Practical Windows Forensics: Cheat Sheet

Disclaimer: This cheatsheet has been created by Blue Cape Security, LLC to provide students with resources and information related to the Practical Windows Forensic (PWF) course. Please note that this cheatsheet is not intended to be a comprehensive list of all available Windows artifacts that could be relevant to an investigation.

Data Collection

Suspend the Virtual Machine before taking memory images.

Virtual Box

Memory

- Identify the VM's UUID:
vboxmanage list vms
- Create a snapshot of the VM's memory:
vboxmanage debugvm <VM_UUID> dumpvm-core --filename win10-mem.raw

Disk

- Identify the VM's UUID:
vboxmanage list vms
- Identify the VM's disk UUID:
vboxmanage showvminfo <VM_UUID>
Note the UUID of the disk in row IDE Controller
- Export the disk using the disk UUID:
vboxmanage clonemedium disk <disk_UUID>

VMWare

Memory

- Collect the .vmem and associated .vmss and .vmsn files if available

Disk

- Collect all .vmdk files associated with the current snapshot ID

- Alternatively, create a single VMDK from split files:
C:\Program Files (x86)\VMware\VMware Player\vm-ware-vdiskmanager.exe» -r «d:\VMLinux\vmd-kname.vmdk» -t 0 MyNewImage.vmdk

Hashing

Windows

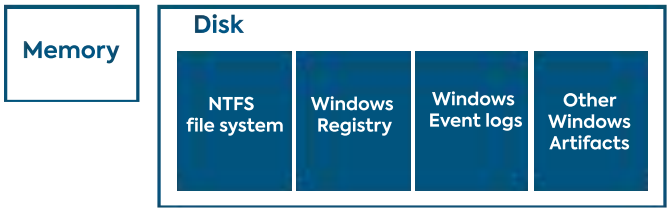
Get-FileHash -Algorithm SHA1 <file>

Mac/Linux

shasum <file>

Data Extraction

Fundamental sources of forensic evidence on Windows systems



Registry Hives

Registry root keys:

Name	Abbreviation
HKEY_CLASSES_ROOT	HKCR
HKEY_CURRENT_USER	HKCU
HKEY_LOCAL_MACHINE	HKLM
HKEY_USERS	HKU
HKEY_CURRENT_CONFIG	HKCC

Registry Hives:

Registry Path	Hive and Supporting Files
HKLM\SAM	SAM, SAM.LOG
HKLM\SECURITY	SECURITY, SECURITY.LOG
HKLM\SOFTWARE	SOFTWARE, SOFTWARE.LOG, SOFTWARE.sav
HKLM\SYSTEM	SYSTEM, SYSTEM.LOG, syst SYSTEM em.sav
HKLM\HARDWARE	(Dynamic/Volatile Hive)
HKU\.DEFAULT	Default, Default.LOG, Default.sav
HKU\SID	NTUSER.DAT
HKU\SID_CLASSES	UsrClass.dat, UsrClass.dat.LOG

Registry Hives Location:

System-specific Hives

\Windows\System32\config\DEFAULT
\Windows\System32\config\SAM
\Windows\System32\config\SECURITY
\Windows\System32\config\SOFTWARE
\Windows\System32\config\SYSTEM

User-specific Hives

\Users\<user>\AppData\Local\Microsoft\Windows\UsrClass.dat
\Users\<user>\NTUSER.DAT

Registry file types:

File Extension	Description
No extension	Registry Hive File
.alt extension	Backup copy of hive, used in Windows 2000, not XP
.log extension	Transaction log of changes to a hive
.sav extension	Backup copy of hive created at the end of text-mode (console) phrase during Windows XP setup

Registry Analysis

System Information

Computername:

HKLM\System\CurrentControlSet\Control\Computername

Windows Version:

HKLM\Software\Microsoft\Windows NT\Currentversion

Timezone:

HKLM\System\CurrentControlSet\Control\TimeZoneInformation

Network Information:

HKLM\System\CurrentControlSet\Services\Tcpip\Parameters\Interfaces\{interface-name}

Shutdown time:

HKLM\System\ CurrentControlSet \Control\Windows\ShutdownTime

Defender settings:

HKLM\Software\Microsoft\Windows Defender

User Profiles:

HKLM\Software\Microsoft\Windows NT\CurrentVersion\ProfileList\{SID}

User Information

UserAssist

NTUSER.DAT\Software\Microsoft\Windows\Currentversion\Explorer\UserAssist\{GUID}

In Vista and Windows 7:

- {CEBFF5CD-ACE2-4F4F-9178-9926F41749EA} – A list of applications, files, links, and other objects that have been accessed.
- {F4E57C4B-2036-45F0-A9AB-443BCFE33D9F} – Lists the shortcut links used to start progams

RecentDocs

NTUSER.DAT\Software\Microsoft\Windows\CurrentVersion\Explorer\RecentDocs

ShellBags

USRCLASS.DAT\Local Settings\Software\Microsoft\Windows\Shell\Bags

USRCLASS.DAT\Local Settings\Software\Microsoft\Windows\Shell\BagMRU

OpenSavePidlMRU

NTUSER.DAT\Software\Microsoft\Windows\CurrentVersion\Explorer\ComDlg32\OpenSavePIDlMRU

Last-Visited MRU

NTUSER.DAT\Software\Microsoft\Windows\CurrentVersion\Explorer\ComDlg32\LastVisitedPIDlMRU

New Technology File System (NTFS)

Files

- C:\$MFT – Master File Table stores records of every file and directory
- C:\$LogFile – Tracks MFT metadata changes
- C:\$Extend\$UsnJrnl:$J (Alternate Data Stream) – Tracks file changes

MFT File Record Structure

Important headers, attributes and values:

MFT Record header
- Headers include entry number, Flags (InUse), etc.

$STD_INFO attribute
- MACB timestamps 0x10 – user level

$FILE_NAME attribute
- File name
- MACB timestamps 0x30 – system level

$DATA attribute
- Resident (True or False)
- Data or DataRun if not resident

MACB Timestamps:

Timestamp	Notation	Description
Modified	m...	File modified
Accessed	.a..	File accessed
Changed ($MFT record)	..c.	MFT record modified
Birth (Created)	...b	File created

Execution

Background Activity Moderator (BAM)

Registry:

HKLM\SYSTEM\CurrentControlSet\Services\bam\User Settings

AmCache

Registry:

C:\Windows\AppCompat\Programs\Amcache.hve

Prefetch

Path:

C:\Windows\Prefetch.pf*

Shortcut (LNK) Files

Path:

C:\users\<username>\AppData\Roaming\Microsoft-\Windows\Recent

Path:

C:\users\<username>\AppData\Roaming\Microsoft-\Office\Recent

Persistence

Auto-Run keys:

Registry:

HKEY_CURRENT_USER\Software\Microsoft\Windows\CurrentVersion\Run

HKEY_CURRENT_USER\Software\Microsoft\Windows\CurrentVersion\RunOnce

HKEY_LOCAL_MACHINE\Software\Microsoft\Windows\CurrentVersion\Run

HKEY_LOCAL_MACHINE\Software\Microsoft\Windows\CurrentVersion\RunOnce

Startup Folders

File Paths:

C:\Users\[Username]\AppData\Roaming\Microsoft-\Windows\Start Menu\Programs\Startup

C:\ProgramData\Microsoft\Windows\Start Menu\Programs\StartUp

Windows Services

Registry:

HKLM\SYSTEM\CurrentControlSet\Servicesoft\Windows\Start Menu\Programs\StartUp

Tasks

Registry:

HKLM\Software\Microsoft\Windows NT\CurrentVersion\Schedule\TaskCache\Tasks

HKLM\Software\Microsoft\Windows NT\CurrentVersion\Schedule\TaskCache\Tree

File Path:

C:\Windows\System32\Tasks

Event Logs

Path:

C:\Windows\System32\winevt\logs

Source	Event IDs	Description
Microsoft-Windows-Windows Defender	5000	Defender enabled
	5001	Defender disabled
System	7045	A new service was installed
Security	4624	An account was successfully logged on
Windows PowerShell	400	Engine state is changed from None to Available
Microsoft-Windows-Sysmon	1	Process creation
	3	Network connection
	11	File create
	12, 13	Registry events
	22	DNS query

Memory Analysis

Additional memory related artifacts:

hiberfil.sys	Hibernation system file
pagefile.sys	Paging file
swapfile.sys	Special type pagefile

Volatility

https://github.com/volatilityfoundation/volatility/wiki/Command-Reference

Command:
vol-fwin10-memory.raw windows.info

Plugins	Description
Windows.info	Show operating system information
Windows.pstree	List processes in tree structure
Windows.pslist	List processes
Windows.pslist --pid <PID> --dump	Dump process
Windows.dlllist -- pid <PID> --dump	Dump DLLs associated with a process
Windows.getsids --pid <PID>	SIDs associated with a process
Windows.registry.hivelist	Show registry hives and offsets
Windows.registry.printkey –offset <hive_offset> --key <key_name>	Show registry key

Super Timelines

QEMU

Convert VHD to RAW disk:

Qemu-img convert -O raw disk.vhd disk.raw

Volatility

Create timeline from memory:

Vol -f memory.raw timeliner --create-bodyfile

Log2Timeline

https://plaso.readthedocs.io/en/latest/index.html

Create plaso file from raw disk:

Log2timeline.py --storage-file disk.plaso disk.raw

Show plaso file info:

Pinfo.py disk.plaso

Merge body with plaso file:

Log2timline.py --parser=mactime --storage-file=disk.plaso volatility.body

Create CSV timeline from date:

Psort.py -o l2tcsv -w super-timeline.csv disk.plaso "date > '2022-03-01 00:00:00