections. Malware tends to remain resident doing damage over a long period of time, so this model allows the Enterprise to detect and mitigate an infection before any real damage is done. The malware can be prevented from infecting other hosts, and it can be removed before the malware authors have a chance to give the malware any specific control instructions.

The procedure for deployment is exactly the same as with Deploy on demand, except the Digital DNA™ assessment is scheduled to run more than once.



Performance Considerations for ePO

Like all Enterprise architectures, ePO scales linearly across nodes when the majority of work is processed at the end node. This means that the Digital DNA™ scan can be executed against tens of thousands of nodes simultaneously. By default, the Digital DNA™ scanning process has a low task priority and will not noticeably impact the end user. The amount of data being returned to the ePO server over the network is very small in most cases roughly 200kb per machine. Digital DNA™ performs the entire assessment on the end node and only the results are sent back to the ePO server. For example, a scan of 30,000 nodes can complete at the end nodes in approximately one hour, while delivering the results over a longer period of time. The ePO server provides the configuration management to specify wait times before returning results to the ePO server.

Global Searching for Malware “Traits”

Digital DNA™ results are stored in the McAfee ePO SQL database. Searches made against Digital DNA™ operate entirely at the database layer, and do not

require additional scans. To search for variants of a malware across 30,000 nodes, the analyst simply performs the search at the ePO console and the results are returned almost instantly. The search applies to the last set of results returned for a given group of nodes.

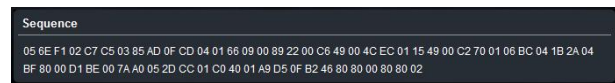
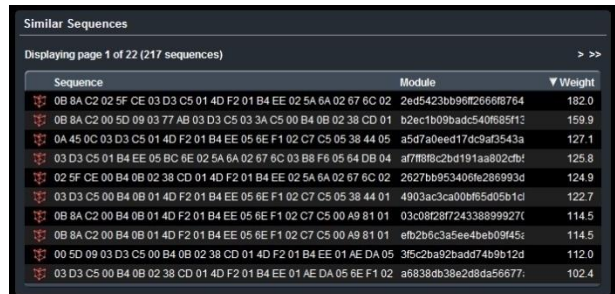


Figure 1 – Digital DNA Sequence for the original malware



The image shows a screenshot of a 'Similar Sequences' window. It displays a table with 10 rows of similar sequences, each with a weight. The table has columns for 'Sequence', 'Module', and 'Weight'. The sequences are listed with their corresponding module names and weights.

Sequence	Module	Weight
0B 8A C2 02 5F CE 03 D3 C5 01 4D F2 01 B4 EE 02 5A 6A 02 67 6C 02	2ed5423bb96f26668764	182.0
0B 8A C2 00 5D 09 03 77 AB 03 D3 C5 03 3A C5 00 B4 0B 02 38 CD 01	b2ec1b09badc540f685f1c	159.9
0A 45 0C 03 D3 C5 01 4D F2 01 B4 EE 05 6E F1 02 C7 C5 05 38 44 05	a5d7a0eed17dc9af3543a	127.1
03 D3 C5 01 B4 EE 05 BC 8E 02 5A 6A 02 67 6C 03 B8 F8 05 64 DB 04	a7f788c2b4191aa802d9f	125.8
02 5F CE 00 B4 0B 02 38 CD 01 4D F2 01 B4 EE 02 5A 6A 02 67 6C 02	2627bb953406fe286893d	124.9
03 D3 C5 00 B4 0B 01 4D F2 01 B4 EE 05 6E F1 02 C7 C5 05 38 44 01	4903ac3ca00bf65d05b1cd	122.7
0B 8A C2 00 B4 0B 01 4D F2 01 B4 EE 05 6E F1 02 C7 C5 00 A9 81 01	03c08f28f724338899927f	114.5
0B 8A C2 00 B4 0B 01 4D F2 01 B4 EE 05 6E F1 02 C7 C5 00 A9 81 01	efb2b6c3a5ee4beb09f45c	114.5
00 5D 09 03 D3 C5 00 B4 0B 02 38 CD 01 4D F2 01 B4 EE 01 AE DA 05	3f5c2ba92bad474b9b12d	112.0
03 D3 C5 00 B4 0B 02 38 CD 01 4D F2 01 B4 EE 01 AE DA 05 6E F1 02	a6838db38e2d8da56677	102.4

Figure 2 - Sequences that match 75% or better, variants of the malware

New Approach - Responder Pro- The Ultimate Tool for Incident Detection and Malware Analysis

In order to complement Digital DNA malware detection, HBGary developed Responder Pro. Responder Pro provides the essential capabilities to perform memory forensics like never before, detect malware that no one else can, and then perform automated malware analysis to generate a report with remediation recommendations so you can effectively and efficiently mitigate the threat across your enterprise. Responder Pro is currently used by Computer Emergency Response Teams, Information Assurance Analysts, Malware Reverse Engineers, and Computer Forensic Investigators by the many in the Fortune 100 and U.S. Government agencies in order to quickly ascertain the implications of what the malware is doing, where it's coming from, and, in some cases, who it's coming from, etc.

Up until this point, companies or the government would have to outsource this type of work because so few people could quickly (less than a ½ day) get this information from logs, disk info, malware, Internet browsing history, memory dumps etc. Traditional tools take an extreme amount of knowledge to not only acquire this information but then to manually sift through it all. HBGary's Responder Pro is actually codifying the methods a Reverse Engineer goes through in order to gain information about a piece of software. For more information about Responder, please visit our website at www.hbgary.com

HBGary Digital DNA CASE STUDIES

Large Financial Organization

March 2009 - A zero-day spear phishing attack bypassed the bank's layers of security defenses. The malicious PDF document looked legitimate and was opened by an executive. Processes were injected into Internet Explorer and Svchost.exe to use the Internet connection and download the "real malware". Five different applications were downloaded and installed in "stages" to build the modular malware that would remain installed. This malware installation technique is used to bypass scanning engines and is designed to fly under the radar. Digital DNA identified the original PDF as a threat. Digital DNA was used to identify all compromised machines in the network prior to anti-virus having a signature.

Large Entertainment Company

One of the largest entertainment companies in southern California currently uses Digital DNA to verify if viruses are properly cleaned by an anti-virus signature file. Statistics showed that 50% of all machines were still compromised after being cleaned by the anti-virus signature file.

Company suspected an employee of stealing "Priority Two" information off PCI servers in Los Angeles from their manufacturing plant in Tijuana. They imaged the suspect's computer using HBGary FastDump Pro. Included in the memory image was the password to a Google account, not authorized by the company. Forensic examiners from the company logged into the Google account and found credit cards taken off corporate PCI servers from customers who downloaded music. Total investigation took 8 hours from start to finish including arresting employee. Prosecution of employee is moving forward.

Large Pharmaceutical Company

During the Conficker.C outbreak: The organization thought the malware was contained after they discovered 100 machines infected with anti-virus software. A new scan with Digital DNA revealed there were 113 more machines infected with variations of malware that the anti-virus software did not detect. Digital DNA discovered six new versions on 113 machines. The organization was able to send malware samples and intelligence to their AV vendor for signatures. The security team was able to discover all infections using HBGary Responder Pro to identify the source of the infections.

Consulting Company

IDS system triggered an alarm related to the Blaster worm. It turned out that the two hosts involved were a server that gathers backup images from VMware ESX servers and sends the images over to the backup server. From the IDS signature, it appeared that the source host was attempting to communicate on SMB port 445, and appeared to be sending a TFTP command to retrieve a system file. The payload also indicated that this activity was the result of a Blaster exploit being launched.

Thought was that one of the VMware images being backed up could be infected with the Blaster worm. Next logical step would be to get a current dump of memory from the server and also a copy of memory from the restored backup. "I used HBGary to dump the memory along with the page file. I then imported it into Responder product. HBGary was able to map the part of memory with the suspicious keywords back to the mcshield.exe process. The keywords were part of virus definitions for McAfee that had gotten written to the page file. McAfee decodes these definitions in memory which is why they were not found on the disk with a strings search. I also found several other malware related keywords in these same processes for other definitions. With this information, I was able to whitelist this activity between the VMware ESX server and the backup server."

U.S. Government Agency & U.S. Department of Defense

One agency using a freeware memory tool found a piece of malware on a computer. Analyzing the memory image, they found two Websites that "could have" contributed to the malware infection, these sites were blocked. Analyzing the same image using HBGary Responder Pro, agency was able to find a total of 6 Websites where malware was downloaded as well as information about ports used and was able to fully analyze malware and determine if there were additional machines infected.

Memory Forensics and HBGary Digital DNA are used by some of the most advanced computer network defense teams in the U.S. Government today for computer intrusions, incident response and enterprise malware detection. These teams employ standards and best practices for detecting advanced threats, diagnosing the nature of the threat so that they can rapidly obtain root cause analysis and improve enterprise policy fast to mitigate the threat.

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- ⁷ White Paper: Analysis of Sinowal. P. Kleissner. <http://web17.webbpro.de/index.php?page=analysis-of-sinowal>
- ⁸ White Paper: Your Botnet is my Botnet: Analysis of a Botnet Takeover, Department of Computer Science, University of California Santa Barbara www.cs.ucsb.edu/~seclab/projects/torpig/torpig.pdf

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