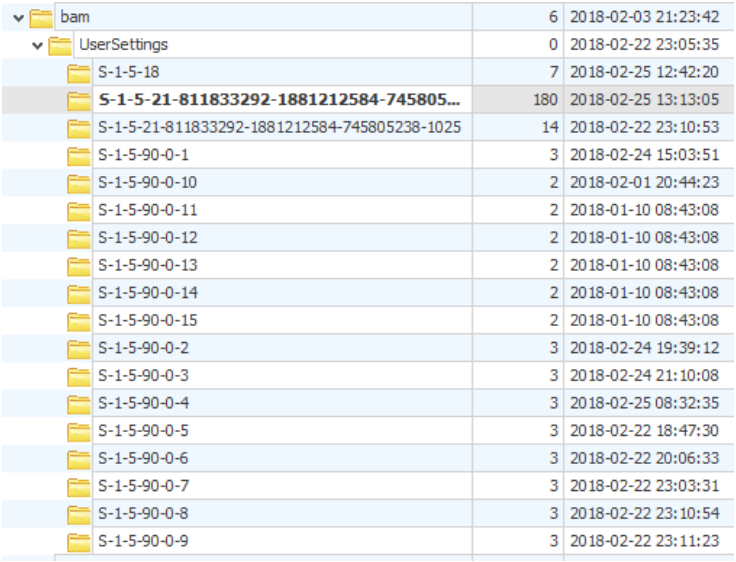
Background Activity Moderator (BAM)

The Bam key found in the SYSTEM hive at the

"ControlSet001\Services\bam\" key

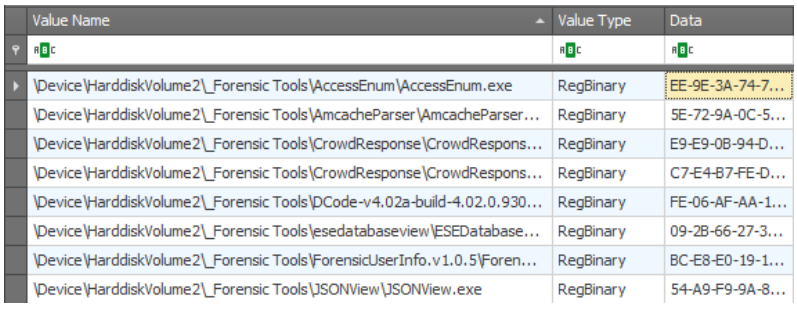
Has a subkey of "\UserSettings\"

Which lists all the user SIDs in the current system.



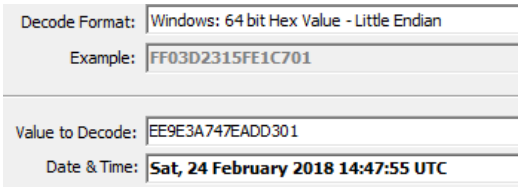
bam	6	2018-02-03 21:23:42
UserSettings	0	2018-02-22 23:05:35
S-1-5-18	7	2018-02-25 12:42:20
S-1-5-21-811833292-1881212584-745805...	180	2018-02-25 13:13:05
S-1-5-21-811833292-1881212584-745805238-1025	14	2018-02-22 23:10:53
S-1-5-90-0-1	3	2018-02-24 15:03:51
S-1-5-90-0-10	2	2018-02-01 20:44:23
S-1-5-90-0-11	2	2018-01-10 08:43:08
S-1-5-90-0-12	2	2018-01-10 08:43:08
S-1-5-90-0-13	2	2018-01-10 08:43:08
S-1-5-90-0-14	2	2018-01-10 08:43:08
S-1-5-90-0-15	2	2018-01-10 08:43:08
S-1-5-90-0-2	3	2018-02-24 19:39:12
S-1-5-90-0-3	3	2018-02-24 21:10:08
S-1-5-90-0-4	3	2018-02-25 08:32:35
S-1-5-90-0-5	3	2018-02-22 18:47:30
S-1-5-90-0-6	3	2018-02-22 20:06:33
S-1-5-90-0-7	3	2018-02-22 23:03:31
S-1-5-90-0-8	3	2018-02-22 23:10:54
S-1-5-90-0-9	3	2018-02-22 23:11:23

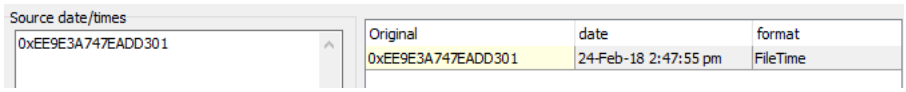
Selecting a user's SID we see a list of paths and executables, not necessarily installed in Windows (eg AccesEnum.exe shown below, which is a command line utility):



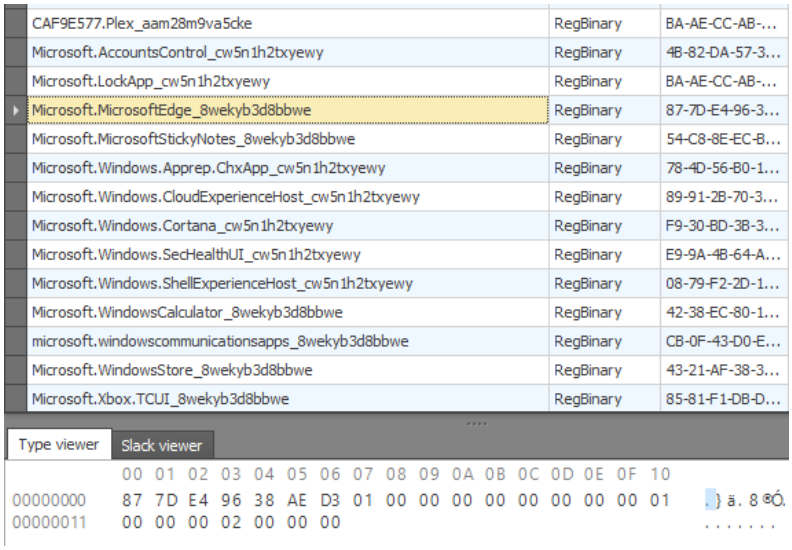
Value Name	Value Type	Data
\Device\HarddiskVolume2_Forensic Tools\AccessEnum\AccessEnum.exe	RegBinary	EE-9E-3A-74-7...
\Device\HarddiskVolume2_Forensic Tools\AmcacheParser\AmcacheParser...	RegBinary	5E-72-9A-0C-5...
\Device\HarddiskVolume2_Forensic Tools\CrowdResponse\CrowdRespons...	RegBinary	E9-E9-0B-94-D...
\Device\HarddiskVolume2_Forensic Tools\CrowdResponse\CrowdRespons...	RegBinary	C7-E4-B7-FE-D...
\Device\HarddiskVolume2_Forensic Tools\DCode-v4.02a-build-4.02.0.930...	RegBinary	FE-06-AF-AA-1...
\Device\HarddiskVolume2_Forensic Tools\esedatabaseview\ESEDatabase...	RegBinary	09-2B-66-27-3...
\Device\HarddiskVolume2_Forensic Tools\ForensicUserInfo.v1.0.5\Foren...	RegBinary	BC-E8-E0-19-1...
\Device\HarddiskVolume2_Forensic Tools\JSONView\JSONView.exe	RegBinary	54-A9-F9-9A-8...

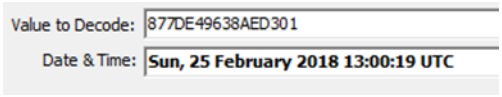
The value of the each of those is the time last executed (?) in Filetime (64bit little Endian) format:





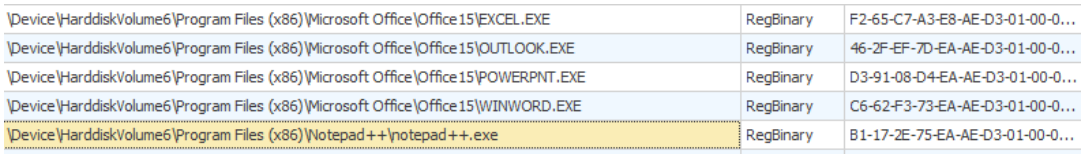
This list also includes Windows apps. For example the last time MS Edge was executed was:



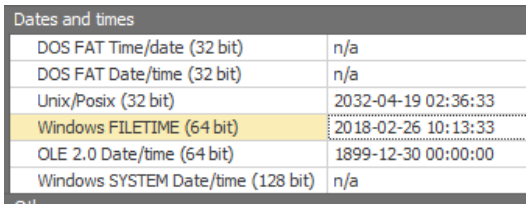


So is it really the last executed time?

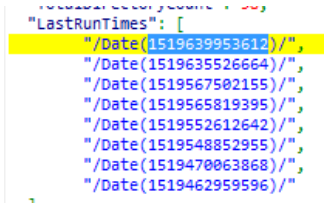
Let's check Notepad++:



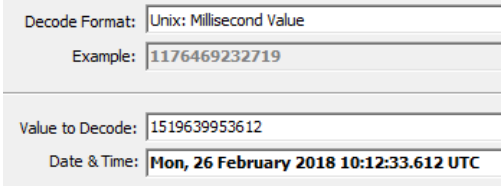
Here we see the last time Notepad++ was executed:



Checking the prefetch file for Notepad++ "20180226105227_NOTEPAD++.EXE-58F9F447.pf" we see the LastRunTimes:



Where the last one decoded is



So we see that there is a small difference of about a minute between the two times.

At the NTuser.dat hive "Software\Microsoft\Windows\CurrentVersion\Search\RecentApps\{E0325B96-8E38-472E-8985-BF103644A570}" key, the LastAccessedTime is 131641135535970000

	AppId	RegSz	{7C5A40EF-A0FB-4BFC-874A-C0F2E0B9FA8E}\Notepad+...
	AppPath	RegSz	C:\Program Files (x86)\Notepad++\notepad++.exe
▶	LastAccessedTime	RegQword	131641135535970000
	LaunchCount	RegDword	4

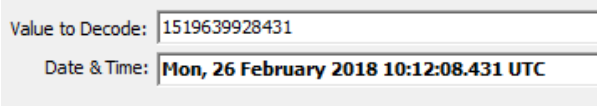
Which decodes to the same date/time as the Prefetch:

Unix/Posix (32 bit)	2013-04-21 03:02:40
Windows FILETIME (64 bit)	2018-02-26 10:12:33
OLE 2.0 Date/time (64 bit)	1899-12-30 00:00:00

Similarly WINWORD, right above notepad++, has a value of 'C6-62-F3-73-EA-AE-D3-01'

Dates and times	
DOS FAT Time/date (32 bit)	n/a
DOS FAT Date/time (32 bit)	2029-06-06 14:31:38
Unix/Posix (32 bit)	2031-08-24 09:32:54
Windows FILETIME (64 bit)	2018-02-26 10:13:31
OLE 2.0 Date/time (64 bit)	1899-12-30 00:00:00

And the respective prefetch "20180226105236_WINWORD.EXE-CFE28797.pf" has a last run time of:



And the same applies to NTuser.dat's key of Software\Microsoft\Windows\CurrentVersion\Search\RecentApps\{CF0E3775-86D6-4C41-AA89-761E587E42D5}\LastAccessedTime which has a value of 131641135284310000

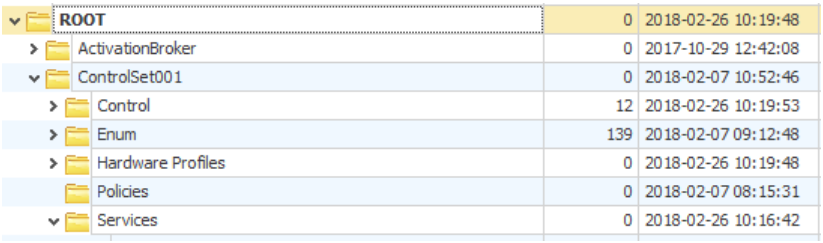
	AppId	RegSz	{7C5A40EF-A0FB-4BFC-874A-C0F2E0B9FA8E}\Microsoft...
	AppPath	RegSz	C:\Program Files (x86)\Microsoft Office\Office15\WINW...
▶	LastAccessedTime	RegQword	131641135284310000
	LaunchCount	RegDword	15

Unix/Posix (32 bit)	2005-04-30 09:29:20
Windows FILETIME (64 bit)	2018-02-26 10:12:08
OLE 2.0 Date/time (64 bit)	1899-12-30 00:00:00

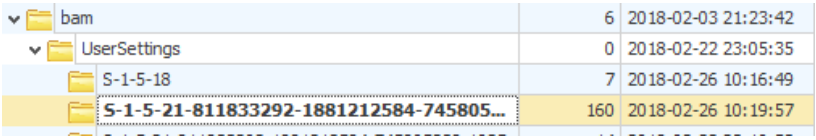
Also with a small a difference of a minute and a few seconds.

~~What I deduce from this is that BAM might take from seconds to a few minutes (depending on system load ?) to update these entries.~~

The BAM entries are updated when Windows boots (or shuts down ?), after the programs/apps were executed, as seen from the last write timestamps of the SYSTEM hive:



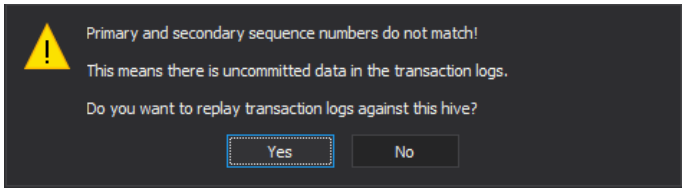
And of the bam\UserSettings\{userSID} key:



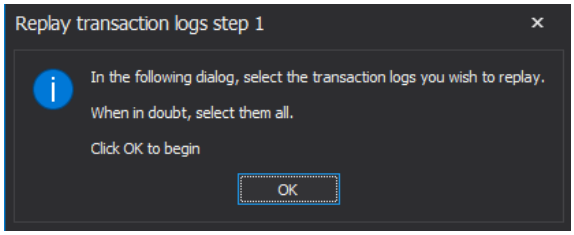
Update 5 March 2018:

The release of Registry Explorer 1.0 by Eric Zimmerman, allows to load the uncommitted data contained in the registry transaction logs (.LOG1 and .LOG2).

So loading the SYSTEM hive gives this message:



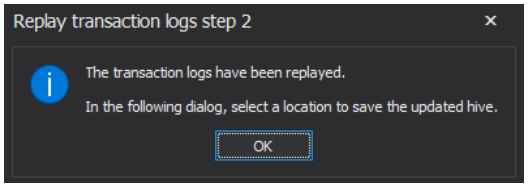
And selecting Yes:



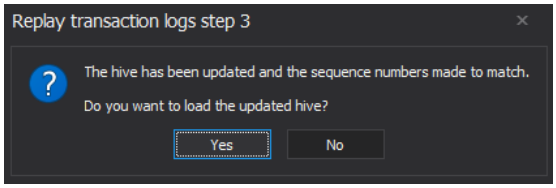
*Note: If exporting these files with FTK imager, you may need to change their attributes with the attrib –H –S *.* from a command console.*

We can pick the two LOG files:

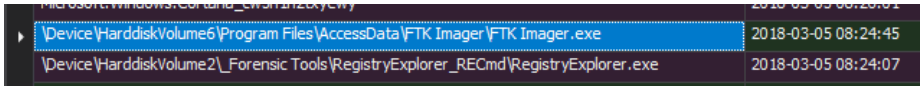
and



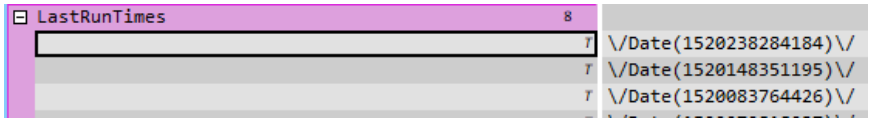
After saving the updated SYSTEM hive, we now are asked if we want to load it:



Let's check the FTK imager in the Bam key's user settings in the updated SYSTEM hive.
It has a UTC execution time of:



Checking the Prefetch for FTK Imager



we see a last run time of
1520238284184 which translates to (UTC):

Original	date	format
1520238284184	05-Mar-18 8:24:44 am	Unix milliseconds

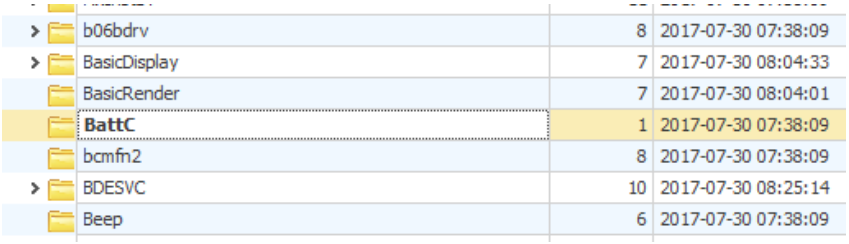
So we see there is now a difference of 1 second in the two execution times.

So what is BAM?
Bam is a service that Controls activity of background applications. This service exists in Windows 10 only after Fall Creators update - version 1709 (needs checking when it was first introduced).

For example a machine running Windows 10 version 15063 (as seen at the Software hive's key "Microsoft\Windows NT\CurrentVersion")

BuildLabEx	RegSz	15063.0.amd64fre.rs2_release.170317-1834
CompositionEditionID	RegSz	Core
CurrentBuild	RegSz	15063
CurrentBuildNumber	RegSz	15063
CurrentMajorVersionNumber	RegDword	10
CurrentMinorVersionNumber	RegDword	0

Does not have a Bam service listed in "ControlSet001\Services\" at the System hive



b06bdrv	8	2017-07-30 07:38:09
BasicDisplay	7	2017-07-30 08:04:33
BasicRender	7	2017-07-30 08:04:01
BattC	1	2017-07-30 07:38:09
bcmfn2	8	2017-07-30 07:38:09
BDESVC	10	2017-07-30 08:25:14
Beep	6	2017-07-30 07:38:09

We can see the service status with the sc command:

```
C:\WINDOWS\system32>sc query bam

SERVICE_NAME: bam
        TYPE               : 1  KERNEL_DRIVER
        STATE              : 4  RUNNING
                                (STOPPABLE, NOT_PAUSABLE, IGNORES_SHUTDOWN)
        WIN32_EXIT_CODE    : 0  (0x0)
        SERVICE_EXIT_CODE  : 0  (0x0)
        CHECKPOINT         : 0x0
        WAIT_HINT          : 0x0
```

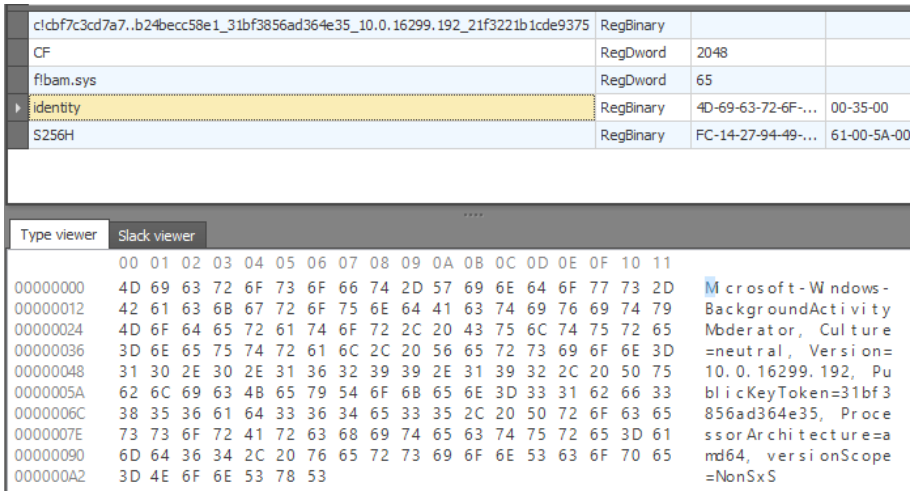
```
C:\WINDOWS\system32>sc qc bam
[SC] QueryServiceConfig SUCCESS

SERVICE_NAME: bam
        TYPE               : 1  KERNEL_DRIVER
        START_TYPE         : 1   SYSTEM_START
        ERROR_CONTROL      : 1   NORMAL
        BINARY_PATH_NAME   : system32\drivers\bam.sys
        LOAD_ORDER_GROUP   :
        TAG                : 0
        DISPLAY_NAME       : Background Activity Moderator Driver
        DEPENDENCIES       :
        SERVICE_START_NAME :
```

The bam.sys driver is found in the “%WinDir%\system32\drivers” folder.

In the COMPONENTS registry hive at the

“*DerivedData\Components\amd64_microsoft-windows-b..ndactivitymoderator_31bf3856ad364e35_10.0.16299.192_none_e2a8303682e9dcc6*”

key, we can see some more info on the bam.sys driver:



c!cbf7c3cd7a7..b24becc58e1_31bf3856ad364e35_10.0.16299.192_21f3221b1cde9375	RegBinary		
CF	RegDword	2048	
f!bam.sys	RegDword	65	
identity	RegBinary	4D-69-63-72-6F-...	00-35-00
S256H	RegBinary	FC-14-27-94-49-...	61-00-5A-00

Type viewer | Slack viewer

```
            00 01 02 03 04 05 06 07 08 09 0A 0B 0C 0D 0E 0F 10 11
00000000    4D 69 63 72 6F 73 6F 66 74 2D 57 69 6E 64 6F 77 73 2D   Microsoft-Windows-
00000012    42 61 63 6B 67 72 6F 75 6E 64 41 63 74 69 76 69 74 79   BackgroundActivity
00000024    4D 6F 64 65 72 61 74 6F 72 2C 20 43 75 6C 74 75 72 65   Moderator, Culture
00000036    3D 6E 65 75 74 72 61 6C 2C 20 56 65 72 73 69 6F 6E 3D   =neutral, Version=
00000048    31 30 2E 30 2E 31 36 32 39 39 2E 31 39 32 2C 20 50 75   10.0.16299.192, Pu
0000005A    62 6C 69 63 4B 65 79 54 6F 6B 65 6E 3D 33 31 62 66 33   blicKeyToken=31bf3
0000006C    38 35 36 61 64 33 36 34 65 33 35 2C 20 50 72 6F 63 65   856ad364e35, Proce
0000007E    73 73 6F 72 41 72 63 68 69 74 65 63 74 75 72 65 3D 61   ssorArchitecture=a
00000090    6D 64 36 34 2C 20 76 65 72 73 69 6F 6E 53 63 6F 70 65   md64, versionScope
000000A2    3D 4E 6F 6E 53 78 53                                     =NonSxS
```

Similarly in the Amcache hive at:

“\InventoryDriverBinary\c:/windows/system32/drivers/bam.sys”

DriverCheckSum	RegDword	105414
DriverCompany	RegSz	Microsoft Corporation
DriverId	RegSz	00004bf81bb5a8e2bf36bcc6137033293c5f719cb...
DriverInBox	RegSz	1
DriverIsKernelMode	RegSz	1
DriverLastWriteTime	RegSz	01/01/2018 12:51:59
DriverName	RegSz	bam.sys
DriverPackageStrongName	RegSz	
DriverSigned	RegSz	1
DriverTimeStamp	RegDword	2422666894
DriverType	RegDword	8650778
DriverVersion	RegSz	10.0.16299.192
ImageSize	RegDword	81920
Inf	RegSz	
Product	RegSz	Microsoft® Windows® Operating System
ProductVersion	RegSz	10.0.16299.192
Service	RegSz	bam
WdfVersion	RegSz	

Happy hunting :)