



GEEK SQUAD
TOOLSET REFERENCE
MRI STARTUP MANAGER – BOOT PROFILER

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Geek Squad Services Academy



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INTRODUCTION

By now you should have already read the other Toolset Reference documents in this series on MRI Startup Manager. The other documents covered Startup List and an overview of the new MRI Startup Manager as a whole. In the event you are trying to start your training from this document, it is recommend you put this one away and go back and read the MRI Startup Manager Introduction and MRI Startup Manager Startup List. Both of these documents can be found on the Best Buy Learning Lounge.

Now if you are all up to date on the other Toolset Reference training, then you should be good to go. This is the last document on MRI Startup Manager and will cover the new Boot Profiler feature and assumes you have already read the other documents. So let's get started.

BOOT PROFILER

One area Startup List can't come through is showing what *actually* happened on boot. It does a phenomenal job setting you up for an accurate guess, but doesn't have the means to prove it. If malware were to find a new load point, or manage to chain-load via another component, Startup List alone might not be able to catch it. Furthermore, troubleshooting crashes or delays on boot has thus far always been a matter of guess and check, with no easy means to figure out what launched what when and what died (maybe a few lucky WinDbg cases here and there).

Giving line of sight to all of that and more is Boot Profiler. Boot Profiler can be configured from any mode of Windows (including MRI PE), and the second the computer reboots it's tracking everything. A log of the entire boot process is created and can be viewed and replayed later. Boot Profiler is both very powerful and complex; it does its best to simplify the data collected, but it still takes agent know-how to find and repair issues.

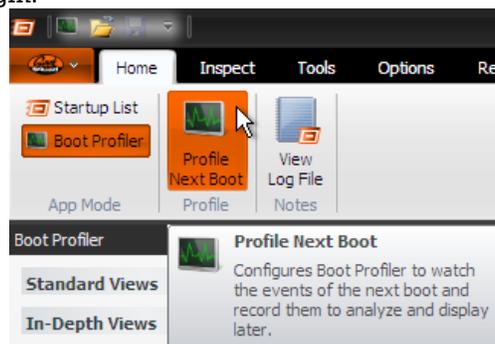
MECHANICS OF A BOOT PROFILE

Boot Profiler works by installing a custom-built driver and service into Windows, both of which are the first of their kind to start on boot. A GSBoot driver is the first driver to load, and a GSBootSvc is the first service. In this manner, every event that occurs during the boot is caught, traced, and logged to the disk for viewing later. As for malware or rootkits, a Windows boot basically goes ntosknl.exe -> drivers, and GSBoot is at the front of that. There isn't much of a chance for malware to get in before us, meaning we should always be up and running and logging *before* the malware can try to hide from us.

MRI Startup Manager is also hyper intelligent about how it handles the Boot Profiler setup – the driver and service installs are checked for integrity to ensure they weren't tampered with, and both automatically self-disable on boot so as to mitigate any chance of them causing a boot loop or running repeatedly. MRI Startup Manager automatically cleans up and alerts when a profile didn't start successfully. With the extent of the safeguards in place, you can rest assured that no permanent damage can be caused any piece of Boot Profiler.

STARTING A BOOT PROFILE

When you first switch into the Boot Profiler App Mode in MRI Startup Manager, you only have two options – Profile Next Boot and View Log File. Profile Next Boot is the first step to starting a Boot Profile, launching the two step configuration wizard seen to your right.



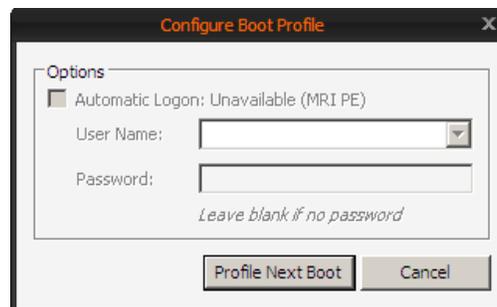
MRI Startup Manager – Boot Profiler – Starting a Boot Profile

The first window presented to you offers the option of Automatic Logon for any Administrator accounts on the system. Passwords are qualified before continuing, and the automatic logon is reverted when the profile completes. Your decision squared away here, clicking Profile Next Boot kicks off the installation of the Boot Profiler components.



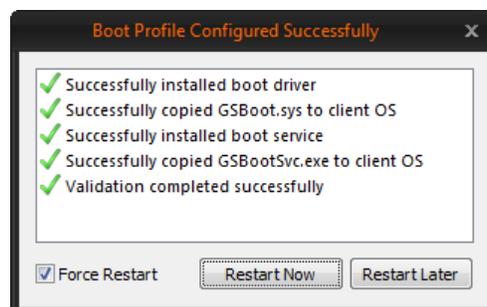
MRI Startup Manager – Configure Boot Profile

Just an FYI, this window is a little different in MRI PE Mode since Automatic Login cannot be selected in MRI PE Mode. That won't cause any issues because all you will need to do is select any User Account once Windows loads. If it's a single user PC, it will already auto login anyways.



MRI Startup Manager – MRI PE Mode – Configure Boot Profile

The mass majority of the time, Boot Profiler will install without issue and you'll be ready to reboot the computer to begin the profile. In the event you choose not to immediately reboot, Restart Later will drop you back into MRI Startup Manager and will highlight the Profile Next Boot button in orange. Toggling this button provides the means to disable / re-setup a boot profile.

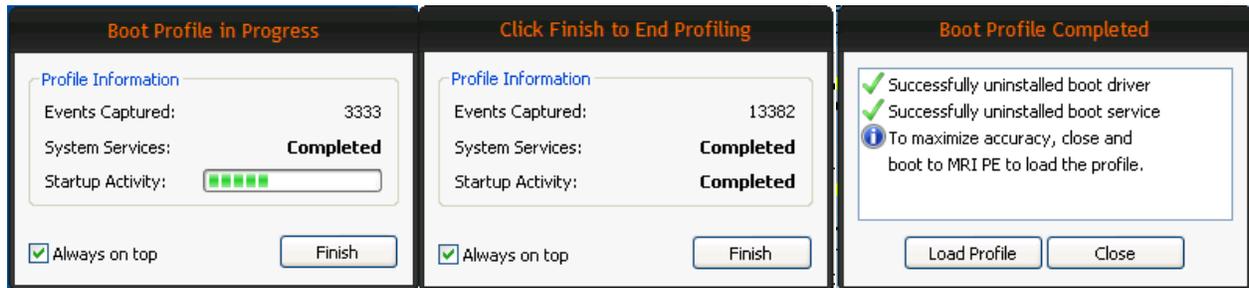


MRI Startup Manager – Boot Profile Configured Successfully

In the rare case that you encounter an error during the installation, the window will indicate as such and the Boot Profiler setup will be cleared from the system. At that point you should boot into MRI PE where the installation can proceed uninhibited by any locally installed software or malware.

ENDING A BOOT PROFILE

Once the reboot begins you're playing the waiting game. The profile takes place silently in the background, and there is no indication of progress until you arrive back at the user's desktop. Once there, MRI Startup Manager launches a window similar to the ones seen here. This Boot Profile in Progress window intelligently displays the status of the automatic start services and the user's startup items and reports when they've finished starting. The Events Captured number represents the number of individual events recorded, and will continue to rise as long as there is system activity. These three pieces of information are there to assist you in determining when you want to end the profile; Boot Profiler will continue until you tell it otherwise.



MRI Startup Manager – Boot Profiling Examples

Once you are satisfied that the computer has fully booted (or that the particular trouble you wanted to catch happen has, in fact, occurred), the End Profiling button is there to complete the profile. Ending the profile stops Boot Profiler's driver and service and uninstalls them from the system.

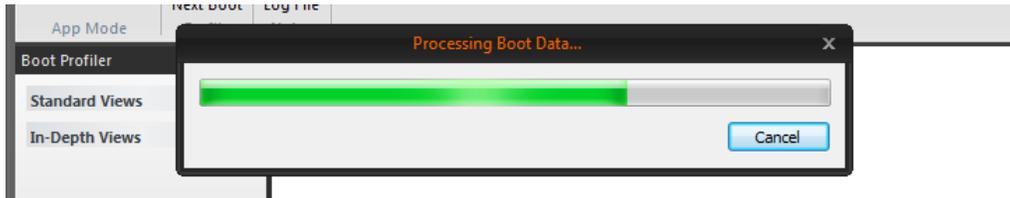
LOADING A BOOT PROFILE

Loading a Boot Profile can take place at any time within MRI Startup Manager. When a Boot Profile completes, the final dialog shown here at the right is displayed and you are offered two choices. You can choose to close the window to open the profile later (possibly in MRI PE to maximize accuracy – MRI PE is completely immune to rootkits and liars) or you can choose to load the profile immediately and jump straight in to MRI Startup Manager.



MRI Startup Manager – Boot Profile Completed message that allows you to Load Profile

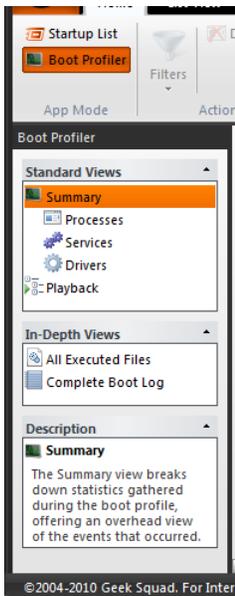
While in Windows, the possibility is very real that malware can attempt to trick or lie to MRI Startup Manager about its file's existence or identity; it will always be safer to view a profile in MRI PE. That said, choosing to load a profile directly from the Boot Profile Completed dialog affords you the one time opportunity for rootkit detection; rootkit detection is restricted to just this particular load in order to minimize the chance of false positives. Rootkit detection applies only to drivers, and should not be seen as a catch all. Regardless of your decision at this window, all future launches of MRI Startup Manager will display a notification in the ribbon. From it, you can choose to load the profile or delete the profile data.



The actual loading of a profile is pretty straightforward. MRI Startup Manager moves you directly to the Boot Profiler App Mode and displays a progress bar as the log file is read. Once complete, analysis and verification of all of the files it saw on boot begins, and you're taken to the first of many views, the Summary view.

WORKING WITH BOOT PROFILE DATA

Throughout the profile, the GSBoot driver is logging away to a log file. The second the hard drive is available to write to (about 3 – 7 seconds into the boot), the events being captured are securely logged to the disk. In this manner, if the computer crashes 10 seconds in or reboots before you can end the profile, everything Boot Profiler gathered up until that point will have been logged safely to the drive. MRI Startup Manager will work with a log file in any state; it doesn't require a complete boot profile to function. You can also load a profile in any mode of Windows, including MRI PE. The moral here is that if Boot Profiler was able to start logging, you're in the clear. Ideally you get to the point when you can click End Profiling, but MRI Startup Manager has your back either way.



With a profile loaded, the Standard and In-Depth Views groups fill out with seven available views. As in Startup List, the Standard Views offer targeted looks at the data captured. A Summary page, views for Processes, Services, and Drivers, and finally a Playback view allow you to see the boot profile from familiar angles. Meanwhile, the In-Depth Views organize the profile data from a more global sense, listing events by file and timestamp respectively. All Executed Files has every file load recorded during boot, and Complete Boot Log is literally a step by step dump of every event captured in timestamp order.

On the note of timestamps, it is important to call out the different nature of the data being displayed in the Boot Profiler app mode. While Startup List sorts generically A – Z or via the entry order found in the registry, Boot Profiler focuses uniquely on timestamps. Every event captured during the profile is logged with the specific timestamp that it occurred at. A dedicated Timestamp column in every view is used to sort the events in the exact order they took occurred during boot. This will make more sense momentarily as we break down the views and their troubleshooting purposes.

Boot Profiler maintains much of the same functionality introduced in Startup List. An Analysis column is always hard at work checking for potential issues or marking files as recognized, and verification takes place automatically. The Properties pane is back again and displays as much information as is available for items in each view. And as in Startup

List, the available columns, search and filters are as flexible as possible to assist in spotting malware or a finding particular process, driver, service, or file.

Service Name	Analysis	Start	Timestamp	Signed	Arch	Company Name	Service File	Service Timeline
GSBootSvc		Automatic	26.538		x86	Geek Squad	GSBootSvc.exe	
DcomLaunch		Automatic	26.779		x86	Microsoft Corporation	rpcss.dll	
Eventlog		Automatic	27.349		x86	Microsoft Corporation	services.exe	
RpcSs		Automatic	27.349		x86	Microsoft Corporation	rpcss.dll	
SamSs		Automatic	28.511		x86	Microsoft Corporation	lsass.exe	
Themes		Automatic	28.511		x86	Microsoft Corporation	shsvcs.dll	
PlugPlay		Automatic	28.511		x86	Microsoft Corporation	services.exe	
Dhcp		Automatic	29.152		x86	Microsoft Corporation	dhcpcsvc.dll	
Dnscache		Automatic	29.152		x86	Microsoft Corporation	dnssrvr.dll	
LmHosts		Automatic	29.152		x86	Microsoft Corporation	lmhosts.dll	
Schedule		Automatic	29.703		x86	Microsoft Corporation	schedsvcs.dll	
ShellHWDetection		Automatic	29.703		x86	Microsoft Corporation	shsvcs.dll	
WZCSVC		Automatic	29.703		x86	Microsoft Corporation	wzcsvc.dll	
Spooler		Automatic	29.703		x86	Microsoft Corporation	spoolsv.exe	
1-vmsvc		Automatic	30.334		x86	Microsoft Corporation	vmsvc.exe	
Apple Mobile Device		Automatic	30.334		x86	Apple Inc.	AppleMobileD...	
AudioSrv		Automatic	30.334		x86	Microsoft Corporation	audiosrv.dll	
BITS		Automatic	30.334		x86	Microsoft Corporation	qmgr.dll	
Bonjour Service		Automatic	30.334		x86	Apple Inc.	mDNSRespon...	
CryptSvc		Automatic	30.334		x86	Microsoft Corporation	cryptsvc.dll	
EventSystem		Manual	30.334		x86	Microsoft Corporation	es.dll	
lanmanworkstation		Automatic	30.334		x86	Microsoft Corporation	wksvc.dll	
WebClient		Automatic	30.334		x86	Microsoft Corporation	webclnt.dll	
dnserver		Automatic	30.334		x86	Microsoft Corp.	dnserver.dll	
ERSvc		Automatic	30.334		x86	Microsoft Corporation	ersvc.dll	

MRI STARTUP MANAGER – BOOT PROFILER



SUMMARY

Once a profile has been loaded, the Summary view (which is the default) will show a full set of statistics that were gathered throughout the boot process. The Profile Summary will detail the date the profile was performed, how long it ran for, as well as total number of processes, services, and drivers seen active during the profile. A System Information group immediately following has a small bit of system specifications mostly as a matter of convenience and line of sight.

Summary	
Profile Date	5/23/2010 10:40 PM
Profile Duration	3m 28s
Process Count	105
Service Count	78
Driver Count	190

System Profile	
Operating System	Windows 7 Service Pack 0 x86
CPU(s)	2
RAM	3.0 GB

Boot Milestones	
Hard Drive Accessible	14.0s
"Boot" Drivers Loaded	14.0s
"System" Drivers Loaded	14.5s
Services Starting	23.1s
To Logon Screen	26.6s
Services Started	45.7s
User Logon	57.4s
Explorer Start	57.4s
Startup Items Complete	1m 19s
Finish Time	3m 28s

Total Time	
At Loading Windows S...	14.9s
Running Chkdsk	0.5s
At Logon Screen	35.8s

The next two groups, Boot Milestones and Total Time, try to explain when certain milestones were reached, or where chunks of time were invested. Their goal is to help you connect the dots between a timestamp and a specific stage in the boot process. With the Boot Milestones, for example, if you saw a major delay in the boot once a user logged in, you could focus on events from around the 60 second mark. Explorer didn't start until a minute nineteen, so your trouble is likely to fall between those two times.

Meanwhile, Total Time describes which stages of the boot process saw how much time. In our example to the left, 15 seconds of the boot was spent at the loading screen with the scrolling progress bar (or in Windows 7's case, the animated Windows logo). Autochk didn't need to run, so not much time was spent there, and following that we saw 36 seconds invested to the logon screen, possibly configuring updates or waiting for a user to authenticate. Finally, we see that the last two and

half minutes of the boot were dedicated to waiting for an agent to end the profile. Whether Rootkit Detection was performed is also detailed in the Summary view, but we'll discuss that later.

The Summary view's main job is to help you understand where time was invested in the boot, and spot any major issues or gaps. The plaintext nature of these statistics should be somewhat simpler to place than watching processes fly by later.

The screenshot shows the MRI Startup Manager interface with the Boot Profiler Summary view selected. The interface includes a menu bar (Home, Inspect, Tools, Options, Resources) and a toolbar with various actions like Startup List, Delete File, File Properties, Certificate Properties, F-MOD, Search Online, Copy to Clipboard, Information, Jump To..., Close Profile, View Log File, and Notes. The main content area is divided into several sections:

- Profile Information:** Profile Date: 6/18/2010 2:20 AM; Profile Duration: 2m 2s; Process Count: 88; Service Count: 55; Driver Count: 112.
- System Information:** Operating System: Windows XP Service Pack 3 x86; CPUs: 1; RAM: 511.5 MB.
- Rootkit Detection (Heuristic):** 1 possible rootkit file(s) found. Rootkit Detection was performed and 1 potential rootkit(s) were detected. This information has been logged to Startup Manager's log file, and the flagged drivers have been highlighted in Red in the Drivers view. Please boot to MRI PE and load the log there for accurate analysis.
- Boot Milestones:** Hard Drive Accessible: 3.4s; "Boot" Drivers Loaded: 9.2s; "System" Drivers Loaded: 22.4s; Services Starting: 25.5s; To Logon Screen: 26.9s; Services Started: 36.7s; User Logon: 1m 6s; Explorer Start: 1m 7s; Startup Items Complete: 1m 58s; Finish Time: 2m 2s.
- Total Time:** At Loading Windows Screen: 22.8s; Running Autochk: 0.0s; At Logon Screen: 36.8s; Waiting to End the Profile: 4.2s.
- Resources:** Video Tutorials: Brief scenario-based tutorials for MRI Startup Manager are available for Agent viewing. Help Documents: In-Depth training documents for MRI Startup Manager are available for Agent consumption.

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MRI STARTUP MANAGER – Boot Profiler Summary showing a detected rootkit using heuristics



PROCESSES

The Processes View displays the boot profile data from the perspective of processes – rather than a left column of Entry Name, we have Process Name, and the view is ordered by timestamp from the first process create to the last. PID, or Process ID, details each process’s PID to provide a means to distinguish between those of similar or the same name. A Special column tries to call out the various different components some processes represent. Many system processes have unique icons that tooltip describing their purpose, and all processes containing services picks up the service gears. Finally, a Process Timeline column on the far right completes the view by showing the start and end time of each process. The black bars you can see below will slowly slide to the right as you get further into the boot process; the green graphs inside each of them represents a process’s unique CPU activity.

Process Name	Analysis	PID	Timestamp	Signed	Company Name	Description	Special	Process Timeline
System		4	0.0000		Microsoft Corporation	NT Kernel & System		
smss.exe		284	14.5469		Microsoft Corporation	Windows Session Manager		
autochk.exe		304	14.9219		Microsoft Corporation	Auto Check Utility		
smss.exe		356	17.8906		Microsoft Corporation	Windows Session Manager		
csrss.exe		408	20.6406		Microsoft Corporation	Client Server Runtime Process		
smss.exe		456	22.9375		Microsoft Corporation	Windows Session Manager		
wininit.exe		464	22.9531		Microsoft Corporation	Windows Start-Up Application		
csrss.exe		476	22.9531		Microsoft Corporation	Client Server Runtime Process		
services.exe		512	23.0781		Microsoft Corporation	Services and Controller app		
lsass.exe		528	23.1250		Microsoft Corporation	Local Security Authority Process		
lsm.exe		536	23.1250		Microsoft Corporation	Local Session Manager Service		
svchost.exe		668	23.7031		Microsoft Corporation	Host Process for Windows Serv...		
winlogon.exe		736	24.0313		Microsoft Corporation	Windows Logon Application		
GSBootSvc.exe		780	24.2031		Geek Squad	MRI Boot Service		
nvvsvc.exe		840	26.1875		NVIDIA Corporation	NVIDIA Driver Helper Service, Ver...		
svchost.exe		888	26.5625		Microsoft Corporation	Host Process for Windows Serv...		
LogonUI.exe		968	26.6250		Microsoft Corporation	Windows Logon User Interface ...		
svchost.exe		1008	27.0156		Microsoft Corporation	Host Process for Windows Serv...		
svchost.exe		1052	27.1094		Microsoft Corporation	Host Process for Windows Serv...		
svchost.exe		1080	27.1250		Microsoft Corporation	Host Process for Windows Serv...		

MRI Startup Manager – Boot Profiler - Processes

Not content with stopping there, the Processes view picks up two unique tabs in the Properties pane to offer even more information. A Process tab details the process name, its parent process, any child processes, and when it started and exited. If the process contains any services, that information is present as well.

Process Name	PID	Timestamp	Company Name
nvvsvc.exe	840	26.1875	NVIDIA Corporation
svchost.exe	888	26.5625	Microsoft Corporation
LogonUI.exe	968	26.6250	Microsoft Corporation
svchost.exe	1008	27.0156	Microsoft Corporation

Property	Value
Process Name	svchost.exe (888)
Parent	services.exe (512)
Create Time	26.562500
Exit Time	<Did not exit>

Service Name	Description
RpcEptMapper	RPC Endpoint Mapper
RpcSs	Remote Procedure Call (RPC)

MRI Startup Manager – Boot Profiler – Process tab

The existence of the second tab, Process Events, stems from the fact that just showing information about the processes themselves wouldn’t cover the bases. A malicious file could load into a completely legitimate process, for example, and nothing thus far would let you see that that happened. To shed light on what a process did while it was running, Process Events gathers every operation performed by a process and lists it in timestamp order. Nine such operations are tracked during the boot profile: Process Create, Module Load, Service Starting, Started, Pausing, Paused, Stopping, and Stopped, and Process Exit.

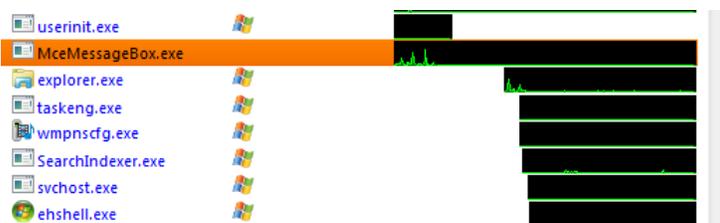
Process Name	Analysis	PID	Timestamp	Signed	Arch	Company Name	Description	Specie
explorer.exe		2364	67.026		x86	Microsoft Corporation	Windows Explorer	
verclsid.exe		2432	67.787		x86	Microsoft Corporation	Verify Class ID	
verclsid.exe		2476	68.228		x86	Microsoft Corporation	Verify Class ID	
ctfmon.exe		2484	68.268		x86	Microsoft Corporation	CTF Loader	
vmusrvc.exe		2584	68.649		x86	Microsoft Corporation	Virtual Machine User Services	
reader_sl.exe		2592	68.689		x86	Adobe Systems, Incorporated	Adobe Acrobat SpeedLauncher	
AdobeADM.exe		2608	68.789		x86	Adobe Systems, Incorporated	Adobe Reader and Acrobat Manager	

Entry Name	Analysis	Operation	Timestamp	Signed	Arch	Company Name	Description
riched20.dll		Module Load	67.117		x86	Microsoft Corporation	Rich Text Edit Control, v3.0
comctl32.dll		Module Load	67.127		x86	Microsoft Corporation	Common Controls Library
4DW4R3RvDMrJRpwX.dll		Module Load	67.127				
wsock32.dll		Module Load	67.127		x86	Microsoft Corporation	Windows Socket 32-Bit DLL
ws2_32.dll		Module Load	67.127		x86	Microsoft Corporation	Windows Socket 2.0 32-Bit DI
ws2help.dll		Module Load	67.127		x86	Microsoft Corporation	Windows Socket 2.0 Helper fi
mwssock.dll		Module Load	67.137		x86	Microsoft Corporation	Microsoft Windows Sockets 2
ws2_32.dll		Module Load	67.147		x86	Microsoft Corporation	Windows Socket 2.0 32-Bit DI
hnetcfg.dll		Module Load	67.187		x86	Microsoft Corporation	Home Networking Configurati
wshtcpip.dll		Module Load	67.197		x86	Microsoft Corporation	Windows Sockets Helper DLL
MSCTIME.IME		Module Load	67.197		x86	Microsoft Corporation	Microsoft Text Frame Work 5
apphelp.dll		Module Load	67.227		x86	Microsoft Corporation	Application Compatibility Clie
clbcatq.dll		Module Load	67.227		x86	Microsoft Corporation	

MRI Startup Manager – Boot Profiler – Process Events with a malware Module Load event

Now a big point of clarification needs to be made in regard to items under Process Events and items in the main list view above it, specifically in relation to how signing and filtering work. In the main list view, processes are highlighted in blue indicating being signed based solely on their main executable – no regard is paid to potential existence of unsigned files loading into the process later. This holds true when the Processes view is filtered – a 'Hide Entries Signed by Microsoft' filter will hide every process whose main exe signed by Microsoft, regardless of any unsigned or signed-by-other-parties files that may be loaded in the exe. There is no way to filter based on Process Events or to receive line of sight to the existence of such files without manually looking; that said, the view All Executed Files that we'll cover shortly can help mitigate the need to do so.

With an understanding of how the different arms of the Processes view work, it's time to delve into some troubleshooting scenarios where the view comes into play. The Process Timeline graphs can be simple clues as to where there may have been trouble on boot. As the boot progresses and you're moving down the list of processes, the Process Timeline graphs will be sliding to the right. A significant delay that appears to be holding up the start of subsequent processes is likely to be problem.



MRI Startup Manager – Boot Profiler – Process Time example of MceMessageBox.exe

In the example above, userinit.exe launched MceMessageBox.exe immediately on login, which seems to have held explorer.exe up for quite some time. You should investigate what MceMessageBox is, and possibly disable it from startup. Boot Profiler has a Startup List jump to button available in the ribbon that will jump you back to the Startup List App Mode, switch to the "Everything" view, and create a filter to show just startup entries matching the MceMessageBox.exe file path.

The Process Timeline graphs are great for spotting such unexpected delays. Another way to use the graphs is in combination with the Process Events tab in the Properties Pane. If you were seeing a situation where explorer.exe was crashing shortly after launching, you could select the explorer.exe process, switch to the Process Events tab in the Properties Pane, and scroll down to the bottom of the list. While not always the case, the last few operations can often be a great help in diagnosing the trouble. Below it seems that explorer.exe died in the moments after it loaded the unsigned file yke4wxx.dll. It is very likely that this file attributed to the crash, and should probably be removed from the computer.

Entry Name	Analysis	Operation	Timestamp
explorer.exe (PID: 3196)		Process Create	57.4092
explorer.exe		Module Load	57.4150
ntdll.dll		Module Load	57.4150
kernel32.dll		Module Load	57.4150
KernelBase.dll		Module Load	57.4150
advapi32.dll		Module Load	57.4160
msvcrt.dll		Module Load	57.4160
sechost.dll		Module Load	57.4160
rpcrt4.dll		Module Load	57.4170
gdi32.dll		Module Load	57.4170
user32.dll		Module Load	57.4170
lpk.dll		Module Load	57.4170
usp10.dll		Module Load	57.4170
yke4wxx.dll		Module Load	57.4180
explorer.exe (PID: 3196)		Process Exit	57.4182

MRI Startup Manager – Boot Profiler – Process Events example of yke4wxx.dll loading before explorer.exe exits

Every boot profile will be different than the last, and not every issue will be immediately obvious and solvable from just the perspective of processes. Stepping beyond Processes in the Standard Views takes us to Services.

SERVICES

Services are often seen as magical creatures hidden in the background of Windows. Boot Profiler takes service information gathered during the profile and displays it in a clean, intuitive view. As with Processes, the view is ordered by timestamp and bookended by a Service Name column on the left and a Service Timeline column on the right. Outside of a service changing states (starting, stopping, etc), it's not really possible to track what it does – services run inside of a process, but you can't separate the actions of the process from the actions of any number of potential services inside it. As such, there is not specific information around what files were loaded or how much CPU a service used. The Services view is constrained to the main service file, when the service started, and the different states the service was in.

That said, the view serves its purpose well. Any delays in the boot brought on by a service are very obvious in the Service Timeline graphs. The graphs use four colors to represent the state of the service at that moment in time – green on the graph indicates time the service spent in the 'Starting' state. Black indicates time spent 'Started', with Grey representing 'Paused' and Red 'Stopping'. As a general rule, colored portions of the graphs should be very small, and the service timeline should slide to right smoothly. Lengthy amounts of time in Green / Red may indicate trouble with the service, and bear investigation.

If you find a service is significantly delaying others from starting, or appears to have stopped prematurely, you have a few options. You can search online for any known issues that can cause the delay, or attempt to start the service in Startup Manager and research the error returned. If you determine the service isn't critical, simply disabling it may be a solution.

Service Name	Analysis	Start	Timestamp	Signed	Arch	Company Name	Service File	Service Timeline
GSBootSvc	Automatic	Automatic	17.563		x86	Geek Squad	GSBootSvc.exe	
DcomLaunch	Automatic	Automatic	17.672		x86	Microsoft Corporation	rpcss.dll	
Dhcp	Automatic	Automatic	18.313		x86	Microsoft Corporation	dhcpcsvc.dll	
Dnscache	Automatic	Automatic	18.313		x86	Microsoft Corporation	dnssrvr.dll	
Eventlog	Automatic	Automatic	18.313		x86	Microsoft Corporation	services.exe	
PlugPlay	Automatic	Automatic	18.313		x86	Microsoft Corporation	services.exe	
RpcSs	Automatic	Automatic	18.313		x86	Microsoft Corporation	rpcss.dll	
SamSs	Automatic	Automatic	18.313		x86	Microsoft Corporation	lsass.exe	
Themes	Automatic	Automatic	18.313		x86	Microsoft Corporation	shsvcs.dll	
LmHosts	Automatic	Automatic	18.313		x86	Microsoft Corporation	lmhsvc.dll	
WZCVC	Automatic	Automatic	18.938		x86	Microsoft Corporation	wzcsvc.dll	
ccSetMgr	Automatic	Automatic	18.938		x86	Symantec Corporation	ccSetMgr.exe	
ccEvtMgr	Automatic	Automatic	19.578		x86	Symantec Corporation	ccEvtMgr.exe	
ccProxy	Automatic	Automatic	20.219		x86	Symantec Corporation	ccProxy.exe	
Schedule	Automatic	Automatic	20.219		x86	Microsoft Corporation	schedsvc.dll	
ShellHWDetection	Automatic	Automatic	20.219		x86	Microsoft Corporation	shsvcs.dll	
Spooler	Automatic	Automatic	20.219		x86	Microsoft Corporation	spoolsv.exe	
AudioSrv	Automatic	Automatic	20.859		x86	Microsoft Corporation	audiosrv.dll	
Ianmanworkstation	Automatic	Automatic	20.859		x86	Microsoft Corporation	wkssvc.dll	
WebClient	Automatic	Automatic	26.625		x86	Microsoft Corporation	webclnt.dll	
ARSVC	Automatic	Automatic	26.625		x86	Microsoft	arservice.exe	
CryptSvc	Automatic	Automatic	29.938		x86	Microsoft Corporation	cryptsvc.dll	
dmserver	Automatic	Automatic	29.938		x86	Microsoft Corp.	dmserver.dll	
ehRecvr	Automatic	Automatic	29.938		x86	Microsoft Corporation	ehrecvr.exe	

MRI Startup Manager Boot Profiler - Services



DRIVERS

Drivers are about as low-level and powerful as things get in Windows. Once a driver loads, it has essentially assumed God Mode and, with the right code, can affect just about anything. Due to their low-level nature, Windows heavily optimizes how they run, and file loads, CPU usage, or a timeline aren't really relevant. Drivers function with just the code in their driver file or in tandem with other drivers. Any CPU usage that would be reported is seen via the System process, visible generically in Processes. With this minimal yet powerful nature in mind, the Drivers view comes together as a list of the various driver files that loaded on boot and the device arrivals that followed.

Entry Name	Operation	Timestamp	Analysis	Signed	Arch	Company Name	Description
ntkrnlpa.exe	Driver Load	0.000			x86	Microsoft Corporation	NT Kernel & System
hal.dll	Driver Load	0.000			x86	Microsoft Corporation	Hardware Abstraction Layer DLL
KDCOM.DLL	Driver Load	0.000			x86	Microsoft Corporation	Kernel Debugger HW Extension DLL
BOOTVID.dll	Driver Load	0.000			x86	Microsoft Corporation	VGA Boot Driver
GSBboot.sys	Driver Load	0.000			x86	Geek Squad	MRI Boot Driver
ACPI.sys	Driver Load	0.000			x86	Microsoft Corporation	ACPI Driver for NT
WMILIB.SYS	Driver Load	0.000			x86	Microsoft Corporation	WMILIB WMI support library Dll
pci.sys	Driver Load	0.000			x86	Microsoft Corporation	NT Plug and Play PCI Enumerator
isapnp.sys	Driver Load	0.000			x86	Microsoft Corporation	PNP ISA Bus Driver
ohci1394.sys	Driver Load	0.000			x86	Microsoft Corporation	1394 OpenHCI Port Driver
1394BUS.SYS	Driver Load	0.000			x86	Microsoft Corporation	1394 Bus Device Driver
pcide.sys	Driver Load	0.000			x86	Microsoft Corporation	Generic PCI IDE Bus Driver
PCIIDEV.SYS	Driver Load	0.000			x86	Microsoft Corporation	PCI IDE Bus Driver Extension
viaide.sys	Driver Load	0.000			x86	Microsoft Corporation	Generic PCI IDE Bus Driver
intelide.sys	Driver Load	0.000			x86	Microsoft Corporation	Intel PCI IDE Driver
MountMgr.sys	Driver Load	0.000			x86	Microsoft Corporation	Mount Manager
ftdisk.sys	Driver Load	0.000			x86	Microsoft Corporation	FT Disk Driver
dmload.sys	Driver Load	0.000			x86	Microsoft Corp., Verit...	NT Disk Manager Startup Driver
dmio.sys	Driver Load	0.000			x86	Microsoft Corp., Verit...	NT Disk Manager I/O Driver
PartMgr.sys	Driver Load	0.000			x86	Microsoft Corporation	Partition Manager
VolSnap.sys	Driver Load	0.000			x86	Microsoft Corporation	Volume Shadow Copy Driver
iaStor.sys	Driver Load	0.000			x86	Intel Corporation	Intel Matrix Storage Manager driver
atapi.sys	Driver Load	0.000			x86	Microsoft Corporation	IDE/ATAPI Port Driver
PxHelp20.sys	Driver Load	0.000			x86	Sonic Solutions	Px Engine Device Driver For Windows ...
SCSIPTORT.SYS	Driver Load	0.000			x86	Microsoft Corporation	SCSI Port Driver
disk.sys	Driver Load	0.000			x86	Microsoft Corporation	PnP Disk Driver
CLASSPNP.SYS	Driver Load	0.000			x86	Microsoft Corporation	SCSI Class System Dll

MRI Startup Manager Boot Profiler - Drivers

The Drivers view has a few idiosyncrasies. Every Boot start driver reports a timestamp of 0.000. While the order is accurate, these drivers load so early no actual timestamp is available. Next, PNP Device Arrivals are notifications from the Windows kernel that a device is now 'connected' and ready for use. These are not able to be directly tied to a driver, but some basic logic can help you associate the various events. For example, disk.sys loaded before the hard drives arrived.

Regardless, the true value of the Drivers view is found in the following two situations – a BSOD on boot, and detecting malware hiding itself with a driver. A BSOD on boot will have the boot profile log suddenly come to a screeching halt. As in, you'll reach a certain point scrolling down and things will just stop – in all likelihood, a driver or device near the bottom will be behind the BSOD. If you caught the stop code, a quick bit of searching online can often reveal the answer.

disk.sys	Driver Load	0.0000	
CLASSPNP.SYS	Driver Load	0.0000	
null.sys	Driver Load	0.0000	
ACPI Fixed Feature Button	PNP Device ...	2.6875	
ACPI Sleep Button	PNP Device ...	2.6875	
Microsoft Virtual Drive En...	PNP Device ...	2.6875	
Volume Manager	PNP Device ...	2.9688	
ATA Channel 0	PNP Device ...	3.0938	
ATA Channel 1	PNP Device ...	3.0938	
ATA Channel 0	PNP Device ...	3.0938	
ATA Channel 1	PNP Device ...	3.0938	
ATA Channel 0	PNP Device ...	3.0938	
ATA Channel 1	PNP Device ...	3.0938	
WDC WD1600JD-75HBC0 ...	PNP Device ...	5.9844	
WDC WD400BB-00DGA0 ...	PNP Device ...	6.2188	
Generic volume	PNP Device ...	6.2188	
C:\ Volume Mounted	PNP Device ...	6.2344	
Generic volume	PNP Device ...	7.3594	
crashdmp.sys	Driver Load	13.9531	

As for finding malware, GSBboot is the first driver that loads on boot, hopefully trumping any malicious drivers. In this manner, they shouldn't have started yet to hide themselves, and as such will be caught and listed in the Drivers view on load. Furthermore, when a profile is loaded from the Load Profile immediately upon its completion, Rootkit Detection kicks in and can catch a virus trying to point Boot Profiler away from the driver file that actually loaded on boot. In such situations, Boot Profiler will alert that it may have detected a rootkit, and the driver will be colored red and called out via Analysis. Work in this view requires agent smarts, but should hopefully assist in solving some complex issues on boot.

PLAYBACK

The Playback view takes the data gathered during the boot profile and replays it as you could expect to see it via a program like MRI's Process Analyzer. At a default speed of 5x normal, you can watch processes being created and exiting, using CPU and hard disk I/O, even follow along with corresponding system graphs in the Properties pane. Playback is essentially the Processes view DVR'd.

The screenshot displays the MRI Startup Manager - Boot Profiler - Playback view. The interface includes a ribbon with tabs for Home, Inspect, Tools, Options, Resources, and Controls. The Controls tab is active, showing playback speed (5x), a timeline (53.5s), and checkboxes for CPU, Physical Memory, Virtual Memory, Primary HDD Reads, and Primary HDD Writes. The main area shows a process list with columns for Entry Name, CPU, Memory, PID, I/O Total, Signed, Company Name, and Description. The Properties Pane at the bottom shows system graphs for CPU, Phys Mem, and HD Reads. The footer includes the text "@2004-2010 Geek Squad. For Internal Use Only." and "Recognized OS".

Entry Name	CPU	Memory	PID	I/O Total	Signed	Company Name	Description
System		352 KB	4	3.64 KB		Microsoft Corporation	NT Kernel & System
smss.exe		404 KB	356			Microsoft Corporation	Windows NT Session Manager
csrss.exe		3,276 KB	428			Microsoft Corporation	Client Server Runtime Process
winlogon.exe		2,512 KB	540			Microsoft Corporation	Windows NT Logon Application
services.exe		7,164 KB	596			Microsoft Corporation	Services and Controller app
G5BootSvc.exe		3,148 KB	780			Geek Squad	MRI Boot Service
StartupManag...		21,356 KB	1592	16 B		Geek Squad	MRI Startup Manager
svchost.exe		7,068 KB	820			Microsoft Corporation	Generic Host Process for Win...
unsecapp.exe		4,488 KB	488			Microsoft Corporation	WMI
wmiprvse.exe		6,296 KB	516			Microsoft Corporation	WMI
wmiprvse.exe		5,512 KB	1088			Microsoft Corporation	WMI
svchost.exe		4,968 KB	940			Microsoft Corporation	Generic Host Process for Win...
svchost.exe		21,584 KB	1004			Microsoft Corporation	Generic Host Process for Win...
wuauclt.exe		9,428 KB	2028			Microsoft Corporation	Windows Update
svchost.exe		3,568 KB	1108			Microsoft Corporation	Generic Host Process for Win...

MRI Startup Manager - Boot Profiler - Playback

Full controls in the ribbon allow you to slide to any point the boot, speed up or slow the playback, even add a whole host of different graphs to track where resources were being spent. Playback is best used to isolate trouble at specific points in boot, diagnosing errors or wasted resources, or to otherwise spot when and via what a particular exe launched. Out of all of the views, Playback gives the best sense of how the boot proceeded, and should prove a valuable troubleshooting tool.

IN-DEPTH VIEWS

The two In-Depth views act as blatant dumps of data. All Executed Files lists every file that loaded on boot, sorted by unique file paths. The Properties Pane in this view picks up a unique File Events tab that lists the different process the selected file loaded into, making it easy associate a random file to a recognizable process.

ALL EXECUTED FILES

All Executed Files is possibly the best malware tool in our arsenal to date. With a filter in place, this view essentially becomes a list of unrecognized files that ran on boot; malware will sit visible in the open for easy pickings. Combined with some quick Delete Files in MRI PE and entire infections can be terminated in a matter of minutes.

Hide all files signed by "Microsoft Corporation" OR "Verisign, Inc."

File Path	Analysis	Count	Initial Load	Signed	Arch	Company Name
C:\cleansweep.exe\cleansweep.exe	⚠	1	72.815		x86	
C:\DOCUME~1\Ash\LOCALS~1\Temp\chkntf...		1	73.466		x86	Microsoft Corpor
C:\DOCUME~1\Ash\LOCALS~1\Temp\ope71...		1	69.710		x86	
C:\DOCUME~1\Ash\LOCALS~1\Temp\ope86...		1	69.760		x86	
C:\DOCUME~1\Ash\LOCALS~1\Temp\svchos...		11	71.293		x86	
C:\DOCUME~1\Bruce\LOCALS~1\Temp\ope2...		1	71.503		x86	
C:\DOCUME~1\Bruce\LOCALS~1\Temp\ope2...		1	71.683		x86	
C:\DOCUME~1\Client\LOCALS~1\Temp\ope3...		1	72.584		x86	
C:\Program Files\HP\Digital Imaging\bin\hpdq...		1	35.922		x86	Hewlett-Packard
C:\Program Files\HP\Digital Imaging\bin\hpdq...		2	30.434		x86	Hewlett-Packard
C:\Program Files\HP\Digital Imaging\bin\hpdq...		1	30.434		x86	Hewlett-Packard
C:\Program Files\HP\Digital Imaging\bin\hpdqtr...		1	75.479		x86	Hewlett-Packard
C:\Program Files\HP\Digital Imaging\bin\HPSL...		1	30.734		x86	Hewlett-Packard
C:\Program Files\side\side.exe		1	69.360		x86	
C:\Program Files\Java\jre6\bin\awt.dll		1	37.254		x86	Sun Microsystem
C:\Program Files\Java\jre6\bin\client\jvm.dll		1	37.254		x86	Sun Microsystem
C:\Program Files\Java\jre6\bin\dcpr.dll		1	37.264		x86	Sun Microsystem
C:\Program Files\Java\jre6\bin\deploy.dll		1	37.274		x86	Sun Microsystem
C:\Program Files\Java\jre6\bin\fontmanager.dll		1	37.274		x86	Sun Microsystem

MRI Startup Manager - Boot Profiler – All Executed Files with a Filter turned on

COMPLETED BOOT LOG

The Complete Boot Log, on the other hand, functions just like it sounds – every event recorded by Boot Profiler, in the order it was recorded in, is displayed. If you were searching for a particular event but weren't sure where to find it, this is the view to use. Aside from that, the data here is usually too complex to decipher directly. It's best to use the other views to place events on boot.

Entry Name	Analysis	Operation	Process Name	#	Timestamp	Cor
ole32.dll		Module Load	nsvsc32.exe...	1743	31.875 Micr	
samlib.dll		Module Load	nsvsc32.exe...	1744	31.875 Micr	
urlmon.dll		Module Load	explorer.exe...	1745	32.234 Micr	
FastUserSwitchingCompat...		Service Started	svchost.exe ...	1746	32.344	
rundll32.exe (PID: 2308)		Process Exit	rundll32.exe ...	1747	32.516 Micr	
SAVRT.SYS		Driver Load	System (4)	1748	32.516 Syrr	
SYMEVENT.SYS		Driver Load	System (4)	1749	32.516 Syrr	
es.dll		Module Load	ehRec.exe (...)	1750	32.531 Micr	
wtsapi32.dll		Module Load	ehRec.exe (...)	1751	32.531 Micr	
winsta.dll		Module Load	ehRec.exe (...)	1752	32.531 Micr	
linkinfo.dll		Module Load	explorer.exe...	1753	32.531 Micr	
sqldb20.dll		Module Load	ehRec.exe (...)	1754	32.609 Micr	
sqlse20.dll		Module Load	ehRec.exe (...)	1755	32.609 Micr	
sqlqp20.dll		Module Load	ehRec.exe (...)	1756	32.609 Micr	
NavEx15.Sys		Driver Load	System (4)	1757	32.641 Syrr	
NAVENG.Sys		Driver Load	System (4)	1758	32.641 Syrr	
ntshrui.dll		Module Load	explorer.exe...	1759	32.766 Micr	
atl.dll		Module Load	explorer.exe...	1760	32.828 Micr	

Select an item to view Properties

©2004-2010 Geek Squad. For Internal Use Only. | Total: 3819 | Visible: 3819 | Hidden: 0 | Recognized OS

MRI Startup Manager - Boot Profiler – Complete Boot Log

Boot Profiler

1 critical, 27 cautionary warnings in the current view. Show Warnings

Entry Name	Analysis	Operation	Process Name	#	Timestamp	Signed
Mup.sys		Driver Load	System (4)	28	0.000	
ACPI Fixed Feature Button		PNP Device Arrival	System (4)	29	0.030	
Volume Manager		PNP Device Arrival	System (4)	30	0.591	
Logical Disk Manager		PNP Device Arrival	System (4)	31	0.601	
Virtual HD		PNP Device Arrival	System (4)	32	1.993	
C:\ Volume Mounted		PNP Device Arrival	System (4)	33	1.993	
i8042prt.sys		Driver Load	System (4)	34	9.203	
kbdclass.sys		Driver Load	System (4)	35	9.203	
msvmmouf.sys		Driver Load	System (4)	36	9.203	
mouclass.sys		Driver Load	System (4)	37	9.203	
serial.sys		Driver Load	System (4)	38	9.203	
serenum.sys		Driver Load	System (4)	39	13.409	
Fdc.sys		Driver Load	System (4)	40	13.409	
parport.sys		Driver Load	System (4)	41	13.409	
WUDFPNP.sys		Driver Load	System (4)	42	13.409	

Properties for "serial.sys"

File Attributes

File Path: C:\WINDOWS\system32\DRIVERS\serial.sys

Size: 63.0 KB

Attributes:

Architecture: x86

File Details

Comments:

Company Name:

File Properties

MRI Startup Manager - Boot Profiler – Complete Boot Log showing a rootkit that compromised a boot driver

CONCLUSION

This concludes the entire trilogy of MRI Startup Manager Toolset Reference documents! You are totally stoked by now and are itching to start using MRI Startup Manager, Startup List, and Boot Profiler. So go ahead Agent, start saving the world from computer uprisings!!

If you have any MRI Toolset questions, feel free to reach out to the Technical Tools team at MRI@geeksquad.com. If you have any technical training questions, feel free to reach out to InternalAffairs@geeksquad.com. Don't forget you can also hit up the Geek Squad Forums.

For more on the new MRI Startup Manager, you can visit the Learning Lounge or hit up the Resources tab in MRI Startup Manager. There you can access other Toolset Reference documents and videos on MRI Startup Manager and more.

