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Fighting malware and spam

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vbSpam supplement

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COMMENT

'By installing a security suite you not only protect yourself, but you increase the safety of the whole community.'

Claudiu Musat, BitDefender

PUBLIC LIABILITY INSURANCE FOR COMPUTER INTRUSION

Spam and malware are problems for everyone who uses the Internet, and common methods that are used to combat the phenomena – such as filtering the junk and controlling access – do not seem to be much of a deterrent for the attackers.

The creation and distribution of malware and the sending of spam are activities that are driven by profit, and they will continue for as long as the benefits to the perpetrators exceed their cost. But these activities also impose costs on other users of the Internet: spillover costs. In any activity, spillover costs are a sign that the activity has exceeded an acceptable level. There must be a way to counter the spillover costs by diminishing the benefits or increasing the penalties for the perpetrators.

The most obvious solution is to increase the penalties for spamming and unauthorized computer intrusion – and many countries now have extensive anti-spam and computer crime laws, but they have had little impact on the levels of these crimes. Suggestions for economic solutions, such as imposing a minimal price for each email sent, have also had little success. So far, one thing no one seems to have considered is the idea of tackling the other categories of users – those who purchase the products/services advertised in spam, and those who leave their computers unprotected and consequently get infected.

Tracking down those who make purchases from spam is likely to be very difficult – which leaves us with those who do not secure their PCs.

In order to understand how a greater number of protected computers would be beneficial, let's look at motor insurance. Uninsured car drivers cause higher insurance premiums (because if an uninsured driver causes an accident and cannot pay the damage, the other driver(s) have to collect from their own insurance companies, driving their premiums upwards). Thus driving an uninsured car imposes spillover costs on all the people you meet on the road. However, the higher the insurance premiums, the less likely that drivers will take out insurance. There is no way to get out of that vicious circle without help from the outside – which comes in the form of mandatory insurance. Mandatory motor insurance brings down the cost of insurance (spillover cost) both because there are fewer uninsured drivers to drive up premiums, and because the more people buy insurance the more likely it is to be offered at a lower cost.

What would happen if the use of security solutions was mandatory? More people would install security products, which would have multiple effects. First, with more machines protected it would be harder for botnet masters to recruit new zombie machines, thus increasing their costs, which in turn would increase the cost of spamming and decrease its profitability. It would also increase the revenues of security companies which, in a highly competitive market, could lead to an overall decrease in the cost of the security products themselves. That would complete the circle, with the lower cost of solutions combined with their mandatory use resulting in a larger number of people protecting their computers.

The key to all this is that by installing a security suite you not only protect yourself, but you increase the safety of the whole community as you protect the rest of us from the menace you would become once infected. Thus it might be viewed as a form of liability insurance.

This approach does face significant obstacles – such as the fact that legislation would have to be passed, which would take time. Furthermore, making computers harder to attack in one country would have little effect unless other countries took action as well – otherwise the attackers would simply shift the focus of their operations to another geographical area. Complications would also arise regarding enforcement of the legislation. A possible solution would be to insist that every buyer has a licence for a security solution when buying a new computer or any major computer component such as the motherboard.

It is my belief that making the use of security products mandatory could make the lives of spammers and other online criminals so much more difficult that it would act as a deterrent and make the Internet a safer place for all.

Editor: Helen Martin
Technical Consultant: John Hawes
Technical Editor: Morton Swimmer
Consulting Editors:
Nick FitzGerald, *Independent consultant, NZ*
Ian Whalley, *IBM Research, USA*
Richard Ford, *Florida Institute of Technology, USA*

NEWS

FESTIVE GREETINGS

The members of the *VB* team extend their warm wishes to all *Virus Bulletin* readers for a very happy holiday season and a healthy, peaceful and prosperous new year.

Season's greetings from the VB team. Clockwise from top left: Simon Bates, John Hawes, Allison Sketchley, Martijn Grooten & Helen Martin (centre).

VB2009 GENEVA: CALL FOR PAPERS

Virus Bulletin is seeking submissions from those wishing to present papers at VB2009, which will take place 23–25 September 2009 at the Crowne Plaza, Geneva, Switzerland.

The conference will include a programme of 40-minute presentations running in two concurrent streams: Technical and Corporate. Submissions are invited on all subjects relevant to anti-malware and anti-spam. In particular, *VB* welcomes the submission of papers that will provide delegates with ideas, advice and/or practical techniques, and encourages presentations that include practical demonstrations of techniques or new technologies.

The deadline for submission of proposals is Friday 6 March 2009. For full details of how to submit a paper, along with a list of topics suggested by attendees of VB2008, please see http://www.virusbtn.com/conference/vb2009/call/.

In addition to the 40-minute presentations, a portion of the technical stream will be set aside for 30-minute,'last-minute' technical presentations, proposals for which need not be submitted until three weeks before the start of the conference. Presenting a full paper will not preclude an individual from being selected to present a last-minute presentation. Further details will be released in due course.

APPLE URGES MAC USERS TO INSTALL AV

Battling the common conception among its users that the *Mac* platform is safe from malware, *Apple* issued a quiet announcement last month encouraging the 'widespread use of multiple anti-virus utilities' on its products.

With increasing numbers of data-stealing trojans and fake anti-malware programs targeting *Mac* users, the announcement will come as a wake-up call to many who misguidedly consider their preferred platform to be unaffected by the dangers that *Windows* users deal with on a daily basis. *Apple* recommended products from *McAfee*, *Symantec* and *Mac* specialist *Intego* in its announcement.

Prevalence Table – October 2008

Malware	Type	%
Agent	Trojan	22.10%
Mytob	Worm	17.74%
Invoice	Trojan	13.06%
NetSky	Worm	9.41%
Suspect packers	Misc	6.28%
Goldun	Trojan	5.66%
Autorun	Worm	5.15%
Bagle	Worm	4.24%
Mydoom	Worm	3.38%
Mywife/Nyxem	Worm	2.86%
Zafi	Worm	1.82%
Downloader-misc	Trojan	1.68%
Bifrose/Pakes	Trojan	1.21%
Monder	Trojan	0.96%
Parite	Worm	0.50%
FunLove/Flcss	Worm	0.50%
Virut	Virus	0.48%
Klez	Worm	0.43%
Small	Trojan	0.43%
Sality	Virus	0.32%
LovGate	Worm	0.30%
Ircbot	Worm	0.30%
Iframe	Exploit	0.22%
Cutwail/Pandex/Pushdo	Trojan	0.18%
Inject	Trojan	0.13%
Basine	Trojan	0.11%
Redlof	Worm	0.10%
Heuristic/generic	Misc	0.09%
Womble	Worm	0.08%
Banload	Trojan	0.08%
Bagz	Worm	0.06%
Mabutu	Worm	0.02%
Bugbear	Worm	0.02%
Others[1]		0.10%
Total		100.00%

[1] Readers are reminded that a complete listing is posted at http://www.virusbtn.com/Prevalence/.

TECHNICAL FEATURE

ANTI-UNPACKER TRICKS – PART ONE

Peter Ferrie
Microsoft, USA

Unpackers have been around for as long as packers themselves, but anti-unpacking tricks are a more recent development. Anti-unpacking tricks have grown quickly both in number and, in some cases, complexity. This paper is an addendum to a paper presented at the CARO workshop in May this year [1], and describes some of the anti-unpacking tricks that have come to light since that paper was published.

INTRODUCTION

Anti-unpacking tricks come in different forms, depending on what kind of unpacker they are intended to attack. Unpackers can be in the form of memory-dumpers, debuggers, or emulators:

- A memory-dumper dumps the process memory of the running process without regard to the code inside it.
- A debugger attaches to the process, allowing single-stepping, or the placing of breakpoints at key locations, in order to stop execution at the right place. The process can then be dumped with more precision than a memory-dumper alone.
- An emulator, as referred to within this paper, is a purely software-based environment, most commonly used by anti-malware software. It places the file to execute inside the environment and watches the execution for particular events of interest.

There are corresponding tricks for each of the above, and they will be discussed separately.

1. ANTI-DUMPING

1.1 Self-unmapping

The data that fills the image space of a process is simply a mapped view of the file. This view can be unmapped using the kernel32 UnmapViewOfFile() function. If the data is moved first to another location, and then any absolute references are adjusted according to the new image base value, then execution can be resumed from the other location. The result is a process that cannot be dumped by ordinary means.

Example code looks like this:

```
    push 0
    call GetModuleHandleA
    mov ebx, [eax+3ch] ;lfanew
    ;SizeOfImage
    mov   ebx, [eax+ebx+50h]
    push  40h ;PAGE_EXECUTE_READWRITE
    push  1000h ;MEM_COMMIT
    push  ebx
    push  0
    xchg  esi, eax
    call  VirtualAlloc
    mov   ecx, ebx
    lea   edi, [eax+offset l1]
    sub   edi, esi
    push  esi
    push  edi
    xchg  edi, eax
    rep   movsb
    jmp   UnmapViewOfFile
l1: ;execution continues here
    ;but in relocated region
    ...
```

1.2 Page redirection

Page redirection is the extreme implementation of the Guard Pages technique that was described in [1], as it applies to *Armadillo*. In the Guard Pages technique, a guard page is used to allow per-page decryption. It could be defeated by touching the pages, one at a time, and then writing those pages to disk, one at a time. Page redirection avoids that weakness by not restoring the pages to their original location. Instead, all accesses are redirected to other locations in memory where the pages now exist. The result is that the kernel32 ReadProcessMemory() function cannot be used to dump the memory remotely, and the kernel WriteFile() function cannot be used to dump the memory locally using the original addresses, because the redirection will not occur. However, there are two methods that can be used to dump the memory. One is to find the addresses of the redirected pages. This is difficult to automate, and there may be further obfuscation of the content, which will interfere with this method. The second method is simply to perform a user-mode copy of the data, using the original addresses, copying it to a dynamically allocated block of memory. The data can then be written directly from that block of memory. This technique is used by BASLR.

2. ANTI-DEBUGGING

2.1 Special APIs

2.1.1 NtYieldExecution

The ntdll NtYieldExecution() function is used to allow the currently running thread to give up the rest of its execution period and allow any other scheduled thread to execute. The function returns an error if no threads are scheduled to execute. When an application is being debugged, the act of single-stepping through the code causes debug events, and as a result the debugger thread is always scheduled to resume execution. This fact can also be used to infer the presence of a debugger, though it may also detect the presence of a thread that is running with high priority.

Example code looks like this:

```
     push   20h
     pop    ebp
 l1: push   0fh
     call   Sleep
     call   NtYieldExecution
     cmp    al, 1
     adc    ebx, ebx
     dec    ebp
     jne    l1
     inc    ebx
     je     being_debugged
```

This technique is used by the Extreme Debugger Detector.

2.1.2 NtSetLdtEntries

Perhaps because the local descriptor table (LDT) is not used by *Windows*, it is generally not supported properly (or at all) by debuggers. As a result, it can be used as a simple anti-debugger technique. Specifically, a new LDT entry can be created, which maps to some code. Then, by performing a far transfer of control (call or jump) to the new LDT entry, the debugger might become lost or refuse to go further.

Example code looks like this:

```
 ;base must be <= PE->ImageBase
 ;but no need for 64kb align
 base equ 12345678h
 ;sel must have bit 2 set
 ;CPU will set bits 0 and 1
 ;even if we don't do it
 sel equ 777h

 xor  eax, eax
 push eax
 push eax
 push eax
 ;4k granular, 32-bit
 ;present, DPL3, exec-only code
 ;limit must not touch kernel mem
 ;calculate carefully to use APIs
 push (base and 0ff000000h) \
      + 0c1f800h \
      + ((base shr 10h) and 0ffh)
 push (base shl 10h) + 0ffffh
 push sel
 call NtSetLdtEntries
 ;jmp far sel:l1
 db   0eah
 dd   offset l1 - base
 dw   sel
l1: ;execution continues here
 ;but using LDT selector
 ...
```

Turbo Debug32 fails to disassemble the code inside the LDT range, but execution continues correctly. *OllyDbg* refuses to continue execution within the LDT range. *WinDbg* disassembles the code correctly inside the LDT range, and execution continues correctly. This technique is used by some malware. It was probably based on some inaccurate documentation on the ReactOS site [2], which misplaces the System bit and includes too many bits in the Type field.

2.1.3 NtQueryInformationProcess

The ntdll NtQueryInformationProcess() function has the following parameters: HANDLE ProcessHandle, PROCESSINFOCLASS ProcessInformationClass, PVOID ProcessInformation, ULONG ProcessInformationLength and PULONG ReturnLength. *Windows Vista* supports 45 classes of ProcessInformationClass information (up from 38 classes in *Windows XP*), but so far only four of them have been documented by *Microsoft*. One of these is the ProcessDebugPort. It is possible to query for the existence (but not the value) of the port. The return value is 0xffffffff if the process is being debugged. Internally, the function queries for the non-zero state of the EPROCESS->DebugPort field. A common method for hiding the debugger process from the ProcessDebugPort class is to zero the value, but without checking the process handle for which the presence of the port is being queried. This presents a problem when a debugger is supposed to be present (for example, in *Armadillo*), since a debug port should exist for that process. This problem has been disclosed publicly [3].

Example code looks like this:

```
 xor  ebx, ebx
 mov  ebp, offset l1
 push ebp
 call GetStartupInfoA
 ;sizeof(PROCESS_INFORMATION)
 sub  esp, 10h
 push esp
 push ebp
 push ebx
 push ebx
 push 1 ;DEBUG_PROCESS
 push ebx
 push ebx
 push ebx
 push ebx
 push offset l2
 call CreateProcessA
 pop  eax
 push eax
 mov  ecx, esp
 push 0
 push 4 ;ProcessInformationLength
 push ecx
 push 7 ;ProcessDebugPort
```

```
   push  eax
   call NtQueryInformationProcess
   pop   eax
   test  eax, eax
   je    being_faked
   ...
   ;sizeof(STARTUPINFO)
l1: db  44h dup (?)
l2: db  "myfile", 0
```

2.1.4 CloseHandle

As with an invalid handle, if a protected handle is passed to the kernel32 CloseHandle() function (or directly to the ntdll NtClose() function) and no debugger is present, then an error code is returned. However, if a debugger is present, an EXCEPTION_HANDLE_NOT_CLOSABLE (0xC0000235) exception will be raised. This exception can be intercepted by an exception handler, and is an indication that a debugger is running.

Example code looks like this:

```
    xor eax, eax
    push offset being_debugged
    push d fs:[eax]
    mov fs:[eax], esp
    push eax
    push eax
    push 3 ;OPEN_EXISTING
    push eax
    push eax
    push 80000000h ;GENERIC_READ
    push offset l1
    call CreateFileA
    push eax
    ;HANDLE_FLAG_PROTECT_FROM_CLOSE
    push 2
    push -1
    xchg ebx, eax
    call SetHandleInformation
    push ebx
    call CloseHandle
    ...
l1: db  "myfile", 0
```

Defeating this method is easiest on *Windows XP*, where a FirstHandler Vectored Exception Handler can be registered by the debugger to hide the exception and silently resume execution. Of course, there is the problem of hooking the kernel32 AddVectoredExceptionHandler() function transparently, in order to prevent another handler from registering as the first handler. However, it is still easier than transparently hooking the ntdll NtClose() function on *Windows NT* and *Windows 2000* in order to register a Structured Exception Handler to hide the exception. This method has been disclosed publicly [4].

2.1.5 NtSystemDebugControl

The ntdll NtSystemDebugControl() function could have been a very nice function for detecting debuggers. It was introduced in *Windows NT*, and its capabilities increased in subsequent versions of *Windows*. It supported a SysDbgQueryModuleInformation command, which was an alternative to the SystemProcessInformation class of the ntdll NtQuerySystemInformation() function. *Windows XP* introduced the SysDbgReadVirtual command, which allowed the reading of virtual memory from anywhere in the system. There were other commands for writing to virtual memory, reading and writing physical memory and MSRs, among others. Alas, in *Windows 2003 SP1* and later, all of these functions were disabled. The functions that remain are for enabling and disabling the kernel debugger, and querying and setting some minor behaviours.

2.1.6 Non-continuable exceptions

When an exception occurs, the flags specify whether it is continuable or not. A continuable exception is one for which the cause can be corrected, and then execution can resume from the location at which the exception occurred. An example of a continuable exception is a memory access violation. The use of such an exception is how user-mode paging is implemented by packers such as *Shrinker*.

A non-continuable exception is one for which, under normal circumstances, the cause cannot be corrected. An example of a non-continuable exception is a division by zero. Any attempt to resume execution after a non-continuable exception is raised will cause *Windows* to issue an EXCEPTION_INVALID_DISPOSITION exception, prior to terminating the application. However, through the use of a breakpoint in the ntdll RtlRaiseException() function, it is possible to interfere with that sequence. Specifically, the context that is saved on the stack prior to the breakpoint exception can be altered to clear the non-continuable flag. Once that is done, execution of the ntdll RtlRaiseException() function can be resumed. At that point, the call to ntdll RtlRaiseException() becomes indistinguishable from an ordinary call. EXCEPTION_INVALID_DISPOSITION is still delivered to the exception handler, but the application is no longer terminated upon return from the handler. Further, the cause can be corrected. In the case of a division by zero, the divisor can be replaced with a non-zero value, and then the division can be attempted again. This technique has been disclosed publicly [5].

2.2 Hardware tricks

Besides the prefetch queue trick that was described in [1], there is another trick that detects single-stepping. It has worked since the earliest of *Intel* CPUs, and was common in DOS, but it still works in all versions of *Windows*. The trick relies on the fact that certain instructions cause all interrupts to be disabled for one instruction. In particular, loading the SS register clears interrupts for one instruction in order to allow the [E]SP register to be used without risk of stack corruption. Of course, the [E]SP register does not need to be loaded. Any instruction can follow the load of the SS register. If a debugger is being used to single-step through the code, then the T flag will be set in the EFLAGS image. This is typically not visible because a debugger will clear the image whenever the flags are saved. However, if the debugger cannot gain control in time to intercept the save, then it has no way of hiding the T flag. Specifically, the debugger cannot gain control if all interrupts are disabled.

Example code looks like this:

```
push ss
pop ss
pushfd
test b [esp+1], 1
jne being_debugged
```

This technique is used by the ChupaChu debugger test.

2.3 Device names

Tools that make use of kernel-mode drivers also need a way of communicating with those drivers. A very common method is through the use of named devices. Any success when attempting to open such a device indicates the presence of the driver.

Example code looks like this:

```
   xor  eax, eax
   mov  edi, offset l2
l1: push eax
   push eax
   push 3 ;OPEN_EXISTING
   push eax
   push eax
   push eax
   push edi
   call CreateFileA
   inc  eax
   jne  being_debugged
   or   ecx, -1
   repne scasb
   cmp  [edi], al
   jne  l1
   ...
l2: <array of ASCIIZ strings,
   null to end>
```

Recent lists include the following names:

\\.\SPCommand

\\.\Syser

\\.\SyserBoot

\\.\SyserLanguage

\\.\SyserDbgMsg

These names belong to *Syser*.

2.4 OllyDbg-specific

A potential arbitrary-code-execution vulnerability was reported recently for *OllyDbg* [6]. However, the author of this paper discovered that the report is incorrect with respect to the target. The problem is not in *OllyDbg*, but in the dbghelp.dll that *OllyDbg* carries. This DLL is used by multiple debuggers, including *IDA*, *SoftICE* and *WinDbg*, but not *Turbo Debug32* or *Immunity Debugger*, for example. It is also shipped as part of *Windows* itself. The version of the DLL that *OllyDbg* carries is indeed vulnerable to a stack buffer overflow. The problem was introduced in *Windows XP*, and corrected in *Windows Server 2003*. In *Windows 2000*, where the file was introduced, a fixed-length copy was performed. Since this was unnecessarily large in most cases, and had the potential to cause crashes because of out-of-bounds reads, it was replaced in *Windows XP* with a string copy. However, the length of the string was not verified prior to performing the copy, leading to the buffer overflow. The fix was to use a string copy with a specified maximum length.

There is a little-known problem in *OllyDbg*'s analyser of floating-point instructions, which is caused by having no mask on invalid floating-point operation errors [7]. This allows two special values to cause floating-point errors when converting from double-extended precision to integer. The values are +/- 9.2233720368547758075e18. There is a publicly available demonstration that specifies only the positive value as a candidate, without mentioning that the negative value is also a candidate.

Example code looks like this:

```
  fld t [offset l1]
  ...
l1: dq -1
  dw 403dh
```

This is the public version. The alternative code looks like this:

```
  fld t [offset l1]
  ...
l1: dq -1
  dw 0c03dh
```

2.5 SoftICE interrupt 0x2D denial of service

When the kernel32 OutputDebugString() function is called and no user-mode debugger is present, eventually the following code is executed:

```
mov eax, [ebp+8] ;service (1)
;pointer to message structure
mov ecx, [ebp+0ch]
mov edx, [ebp+10h] ;unused (0)
int 2dh
```

If *SoftICE* is installed, then the DbgMsg.sys driver is loaded, even if *SoftICE* isn't running. DbgMsg.sys hooks interrupt 0x2D and executes this code when interrupt 0x2D is executed:

```
   push ecx
   push eax
   call l1
   ...
   ;message structure
l1: mov ecx, [esp+8]
   mov eax, [eax+4] ;bug here
```

The read from [eax+4] without checking first if the pointer is valid, leads to a kernel-mode crash (blue screen) if the original ECX register value is invalid.

Example code looks like this:

```
push 1
pop eax
xor ecx, ecx
int 2dh
```

This interrupt 0x2D bug has already been published [8], but without any details about exactly why it happens.

3. ANTI-EMULATING

3.1 Hardware tricks

3.1.1 Exception priority

Given the following code:

```
   xor eax, eax
   push offset l1
   push d fs:[eax]
   mov fs:[eax], esp
   push -1
   popfd
   ;force an exception to occur
   mov eax, [eax]
   ;ExceptionRecord
l1: mov eax, [esp+4]
   ;ExceptionCode
   mov eax, [eax]
l2: ...
```

What is the value of EAX when l2 is reached? Perhaps surprisingly, it is not EXCEPTION_ACCESS_VIOLATION (0xC0000005). It is EXCEPTION_SINGLE_STEP (0x8000004). What actually happens is that an EXCEPTION_ACCESS_VIOLATION is raised, but its delivery to the debuggee is delayed. The reason is that the trap flag remains set when the ntdll KiUserExceptionDispatcher() function gains control, and then after the first instruction is executed, the single step exception is raised and delivered to the debuggee. Upon returning from the debuggee, after dealing with the EXCEPTION_SINGLE_STEP, the EXCEPTION_ACCESS_VIOLATION is delivered to the debuggee. This technique has been disclosed publicly [9].

3.2 Software interrupts

3.2.1 Interrupt 0x2E

Interrupt 0x2E is an interface for user-mode code to communicate with native kernel-mode APIs. It was introduced in *Windows NT*, and continues to be supported for compatibility reasons. The interface accepts a function index in the EAX register. A bounds check is performed against this index, prior to dispatching the request if it is valid. However, if the index is out of bounds, then *Windows* will return a STATUS_INVALID_SYSTEM_SERVICE (0xC000001C) value in the EAX register. If the index is within bounds, then a bounds check is performed against the parameter pointer in the EDX register. If the parameter pointer is out of bounds, then *Windows* will return a STATUS_ACCESS_VIOLATION (0xC0000005) value in the EAX register. Some emulators do not support this behaviour.

Example code looks like this:

```
or eax, -1
cdq
int 2eh
int 2eh
cmp eax, 0c0000005h
jne being_debugged
```

This technique is used by the ChupaChu debugger test.

CLOSING REMARKS

Anti-unpacking tricks continue to be developed because the older ones are constantly being defeated. In part two of this series next month, we will describe some tricks that might become common in the future, along with some countermeasures.

The text of this paper was produced without reference to any Microsoft source code or personnel.

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OPINION

REPERCUSSIONS OF DYNAMIC TESTING

Roel Schouwenberg
Kaspersky Lab, USA

Anyone who is remotely involved in the anti-malware industry will know that testing is a hot topic – the subject has received a lot of attention lately, particularly following the formation of AMTSO, the Anti-Malware Testing Standards Organization, earlier this year.

This article is not intended to be the *n*th paper describing how testing should be performed. However, it will highlight one potential consequence of the attention currently being devoted to dynamic testing: the possibility that the increased focus on dynamic testing may inspire malware authors to devote more attention to circumventing products' protection capabilities, rather than just their detection abilities.

This article will use a number of examples and scenarios to evaluate the risk associated with dynamic testing. It will also put forward a number of suggestions for ways in which testers can mitigate the risk.

TESTING METHODS

Before evaluating the risks associated with dynamic testing we will first have a look at a number of other testing methods.

Static testing

Static testing is the most straightforward type of testing: an on-demand scan is run on a collection of malware. In order to produce meaningful results, any respectable static test these days must use a collection of malware containing thousands of samples, while the test sets used by testing bodies *AV-Test* and *AV-Comparatives* usually contain hundreds of thousands of samples and in some cases more than a million samples.

Since the test collections are so large, the results contain little (if any) useful detail that malware authors can use to help them fine-tune their creations.

Another thing to bear in mind when conducting static tests is the way in which the test collection is broken down. Certain less credible tests seem to have been performed on a big pile of unsorted malware samples – and although the tester may have internally enumerated the results of different sub test sets, this would still be considered bad testing practice.

Other, more credible tests make proper differentiation in their published test results. They sort their test collections into sub-sets – such as viruses, worms and trojans – and publish results for each sub-set. Some tests go even further and attempt to differentiate, for instance, between backdoors and spyware trojans.

Although this provides a greater level of detail, it still does not provide much useful information for the malware author. The only possible risk from static tests comes from those that look at how well products detect polymorphic/metamorphic malware. Such tests may highlight weaknesses in certain products.

However, polymorphic/metamorphic malware is inherently more difficult to detect than static malware – and a malware author who needs the results of a test to find this out is most likely not competent enough to write such malware anyway. Having said that, someone who is not competent enough to write a polymorphic piece of malware can now go to the underground and either buy such a piece of code or advertise for someone to create it.

Response time testing

Although response time testing is carried out only rarely these days, it is still worth looking at. It was most popular during the era of the big email worm outbreaks – NetSky, Bagle, Mydoom, Sober and Sobig are classic examples of that period.

In contrast to static testing, the size of the sample sets used for response time testing are very small. One type of response time testing measures the overall performance of AV vendors based on a larger, though still relatively small, test set [1] – this type doesn't show the results for individual samples. The second type of testing measures detection on a per-sample basis [2].

Such specific, per-sample results could be a clear aid to malware authors. One can speculate that the published response time test results may have led certain malware authors to change their approach to make detection of their malware harder. One example is that of W32/Sober.K [3], which appended random garbage at the end of its file during installation in a deliberate attempt to slow down AV detection. It is quite possible that the author introduced this functionality after being unhappy with the response time results of earlier Sober variants.

Today's response time testing results are published in a more generic fashion with little reference to specific samples. The risk of malware authors gaining too much information is therefore very low.

Retrospective testing

In retrospective testing, an out-of-date product is tested against up-to-date malware samples – but, other than its purpose (to investigate the product's ability to detect unknown samples) and the age of the updates, retrospective testing is no different from static testing.

The level of risk that retrospective tests introduce is very low, just like regular static tests.

Dynamic testing

In dynamic testing, malware samples are introduced into the test system with the intent to execute them. Only a small number of samples can be used in these tests because the process of executing each one is very time consuming. AMTSO has published a document which explains the idea behind dynamic testing in greater detail [4].

Ideally, the samples are introduced onto the test system in the 'right' way – for instance via drive-by download. Even when automated, this is a very time-consuming task, and the fact that virtual machines need to be avoided in order to obtain valid test results does not help the matter.

The number of samples included in tests is currently in the dozens. In time, with better hardware and optimized processes, we can expect the number of samples being used to reach the hundreds. However, the risk to which the industry is exposed with the introduction of dynamic testing is far greater than that associated with any of the other popular testing methods.

A large part of the industry is spending a lot of time on educating people about (new) proactive technologies, and AMTSO has put a lot of work into compiling a best practices paper for dynamic testing [4]. What is collectively being said is that the focus of testers on products' detection rates alone is outdated, and testers now need to consider their protective measures as well.

There's little doubt that the malware authors are also listening.

TIMES CHANGE

Some five years ago, *Symantec* incorporated a protection feature called 'anti-worm' into its *Norton* products. This was a behavioural system used to catch email worms proactively. *Symantec* expected to have to update the technology no more than six months after its introduction in order for it to remain effective against evolving malware. However, the developers have never had to update it [5]. Malware authors either did not know about the technology, didn't bother to circumvent it, or were unable to.

In May 2006, *Kaspersky Lab* launched its version 6 product line which featured a new-generation behaviour blocker. Six months later a patch had to be released for the behaviour blocker because new variants of the LdPinch trojan family were bypassing the technology that had initially been capable of catching them.

What was the difference between the two behaviour blockers? 'Anti-worm' was introduced in the era of big malware epidemics, driven mostly by fame-seeking authors. By 2006 the majority of malware out there was being driven by profit, including LdPinch. Another thing to bear in mind is that *Kaspersky Lab* is a Russian company and LdPinch was a Russian creation, targeted mainly at the Russian market.

However, there could be a third explanation for the difference (though it should be noted that the author of this article is by no means a marketing expert): it would seem that *Kaspersky Lab* invested more effort into the marketing of its behaviour blocker than *Symantec* did at the time it introduced 'anti-worm', thus malware authors were more aware of the *Kaspersky* product and made the effort to circumvent it.

MULTI-SCANNERS

Multi-scanners are another interesting demonstration of malware authors using legitimate services to gain information for their own purposes. Online multi-scanners enjoy great popularity these days, with *JottiScan* [6] and *VirusTotal* [7] being the most popular.

These websites provide a service whereby the user can upload a file and have it scanned by a whole range of scanners to see what the various products detect it as (and if they detect it at all).

These services also enjoy some popularity with malware authors who use them to test their latest creations and see whether they successfully avoid detection. While some anti-malware vendors provide the multi-scanner sites with their most recent scanners and ask the maintainer to use the most paranoid settings to detect as much malware as possible, there are also vendors who don't offer their most recent scanner to these sites. They may also ask the maintainer to use lower than maximum settings, so the product will detect less malware than it is capable of in real-world use [8], thus not revealing its true detection capabilities.

REPERCUSSIONS FROM THE UNDERGROUND

These days malware that bypasses protection features is by no means rare. However, the vast majority of malware authors still focus solely on bypassing detection mechanisms.

Some anti-malware products have little in the way of protection measures, and bypassing their detection capabilities still means bypassing the entire product. Therefore it's not so strange to see Win32 PE malware samples that are obfuscated in such a way that de-obfuscation takes roughly two minutes on a Core 2 Duo running at 2,500 MHz. However, the same malware samples can be detected proactively using behaviour blocker technology from two years ago [9].

There's little doubt that the current noise regarding protection technologies and dynamic testing is causing some malware authors to pay extra attention to these types of technology. With the current buzz surrounding the topic, it's likely that the interest of more malware authors will be piqued.

There are a number of scenarios likely to occur: firstly, it's likely that new groups will form in the underground that will focus on providing the means for malware to circumvent protection technologies. Secondly, there may be a new market for improved multi-scanners which will test products' protection technologies as well as their detection abilities.

The big problem with malware bypassing protection technologies is the matter of fixing the holes the malware authors are exploiting. While vendors can ship a new signature update in hours or even minutes, fixing holes takes much longer – we're talking about a response time of week(s) rather than days, let alone hours.

WHAT CAN TESTERS DO?

Revealing per-sample test result details is a much more dangerous idea with dynamic testing than it is with response time testing. While there is a low-to-moderate risk in revealing too much detail with response time testing, the risk is very high with dynamic testing.

Having a limited sample set for testing means that the samples tested need to be very relevant. If testers are going to publicize the results for each such important sample, including how individual products perform against them, then this is extremely valuable information for the malware authors. It will show them against which products they need to improve their creations.

Virus Bulletin is not yet publishing dynamic testing results, but plans to use information from its (upcoming) prevalence table to pick samples for testing. While the testers will start out just by mentioning malware families, they may end up disclosing specific malware names as well [10].

AV-Comparatives is also not yet publishing dynamic testing results, but intends to publish the names of the samples being used for its future dynamic tests.

As pointed out, this approach should be avoided. *AV-Test*, which is already performing dynamic tests, takes a better approach. Magazines are prohibited from disclosing the malware names or hashes of files that were used in the test. However, *AV-Test* will share the hashes or samples with the AV vendors that participated in the test [10].

Though slightly less transparent for end-users, this approach is by far preferable in terms of risk mitigation, while also allowing for any vendor to notify the tester if they find that any non-relevant samples have been used in the test set.

CONCLUSIONS

The adoption of dynamic testing brings with it some new challenges. Now, more than ever, testing can have real consequences for malware authors and their actions.

Security vendors need to take care that in their quest for education they do not lose sight of what really is important: the protection of users.

Care must be taken to avoid a situation in which education speeds up malware evolution and causes more problems than solutions. AMTSO's first rule of the fundamental principles of testing document states that testing must not endanger the public [4].

The attention on protection technologies and dynamic testing is inevitably leading to increased awareness on all parts, including that of malware authors. It will be up to the industry as a whole, possibly in the form of AMTSO, to minimize the risk and ensure that testers do not reveal too much detail in their public test results.

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SPOTLIGHT

FRAME4: IN THE PICTURE

Anthony Aykut
Frame4 Security Services, The Netherlands

Frame4 Security Services first became known to VB last month and after making a few enquiries it became clear that the company and, more pertinently, the services it provides have a somewhat cloudy reputation in the AV industry. VB decided to find out a little more about the company and discovered a small team attempting to provide a legitimate service for the fringes of the AV and mainstream security industry. Director and co-founder of the company, Anthony Aykut, tells the story.

START UP

Frame4 Security Services was set up by my business partner and me in 2006, operating from Alphen aan den Rijn, not far from Amsterdam, in The Netherlands. I handle the business side of things, while my partner is primarily involved in the technical aspects of the business, including the maintenance of the malware database.

There is a slightly Hitchcockian story behind the setting up of the business, as it all started with a discussion on a train. On the train I had met a technical rep from a company that was in the process of adding the finishing touches to a content-filtering device. The rep explained that they had experienced great problems testing the device – because they simply could not get their hands on enough malware. The developers had approached some AV companies, but had been stonewalled. After listening to the man's experiences I started thinking – what if we could develop a business model that would potentially give security researchers the room to concentrate on developing solutions, instead of spending valuable time trying to track down malware samples?

The result was the *MD:Pro* malware repository service. Criminals have had access to malware repositories for years, whereas the mainstream security industry has never had a reputable research and development resource – and that is the niche we aimed to fill.

While the anti-virus industry has had file exchange mechanisms in place for many years, the exclusivity of this approach has meant that, for those security providers that fall outside of the core circle of anti-virus vendors, enormous amounts of time, money and effort have to be invested in order to gather resources for R&D and testing purposes.

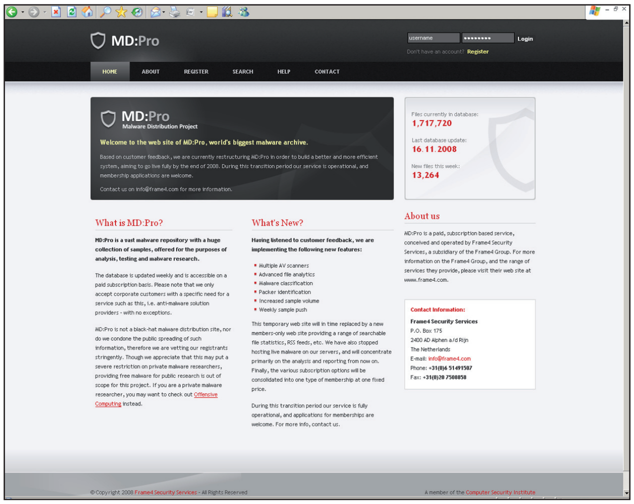
This is perfectly understandable, of course, as the AV industry invests huge amounts of time and resources in collecting malware – though I am puzzled and frustrated by the tendency for many members of the anti-virus community to look on our company and its services with suspicion and to doubt our ethics. For me it is simple: I believe that the security industry has long needed a service such as *MD:Pro*, and the amount of interest and positive feedback we have received from the mainstream security community affirms this belief.

SERVICES

Initially, the company provided a multi-level pay-for-download service, starting off with around 270,000 malware samples. However, we quickly realized that this system would be unworkable as the number of samples in the database started increasing rapidly, with close to 100,000 new samples arriving per month. Realizing that it would be impossible to download such a large volume of samples from the website we went back to the drawing board to design a better system.

Frame4 currently delivers weekly samples via FTP and monthly samples on DVD, though *MD:Pro* is currently being re-structured in order to build a more efficient system. The new service will concentrate on collecting more samples and providing more information on those samples (for example: multiple AV scanning, advanced file analysis, malware classification, packer identification etc.), along with a secure FTP server from which the samples can be downloaded.

We are aiming to go fully live with the restructured service by the end of 2008/beginning of 2009. The new service will be complemented by a members-only website providing a range of searchable file statistics, RSS feeds, etc., though it will no longer be possible to download live



Welcome to the web site of MD:Pro, world's biggest malware archive.

Based on customer feedback, we are currently restructuring MD:Pro in order to build a better and more efficient system, aiming to go live fully by the end of 2008. During this transition period our service is operational, and membership applications are welcome.

Contact us on info@frame4.com for more information.

Files currently in database:
1,717,720

Last database update:
16.11.2008

New files this week:
13,264

What is MD:Pro?

MD:Pro is a vast malware repository with a huge collection of samples, offered for the purposes of analysis, testing and malware research.

The database is updated weekly and is accessible on a paid subscription basis. Please note that we only accept corporate customers with a specific need for a service such as this, i.e. anti-malware solution providers - with no exceptions.

MD:Pro is not a black-hat malware distribution site, nor do we condone the public spreading of such information, therefore we are vetting our registrants stringently. Though we appreciate that this may put a severe restriction on private malware researchers, providing free malware for public research is out of scope for this project. If you are a private malware researcher, you may want to check out Offensive Computing instead.

What's New?

Having listened to customer feedback, we are implementing the following new features:

- Multiple AV scanners
- Advanced file analytics
- Malware classification
- Packer identification
- Increased sample volume
- Weekly sample push

This temporary web site will in time replaced by a new members-only web site providing a range of searchable file statistics, RSS feeds, etc. We have also stopped hosting live malware on our servers, and will concentrate primarily on the analysis and reporting from now on. Finally, the various subscription options will be consolidated into one type of membership at one fixed price.

During this transition period our service is fully operational, and applications for memberships are welcome. For more info, contact us.

About us

MD:Pro is a paid, subscription based service, conceived and operated by Frame4 Security Services, a subsidiary of the Frame4 Group. For more information on the Frame4 Group, and the range of services they provide, please visit their web site at www.frame4.com.

Contact Information:

Frame4 Security Services
P.O. Box 175
2400 AD Alphen a/d Rijn
The Netherlands
E-mail: info@frame4.com
Phone: **+31(0)6 51491507**
Fax: **+31(0)20 7508858**

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A member of the Computer Security Institute samples from the website. We have also decided to get rid of the various different subscription options we started with and instead provide one type of membership at a fixed price.

ETHICS

While we do not have an 'ethics statement' *per se*, we do have a strict set of rules and guidelines within which we operate, and we stick to them rigidly – for example, we only provide malware to corporate customers, and only to those in the IT security field. We made this decision on day one, and we have stuck by it without exception. Since we began operating we have had many requests from individuals wanting to access the database – particularly in the early days – but we have always stuck to our guns and declined to do business with non-corporate customers.

We are lucky in that our customers are generally well-known anti-malware providers or respected players in the IT security field – and if we are dealing with specific individuals within these companies, their identity can easily be verified by contacting the company directly. However, if we are in any way in doubt about a company, its motives (what it is going to do with the malware) or the individual(s) we are dealing with within a company, we will not accept them as a customer – it is simply not worth running the risk of malware getting into the wrong hands. And, yes, we have had to turn away applicants (both individual and corporate) on a few occasions.

TECHNICAL DETAILS

All matters pertaining to the technical side of the business are dealt with by my business partner. When I asked him to describe how our malware collections are maintained, he literally threw the book at me – according to him, *Analysis and Maintenance of a Clean Virus Library* by Vesselin Bontchev is a must-read.

Our collection currently exceeds 1.7 million malware samples, with between 20,000 and 100,000 new samples being added every month. Our samples come from various sources: our own honeypots, trading with other security providers, strategic alliances with security companies, donations and our own research. We are now even trading samples with an anti-virus company.

All samples that we receive are checked against our database; existing samples are discarded, and new samples are run through a set of tools (AV packages, *PEiD*, *TrID*, etc.) that collect various pieces of information about them. This information is written to our database and the identified samples are moved to the repository. Any unidentified and/or suspicious samples are moved to a holding area for further analysis.

Access to the collections for customers that have been approved, is granted on a monthly subscription basis. Customers sign an agreement, pay a subscription fee and start receiving samples from us on a weekly or monthly basis.

The collection is currently subdivided into broad categories by type of malware: worms, viruses, trojans, backdoors and other files (jokes, hoaxes, adware), though we are working on a complete reclassification of the database, as part of the current system overhaul.

CUSTOMERS

Our customer base consists almost entirely of anti-malware vendors – generally those that exist on the fringes of the traditional AV community and in the mainstream security industry. Our malware database is in use in various commercial anti-malware products around the world, ranging from various white and/or blacklisting applications to hardware-based security appliances. *DriveSentry*, for example, uses the samples and the report we provide along with the malware as the backbone of its innovative blacklisting products. There are also customers who use our samples purely for research purposes – such as the team from *Zynamics* (run by Halvar Flake), who use the samples to develop and fine-tune their *VxClass* software.

THE FUTURE

Our hopes for the company and its services in the future are to gain the trust of the entire IT security community – to be acknowledged as a legitimate business and as individuals who are seriously dedicated to the cause and what we believe in. A different approach is not necessarily evil, but in some cases it is a necessary evil. And, of course, we would like *MD:Pro* eventually to become the world's biggest and most trusted malware repository.

We want to be able to provide information about malware to all IT security companies who need and want to have access to it. The knowledge about a specific piece of malware should not be exclusive to one company, or a group of companies – if anything, this is counterproductive. There are a lot of brilliant ideas out there about how malware should be tackled, some in development, some yet to be developed and some on the shelf; we believe that there is no reason why research should suffer due to competition or for the pursuit of exclusivity.

COMPARATIVE REVIEW

WINDOWS VISTA X64

John Hawes

The final VB100 of the year sees a double whammy of potential pitfalls for our comparative participants – the *Vista* operating system, which still seems shiny and new as well as a little scary (to both developers and users), as well as the x64 architecture, whose ostensible compatibility with standard 32-bit software belies oddities and intricacies that developers ignore at their peril. The announcement of the test brought a few surprises, as several regulars opted to skip this one, but the majority of veteran competitors took part as usual, along with several newer faces, many of whom look set to join the ranks of our regulars.

A total of 25 products were expected to take part, however, due to technical difficulties one of our most reliable participants was unable to provide a product on the deadline date. While some vendors have produced dedicated x64 products, many continue to rely on their standard versions. This was expected to cause some difficulties, and after a setup period considerably shaken by a series of hardware disasters, the legacy of a temperature control failure a few weeks ago which continued to cause problems throughout the testing period, we could only hope to get through this month's test with a modicum of sanity intact.

PLATFORM AND TEST SETS

Once again we visit the 64-bit edition of *Microsoft*'s *Windows Vista*, which last played host to a VB100 comparative in August 2007. The user base of the *Vista* platform continues to grow slowly, with *XP* still the platform of choice for the vast majority of desktop users – most estimates suggest *XP* resides on between 70% and 80% of systems, while *Vista* still runs on less than 20% almost two years after its introduction. This pattern looks likely to change as sales of *XP* are gradually retired, but hard-core *Vista*-haters continue to insist they'll wait it out and see what the next iteration looks like before abandoning *XP*.

Meanwhile, the x64 architecture, having had a rather longer time to mature, seems to have become the standard for current processors, with straight x86 fading away into the past. The close compatibility between the two, which has helped this growth considerably, means that many continue to use x86 operating systems and not take full advantage of the architecture, while those running full-blown x64 setups expect to find all their 32-bit applications running without difficulty – although, in this area mileage may vary considerably. The AMD64-based hardware used for much of the testing in the *VB* test lab generally idles along happily running 32-bit operating systems, but once in a while we allow it full rein with a platform designed specifically for the architecture. This is always a cause for concern in VB100 testing, where history has taught us that 'fully compatible' doesn't necessarily mean identical behaviours.

The installation and setup of *Vista* is fairly straightforward, but was hampered as usual by the Machiavellian activation process and complications porting images from one system to another for maximum similarity. The standard set of tweaks were made to the default installation after applying the recent service pack – drivers for display and networking hardware were added, network shares connected, and users and passwords set up. For the purposes of this test, an admin-level user was used throughout, with the User Access Controls running in their default state – while we anticipated some annoyances from the likely large numbers of pop-ups, it seemed appropriate to monitor how various products integrated with this safety measure.

The test sets meanwhile underwent their usual minor upgrades, with much of our efforts concentrated on broader upgrades across the lab in preparation for more significant changes in upcoming tests. A sizeable chunk of new software was added to the clean set, and the trojan set used in the previous test was retired and replaced entirely with samples gathered in the last three months. We hope to introduce the same pattern of replenishment with fresh samples for the other test sets in time for the next review, along with some entirely new sets, more on which later.

The WildList set was aligned with the September issue of the WildList, which was released towards the end of October, a few weeks prior to the product deadline. The changes since the previous set included the addition of another flood of online gaming password-stealers, and the retirement of large swathes of older material. These included most of the bot families that once dominated, along with significant numbers of worms such as W32/Stration (aka Warezov) and W32/Rontokbro (aka Brontok). Several more variants of W32/Virut also fell from the list, indicating a gradual decline in numbers of a family which has caused more than its fair share of difficulties in detection, but we hope to add some of these variants to the polymorphic set, in greatly increased numbers, to ensure detection for this tricky kind of malware remains up to scratch. A few other, less sophisticated items were added to this set this month.

With minimal changes to our own sets, and expansion of the WildList set sizeable but fairly uniform, there looked to be few potholes for products to trip on this month.

Agnitum Outpost Security Suite Pro 2009 6.5.2358.316.0607

ItW	100.00%	**Polymorphic**	80.15%
ItW (o/a)	100.00%	**Trojans**	53.04%
Worms & bots	99.94%	**False positives**	0

Agnitum has become a regular participant in our tests over the past year or so, and the product has made itself welcome with good design and solid functionality. The installation process sparked a yellow alert from the UAC system, defaulting to cancel, followed by some more warnings which were eliminated by allowing the system to 'always trust' *Agnitum*. With these hurdles bypassed, the installation process took a few minutes followed by a reboot, and we were good to go. The interface is simple and clear, with ample controls and fine-tuning available, and everything seemed to run smoothly with no jerks or lags.

Speeds weren't the best, but false positives were absent across the clean and speed sets. Detection in the WildList set was above reproach, and fairly good elsewhere, although a little less than might be hoped for in the trojans set. The product features a variety of behavioural protection mechanisms as part of its main component (the highly regarded firewall), so many of the samples missed in the other sets may in fact be protected against in other ways in a real-world setting. Achieving the VB100 requirements without difficulty, *Agnitum* takes the first award of the month.

AhnLab V3 Internet Security 7.0 Platinum Edition 7.6.4.1

ItW	100.00%	**Polymorphic**	99.78%
ItW (o/a)	100.00%	**Trojans**	66.73%
Worms & bots	98.87%	**False positives**	0

AhnLab's product only produced a basic alert from the UAC system, and installed rapidly without the need for a reboot. The interface seemed fairly clear and lucid, but this proved to be deceptive, as numerous vital controls are tucked away where you would least expect them. There were some ominous lags when opening logs (perhaps understandably as large amounts of information were involved) but also when accessing the file system browser as part of the manual scan process. When faced with a 25s pause for a simple browse dialog on a fast modern machine, one could be forgiven for suspecting something is wrong.

Scanning speeds reflected this slightly lethargic attitude, but were far from dismal. Detection rates were much better than expected, after the developers have put some hard work into catching up with the polymorphic set in recent months. Across the clean sets, a large number of files were flagged on demand, which seemed particularly odd as many of them were in areas reserved for files accompanying standard *Windows* installations. Closer inspection of logs showed that the 'malware' in question was labelled 'W97M/Macro', together with the information that a macro removal tool could be used to remove the offending items. After much consideration and close analysis of the wording of logs, it was decided that, though it was a very close call and some users could be alarmed by it, this intentional detection did not count as a full false alarm. *AhnLab* thus qualifies for a VB100 award.

Alwil avast! 4.8 Pro

ItW	100.00%	**Polymorphic**	91.38%
ItW (o/a)	100.00%	**Trojans**	93.21%
Worms & bots	99.82%	**False positives**	1

Alwil's *avast!* continues to delight and baffle in equal measure, with a lightning-fast install hindered only by the UAC at the start, followed by a reboot and further UAC pop-ups requesting permission to access the interface. This itself remains unchanged, a combination of stylized simple controls with an 'enhanced' version for power users. The full control system is a rather ungainly thing which, with the benefit of considerable experience, was eventually wrangled into the required shape and lumbered its way through the tests. On-demand scanning speeds were quite impressive, but on-access speeds somewhat less so.

Detection, on the other hand, was superb, with an excellent score in the new trojans set and even better elsewhere. The WildList presented no difficulties, and in the clean sets a number of files in deep archives were warned against as potential decompression bombs. While these caused no problems, another file was mislabelled as malware which, unfortunately for *Alwil*, was enough to spoil its chances of a VB100 this month.

AVG Internet Security 8.0.199

ItW	100.00%	**Polymorphic**	91.74%
ItW (o/a)	100.00%	**Trojans**	96.10%
Worms & bots	99.96%	**False positives**	0

AVG is a big player in the free-AV market, soon to be joined by an offering from *Microsoft*, but the company's full suite offers an impressive selection of extras. These are made

On-access detection	WildList viruses		Worms & bots		Polymorphic viruses		Trojans		Clean sets	
	Missed	%	Missed	%	Missed	%	Missed	%	FP	Susp.
Agnitum Outpost	0	100.00%	2	99.94%	366	80.15%	1213	52.69%		
AhnLab V3 Internet Security	0	100.00%	3	99.87%	51	99.78%	853	66.73%		
Alwil avast!	0	100.00%	3	99.82%	312	91.38%	172	93.21%	1	
AVG Internet Security	0	100.00%	1	99.96%	52	91.74%	155	93.95%		
Avira AntiVir	0	100.00%	0	100.00%	0	100.00%	55	97.85%		
CA eTrust	0	100.00%	0	100.00%	177	92.51%	1415	44.81%		
ESET NOD32	0	100.00%	0	100.00%	0	100.00%	327	87.25%		
Fortinet FortiClient	0	100.00%	0	100.00%	0	100.00%	1802	29.72%		
FRISK F-Prot	0	100.00%	0	100.00%	121	96.46%	820	68.02%		
F-Secure Client Security	0	100.00%	0	100.00%	60	98.24%	287	88.81%		
Kaspersky Anti-Virus	0	100.00%	0	100.00%	60	98.24%	333	87.01%		
Kingsoft Internet Security	0	100.00%	16	99.27%	1686	34.24%	2068	47.39%		
McAfee VirusScan	0	100.00%	0	100.00%	0	100.00%	475	81.47%		
Microsoft Forefront	0	100.00%	0	100.00%	130	96.04%	566	77.93%		
Microsoft OneCare	0	100.00%	0	100.00%	130	96.04%	553	78.43%		
Norman Virus Control	0	100.00%	0	100.00%	1079	71.06%	970	62.17%		
Quick Heal AntiVirus	0	100.00%	51	95.53%	986	81.31%	1483	42.16%		
Rising Antivirus	0	100.00%	5	99.62%	1402	57.22%	1632	36.35%		
Sophos Anti-Virus	0	100.00%	0	100.00%	158	93.34%	772	69.89%		4
Symantec Endpoint Protection	0	100.00%	0	100.00%	0	100.00%	765	70.16%		
VirusBuster Professional	0	100.00%	2	99.94%	390	78.21%	1215	52.61%		
Webroot I.S. Essentials	0	100.00%	0	100.00%	813	89.83%	806	68.56%		2

the most of by a main interface crammed to bursting with buttons advertising the various protective layers available, rendering it somewhat cluttered and overwhelming. The installation is quite a slog, with an initial UAC prompt followed by numerous stages including the offer of *Yahoo! Search* toolbars, the setting up of various scheduled checks, selection of networking options and so on, before a reboot finally finishes things off.

Once up and running, the busy interface fairly sensibly requires UAC confirmation to get to the on-access controls, and is reasonably well laid out with accessible but less than comprehensive configuration controls. Speeds were very good on access but a little less splendid on demand where things were a little more thorough. False positives were absent, and detection rates again quite excellent across all sets. With no problems in the WildList, *AVG* wins a VB100 award this month.

Avira AntiVir Pro 8.2.0.609

ItW	100.00%	**Polymorphic**	100.00%
ItW (o/a)	100.00%	**Trojans**	98.71%
Worms & bots	100.00%	**False positives**	0

Avira is another of the leading players in the free market, if it can be called such, and has an excellent reputation for detection. The product's installation process was a little less slick, with another of the yellow UAC pop-ups warning of 'unidentified' software, and a readme appearing over the

On demand detection	WildList viruses		Worms & bots		Polymorphic viruses		Trojans		Clean sets	
	Missed	%	Missed	%	Missed	%	Missed	%	FP	Susp.
Agnitum Outpost	0	100.00%	2	99.94%	366	80.15%	1204	53.04%		3
AhnLab V3 Internet Security	0	100.00%	3	99.87%	51	99.78%	853	66.73%		86
Alwil avast!	0	100.00%	3	99.82%	312	91.38%	172	93.21%	1	21
AVG Internet Security	0	100.00%	1	99.96%	52	91.74%	100	96.10%		
Avira AntiVir	0	100.00%	0	100.00%	0	100.00%	33	98.71%		
CA eTrust	0	100.00%	0	100.00%	177	92.51%	1273	50.35%		
ESET NOD32	0	100.00%	0	100.00%	0	100.00%	227	91.15%		
Fortinet FortiClient	0	100.00%	0	100.00%	0	100.00%	1802	29.72%		
FRISK F-Prot	0	100.00%	0	100.00%	121	96.46%	769	70.01%		
F-Secure Client Security	0	100.00%	0	100.00%	60	98.24%	279	89.12%		
Kaspersky Anti-Virus	0	100.00%	0	100.00%	60	98.24%	195	92.39%		
Kingsoft Internet Security	0	100.00%	16	99.27%	1668	34.95%	2068	47.39%		
McAfee VirusScan	0	100.00%	0	100.00%	0	100.00%	448	82.53%		
Microsoft Forefront	0	100.00%	0	100.00%	130	96.04%	381	85.14%		
Microsoft OneCare	0	100.00%	0	100.00%	130	96.04%	483	81.16%		
Norman Virus Control	0	100.00%	0	100.00%	768	81.03%	932	63.65%	1	
Quick Heal AntiVirus	0	100.00%	48	95.79%	986	81.31%	1114	56.55%		
Rising Antivirus	0	100.00%	3	99.80%	1332	60.80%	1180	53.98%		
Sophos Anti-Virus	0	100.00%	0	100.00%	158	93.34%	734	71.37%		6
Symantec Endpoint Protection	0	100.00%	0	100.00%	0	100.00%	753	70.63%		
VirusBuster Professional	0	100.00%	2	99.94%	390	78.21%	1201	53.16%		
Webroot I.S. Essentials	0	100.00%	0	100.00%	813	89.83%	799	68.84%		2

top of a dialog box towards the end. The installation was followed by an attempt to scan the system, which was eventually stopped after some initial difficulties, and testing got under way.

The interface is another of those that appears straightforward but has deceptive moments of illogic, and this was not only apparent on the surface. Several attempts to run scans were found to be failing to access files, an oddity eventually diagnosed as being caused by the on-access scanner preventing the on-demand scanner from working properly. With the appropriate parts disabled, all tests were run through at their usual superb speed and with incredible accuracy. With barely anything missed and not a shadow of a false alarm, *Avira* justly earns a VB100 award for its product's performance.

CA eTrust 8.1.637.0

ItW	100.00%	**Polymorphic**	92.51%
ItW (o/a)	100.00%	**Trojans**	50.35%
Worms & bots	100.00%	**False positives**	0

CA's product has remained unchanged over several VB100 tests, with the same main installer used each time and simple updates provided for each test. The lengthy installation process with its multiple EULAs runs through on automatic, after an initial

UAC prompt, and was only enlivened this time by a failing updater – an error was diagnosed thanks to the ‘x86’ in the file’s name, rather than from the rather misleading error message, and with a 64-bit version duly replacing it things moved along.

The interface is something of a horror – this time it was less sluggish to respond than usual, but still awkward and fiddly, with access to logging data almost impossible. Some of the functions continue to bemuse, such as the engine selection button which continues to hang around years after the product’s optional second engine was dropped, and the conspicuous lack of archive scanning on access despite clear options to enable it. Nevertheless, scanning speeds remain lightning-fast, and detection rates decent, although a little poor on the trojans set. With no false positives and no items missed in the WildList set, *CA* earns yet another VB100 award.

ESET NOD32 Antivirus 3.0.672.0

ItW	100.00%	**Polymorphic**	100.00%
ItW (o/a)	100.00%	**Trojans**	91.15%
Worms & bots	100.00%	**False positives**	0

The latest iteration of *ESET*’s product started with another fairly straightforward install, despite dragging on somewhat during the file-copying phase and with a UAC prompt halfway through. It retains its stylish good looks and decent navigability, along with speeds which seem slightly less impressive than in previous versions but still well ahead of the crowd. Some sensible defaults and comprehensive options made for easy testing. The performance was marred by a few buggy moments, the occasional refusal to cooperate and on a couple of occasions full-on freezes, requiring a reboot to regain access to the controls. There were also a few occasions where options appeared to respond in ways not entirely expected.

All this did little to dent an otherwise solid performance, and detection rates were solid with high marks across the board. No trouble with the WildList samples and no false positives means that yet another VB100 award is earned by *ESET*.

Fortinet FortiClient 3.0.606

ItW	100.00%	**Polymorphic**	100.00%
ItW (o/a)	100.00%	**Trojans**	29.72%
Worms & bots	100.00%	**False positives**	0

FortiClient brought up another of the yellow UAC prompts during its installation, and some scarier red ones as various driver components were installed. Once the reboot was completed some more confirmation requests were presented when going through the setup process and accessing configuration. Some extremely thorough defaults meant little of this was required, but slowed down the speed tests somewhat. Nevertheless, respectable scanning speeds were evident.

Detection rates were mostly excellent, although in the trojans set the rate dropped sharply; liaison with the developers after a similar performance in the last test suggested many of the items included in the set are covered by the product’s greyware detections, not enabled by default. However, a rescan with these settings turned on produced few extra detections.

Despite this, the WildList was covered just fine, and without false positives *Fortinet* also wins a VB100 award.

FRISK F-Prot 6.0.9.1

ItW	100.00%	**Polymorphic**	96.46%
ItW (o/a)	100.00%	**Trojans**	70.01%
Worms & bots	100.00%	**False positives**	0

F-Prot is a much simpler beast than the suites and multi-tools proffered by many other participants in our tests these days, and as such its installation and use is expected to be less strenuous. The pared-down, wintry interface offers little in the way of user control or interactivity, but goes about its business in a workman-like way. Accessing logs, somewhat unexpectedly, required acceptance of a UAC pop-up, but little else hindered testing as we tripped merrily through the speed tests and ploughed through the infected sets with splendid detection and a lack of false positives. Full coverage of the WildList grants *FRISK* another VB100 award for its tally.

F-Secure Client Security 8.00 build 232

ItW	100.00%	**Polymorphic**	98.24%
ItW (o/a)	100.00%	**Trojans**	89.12%
Worms & bots	100.00%	**False positives**	0

F-Secure returns us to the more complex world of multi-layer protection, the product including the company’s new and much-vaunted *Deepguard* system, using an online reputation database in addition to local information as part of the behavioural protection system. Sadly, the impact of this could not be fully analysed in our current test setup, but

		ACE	CAB	JAR	LZH	RAR	TGZ	ZIP	ZIP-SFX	EXT*
Agnitum Outpost	OD	2	√	√	X	√	√	√	√	√
	OA	X	X	X	X	X	X	X	X	√
AhnLab V3 Internet Security	OD	X	9	X	9	9	X	9	X	√
	OA	X	X	X	X	X	X	X	X	√
Alwil avast!	OD	X/√	X/√	X/√	X/√	X/√	X/√	X/√	X/√	X/√
	OA	X/√	X/√	X/√	X/√	X/√	X/√	X/√	√	√
AVG Internet Security	OD	X	√	X	X	√	X	√	√	X/√
	OA	X	X	X	X	X	X	X	X	√
Avira AntiVir	OD	√	X/√	X/√	X/√	X/√	X/√	X/√	X/√	X/√
	OA	X	X/√	X/√	X/√	X/√	X/√	X/√	X/√	X/√
CA eTrust	OD	√	√	√	√	√	√	√	√	√
	OA	X	X	1	X	X	X	1	X	√
ESET NOD32	OD	X	√	X	√	√	5	√	√	√
	OA	X	X	X	X	X	X	X	X	√
Fortinet FortiClient	OD	X	√	√	√	√	√	√	4	√
	OA	X	√	√	√	√	√	√	4	√
FRISK F-Prot	OD	1	√	√	√	√	√	√	√	√
	OA	1	X	2	2	X	X	X	2	√
F-Secure Client Security	OD	X/√	5	5	5	5	2	5	5	√
	OA	X/√	X/5	X/5	X/5	X/5	X/2	X/5	X/5	X/√
Kaspersky Anti-Virus	OD	√	√	√	√	√	√	√	√	√
	OA	X/4	X/4	X/4	X/4	X/5	X/1	X/2	X/1	X/√
Kingsoft Internet Security	OD	X	X	√	√	√	√	√	X	√
	OA	X	X	X	X	X	X	X	X	√
McAfee VirusScan	OD	2	√	√	√	√	√	√	√	√
	OA	X/2	X/√	X/√	X/√	X/√	X/√	X/√	X/√	X/√
Microsoft Forefront	OD	√	√	√	√	√	√	√	√	√
	OA	X	X	1	X	X	X	1	1	√
Microsoft OneCare	OD	X	X	1	X	X	X	1	1	√
	OA	X	X	1	X	X	X	1	1	√
Norman Virus Control	OD	X	X	√	√	√	√	√	X	√
	OA	X	X	X	X	X	X	X	X	√
Quick Heal AntiVirus	OD	X/2	X/5	2/5	X	2/5	X/1	2/5	X	X/√
	OA	X	X	X	X	X	X	X	X	X
Rising Antivirus	OD	√	√	√	√	√	√	√	√	√
	OA	√	√	√	√	√	√	√	√	√
Sophos Anti-Virus	OD	X	5	5	5	5	5	5	5	√
	OA	X	X/5	X/5	X/5	X/5	X/5	X/5	X/5	√
Symantec Endpoint Protection	OD	X	3/√	3/√	3/√	3/√	3/√	3/√	3/√	√
	OA	X	X	X	X	X	X	X	X/√	√
VirusBuster Professional	OD	√	√	X	X	√	√	√	√	X
	OA	X	X	X	X	X	X	X	X	X
Webroot I.S. Essentials	OD	X	√	5	√	√	5	√	5	√
	OA	X	X	X	X	X	X	X	X	√

Key:
X - Archive not scanned
√ - Archives scanned to depth of 10 or more levels
[1-9] - Archives scanned to limited depth
X/√ - Default settings/thorough settings
*Executable file with randomly chosen extension

the rest of the product seemed pretty solid for the most part.

The installer runs through nice and simply, with a UAC prompt at the start and the selection of local or remote management the only non-standard moments. Once installed, and after a reboot, testing proceeded fairly slowly, thanks to the in-depth multi-engine approach, and the only blot on the performance was a loss of connectivity between various parts of the product at one stage – attempts to set off an on-demand scan were met with messages telling us the 'AV handler' was not running. Another reboot soon fixed this, and the problem did not recur. We powered through

On-demand throughput (MB/s)	Archive files				Binaries and system files				Media and documents				Other file types			
	Default settings		All files		Default settings		All files		Default settings		All files		Default settings		All files	
	Time (s)	Through-put (MB/s)	Time (s)	Through-put (MB/s)	Time (s)	Through-put (MB/s)	Time (s)	Through-put (MB/s)	Time (s)	Through-put (MB/s)	Time (s)	Through-put (MB/s)	Time (s)	Through-put (MB/s)	Time (s)	Through-put (MB/s)
Agnitum Outpost	942	3.24	942	3.24	339	7.66	339	7.66	143	14.43	143	14.43	94	10.02	94	10.02
AhnLab V3 Internet Security	1683	1.82	1683	1.82	394	6.59	394	6.59	185	11.16	185	11.16	210	4.49	210	4.49
Alwil avast!	34	89.86	612	4.99	191	13.60	219	11.86	56	36.86	94	21.96	207	4.55	231	4.08
AVG Internet Security	1253	2.44	1253	2.44	267	9.73	267	9.73	273	7.56	273	7.56	40	23.56	144	6.54
Avira AntiVir	265	11.53	289	10.57	93	27.93	88	29.52	53	38.94	49	42.12	32	29.45	42	22.43
CA eTrust	264	11.57	264	11.57	157	16.54	157	16.54	68	30.35	68	30.35	36	26.17	36	26.17
ESET NOD32	756	4.04	756	4.04	367	7.08	367	7.08	40	51.60	40	51.60	82	11.49	82	11.49
Fortinet FortiClient	286	10.68	286	10.68	377	6.89	377	6.89	40	51.60	40	51.60	90	10.47	90	10.47
FRISK F-Prot	293	10.43	293	10.43	341	7.62	341	7.62	51	40.47	51	40.47	41	22.98	41	22.98
F-Secure Client Security	1397	2.19	1852	1.65	301	8.63	296	8.77	66	31.27	167	12.36	40	23.56	133	7.08
Kaspersky Anti-Virus	591	5.17	591	5.17	137	18.96	137	18.96	53	38.94	53	38.94	37	25.47	37	25.47
Kingsoft Internet Security	6945	0.44	6945	0.44	1311	1.98	1311	1.98	619	3.33	619	3.33	1166	0.81	1166	0.81
McAfee VirusScan	700	4.36	700	4.36	321	8.09	321	8.09	83	24.87	83	24.87	112	8.41	112	8.41
Microsoft Forefront	841	3.63	841	3.63	860	3.02	860	3.02	69	29.91	69	29.91	95	9.92	95	9.92
Microsoft OneCare	1034	2.95	NA	NA	495	5.25	495	5.25	88	23.45	88	23.45	71	13.27	71	13.27
Norman Virus Control	618	4.94	618	4.94	1332	1.95	1332	1.95	99	20.85	99	20.85	218	4.32	218	4.32
Quick Heal AntiVirus	300	10.18	596	5.13	64	40.58	67	38.77	79	26.13	90	22.93	50	18.85	63	14.96
Rising Antivirus	1391	2.20	1391	2.20	665	3.91	665	3.91	254	8.13	254	8.13	215	4.38	215	4.38
Sophos Anti-Virus	336	9.09	336	9.09	223	11.65	223	11.65	89	23.19	89	23.19	91	10.35	91	10.35
Symantec Endpoint Protection	430	7.10	452	6.76	168	15.46	243	10.69	117	17.64	175	11.79	97	9.71	99	9.52
VirusBuster Professional	462	6.61	2645	1.16	190	13.67	1753	1.48	37	55.78	316	6.53	21	44.87	170	5.54
Webroot I.S. Essentials	738	4.14	738	4.14	270	9.62	270	9.62	107	19.29	107	19.29	115	8.19	155	6.08

the infected sets with excellent detection rates, scored no false positives in the clean sets and covered the WildList flawlessly. Another VB100 goes to *F-Secure* for the product's performance.

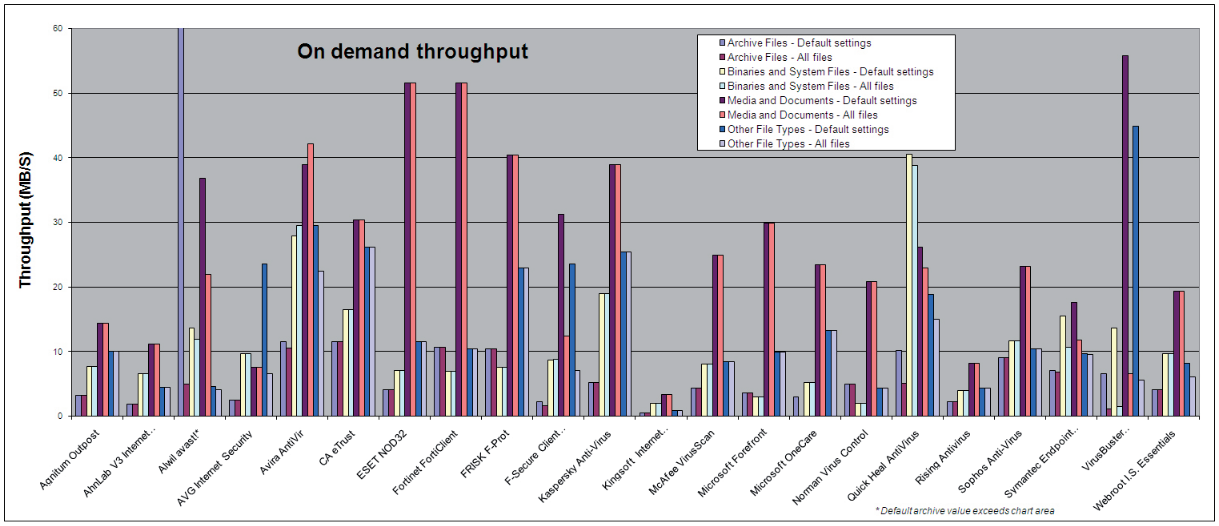
Kaspersky Anti-Virus 2009 8.0.0.454

ItW	100.00%	**Polymorphic**	98.24%
ItW (o/a)	100.00%	**Trojans**	92.39%
Worms & bots	100.00%	**False positives**	0

Kaspersky's latest offering provoked considerable enthusiasm from our test engineer, who was impressed by the wide range of protective layers provided as well as the pleasant and informative interface with its range of data displays, including rolling graphs of monitored files and blocked attacks.

Glancing over the test results, scanning speeds were similarly impressive, and detection rates at their usual high level.

vb Dec 2008
100
VIRUS
virusbtn.com



With the full range of VB100 requirements met without difficulty, *Kaspersky* also makes the grade and wins the award.

Kingsoft Internet Security 2008.11.6.63

ItW	100.00%	**Polymorphic**	34.95%
ItW (o/a)	100.00%	**Trojans**	47.39%
Worms & bots	99.27%	**False positives**	0

Kingsoft has been on a bit of a rollercoaster of late, with various product and detection issues meaning its record of VB100s has been somewhat sporadic. This time, however, the product seemed to behave itself for the most part.

After a rather lengthy but mostly quite straightforward installation process, testing ran along mainly using the default settings, as in-depth configuration was limited. No signs of the product's previous instability issues were evident. The only problem encountered was in accessing the logs, as the various buttons to access the 'log viewer' system appeared disabled. After some poking around we found that this was another UAC problem, silent this time, and the logs could be accessed by running the viewer with admin rights from the start menu.

Speeds were remarkable, although not for the happiest of reasons, and detection rates left much to be desired in several sets. However, the WildList samples all detected correctly and no files were falsely alerted on in the clean test set, which means that *Kingsoft* makes the grade for another VB100 award.

McAfee VirusScan Enterprise 8.7.0i

ItW	100.00%	**Polymorphic**	100.00%
ItW (o/a)	100.00%	**Trojans**	82.53%
Worms & bots	100.00%	**False positives**	0

A quite different kettle of fish, *McAfee*'s product is a veteran war horse which has weathered many VB100s with barely a stumble. The product remains little changed, presenting a plain and unfussy face to the world but providing all the fine-tuning options expected of an enterprise-level product beneath its bonnet.

Our test engineer felt *VirusScan* was rather more affected by UAC blocks than some other products, and the system took considerably longer than usual to regain its desktop after the post-install reboot, but otherwise no issues were observed, with good scanning speeds and very good detection rates. No problems in the WildList or clean sets means that *McAfee* qualifies comfortably for another VB100 award.

Microsoft Forefront Client Security 1.5.1955.0

ItW	100.00%	**Polymorphic**	96.04%
ItW (o/a)	100.00%	**Trojans**	85.14%
Worms & bots	100.00%	**False positives**	0

Microsoft's corporate product offers considerably fewer of those fine-tuning options than the product discussed above, at least at the desktop level, presenting an interface described by our test engineer as 'very simple', with not many options but lots of help. The absence of in-depth

File access lag time (s/MB)	Archive files				Binaries and system files				Media and documents				Other file types			
	Default settings		All files		Default settings		All files		Default settings		All files		Default settings		All files	
	Time (s)	Lag (s/MB)	Time (s)	Lag (s/MB)	Time (s)	Lag (s/MB)	Time (s)	Lag (s/MB)	Time (s)	Lag (s/MB)	Time (s)	Lag (s/MB)	Time (s)	Lag (s/MB)	Time (s)	Lag (s/MB)
Agnitum Outpost	61	0.019	NA	NA	265	0.096	265	0.096	178	0.071	178	0.071	143	0.128	143	0.128
AhnLab V3 Internet Security	79	0.025	NA	NA	220	0.078	220	0.078	120	0.043	120	0.043	144	0.129	144	0.129
Alwil avast!	143	0.046	684	0.223	457	0.170	275	0.100	159	0.062	198	0.081	147	0.132	154	0.140
AVG Internet Security	151	0.048	174	0.056	345	0.127	379	0.140	127	0.046	170	0.067	40	0.019	117	0.101
Avira AntiVir	35	0.010	291	0.094	102	0.033	109	0.036	66	0.017	86	0.027	33	0.012	61	0.041
CA eTrust	26	0.007	NA	NA	76	0.023	76	0.023	75	0.022	75	0.022	51	0.031	51	0.031
ESET NOD32	12	0.003	NA	NA	52	0.014	52	0.014	78	0.023	78	0.023	95	0.077	95	0.077
Fortinet FortiClient	276	0.089	276	0.089	367	0.135	367	0.135	68	0.018	68	0.018	123	0.108	123	0.108
FRISK F-Prot	72	0.023	NA	NA	396	0.146	396	0.146	64	0.016	64	0.016	51	0.031	51	0.031
F-Secure Client Security	45	0.014	1682	0.549	313	0.114	448	0.166	108	0.037	307	0.134	58	0.038	201	0.190
Kaspersky Anti-Virus	27	0.008	104	0.033	131	0.044	307	0.112	105	0.036	117	0.042	66	0.047	92	0.075
Kingsoft Internet Security	84	0.026	NA	NA	1353	0.515	1353	0.515	682	0.316	682	0.316	1079	1.122	1079	1.122
McAfee VirusScan	43	0.013	462	0.150	274	0.099	259	0.094	112	0.040	115	0.041	114	0.098	117	0.101
Microsoft Forefront	137	0.044	NA	NA	433	0.160	433	0.160	91	0.029	91	0.029	115	0.099	115	0.099
Microsoft OneCare	147	0.047	NA	NA	487	0.181	487	0.181	113	0.040	113	0.040	82	0.063	82	0.063
Norman Virus Control	57	0.018	NA	NA	242	0.087	242	0.087	114	0.040	114	0.040	188	0.177	188	0.177
Quick Heal AntiVirus	14	0.003	NA	NA	76	0.023	NA	NA	68	0.018	NA	NA	33	0.012	NA	NA
Rising Antivirus	25	0.007	25	0.007	744	0.280	744	0.280	281	0.121	281	0.121	155	0.141	155	0.141
Sophos Anti-Virus	39	0.012	1523	0.497	217	0.077	799	0.301	70	0.019	143	0.055	52	0.032	140	0.125
Symantec Endpoint Protection	29	0.008	NA	NA	125	0.042	125	0.042	75	0.021	75	0.021	89	0.071	89	0.071
VirusBuster Professional	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Webroot I.S. Essentials	24	0.007	NA	NA	35	0.007	NA	NA	42	0.005	NA	NA	38	0.017	NA	NA

configuration made for fairly straightforward testing, and the defaults seemed generally fairly sensible, with in-depth logging, not previously revealed to us by the developers, finally put to good use and the awkward event log system no longer required. One oddity of the logging was frequent warnings about 'expensive' files, but as there is nothing in the VB100 rules about overestimating the value of software, we let this pass.

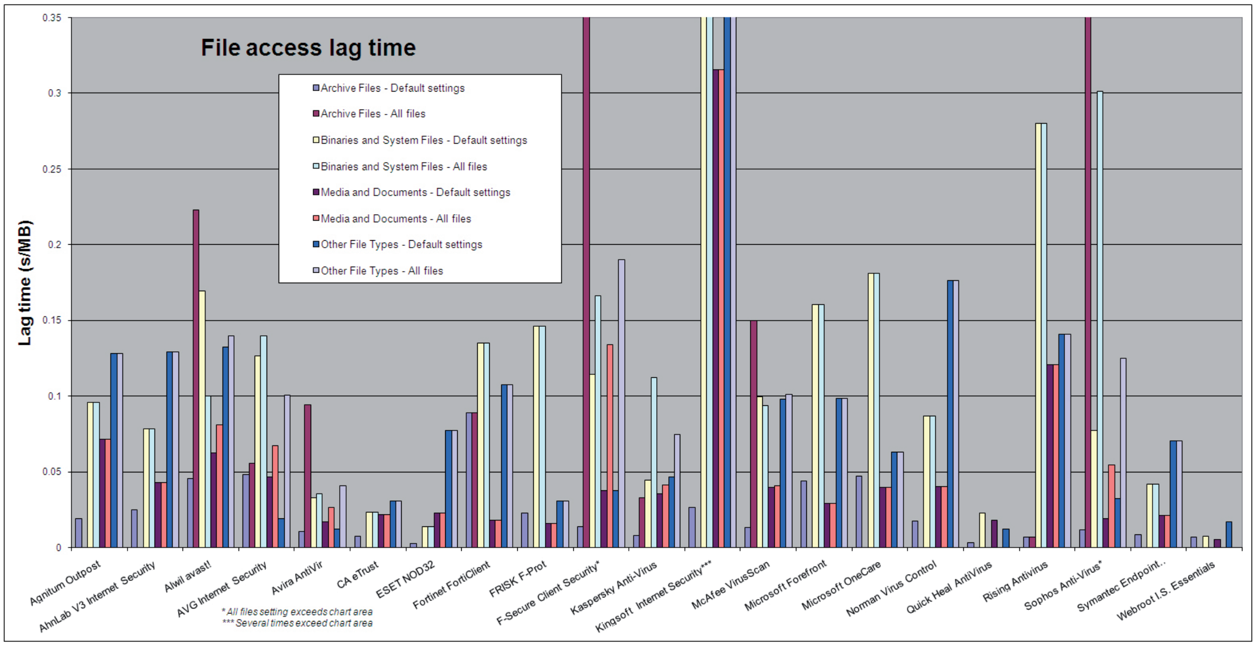
The results showed fairly decent scanning speeds and detection rates were once again greatly improved. No false positives, and still no WildList misses, means another VB100 award goes to *Forefront* this month.

vb Dec 2008 100 VIRUS virusbtn.com

Microsoft OneCare 2.5.2900.15

ItW	100.00%	**Polymorphic**	96.04%
ItW (o/a)	100.00%	**Trojans**	81.16%
Worms & bots	100.00%	**False positives**	0

Many will have been shaken this month by the news that *OneCare*, *Forefront*'s home-user sibling, is to be retired next year and replaced by a livelier, simpler model. *VB* will not



* All files setting exceeds chart area
*** Several times exceed chart area

be mourning too deeply, although we will be looking forward with some interest to the new version.

As it stands, *OneCare* is even simpler than *Forefront*, despite the various extra functions included, such as backup and disk defragmentation. There is very little opportunity for the user to manipulate its behaviour beyond the very basics, and on several occasions we found test systems completely crippled, and scan logs rendered inaccessible, by unexpected runs of 'tune-up' tasks. On most occasions, once this problem was diagnosed and the tasks aborted, a simple reboot allowed access to logs once more, despite the ominous tone of the error messages.

Speed results proved very slightly slower than *Forefront*, and detection rates pretty similar, with an identical lack of difficulties in the WildList and clean set resulting in another VB100 award for *Microsoft*.

Norman Virus Control 5.99

ItW	100.00%	**Polymorphic**	81.03%
ItW (o/a)	100.00%	**Trojans**	63.65%
Worms & bots	100.00%	**False positives**	1

Norman's unusual multi-interface approach made for more interference than usual from the UAC pop-ups, as various different parts of the product required individual confirmation. This meant that there were some rather long pauses moving from one part to another in the process of carrying out our various tasks. Configuration was patchy – in-depth in some areas and apparently absent in others, but things got done once the control system had been deciphered.

Scanning speeds were somewhat below average, but detection rates were pretty reasonable in general, with no difficulty covering the WildList. In the clean sets, however, a single file was mislabelled as the notorious Zlob trojan, and this was enough to spoil *Norman*'s chances for a VB100 award this month.

Quick Heal AntiVirus 9.50

ItW	100.00%	**Polymorphic**	81.31%
ItW (o/a)	100.00%	**Trojans**	56.55%
Worms & bots	95.79%	**False positives**	0

Quick Heal proved once again to be worthy of its name, with testing completed fairly quickly once our test engineer had found his way around the interface. He described the interface as 'bizarrely laid out', and said that it seemed to keep some of its important functions quite well hidden.

Along with the excellent scanning speeds went less-than-superb detection rates, with detection for large numbers of items recently retired from the WildList apparently removed from databases – presumably to maintain that excellent scan rate. The WildList itself, however, was covered without problems, and without false positives *Quick Heal* is worthy of a VB100 award.

Rising Antivirus 20.67.10

ItW	100.00%	**Polymorphic**	60.80%
ItW (o/a)	100.00%	**Trojans**	53.98%
Worms & bots	99.80%	**False positives**	0

Rising is another relative newcomer to the VB100 award, but the company has done pretty well so far with a nicely designed product. The setup process in this case was fairly complex, with a yellow warning from the UAC system and further configuration requirements after the reboot.

The stability that was noted with approval in previous tests was sadly less evident this time, with some oddities of behaviour and downright crashes slowing down the progress of our testing. On one occasion, after an on-demand scan of clean files, the ominous message 'Rising Antivirus has stopped working' appeared, while several times during on-access testing file accesses seemed to accelerate rapidly, and detections cut off completely, implying that the on-access scanner had also cut out.

After several retries some reasonably reliable results were obtained, showing some rather sluggish scanning speeds and less-than-perfect detection rates, but the WildList at least was well handled, and without false positives *Rising* also qualifies for a VB100 award.

Sophos Anti-Virus 7.6.1

ItW	100.00%	**Polymorphic**	93.34%
ItW (o/a)	100.00%	**Trojans**	71.37%
Worms & bots	100.00%	**False positives**	0

Sophos is another veteran participant in the VB100, and the product impressed our tester with its speed of installation, well laid out interface and depth of configuration. UAC prompts seemed to accompany most selections from the main part of the interface.

Scanning speeds were pretty fast, at least with the default settings, and detection rates generally decent too, with no problems in the WildList and no false positives. *Sophos* thus joins the ranks of this month's VB100 award winners.

Symantec Endpoint Protection 11.0.3001.2224

ItW	100.00%	**Polymorphic**	100.00%
ItW (o/a)	100.00%	**Trojans**	70.63%
Worms & bots	100.00%	**False positives**	0

Symantec's business desktop product has had a serious redesign of late, and the new look and feel has moved sharply away from the business-like, configurable simplicity of the previous edition towards the colourful and over-simplified. Though scanning speeds were decent, there were some very noticeable lags on various button presses, especially when trying to access the logs. These were most likely caused by the raw data, which in the case of our test runs often ran to hundreds of megabytes. Similar lags were also observed after some longer scan jobs.

Nevertheless, detection rates were solid, with no problems in the WildList or in the clean sets, and thus *Symantec* wins another VB100 award too.

VirusBuster Professional 6.0 build 206

ItW	100.00%	**Polymorphic**	78.21%
ItW (o/a)	100.00%	**Trojans**	53.16%
Worms & bots	99.94%	**False positives**	0

VirusBuster's installer needed to be run with full admin rights to function, but was still interrupted by the UAC prompts. After this, the installation was fast and simple, all done in less than 30 seconds, but this speed did not extend to the testing, with our tester finding the interface 'appalling'. The convoluted layout, and lack of progress information on scanning times, didn't make *VirusBuster* any new friends in the *VB* lab.

While on-demand scanning times were pretty decent, on-access times could not be gathered, as the product's usual on-read detection appeared not to be functioning as expected on the platform under test. On-access results were thus obtained by copying file sets to the system with the product set to delete, and analysing the remains to measure accuracy. This proved mostly quite decent, with no difficulties in the WildList and no false positives, and *VirusBuster* is thus awarded another VB100 for its efforts.

Webroot I.S. Essentials 6.0.2.22

ItW	100.00%	**Polymorphic**	89.83%
ItW (o/a)	100.00%	**Trojans**	68.84%
Worms & bots	100.00%	**False positives**	0

Webroot's '*WISE*' was another product that failed to impress our tester, with an interface that looked attractive on the surface, but quickly grew ugly when trying to do anything beyond the very basics. Configuration is very minimal, and responsiveness somehow even lower, with huge time lags between various components, most notably the file browsing to select areas to scan. Scanning times were also rather slow, and although once again the on-access component appeared not to be sparked by simple file accesses, times were still recorded for this test as they were in some cases slower than other products that did scan the files.

Logging also proved an issue, with all data discarded after 1,000 lines, not much by the standards we require. Nevertheless, with a combination of careful scanning of tiny portions of our sets at a time, copying files around and to the system and allowing the product to mangle them as it saw fit, then comparing the results with the originals to check for changes, we finally managed to get some usable results. The results seemed to tally fairly closely with those of the *Sophos* engine at the core of the product's detection capabilities. This meant that there were no issues in either the WildList or clean sets, and that, despite annoying the test team quite thoroughly, *Webroot* earned another VB100 award.

CONCLUSIONS

On top of the already rather arduous task of getting through multiple tests on multiple products, this month presented more than the average number of small annoyances and petty frustrations. These included bizarre and buggy interfaces, hidden or absent options, and unreliable behaviours, as well as a few more major issues, including product freezes and crashes, blatant contradiction of advertised behaviours, and the occasional product which all but defied testing. Much of this can be put down to the less than ubiquitous platform, but developers claiming to support a given platform need to ensure that their products undergo full and thorough quality assurance.

This month's test has been notable for the more than usually high number of passes – indeed only two products failed to meet the required standard, with a couple of other close calls. It seems appropriate to remind readers that we expect products to pass our base test requirements on a regular basis, that the VB100 requirements are not intended as an indication of superlative products, merely of adequate and reasonably reliable ones. The purpose of the scheme is to provide certification of products proven to be legitimate, and to provide a basic level of protection. A single test result should not be taken in a vacuum, but patterns and trends of performance over time can be a valuable guide to the trustworthiness of a product and its developers.

In addition to the plain pass/fail outcomes which some take to be the be-all and end-all of the VB100, we provide a wide range of additional information on the products that take part, including measurements of scanning speed and overheads, overviews of additional functionality and usability, and detection rates over a selection of additional test sets.

In the next VB100, we plan to introduce a major addition to this range of extras, based on weekly test sets built up in the weeks immediately prior to, and shortly after, the product submission deadline. This should provide a useful indicator of how well developers are keeping up with the ever-growing flood of new malware samples seen on a daily basis, many of them frequently morphed and fine-tuned with the explicit aim of avoiding detection by anti-malware software. The test should also provide some insight into how well heuristic and generic detection techniques are allowing products to detect malware as yet unseen by analysis labs.

Details of the new test system, which we have dubbed '*RAP*', standing for *Reactive And Proactive* measuring, were presented at the recent *VB* conference and have since been opened to deeper consultation with interested parties. In its fully developed form the new test should provide clear and easily understood additional data, which will also build up over time to show long-term trends and patterns of improvement, stagnation or decline in the performance of scanner products.

This will go some way to providing more information on the performance and capabilities of current security software, but of course there are many diverse new functions being added to solutions with every new generation, many of which require major shifts in test design to properly measure their efficacy. In conjunction with groups like AMTSO, our own expert advisory board and other interested parties, we will continue to investigate and develop new testing methodologies, and even new certification schemes, that will enable us to more accurately evaluate the products' full capabilities. We hope to make many more strides in this direction in the course of the coming year, and as always we welcome any feedback, input, suggestions and opinions from our readers.

Technical details

All products were tested on identical systems with *AMD Athlon64 X2* Dual Core 5200+ processors, 2 GB RAM, dual 80 GB and 400 GB hard drives, running *Microsoft Windows Vista Business Edition* (64-bit).

Developers interested in submitting products for Virus Bulletin's comparative reviews should contact john.hawes@virusbtn.com. A schedule of forthcoming tests can be found at http://www.virusbtn.com/vb100/about/schedule.xml.

END NOTES & NEWS

The 2nd Annual Chief Security Officer Summit will take place 8–10 December 2008 in Geneva, Switzerland. The summit aims to bring together security directors from across Europe, Africa and the Middle East to tackle the most critical and strategic security challenges at the highest business level. For more information see http://www.mistieurope.com/cso/.

ACSAC 24 (the Applied Computer Security Associates' Annual Computer Security Conference) will be held 8–12 December 2008 in Anaheim, CA, USA. For details see http://www.acsac.org/.

AVAR 2008 will be held 10–12 December 2008 in New Delhi, India. The 11th Association of anti-Virus Asia Researchers International Conference will be hosted by *Quick Heal Technologies Pvt*. See http://www.aavar.org/avar2008/index.htm.

Black Hat DC 2009 takes place 16–19 February 2009 in Washington, DC, USA. Online registration is now open and a call for papers has been issued (deadline 1 January 2009). For details see http://www.blackhat.com/.

CanSecWest 2009 will take place 16–20 March 2009 in Vancouver, Canada. Those interested in presenting at the event should submit proposals by 8 December. For full details see http://cansecwest.com/.

The 3rd Annual Securasia Congress takes place in Kuala Lumpur, Malaysia, 25–26 March 2009. Key topics include global threats to security, social engineering and malware trends, addressing the insider threat to database security and developing meaningful security metrics for security management. For full details see http://www.securasia-congress.com/.

Black Hat Europe 2009 takes place 14–17 April 2009 in Amsterdam, the Netherlands, with training taking place 14–15 April and the briefings part of the event from 16–17 April. Registration is now open and a call for papers has been issued (deadline 1 February 2009). See http://www.blackhat.com/.

RSA Conference 2009 will take place 20–24 April 2009 in San Francisco, CA, USA. The conference theme is the influence of Edgar Allen Poe, a poet, writer and literary critic who was fascinated by cryptography. For more information including registration rates and packages see http://www.rsaconference.com/2009/US/.

Infosecurity Europe 2009 takes place 28–30 April 2009 in London, UK. For more details see http://www.infosec.co.uk/.

The 18th EICAR conference will be held 11–12 May 2009 in Berlin, Germany, with the theme 'Computer virology challenges of the forthcoming years: from AV evaluation to new threat management'. A call for papers has been issued, with a submission deadline of 21 December 2008 for peer-reviewed papers and 14 December 2008 for non-reviewed papers. For more information see http://eicar.org/conference/.

NISC 10 will take place 20–22 May 2009 in St Andrews, Scotland. For more details including provisional agenda and online registration see http://www.nisc.org.uk/.

Black Hat USA 2009 will take place 25–30 July 2009 in Las Vegas, NV, USA. Training will take place 25–28 July, with the briefings on 29 and 30 July. Online registration will open in February 2009, when a call for papers will also be issued. For details see http://www.blackhat.com/.

The 18th USENIX Security Symposium will take place 12–14 August 2009 in Montreal, Canada. For more information see http://www.usenix.org/events/sec09/.

vb 2009 GENEVA

VB2009 will take place 23–25 September 2009 in Geneva, Switzerland. For details of sponsorship opportunities and any other queries relating to VB2009, please email conference@virusbtn.com.

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vb Spam supplement

NEWS & EVENTS

SPAM LEVELS BOUNCE BACK

Spam levels have started to rise again just two weeks after a massive drop when web-hosting firm *McColo* was taken offline.

McColo – which hosted botnet control centres that controlled zombies around the world and which were responsible for more than 75% of the spam sent globally each day – was taken offline by its upstream providers last month after security researcher Brian Kreb presented them with evidence about suspicious activities on the provider's network. Spam levels plummeted almost instantly.

Now, however, spam levels have begun to rise again. Estimates vary as to the extent of the rise, *IronPort Systems* putting the level of spam at less than half that prior to the *McColo* shutdown, while *MessageLabs* believes the level to have risen to around two-thirds that prior to the shutdown. Of course, none of this comes as a surprise – researchers have been expecting to see botnets kick back into action and the last few days of November saw the resurrection of the Rustock and Srizbi botnets, each of which is capable of sending massive amounts of spam.

While levels are currently lower than prior to the *McColo* shutdown, there is little doubt that this month will see spam levels reach record heights again.

EVENTS

The 15th general meeting of the Messaging Anti-Abuse Working Group (MAAWG) will be held in San Francisco, CA, USA, 17–19 February 2009. The 16th and 17th general meetings will be held 9–11 June 2009 in Amsterdam, The Netherlands, and 27–29 October 2009 in Philadelphia, PA, USA, respectively. For full details see http://www.maawg.org/.

The Counter-eCrime Operations Summit will be held 12–14 May 2009 in Barcelona. For more details see http://www.antiphishing.org/.

FEATURE

FIGHTING PHISHING AT THE BROWSER LEVEL

Alexandru C. Cosoi
BitDefender, Romania

Phishing can no longer be considered a new and emerging phenomenon. Fake websites impersonating both national and international financial institutions appear everywhere, trying to manipulate users into giving away their credentials. This article describes a method that attempts to deal with the phishing problem at the browser level, by combining both whitelisting and content-based solutions into a web page forgery detector.

INTRODUCTION

Phishing is a form of social engineering in which an attacker attempts to acquire sensitive information from a victim by impersonating a trustworthy third party.

In a typical phishing attempt, a fake website (also termed a clone) poses as a genuine web page belonging to an online retailer or a financial institution, and the user is asked to enter some personal information (e.g. username and password) and/or financial information (e.g. credit card number, bank account number, security code etc.). Once the information has been submitted by the unsuspecting user, it is harvested by the attacker. The user may also be directed to a web page which installs malicious software (e.g. viruses, trojans) on the user's computer. The malicious software may continue to steal personal information by recording the user's keystrokes while visiting certain web pages, and may transform the user's computer into a platform for launching other phishing or spam attacks.

Current anti-spam technologies have achieved competitive detection rates against phishing emails, but recently phishers have started using a number of different mediums to lure users to their fake websites – including instant messaging, social networks, blog posts and even SMS [1, 2]. Once attackers have some basic information about their victims from social network profiles [3], it is easy for them to socially engineer their way into the users' trust. This makes it even more important for browser-level protection to prevent the user from accessing the malicious websites.

Current browser-based technologies employ whitelisting and blacklisting techniques, various heuristics to see if URLs are similar to well-known legitimate URLs, community ratings and content-based heuristics [4], and lately visual similarity techniques [5].

Blacklisting has worked well so far, but the time it takes for a URL to become blacklisted worldwide overlaps in most cases with the time frame in which the phishing attack is most successful. Also, not all of the current content-based solutions make use of whitelists, which can result in the misclassification of sites – for example a filter might treat the official *eBay* website as a phishing site [6].

PROPOSED METHOD

In developing our method we started from the following hypothesis: in a given language, the number of different possible ways of phrasing a message that transmits the same or similar information (such as 'Please log into your online banking account in order to access your funds') is limited by the writer's common sense (i.e. the information must be phrased in a simple, readable and understandable form). In other words, we assume that the English login pages of financial institutions will have a large set of common words, since they share a common purpose and specialized financial vocabulary [7–12].

Two documents, A and B (in our case the web pages of financial institutions such as *PayPal* or *Bank of America*), can be represented as sets of words:

$A = C \cup N_1$ and $B = C \cup N_2$

where C represents the common words between the two documents, and N_1 and N_2 the distinct words. This means that the number of words needed to construct a database with triples of the form (word, document, occurrences), is:

$|C| + |N_1| + |N_2| \leq 2|C| + |N_1| + |N_2|$

or in short $|A \cap B| \leq |A \cup B|$. In the case of only two documents, this technique might not be very useful, but in the case of several documents which serve the same purpose (e.g. the websites of financial institutions), we can assume that the outcome will consist of a large number of common words.

We will now define a similarity indicator between two documents, known as the Jaccard distance[1] for sets:

$$d = 1 - \frac{|A \cap B|}{|A \cup B|} \qquad (1)$$

On identical documents, this distance will have a null value, while in the case of similar, but non-identical documents it will be close to 0. Since these are not standard sets (e.g. in ordinary sets, identical elements appear just once, while in this set, we decided that each element – or word – appears as many times as it is found in the document), the distance actually provides an acceptable similarity value, based on the number of words.

On a corpus of 101 financial institutions from three different countries – the top five phished banks in Romania, seven websites from Germany and 89 randomly chosen US institutions which showed a high frequency of email phishing in our internal email corpus, with an average of 100 words per page – we obtained a database of just 4,422 different words, instead of an expected minimum of 10,000 words.

Considering a pool of web pages (such as those described above), we can construct a database in the format presented in Table 1.

Table 1: Database format.

	Bank 1	Bank 2	Bank 3	Bank 4	Bank 5
Word 1	3	1	0	2	1
Word 2	0	0	3	1	0

Based on this initial background, our proposed method is outlined in Figure 1. First, the presented web page is verified against a blacklist and a whitelist. Afterwards, some simple heuristics are run on the content of the web page, to check whether it tries to mimic an official login page

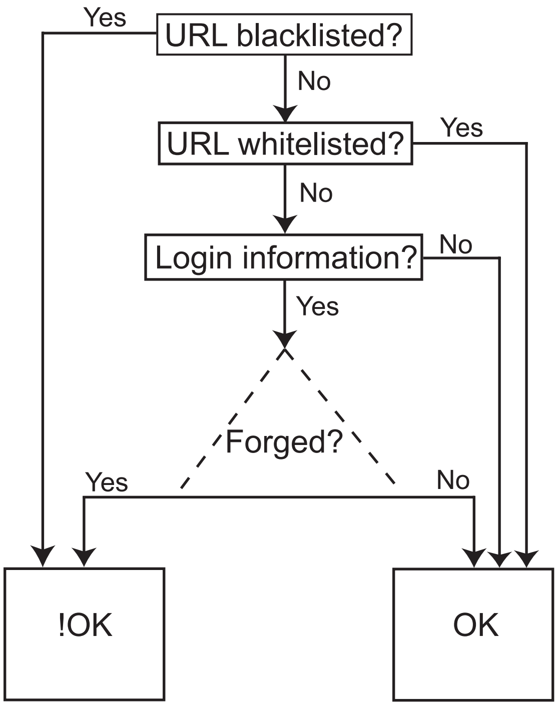

Figure 1: Toolbar algorithm.

[1] *A* represents the number of elements of set A.

(e.g. contains a submit button or key words such as *eBay*, *PayPal*, etc.). We introduced this step for speed optimization purposes (it would be pointless to check if a web page with no submit form tries to duplicate a web page that has such a form).

If we consider it necessary to run our forgery filter on a target web page, then we start computing the Jaccard distance for each institution on which the filter has trained (the words from learned web pages are stored in the database[2]). The lowest distance obtained indicates the highest similarity between the target web page and a reference web page in our database. If the computed distance is smaller than a predefined threshold, we consider the target website to be forged.

When dealing with this technology, the use of an up-to-date whitelist is essential in order to prevent the forgery filter being run on original websites, and thus prevent false positives.

RESULTS

Usually, if the filter has been trained on a certain web page, we will have a similarity distance of at least .01, and experimentally (using over 10,000 samples) we never obtained a distance of higher than 0.2 on phishing websites. For training, we used a corpus of 101 pages (presented earlier) and a value of 0.25 for the similarity threshold.

We tested our filter on two different corpuses: one containing 10,000 forged websites of the exact pages on which the filter has trained (randomly selected from real phishing pages) and the other containing the URLs published on *PhishTank*[3] over a period of 10 days.

We obtained a 99.8% detection on the first corpus, with 20 false negatives – which were mostly due to the fact that they were generated with screenshots from the original web page and did not show enough text content for a discriminative decision. We obtained a 42.8% detection on the *PhishTank* URLs. Although this may seem low, our data indicates that we obtained these results due to the fact that 144 hijacked brands were co-opted in phishing attacks in December 2007[4] – which was far more than in our training corpus.

This experiment can easily be reproduced if, in a multicategorical Bayesian filter, we swap the probability function with equation 1 and the probability of each word belonging to a category will represent the number of occurrences of that word in that category. Then, if instead of choosing the category with the highest probability, we chose the category with the smallest distance, we would obtain the same results as presented above.

As for false positives, on a corpus of 25,000 samples of web pages containing login forms, or any other information that would activate the forgery filter, we obtained 10 false alarms. Eight of them were real financial institutions, which would have been in the whitelist if the filter had been properly trained, while the other two were genuine false positives (two online financial newspapers) and this problem can easily be solved by whitelisting the sites.

FUTURE DEVELOPMENTS

Right now, because of the lack of content-based solutions [4, 6], phishers are putting only a small amount of effort into customizing their forged websites (e.g. using random invisible content, frames, HTML obfuscation) and concentrating instead on rapidly changing their hosting addresses. Since initially we were expecting a higher rate of false positives, we also developed another distance:

$$d = 1 - \frac{|\Delta|}{|A \cup B|} \qquad (2)$$

where $\Delta = \{w \in A \cap B \mid \alpha - \varepsilon \leq x_w - y_w \leq \alpha + \varepsilon\}$, wherein w represents a word, A represents the target word set[5], B represents the reference word set, x_w represents a position index of the word w within the reference word set and y_w represents a position index of the word w within the reference word set. We accept a certain number of missing or extra words between different paragraphs if their number is between $[(\alpha - \varepsilon), (\alpha + \varepsilon)]$ (e.g. we accept a variable but controlled difference between the target and the reference position index).

In equation 2 (which is in fact a modified Jaccard distance), d is close to 0 if the target word set and the reference word set share a large number of words in the same order of appearance, and d is close to 1 if the word sets have few common words and/or the words appear in a different order in the target and reference web pages.

We observed that, although the second distance provides a greater protection against false positives, it will also score more false negatives, since phishers sometimes change the order of phrases when forging a website.

CONCLUSIONS

Since phishing websites are no longer solely advertised through email, we believe that it is time for companies to invest more in the research and development of browser-level anti-phishing protection.

[2] Only visible words will be inserted in the database.

[3] http://www.phishtank.com/

[4] http://www.antiphishing.org/reports/apwg_report_dec_2007.pdf

[5] A word set represents the list of all words found in the documents. If a word is found 10 times in a certain document, it will also be found 10 times in the word set.

The proposed method is intended to be used alongside current technologies, providing the user with extra information about visited web pages. Although not a complete solution on its own (it is ineffective on phishing websites that do not mimic the original website), when used in combination with other technologies (e.g. blacklists, content and URL heuristics) it increases the value of any anti-phishing toolbar.

The obtained results show that this is a viable method to provide forgery detection for the websites of legitimate financial institutions. It is not necessary to run this system on all the pages visited by the user, focusing just on those that require the user to submit information, thereby highly increasing the user's tolerance level by decreasing the time required for analysis.

ACKNOWLEDGEMENTS

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