Pending Investigations

Malware Analysis, Reverse Engineering and Applications of Logic

Dissect vs SysInternals Case Part 1: Planning and Testing

I've been wanting to try out Dissect more often so that I can understand its strengths and limitations. Last time I mainly used it interactively, which is very useful for triage. While I'll do that again to start in this case, my goal this time is to get closer to bulk ingesting and super-timelining, or maybe even working with their Python API.

Challenge Approach

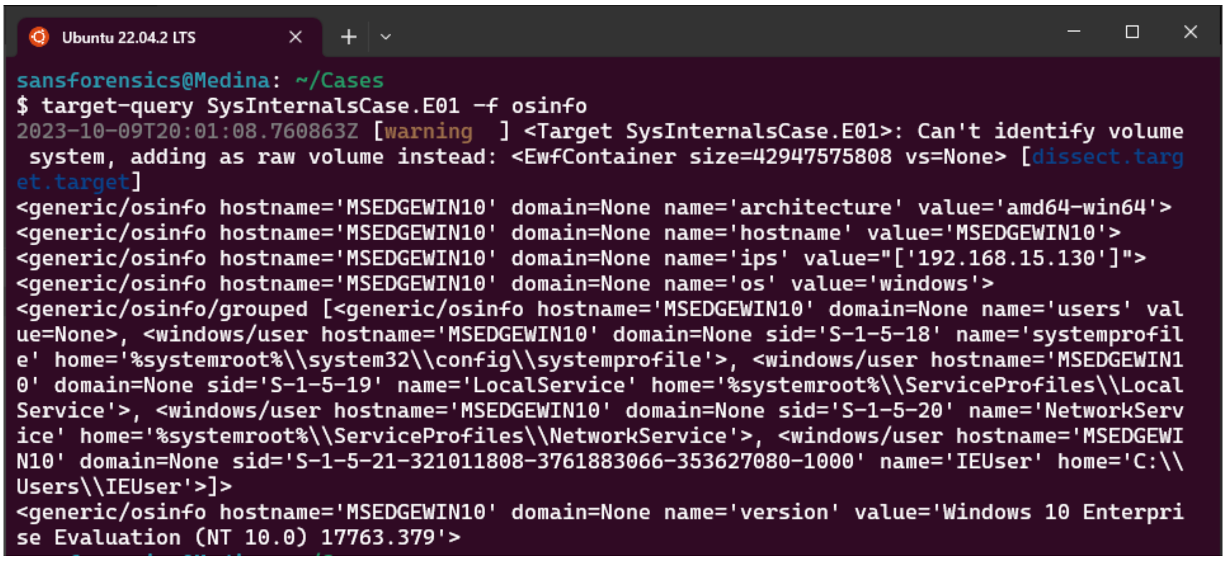
My goal here is to identify all artifact types that may be involved and to make a super-timeline that I can work with, outputting it as a spreadsheet. This output can be refined until it includes mostly relevant artifacts. First, I'll have to triage what's happening since all we know is that some malicious program was probably run. Here's the scenario:

> *The user downloaded what they thought was the SysInternals tool suite, double-clicked it, but the tools did not open and were not accessible. Since that time, the user has noticed that the system has "slowed down" and become less and less responsive.*

It's interesting that this challenge sounds approachable from the malware reversing angle. Of course, this may not be the case if the malware was a downloader and didn't have the payload embedded in it. But we're focused on forensics this time. What happened and when? My first thought is to look for any artifacts related to download and execution, find the time period of interest, then do a super-timeline of the surrounding 5 minutes or so.

First things first, we'll get some general information about the host using the following command:

```
target-query SysInternalsCase.E01 -f osinfo
```



```
sansforensics@Medina: ~/Cases
$ target-query SysInternalsCase.E01 -f osinfo
2023-10-09T20:01:08.760863Z [warning  ] <Target SysInternalsCase.E01>: Can't identify volume
 system, adding as raw volume instead: <EwfContainer size=42947575808 vs=None> [dissect.targ
et.target]
<generic/osinfo hostname='MSEDGEWIN10' domain=None name='architecture' value='amd64-win64'>
<generic/osinfo hostname='MSEDGEWIN10' domain=None name='hostname' value='MSEDGEWIN10'>
<generic/osinfo hostname='MSEDGEWIN10' domain=None name='ips' value="['192.168.15.130']">
<generic/osinfo hostname='MSEDGEWIN10' domain=None name='os' value='windows'>
<generic/osinfo/grouped [<generic/osinfo hostname='MSEDGEWIN10' domain=None name='users' val
ue=None>, <windows/user hostname='MSEDGEWIN10' domain=None sid='S-1-5-18' name='systemprofil
e' home='%systemroot%\\system32\\config\\systemprofile'>, <windows/user hostname='MSEDGEWIN1
0' domain=None sid='S-1-5-19' name='LocalService' home='%systemroot%\\ServiceProfiles\\Local
Service'>, <windows/user hostname='MSEDGEWIN10' domain=None sid='S-1-5-20' name='NetworkServ
ice' home='%systemroot%\\ServiceProfiles\\NetworkService'>, <windows/user hostname='MSEDGEWI
N10' domain=None sid='S-1-5-21-321011808-3761883066-353627080-1000' name='IEUser' home='C:\\
Users\\IEUser'>]>
<generic/osinfo hostname='MSEDGEWIN10' domain=None name='version' value='Windows 10 Enterpri
se Evaluation (NT 10.0) 17763.379'>
```

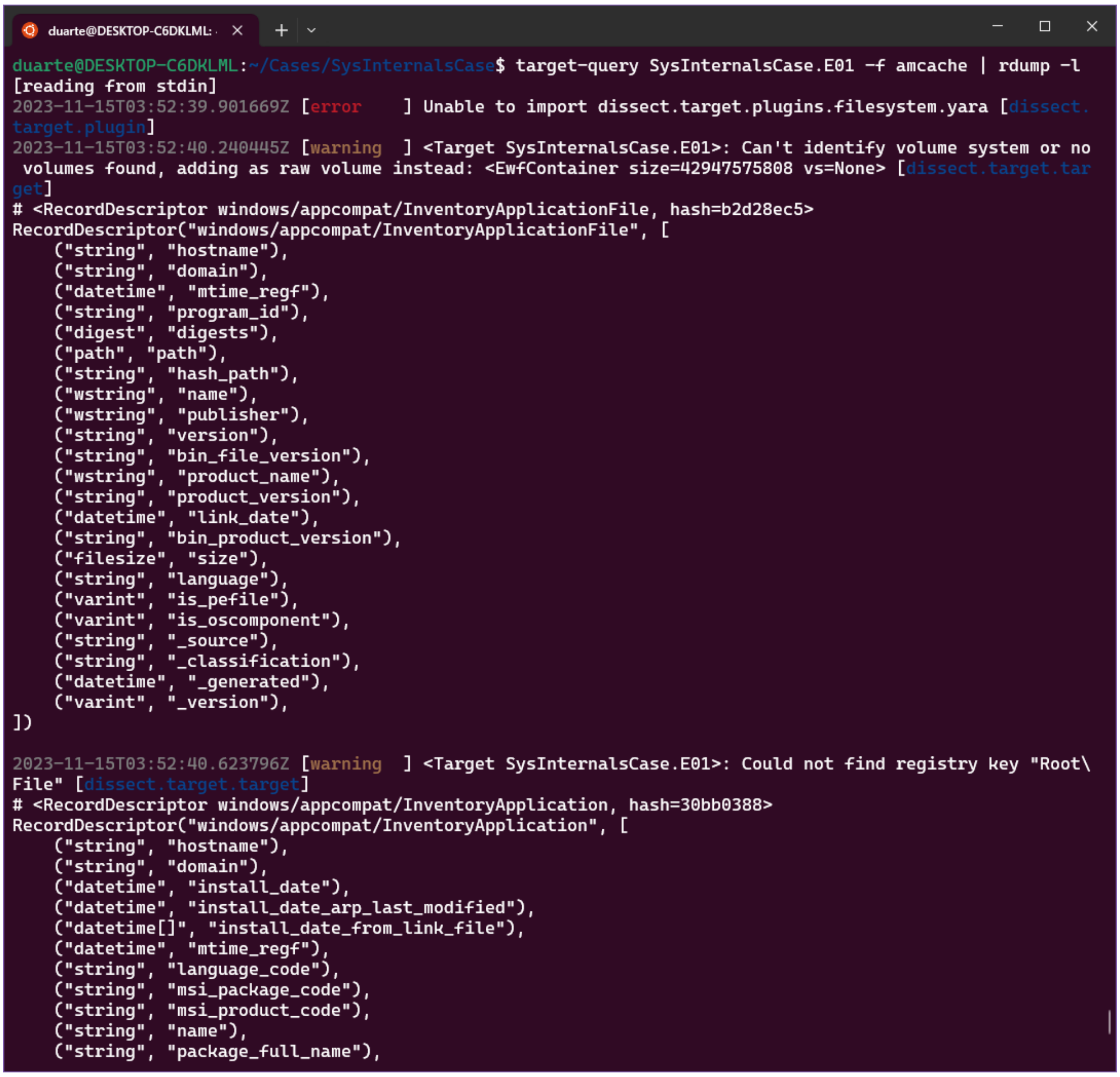
OS version, Architecture	Windows 10 Enterprise (amd64) build 17763.279
Hostname	MSEDGEWIN10
IPs	192.168.15.130
Primary User	IEUser

Straightforward enough.

Artifact Fields and Basic Searching

Next, a shot in the dark: let's just look for something in the Amcache or Prefetch with the name SysInternals. It turns out there was no output of the Prefetch plugin, so I went with Amcache first. Determining which field to search requires some testing to determine which fields are available in the artifact. If you want to list fields and their types, pipe your plugin to rdump -l like this:

```
target-query SysInternalsCase.E01 -f amcache | rdump -l
```



```
duarte@DESKTOP-C6DKLML:~/Cases/SysInternalsCase$ target-query SysInternalsCase.E01 -f amcache | rdump -l
[reading from stdin]
2023-11-15T03:52:39.901669Z [error    ] Unable to import dissect.target.plugins.filesystem.yara [dissect.
target.plugin]
2023-11-15T03:52:40.240445Z [warning  ] <Target SysInternalsCase.E01>: Can't identify volume system or no
 volumes found, adding as raw volume instead: <EwfContainer size=42947575808 vs=None> [dissect.target.tar
get]
# <RecordDescriptor windows/appcompat/InventoryApplicationFile, hash=b2d28ec5>
RecordDescriptor("windows/appcompat/InventoryApplicationFile", [
    ("string", "hostname"),
    ("string", "domain"),
    ("datetime", "mtime_regf"),
    ("string", "program_id"),
    ("digest", "digests"),
    ("path", "path"),
    ("string", "hash_path"),
    ("wstring", "name"),
    ("wstring", "publisher"),
    ("string", "version"),
    ("string", "bin_file_version"),
    ("wstring", "product_name"),
    ("string", "product_version"),
    ("datetime", "link_date"),
    ("string", "bin_product_version"),
    ("filesize", "size"),
    ("string", "language"),
    ("varint", "is_pefile"),
    ("varint", "is_oscomponent"),
    ("string", "_source"),
    ("string", "_classification"),
    ("datetime", "_generated"),
    ("varint", "_version"),
])

2023-11-15T03:52:40.623796Z [warning  ] <Target SysInternalsCase.E01>: Could not find registry key "Root\
File" [dissect.target.target]
# <RecordDescriptor windows/appcompat/InventoryApplication, hash=30bb0388>
RecordDescriptor("windows/appcompat/InventoryApplication", [
    ("string", "hostname"),
    ("string", "domain"),
    ("datetime", "install_date"),
    ("datetime", "install_date_arp_last_modified"),
    ("datetime[]", "install_date_from_link_file"),
    ("datetime", "mtime_regf"),
    ("string", "language_code"),
    ("string", "msi_package_code"),
    ("string", "msi_product_code"),
    ("string", "name"),
    ("string", "package_full_name"),
```

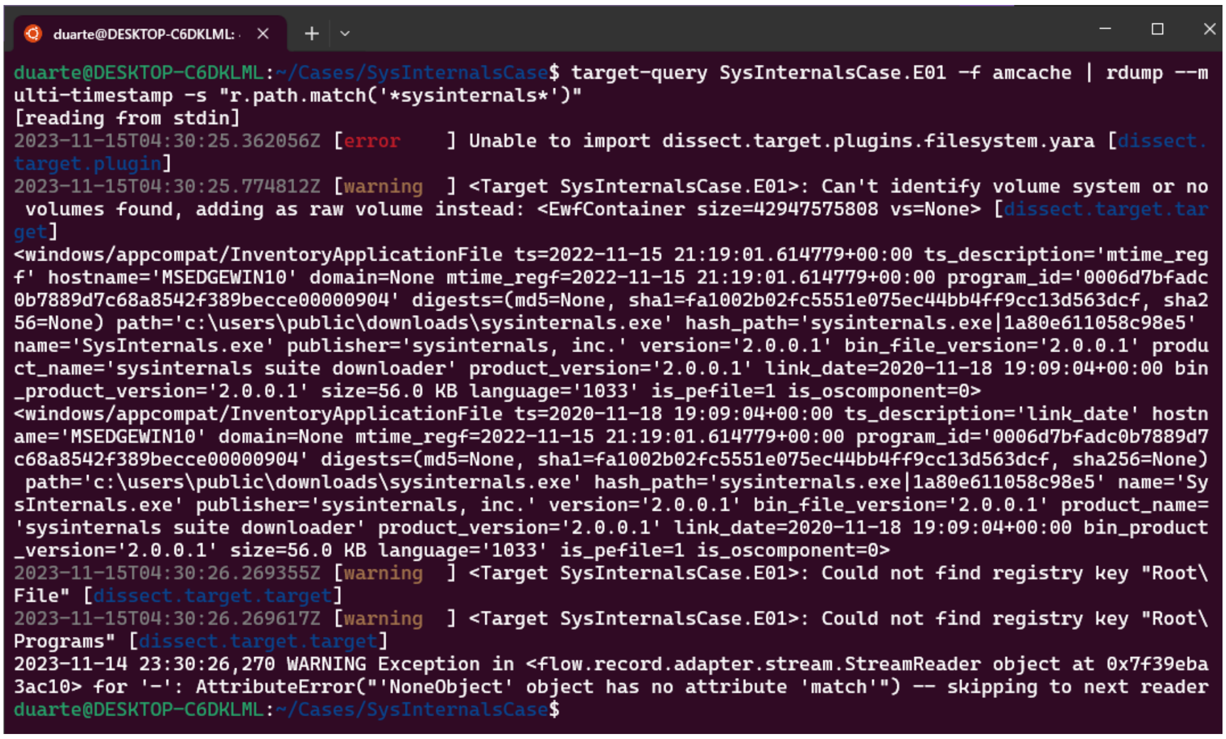
In this case, there are 3 types of flow records present: DeviceContainer, InventoryApplication, and InventoryApplicationFile. In our case I'm thinking we're interested in InventoryApplicationFile records. So, for our first shot at our query for records related to SysInternals, we're going to use the field "path," which in this case has the type of a typical Python Path (this was just recently changed from the type URI as I wrote the blog, so you may have to change some scripts if you treated this field as a string in the past). I think this is great, as there are all kinds of manipulations you can do with Paths. The good news is that this is a Windows Path and is case-insensitive (we can test this).

In addition to that path field matching SysInternals, I'd like any timestamps related to this record to be separated out so we can see distinct events separately. So I'll also use the –multi-timestamp argument and we end up with this command:

```
target-query SysInternalsCase.E01 -f amcache | rdump --multi-
timestamp -s "r.path.match('*sysinternals*')"
```

If you like, you can also run the following command to test whether the case matters when we use the matches method of a Path object:

```
target-query SysInternalsCase.E01 -f amcache | rdump --multi-
timestamp -s "r.path.match('*SysInteRnals*')"
```



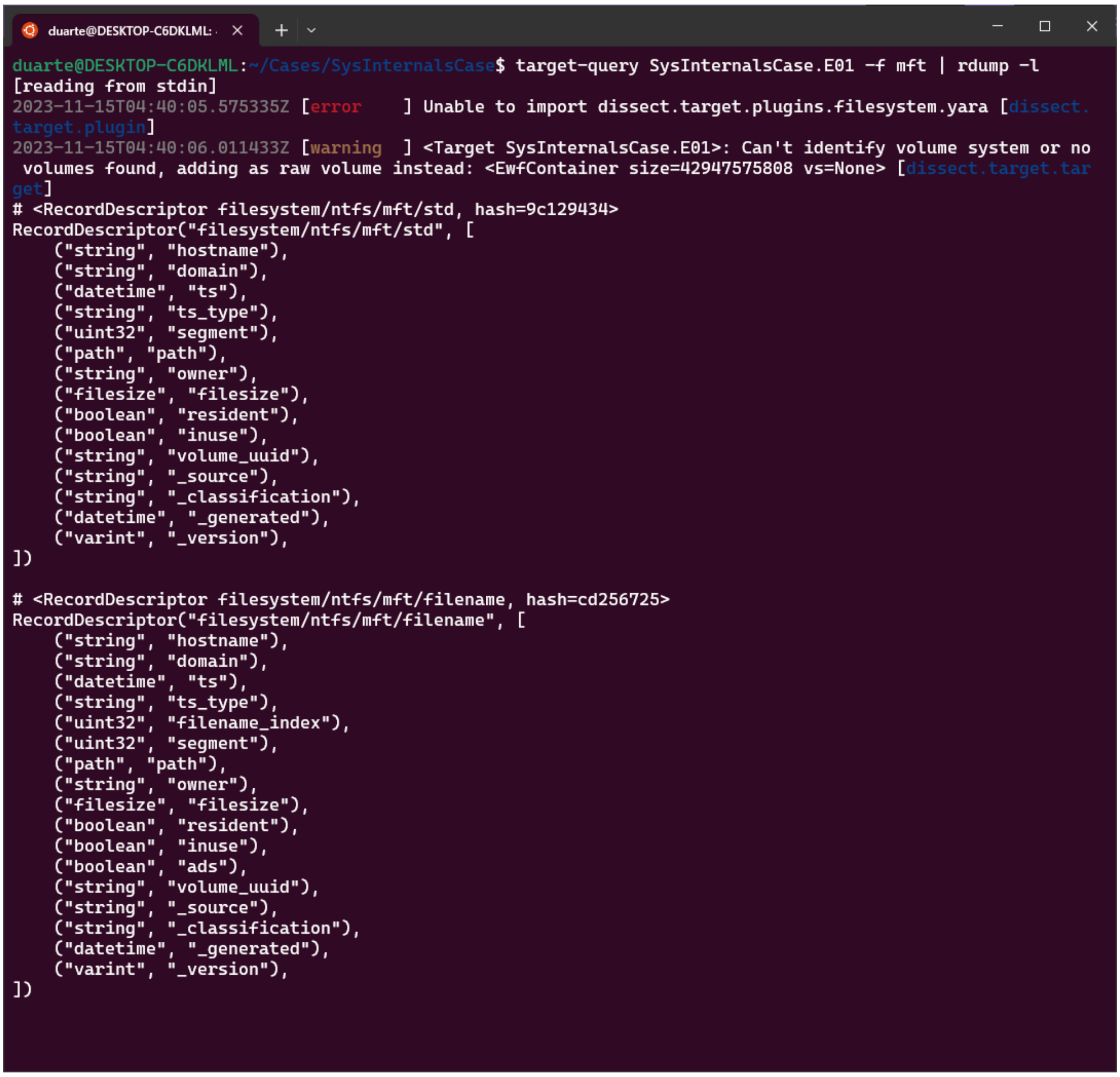
```
duarte@DESKTOP-C6DKLML:~/Cases/SysInternalsCase$ target-query SysInternalsCase.E01 -f amcache | rdump --m
ulti-timestamp -s "r.path.match('*sysinternals*')"
[reading from stdin]
2023-11-15T04:30:25.362056Z [error    ] Unable to import dissect.target.plugins.filesystem.yara [dissect.
target.plugin]
2023-11-15T04:30:25.774812Z [warning  ] <Target SysInternalsCase.E01>: Can't identify volume system or no
 volumes found, adding as raw volume instead: <EwfContainer size=42947575808 vs=None> [dissect.target.tar
get]
<windows/appcompat/InventoryApplicationFile ts=2022-11-15 21:19:01.614779+00:00 ts_description='mtime_reg
f' hostname='MSEDGEWIN10' domain=None mtime_regf=2022-11-15 21:19:01.614779+00:00 program_id='0006d7bfadc
0b7889d7c68a8542f389becce00000904' digests=(md5=None, sha1=fa1002b02fc5551e075ec44bb4ff9cc13d563dcf, sha2
56=None) path='c:\users\public\downloads\sysinternals.exe' hash_path='sysinternals.exe|1a80e611058c98e5'
name='SysInternals.exe' publisher='sysinternals, inc.' version='2.0.0.1' bin_file_version='2.0.0.1' produ
ct_name='sysinternals suite downloader' product_version='2.0.0.1' link_date=2020-11-18 19:09:04+00:00 bin
_product_version='2.0.0.1' size=56.0 KB language='1033' is_pefile=1 is_oscomponent=0>
<windows/appcompat/InventoryApplicationFile ts=2020-11-18 19:09:04+00:00 ts_description='link_date' hostn
ame='MSEDGEWIN10' domain=None mtime_regf=2022-11-15 21:19:01.614779+00:00 program_id='0006d7bfadc0b7889d7
c68a8542f389becce00000904' digests=(md5=None, sha1=fa1002b02fc5551e075ec44bb4ff9cc13d563dcf, sha256=None)
 path='c:\users\public\downloads\sysinternals.exe' hash_path='sysinternals.exe|1a80e611058c98e5' name='Sy
sInternals.exe' publisher='sysinternals, inc.' version='2.0.0.1' bin_file_version='2.0.0.1' product_name=
'sysinternals suite downloader' product_version='2.0.0.1' link_date=2020-11-18 19:09:04+00:00 bin_product
_version='2.0.0.1' size=56.0 KB language='1033' is_pefile=1 is_oscomponent=0>
2023-11-15T04:30:26.269355Z [warning  ] <Target SysInternalsCase.E01>: Could not find registry key "Root\
File" [dissect.target.target]
2023-11-15T04:30:26.269617Z [warning  ] <Target SysInternalsCase.E01>: Could not find registry key "Root\
Programs" [dissect.target.target]
2023-11-14 23:30:26,270 WARNING Exception in <flow.record.adapter.stream.StreamReader object at 0x7f39eba
3ac10> for '-': AttributeError("'NoneObject' object has no attribute 'match'") -- skipping to next reader
duarte@DESKTOP-C6DKLML:~/Cases/SysInternalsCase$
```

Good, in this case we got two events related to the same file. In addition to the path and sha1 hash being the same, we can see that the program ID is the same as well (0006d7bfadc0b7889d7c68a8542f389becce00000904). We can see the timestamp for the modification time in the Registry is **2022-11-15 21:19:01** while the timestamp for when the executable was linked is **2020-11-18 19:09:04** (dissect outputs timestamps in UTC).

Adding Context with the MFT Plugin

Now that we have an indication of an amcache entry being created, I want to add MFT records to this to provide some context. Which field should I use for records from that plugin?

```
target-query SysInternalsCaseE01 -f mft | rdump -l
```



```
duarte@DESKTOP-C6DKLML:~/Cases/SysInternalsCase$ target-query SysInternalsCase.E01 -f mft | rdump -l
[reading from stdin]
2023-11-15T04:40:05.575335Z [error    ] Unable to import dissect.target.plugins.filesystem.yara [dissect.
target.plugin]
2023-11-15T04:40:06.011433Z [warning  ] <Target SysInternalsCase.E01>: Can't identify volume system or no
 volumes found, adding as raw volume instead: <EwfContainer size=42947575808 vs=None> [dissect.target.tar
get]
# <RecordDescriptor filesystem/ntfs/mft/std, hash=9c129434>
RecordDescriptor("filesystem/ntfs/mft/std", [
    ("string", "hostname"),
    ("string", "domain"),
    ("datetime", "ts"),
    ("string", "ts_type"),
    ("uint32", "segment"),
    ("path", "path"),
    ("string", "owner"),
    ("filesize", "filesize"),
    ("boolean", "resident"),
    ("boolean", "inuse"),
    ("string", "volume_uuid"),
    ("string", "_source"),
    ("string", "_classification"),
    ("datetime", "_generated"),
    ("varint", "_version"),
])

# <RecordDescriptor filesystem/ntfs/mft/filename, hash=cd256725>
RecordDescriptor("filesystem/ntfs/mft/filename", [
    ("string", "hostname"),
    ("string", "domain"),
    ("datetime", "ts"),
    ("string", "ts_type"),
    ("uint32", "filename_index"),
    ("uint32", "segment"),
    ("path", "path"),
    ("string", "owner"),
    ("filesize", "filesize"),
    ("boolean", "resident"),
    ("boolean", "inuse"),
    ("boolean", "ads"),
    ("string", "volume_uuid"),
    ("string", "_source"),
    ("string", "_classification"),
    ("datetime", "_generated"),
    ("varint", "_version"),
])
```

According to the field list, both the FILE_NAME and STANDARD_INFORMATION records have the field "path" as well. So ideally we could just run:

```
target-query SysInternalsCase.E01 -f amcache,mft | rdump --multi-
timestamp -s "r.path.match('*sysinternals*')"
```

For some reason this didn't work though. I think it's due to some incompatibility between the plug-ins? I was getting some errors related to a broken pipe, but they weren't too descriptive. Since this selection statement works fine with the amcache records, I went ahead and ran the same query with just the mft plugin alone. (Note: this command will take on the order of 15-20 minutes). I decided to write the filtered output of the MFT command to a .rec file so we can work with the output again quickly (I also recommend this when using the evtx plugin):

```
target-query SysInternalsCase.E01 -f mft | rdump --multi-timestamp
-s "r.path.match('*sysinternals*')" -w mft_filtered.rec
```

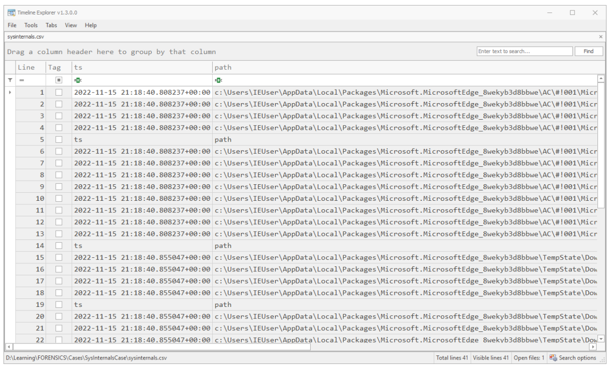
With that being said, I get the feeling I'll be working mostly with its JSON output for the sake of scripting in Python when things get up to scale.

Combining Multiple Artifacts

Anyways now that we have the records file mft_filtered.rec, we can make it into a .csv and/or select columns of interest using rdump again. For the purposes of this exercise, all we care about is timestamp, path, artifact name and timestamp type. So I dump to a csv using this command:

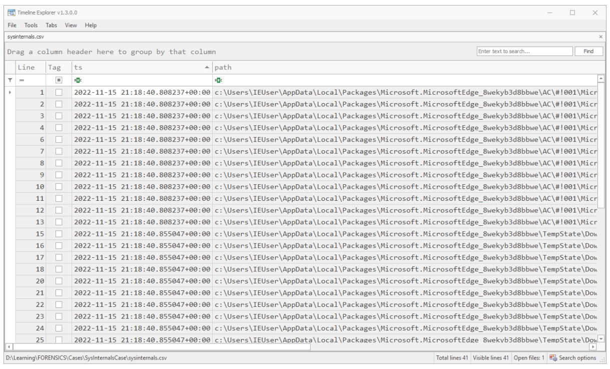
```
rdump mft_filtered.rec -F ts,path,ts_type --csv -w sysinternals.csv
```

This gives good output, even though it seems a bunch of header rows are interspersed. It's easy to remove these once you sort by the first column.


Timeline Explorer v1.3.0.0
File
Tools
Tabs
View
Help
sysinternals.csv
Drag a column header here to group by that column
Enter text to search...
Find

Line	Tag	ts	path
1	☐	2022-11-15 21:18:40.808237+00:00	c:\Users\IEUser\AppData\Local\Packages\Microsoft.MicrosoftEdge_8wekyb3d8bbwe\AC\#!001\Micr
2	☐	2022-11-15 21:18:40.808237+00:00	c:\Users\IEUser\AppData\Local\Packages\Microsoft.MicrosoftEdge_8wekyb3d8bbwe\AC\#!001\Micr
3	☐	2022-11-15 21:18:40.808237+00:00	c:\Users\IEUser\AppData\Local\Packages\Microsoft.MicrosoftEdge_8wekyb3d8bbwe\AC\#!001\Micr
4	☐	2022-11-15 21:18:40.808237+00:00	c:\Users\IEUser\AppData\Local\Packages\Microsoft.MicrosoftEdge_8wekyb3d8bbwe\AC\#!001\Micr
5	☐	ts	path
6	☐	2022-11-15 21:18:40.808237+00:00	c:\Users\IEUser\AppData\Local\Packages\Microsoft.MicrosoftEdge_8wekyb3d8bbwe\AC\#!001\Micr
7	☐	2022-11-15 21:18:40.808237+00:00	c:\Users\IEUser\AppData\Local\Packages\Microsoft.MicrosoftEdge_8wekyb3d8bbwe\AC\#!001\Micr
8	☐	2022-11-15 21:18:40.808237+00:00	c:\Users\IEUser\AppData\Local\Packages\Microsoft.MicrosoftEdge_8wekyb3d8bbwe\AC\#!001\Micr
9	☐	2022-11-15 21:18:40.808237+00:00	c:\Users\IEUser\AppData\Local\Packages\Microsoft.MicrosoftEdge_8wekyb3d8bbwe\AC\#!001\Micr
10	☐	2022-11-15 21:18:40.808237+00:00	c:\Users\IEUser\AppData\Local\Packages\Microsoft.MicrosoftEdge_8wekyb3d8bbwe\AC\#!001\Micr
11	☐	2022-11-15 21:18:40.808237+00:00	c:\Users\IEUser\AppData\Local\Packages\Microsoft.MicrosoftEdge_8wekyb3d8bbwe\AC\#!001\Micr
12	☐	2022-11-15 21:18:40.808237+00:00	c:\Users\IEUser\AppData\Local\Packages\Microsoft.MicrosoftEdge_8wekyb3d8bbwe\AC\#!001\Micr
13	☐	2022-11-15 21:18:40.808237+00:00	c:\Users\IEUser\AppData\Local\Packages\Microsoft.MicrosoftEdge_8wekyb3d8bbwe\AC\#!001\Micr
14	☐	ts	path
15	☐	2022-11-15 21:18:40.855047+00:00	c:\Users\IEUser\AppData\Local\Packages\Microsoft.MicrosoftEdge_8wekyb3d8bbwe\TempState\Dow
16	☐	2022-11-15 21:18:40.855047+00:00	c:\Users\IEUser\AppData\Local\Packages\Microsoft.MicrosoftEdge_8wekyb3d8bbwe\TempState\Dow
17	☐	2022-11-15 21:18:40.855047+00:00	c:\Users\IEUser\AppData\Local\Packages\Microsoft.MicrosoftEdge_8wekyb3d8bbwe\TempState\Dow
18	☐	2022-11-15 21:18:40.855047+00:00	c:\Users\IEUser\AppData\Local\Packages\Microsoft.MicrosoftEdge_8wekyb3d8bbwe\TempState\Dow
19	☐	ts	path
20	☐	2022-11-15 21:18:40.855047+00:00	c:\Users\IEUser\AppData\Local\Packages\Microsoft.MicrosoftEdge_8wekyb3d8bbwe\TempState\Dow
21	☐	2022-11-15 21:18:40.855047+00:00	c:\Users\IEUser\AppData\Local\Packages\Microsoft.MicrosoftEdge_8wekyb3d8bbwe\TempState\Dow
22	☐	2022-11-15 21:18:40.855047+00:00	c:\Users\IEUser\AppData\Local\Packages\Microsoft.MicrosoftEdge_8wekyb3d8bbwe\TempState\Dow

D:\Learning\FORENSICS\Cases\SysInternalsCase\sysinternals.csv Total lines 41 Visible lines 41 Open files: 1 Search options

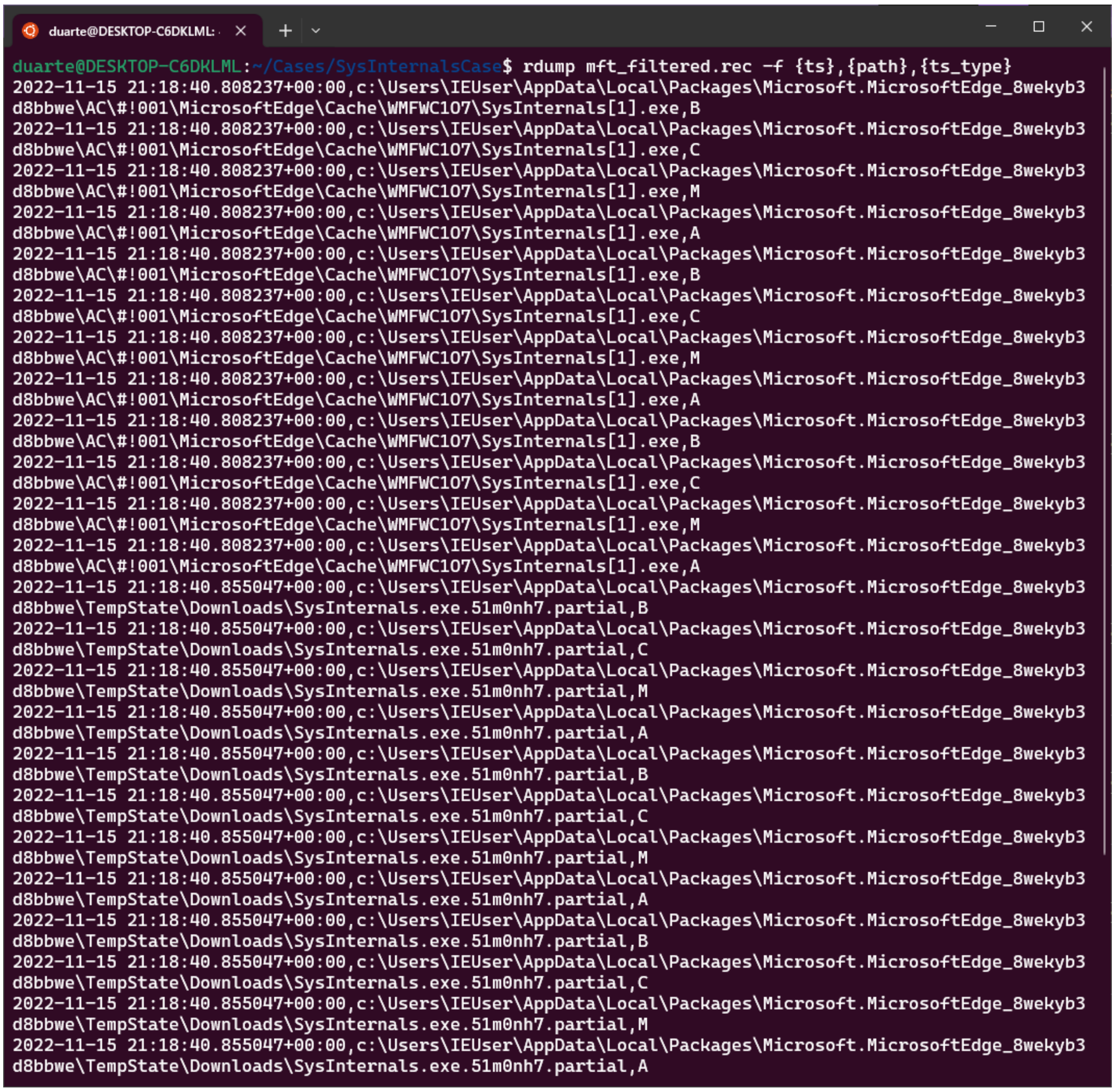

Timeline Explorer v1.3.0.0
File
Tools
Tabs
View
Help
sysinternals.csv
Drag a column header here to group by that column
Enter text to search...
Find

Line	Tag	ts	path
1	☐	2022-11-15 21:18:40.808237+00:00	c:\Users\IEUser\AppData\Local\Packages\Microsoft.MicrosoftEdge_8wekyb3d8bbwe\AC\#!001\Micr
2	☐	2022-11-15 21:18:40.808237+00:00	c:\Users\IEUser\AppData\Local\Packages\Microsoft.MicrosoftEdge_8wekyb3d8bbwe\AC\#!001\Micr
3	☐	2022-11-15 21:18:40.808237+00:00	c:\Users\IEUser\AppData\Local\Packages\Microsoft.MicrosoftEdge_8wekyb3d8bbwe\AC\#!001\Micr
4	☐	2022-11-15 21:18:40.808237+00:00	c:\Users\IEUser\AppData\Local\Packages\Microsoft.MicrosoftEdge_8wekyb3d8bbwe\AC\#!001\Micr
6	☐	2022-11-15 21:18:40.808237+00:00	c:\Users\IEUser\AppData\Local\Packages\Microsoft.MicrosoftEdge_8wekyb3d8bbwe\AC\#!001\Micr
7	☐	2022-11-15 21:18:40.808237+00:00	c:\Users\IEUser\AppData\Local\Packages\Microsoft.MicrosoftEdge_8wekyb3d8bbwe\AC\#!001\Micr
8	☐	2022-11-15 21:18:40.808237+00:00	c:\Users\IEUser\AppData\Local\Packages\Microsoft.MicrosoftEdge_8wekyb3d8bbwe\AC\#!001\Micr
9	☐	2022-11-15 21:18:40.808237+00:00	c:\Users\IEUser\AppData\Local\Packages\Microsoft.MicrosoftEdge_8wekyb3d8bbwe\AC\#!001\Micr
10	☐	2022-11-15 21:18:40.808237+00:00	c:\Users\IEUser\AppData\Local\Packages\Microsoft.MicrosoftEdge_8wekyb3d8bbwe\AC\#!001\Micr
11	☐	2022-11-15 21:18:40.808237+00:00	c:\Users\IEUser\AppData\Local\Packages\Microsoft.MicrosoftEdge_8wekyb3d8bbwe\AC\#!001\Micr
12	☐	2022-11-15 21:18:40.808237+00:00	c:\Users\IEUser\AppData\Local\Packages\Microsoft.MicrosoftEdge_8wekyb3d8bbwe\AC\#!001\Micr
13	☐	2022-11-15 21:18:40.808237+00:00	c:\Users\IEUser\AppData\Local\Packages\Microsoft.MicrosoftEdge_8wekyb3d8bbwe\AC\#!001\Micr
15	☐	2022-11-15 21:18:40.855047+00:00	c:\Users\IEUser\AppData\Local\Packages\Microsoft.MicrosoftEdge_8wekyb3d8bbwe\TempState\Dow
16	☐	2022-11-15 21:18:40.855047+00:00	c:\Users\IEUser\AppData\Local\Packages\Microsoft.MicrosoftEdge_8wekyb3d8bbwe\TempState\Dow
17	☐	2022-11-15 21:18:40.855047+00:00	c:\Users\IEUser\AppData\Local\Packages\Microsoft.MicrosoftEdge_8wekyb3d8bbwe\TempState\Dow
18	☐	2022-11-15 21:18:40.855047+00:00	c:\Users\IEUser\AppData\Local\Packages\Microsoft.MicrosoftEdge_8wekyb3d8bbwe\TempState\Dow
20	☐	2022-11-15 21:18:40.855047+00:00	c:\Users\IEUser\AppData\Local\Packages\Microsoft.MicrosoftEdge_8wekyb3d8bbwe\TempState\Dow
21	☐	2022-11-15 21:18:40.855047+00:00	c:\Users\IEUser\AppData\Local\Packages\Microsoft.MicrosoftEdge_8wekyb3d8bbwe\TempState\Dow
22	☐	2022-11-15 21:18:40.855047+00:00	c:\Users\IEUser\AppData\Local\Packages\Microsoft.MicrosoftEdge_8wekyb3d8bbwe\TempState\Dow
23	☐	2022-11-15 21:18:40.855047+00:00	c:\Users\IEUser\AppData\Local\Packages\Microsoft.MicrosoftEdge_8wekyb3d8bbwe\TempState\Dow
24	☐	2022-11-15 21:18:40.855047+00:00	c:\Users\IEUser\AppData\Local\Packages\Microsoft.MicrosoftEdge_8wekyb3d8bbwe\TempState\Dow
25	☐	2022-11-15 21:18:40.855047+00:00	c:\Users\IEUser\AppData\Local\Packages\Microsoft.MicrosoftEdge_8wekyb3d8bbwe\TempState\Dow

D:\Learning\FORENSICS\Cases\SysInternalsCase\sysinternals.csv Total lines 41 Visible lines 41 Open files: 1 Search options

However, if you'd prefer to work with text and are only interested in a couple of fields, you can format this as text and won't end up with the extraneous headers:

```
rdump mft_filtered.rec -f {ts},{path},{ts_type}
```



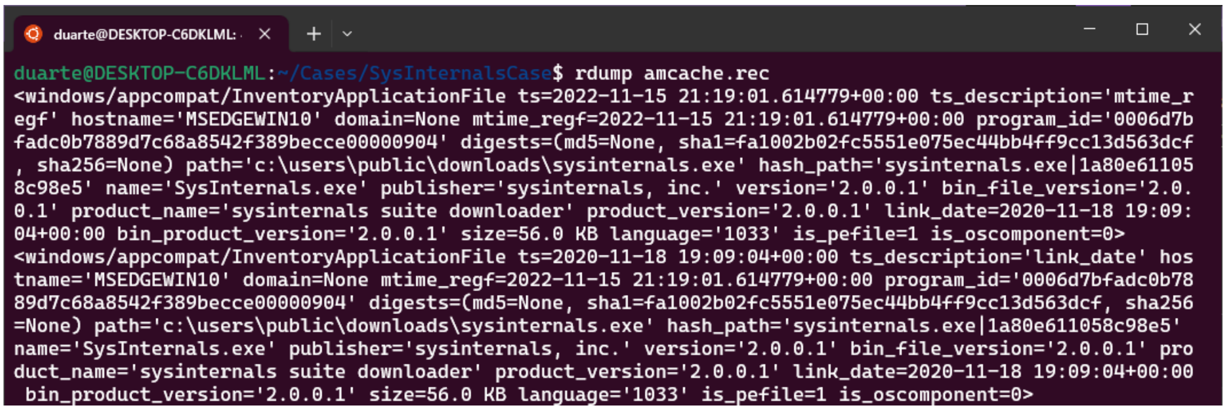
```
duarte@DESKTOP-C6DKLML:~/Cases/SysInternalsCase$ rdump mft_filtered.rec -f {ts},{path},{ts_type}
2022-11-15 21:18:40.808237+00:00,c:\Users\IEUser\AppData\Local\Packages\Microsoft.MicrosoftEdge_8wekyb3
d8bbwe\AC\#!001\MicrosoftEdge\Cache\WMFWC107\SysInternals[1].exe,B
2022-11-15 21:18:40.808237+00:00,c:\Users\IEUser\AppData\Local\Packages\Microsoft.MicrosoftEdge_8wekyb3
d8bbwe\AC\#!001\MicrosoftEdge\Cache\WMFWC107\SysInternals[1].exe,C
2022-11-15 21:18:40.808237+00:00,c:\Users\IEUser\AppData\Local\Packages\Microsoft.MicrosoftEdge_8wekyb3
d8bbwe\AC\#!001\MicrosoftEdge\Cache\WMFWC107\SysInternals[1].exe,M
2022-11-15 21:18:40.808237+00:00,c:\Users\IEUser\AppData\Local\Packages\Microsoft.MicrosoftEdge_8wekyb3
d8bbwe\AC\#!001\MicrosoftEdge\Cache\WMFWC107\SysInternals[1].exe,A
2022-11-15 21:18:40.808237+00:00,c:\Users\IEUser\AppData\Local\Packages\Microsoft.MicrosoftEdge_8wekyb3
d8bbwe\AC\#!001\MicrosoftEdge\Cache\WMFWC107\SysInternals[1].exe,B
2022-11-15 21:18:40.808237+00:00,c:\Users\IEUser\AppData\Local\Packages\Microsoft.MicrosoftEdge_8wekyb3
d8bbwe\AC\#!001\MicrosoftEdge\Cache\WMFWC107\SysInternals[1].exe,C
2022-11-15 21:18:40.808237+00:00,c:\Users\IEUser\AppData\Local\Packages\Microsoft.MicrosoftEdge_8wekyb3
d8bbwe\AC\#!001\MicrosoftEdge\Cache\WMFWC107\SysInternals[1].exe,M
2022-11-15 21:18:40.808237+00:00,c:\Users\IEUser\AppData\Local\Packages\Microsoft.MicrosoftEdge_8wekyb3
d8bbwe\AC\#!001\MicrosoftEdge\Cache\WMFWC107\SysInternals[1].exe,A
2022-11-15 21:18:40.808237+00:00,c:\Users\IEUser\AppData\Local\Packages\Microsoft.MicrosoftEdge_8wekyb3
d8bbwe\AC\#!001\MicrosoftEdge\Cache\WMFWC107\SysInternals[1].exe,B
2022-11-15 21:18:40.808237+00:00,c:\Users\IEUser\AppData\Local\Packages\Microsoft.MicrosoftEdge_8wekyb3
d8bbwe\AC\#!001\MicrosoftEdge\Cache\WMFWC107\SysInternals[1].exe,C
2022-11-15 21:18:40.808237+00:00,c:\Users\IEUser\AppData\Local\Packages\Microsoft.MicrosoftEdge_8wekyb3
d8bbwe\AC\#!001\MicrosoftEdge\Cache\WMFWC107\SysInternals[1].exe,M
2022-11-15 21:18:40.808237+00:00,c:\Users\IEUser\AppData\Local\Packages\Microsoft.MicrosoftEdge_8wekyb3
d8bbwe\AC\#!001\MicrosoftEdge\Cache\WMFWC107\SysInternals[1].exe,A
2022-11-15 21:18:40.855047+00:00,c:\Users\IEUser\AppData\Local\Packages\Microsoft.MicrosoftEdge_8wekyb3
d8bbwe\TempState\Downloads\SysInternals.exe.51m0nh7.partial,B
2022-11-15 21:18:40.855047+00:00,c:\Users\IEUser\AppData\Local\Packages\Microsoft.MicrosoftEdge_8wekyb3
d8bbwe\TempState\Downloads\SysInternals.exe.51m0nh7.partial,C
2022-11-15 21:18:40.855047+00:00,c:\Users\IEUser\AppData\Local\Packages\Microsoft.MicrosoftEdge_8wekyb3
d8bbwe\TempState\Downloads\SysInternals.exe.51m0nh7.partial,M
2022-11-15 21:18:40.855047+00:00,c:\Users\IEUser\AppData\Local\Packages\Microsoft.MicrosoftEdge_8wekyb3
d8bbwe\TempState\Downloads\SysInternals.exe.51m0nh7.partial,A
2022-11-15 21:18:40.855047+00:00,c:\Users\IEUser\AppData\Local\Packages\Microsoft.MicrosoftEdge_8wekyb3
d8bbwe\TempState\Downloads\SysInternals.exe.51m0nh7.partial,B
2022-11-15 21:18:40.855047+00:00,c:\Users\IEUser\AppData\Local\Packages\Microsoft.MicrosoftEdge_8wekyb3
d8bbwe\TempState\Downloads\SysInternals.exe.51m0nh7.partial,C
2022-11-15 21:18:40.855047+00:00,c:\Users\IEUser\AppData\Local\Packages\Microsoft.MicrosoftEdge_8wekyb3
d8bbwe\TempState\Downloads\SysInternals.exe.51m0nh7.partial,M
2022-11-15 21:18:40.855047+00:00,c:\Users\IEUser\AppData\Local\Packages\Microsoft.MicrosoftEdge_8wekyb3
d8bbwe\TempState\Downloads\SysInternals.exe.51m0nh7.partial,A
2022-11-15 21:18:40.855047+00:00,c:\Users\IEUser\AppData\Local\Packages\Microsoft.MicrosoftEdge_8wekyb3
d8bbwe\TempState\Downloads\SysInternals.exe.51m0nh7.partial,B
2022-11-15 21:18:40.855047+00:00,c:\Users\IEUser\AppData\Local\Packages\Microsoft.MicrosoftEdge_8wekyb3
d8bbwe\TempState\Downloads\SysInternals.exe.51m0nh7.partial,C
2022-11-15 21:18:40.855047+00:00,c:\Users\IEUser\AppData\Local\Packages\Microsoft.MicrosoftEdge_8wekyb3
d8bbwe\TempState\Downloads\SysInternals.exe.51m0nh7.partial,M
2022-11-15 21:18:40.855047+00:00,c:\Users\IEUser\AppData\Local\Packages\Microsoft.MicrosoftEdge_8wekyb3
d8bbwe\TempState\Downloads\SysInternals.exe.51m0nh7.partial,A
```

In any case, once things are sorted we can see that the MFT has file entries for this SysInternals.exe file in the Microsoft Edge Cache, as a .partial file in the TempState\Downloads folder, and finally at the path **C:\Users\Public\Downloads\SysInternals.exe**.

So now, how can we combine the timestamps from these two plugins (amcache and mft) into one CSV? To do this, I first dumped amcache records matching “sysinternals” to a file named amcache.rec:

```
target-query SysInternalsCase.E01 -f amcache | rdump --multi-
timestamp -s "r.path.match('*sysinternals*')" -w amcache.rec
```

We can check that there’s content in the .rec file by using the command `rdump amcache.rec`:

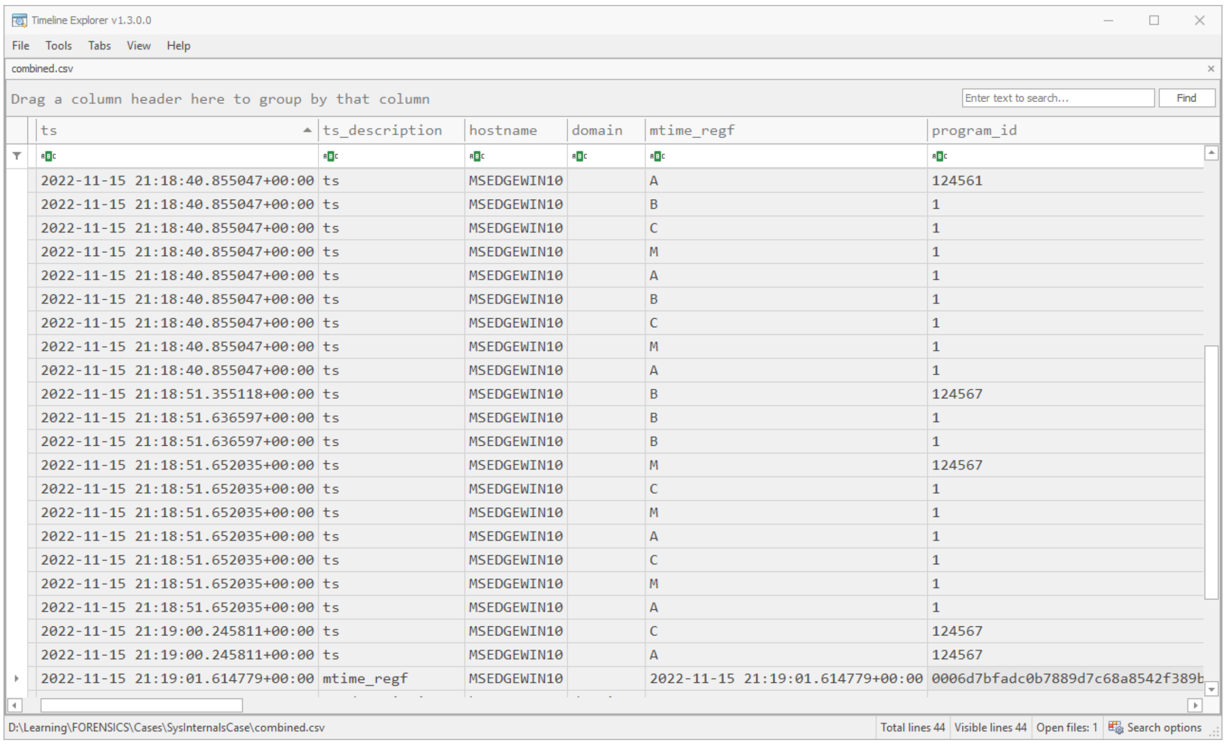


```
duarte@DESKTOP-C6DKLML:~/Cases/SysInternalsCase$ rdump amcache.rec
<windows/appcompat/InventoryApplicationFile ts=2022-11-15 21:19:01.614779+00:00 ts_description='mtime_r
egf' hostname='MSEDGEWIN10' domain=None mtime_regf=2022-11-15 21:19:01.614779+00:00 program_id='0006d7b
fadc0b7889d7c68a8542f389becce00000904' digests=(md5=None, sha1=fa1002b02fc5551e075ec44bb4ff9cc13d563dcf
, sha256=None) path='c:\users\public\downloads\sysinternals.exe' hash_path='sysinternals.exe|1a80e61105
8c98e5' name='SysInternals.exe' publisher='sysinternals, inc.' version='2.0.0.1' bin_file_version='2.0.
0.1' product_name='sysinternals suite downloader' product_version='2.0.0.1' link_date=2020-11-18 19:09:
04+00:00 bin_product_version='2.0.0.1' size=56.0 KB language='1033' is_pefile=1 is_oscomponent=0>
<windows/appcompat/InventoryApplicationFile ts=2020-11-18 19:09:04+00:00 ts_description='link_date' hos
tname='MSEDGEWIN10' domain=None mtime_regf=2022-11-15 21:19:01.614779+00:00 program_id='0006d7bfadc0b78
89d7c68a8542f389becce00000904' digests=(md5=None, sha1=fa1002b02fc5551e075ec44bb4ff9cc13d563dcf, sha256
=None) path='c:\users\public\downloads\sysinternals.exe' hash_path='sysinternals.exe|1a80e611058c98e5'
name='SysInternals.exe' publisher='sysinternals, inc.' version='2.0.0.1' bin_file_version='2.0.0.1' pro
duct_name='sysinternals suite downloader' product_version='2.0.0.1' link_date=2020-11-18 19:09:04+00:00
 bin_product_version='2.0.0.1' size=56.0 KB language='1033' is_pefile=1 is_oscomponent=0>
```

And next, to combine these two record types into one CSV, I used the following command:

```
rdump --csv -w combined.csv amcache.rec mft_filtered.rec
```

In this output combined.csv, we can see the last modification time for this amcache entry alongside the MFT events for the download:



Timeline Explorer v1.3.0.0
File
Tools
Tabs
View
Help
combined.csv
Drag a column header here to group by that column
Enter text to search...
Find

ts	ts_description	hostname	domain	mtime_regf	program_id
2022-11-15 21:18:40.855047+00:00	ts	MSEDGEWIN10		A	124561
2022-11-15 21:18:40.855047+00:00	ts	MSEDGEWIN10		B	1
2022-11-15 21:18:40.855047+00:00	ts	MSEDGEWIN10		C	1
2022-11-15 21:18:40.855047+00:00	ts	MSEDGEWIN10		M	1
2022-11-15 21:18:40.855047+00:00	ts	MSEDGEWIN10		A	1
2022-11-15 21:18:40.855047+00:00	ts	MSEDGEWIN10		B	1
2022-11-15 21:18:40.855047+00:00	ts	MSEDGEWIN10		C	1
2022-11-15 21:18:40.855047+00:00	ts	MSEDGEWIN10		M	1
2022-11-15 21:18:40.855047+00:00	ts	MSEDGEWIN10		A	1
2022-11-15 21:18:51.355118+00:00	ts	MSEDGEWIN10		B	124567
2022-11-15 21:18:51.636597+00:00	ts	MSEDGEWIN10		B	1
2022-11-15 21:18:51.636597+00:00	ts	MSEDGEWIN10		B	1
2022-11-15 21:18:51.652035+00:00	ts	MSEDGEWIN10		M	124567
2022-11-15 21:18:51.652035+00:00	ts	MSEDGEWIN10		C	1
2022-11-15 21:18:51.652035+00:00	ts	MSEDGEWIN10		M	1
2022-11-15 21:18:51.652035+00:00	ts	MSEDGEWIN10		A	1
2022-11-15 21:18:51.652035+00:00	ts	MSEDGEWIN10		C	1
2022-11-15 21:18:51.652035+00:00	ts	MSEDGEWIN10		M	1
2022-11-15 21:18:51.652035+00:00	ts	MSEDGEWIN10		A	1
2022-11-15 21:19:00.245811+00:00	ts	MSEDGEWIN10		C	124567
2022-11-15 21:19:00.245811+00:00	ts	MSEDGEWIN10		A	124567
2022-11-15 21:19:01.614779+00:00	mtime_regf	MSEDGEWIN10		2022-11-15 21:19:01.614779+00:00	0006d7bfadc0b7889d7c68a8542f389b

D:\Learning\FORENSICS\Cases\SysInternalsCase\combined.csv Total lines 44 Visible lines 44 Open files: 1 Search options

Building a Mini Super-Timeline (Time Filtering)

Now that we have what seems like a strong indication of an execution event. I can add in lnk files and some user interaction artifacts in the same way, but now that we have a time I want to see if we can get a mini-timeline going, using the timestamp in the selector statement instead of our keyword "*sysinternals*".

For this mini-timeline, I'm going to pick the artifacts mft, shimcache, amcache, shellbags, lnk, services, and runkeys. I would like to add scheduled tasks in, but for some reason the –multi-timestamp argument breaks this plugin (bummer). I'm selecting the minute before and after the amcache record to see if there's anything additional and to pick up persistence mechanisms. Here is my draft command:

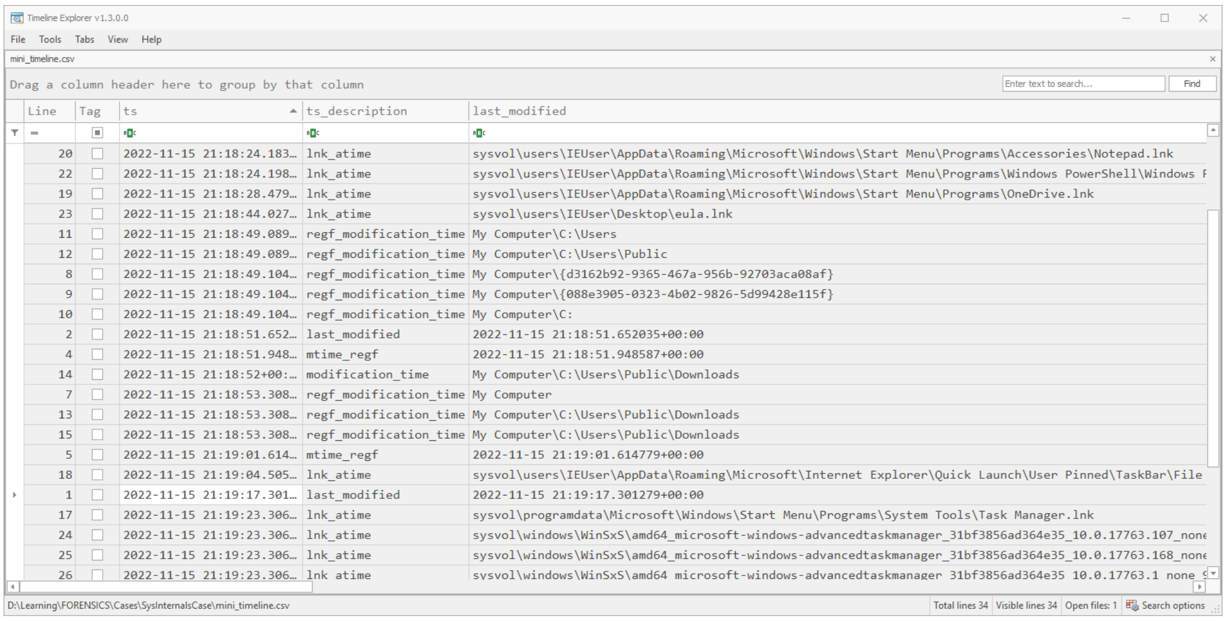
```
target-query -f shimcache,amcache,shellbags,lnk,services,runkeys
SysInternalsCase.E01 | rdump --multi-timestamp -s "r.ts and r.ts >=
datetime.datetime(2022,11,15,21,18) and r.ts <=
datetime.datetime(2022,11,15,21,20)" --csv -w mini_timeline.rec
```

Unfortunately, the datetime and timedelta modules aren't accessible from the string selector. We could try converting the timestamp to a string, but it is clunky and perhaps it is about time to switch to Python scripting here. Still, I feel that this should be an important use of the selector in rdump that should be supported. Last try at getting something working:

```
target-query -f shimcache,amcache,shellbags,lnk,services,runkeys
SysInternalsCase.E01 | rdump --multi-timestamp -s "r.ts and
r.ts.year == 2022 and r.ts.month == 11 and r.ts.day == 15 and
r.ts.hour == 21 and r.ts.minute in range(18,20)" --csv -w
mini_timeline.csv
```

This resulted in only 7 records in the outputted CSV. I opened up an issue with the flow.record module and one of the maintainers helped me realize my mistake here. rdump –multi-timestamp is the operation that breaks copies each timestamp in the record into its own event with an r.ts field, which means that the field is not yet present in the record in the first operation. I needed to pipe the output of –multi-timestamp to another rdump execution to select that field. Like so:

```
target-query -f shimcache,amcache,shellbags,lnk,services,runkeys
SysInternalsCase.E01 | rdump --multi-timestamp -w - | rdump -s
"r.ts and r.ts.year == 2022 and r.ts.month == 11 and r.ts.day == 15
and r.ts.hour == 21 and r.ts.minute in range(18,20)" --csv -w
mini_timeline.csv
```


Timeline Explorer v1.3.0.0
File
Tools
Tabs
View
Help
mini_timeline.csv
Drag a column header here to group by that column
Enter text to search...
Find

Line	Tag	ts	ts_description	last_modified
20	☐	2022-11-15 21:18:24.183…	lnk_atime	sysvol\users\IEUser\AppData\Roaming\Microsoft\Windows\Start Menu\Programs\Accessories\Notepad.lnk
22	☐	2022-11-15 21:18:24.198…	lnk_atime	sysvol\users\IEUser\AppData\Roaming\Microsoft\Windows\Start Menu\Programs\Windows PowerShell\Windows F
19	☐	2022-11-15 21:18:28.479…	lnk_atime	sysvol\users\IEUser\AppData\Roaming\Microsoft\Windows\Start Menu\Programs\OneDrive.lnk
23	☐	2022-11-15 21:18:44.027…	lnk_atime	sysvol\users\IEUser\Desktop\eula.lnk
11	☐	2022-11-15 21:18:49.089…	regf_modification_time	My Computer\C:\Users
12	☐	2022-11-15 21:18:49.089…	regf_modification_time	My Computer\C:\Users\Public
8	☐	2022-11-15 21:18:49.104…	regf_modification_time	My Computer\{d3162b92-9365-467a-956b-92703aca08af}
9	☐	2022-11-15 21:18:49.104…	regf_modification_time	My Computer\{088e3905-0323-4b02-9826-5d99428e115f}
10	☐	2022-11-15 21:18:49.104…	regf_modification_time	My Computer\C:
2	☐	2022-11-15 21:18:51.652…	last_modified	2022-11-15 21:18:51.652035+00:00
4	☐	2022-11-15 21:18:51.948…	mtime_regf	2022-11-15 21:18:51.948587+00:00
14	☐	2022-11-15 21:18:52+00:…	modification_time	My Computer\C:\Users\Public\Downloads
7	☐	2022-11-15 21:18:53.308…	regf_modification_time	My Computer
13	☐	2022-11-15 21:18:53.308…	regf_modification_time	My Computer\C:\Users\Public\Downloads
15	☐	2022-11-15 21:18:53.308…	regf_modification_time	My Computer\C:\Users\Public\Downloads
5	☐	2022-11-15 21:19:01.614…	mtime_regf	2022-11-15 21:19:01.614779+00:00
18	☐	2022-11-15 21:19:04.505…	lnk_atime	sysvol\users\IEUser\AppData\Roaming\Microsoft\Internet Explorer\Quick Launch\User Pinned\TaskBar\File
1	☐	2022-11-15 21:19:17.301…	last_modified	2022-11-15 21:19:17.301279+00:00
17	☐	2022-11-15 21:19:23.306…	lnk_atime	sysvol\programdata\Microsoft\Windows\Start Menu\Programs\System Tools\Task Manager.lnk
24	☐	2022-11-15 21:19:23.306…	lnk_atime	sysvol\windows\WinSxS\amd64_microsoft-windows-advancedtaskmanager_31bf3856ad364e35_10.0.17763.107_none
25	☐	2022-11-15 21:19:23.306…	lnk_atime	sysvol\windows\WinSxS\amd64_microsoft-windows-advancedtaskmanager_31bf3856ad364e35_10.0.17763.168_none
26	☐	2022-11-15 21:19:23.306…	lnk_atime	sysvol\windows\WinSxS\amd64_microsoft-windows-advancedtaskmanager_31bf3856ad364e35_10.0.17763.1_none_

D:\Learning\FORENSICS\Cases\SysInternalsCase\mini_timeline.csv Total lines 34 Visible lines 34 Open files: 1 Search options

After sorting by timestamp, we get 29 rows of timestamped events, plus header rows. Between amcache, shimcache, shellbags and lnk files, we can see that the user navigated to the Public downloads folder and executed SysInternals.exe. Since there seems to have been a download, I want to add in the dissect function **browsers** to enumerate all browsers and extract relevant events. Running the following command took approximately 4 minutes and 15 seconds:

```
target-query -f
shimcache,amcache,shellbags,lnk,services,runkeys,browsers
SysInternalsCase.E01 | rdump --multi-timestamp -w - | rdump -s
"r.ts and r.ts.year == 2022 and r.ts.month == 11 and r.ts.day == 15
and r.ts.hour == 21 and r.ts.minute in range(18,20)" --csv -w
mini_timeline.csv
```

In addition to the information in the previous mini-timeline, the following URLs were extracted from the browser plugin, occurring in order:

https://go.microsoft.com/fwlink/?LinkId=525773
https://go.microsoft.com/
ms-appx-web://microsoft.microsoftedge/
ms-appx-web://microsoft.microsoftedge/assets/errorpages/dnserror.html?DNSError=11001&ErrorStatus=0x800C0005&NetworkStatusSupported=1
ms-appx-web://microsoft.microsoftedge/assets/errorpages/dnserror.html?DNSError=11001&ErrorStatus=0x800C0005&NetworkStatusSupported=1
https://www.msn.com/
ms-appx-web://microsoft.microsoftedge/assets/errorpages/dnserror.html?DNSError=11001&ErrorStatus=0x800C0005&NetworkStatusSupported=1
http://www.sysinternals.com/SysInternals.exe
http://www.sysinternals.com/SysInternals.exe

It's fascinating the malware seems to come from a well-known site. However, it's not clear at this point that the user connected to the proper IP to download this file. To determine that, it would be nice to get some confirmation from event logs, especially the DNS client.

Trying out target-dump

I was thinking that there might be some benefit to dumping the content of all these plugins to json-lines format instead, in case I want to do an operation on a particular artifact a bit more quickly or debug that artifact. I'm also curious if there are speed or memory benefits of this.

Note: It turns out there is a bug in target-dump and it doesn't support plugin namespaces (yet). So for the amcache function specifically, I had to qualify the plugin names:

```
target-dump --restart -o . -f
shimcache,amcache.files,amcache.application_files,amcache.programs,
shellbags,lnk,services,runkeys,browsers SysInternalsCase.E01
```

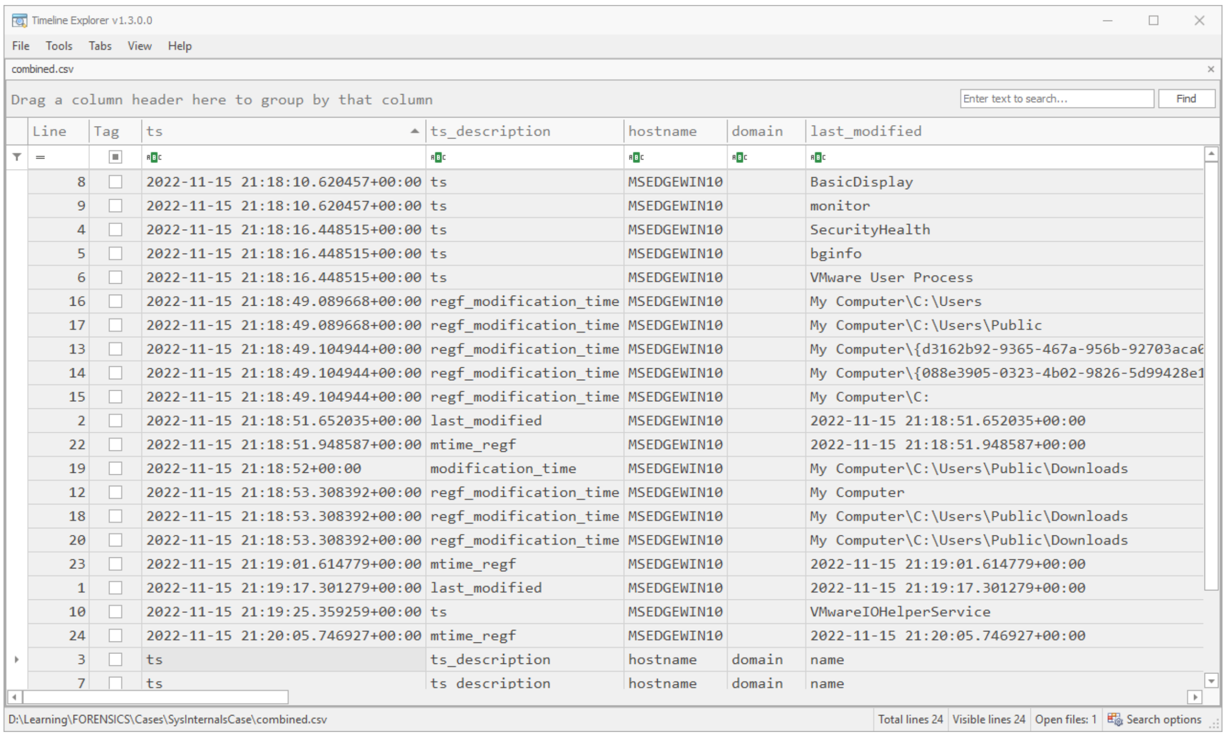
The output of this command creates a folder with the name of the endpoint, in this case MSEDGEWIN10. Then you can use this command to combine them all into one .jsonlines file:

```
rdump --multi-timestamp -J -w combined.jsonl
MSEDGEWIN10/shimcache/windows_shimcache.jsonl
MSEDGEWIN10/runkeys/windows_registry_run.jsonl
MSEDGEWIN10/services/windows_service.jsonl
MSEDGEWIN10/shellbags/windows_shellbag.jsonl
MSEDGEWIN10/tasks/filesystem_windows_task_grouped.jsonl
```

I also noticed that the –multi-timestamp argument doesn't work with the task output filesystem_windows_task.json, which is why I left that file out in the above command. With that caveat in mind, we can use the same selector as before, but operating on combined.jsonl:

```
rdump --csv -w combined.csv -s "r.ts and r.ts.year == 2022 and
r.ts.month == 11 and r.ts.day == 15 and r.ts.hour == 21 and
r.ts.minute in range(18,21)" combined.jsonl
```

Here is the result (combined.csv). We end up with 20 rows of timestamped events and 4 header rows:


Timeline Explorer v1.3.0.0

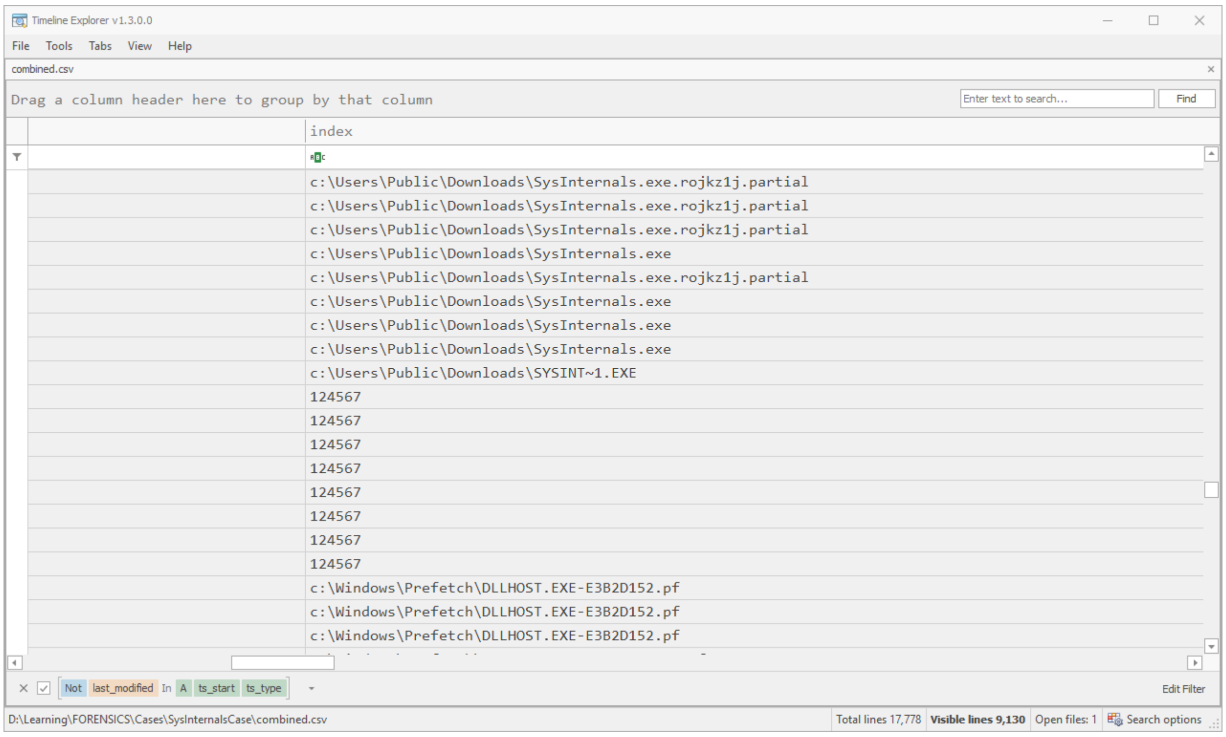
combined.csv

Drag a column header here to group by that column

Line	Tag	ts	ts_description	hostname	domain	last_modified
8	☐	2022-11-15 21:18:10.620457+00:00	ts	MSEDGEWIN10		BasicDisplay
9	☐	2022-11-15 21:18:10.620457+00:00	ts	MSEDGEWIN10		monitor
4	☐	2022-11-15 21:18:16.448515+00:00	ts	MSEDGEWIN10		SecurityHealth
5	☐	2022-11-15 21:18:16.448515+00:00	ts	MSEDGEWIN10		bginfo
6	☐	2022-11-15 21:18:16.448515+00:00	ts	MSEDGEWIN10		VMware User Process
16	☐	2022-11-15 21:18:49.089668+00:00	regf_modification_time	MSEDGEWIN10		My Computer\C:\Users
17	☐	2022-11-15 21:18:49.089668+00:00	regf_modification_time	MSEDGEWIN10		My Computer\C:\Users\Public
13	☐	2022-11-15 21:18:49.104944+00:00	regf_modification_time	MSEDGEWIN10		My Computer\{d3162b92-9365-467a-956b-92703aca
14	☐	2022-11-15 21:18:49.104944+00:00	regf_modification_time	MSEDGEWIN10		My Computer\{088e3905-0323-4b02-9826-5d99428e1
15	☐	2022-11-15 21:18:49.104944+00:00	regf_modification_time	MSEDGEWIN10		My Computer\C:
2	☐	2022-11-15 21:18:51.652035+00:00	last_modified	MSEDGEWIN10		2022-11-15 21:18:51.652035+00:00
22	☐	2022-11-15 21:18:51.948587+00:00	mtime_regf	MSEDGEWIN10		2022-11-15 21:18:51.948587+00:00
19	☐	2022-11-15 21:18:52+00:00	modification_time	MSEDGEWIN10		My Computer\C:\Users\Public\Downloads
12	☐	2022-11-15 21:18:53.308392+00:00	regf_modification_time	MSEDGEWIN10		My Computer
18	☐	2022-11-15 21:18:53.308392+00:00	regf_modification_time	MSEDGEWIN10		My Computer\C:\Users\Public\Downloads
20	☐	2022-11-15 21:18:53.308392+00:00	regf_modification_time	MSEDGEWIN10		My Computer\C:\Users\Public\Downloads
23	☐	2022-11-15 21:19:01.614779+00:00	mtime_regf	MSEDGEWIN10		2022-11-15 21:19:01.614779+00:00
1	☐	2022-11-15 21:19:17.301279+00:00	last_modified	MSEDGEWIN10		2022-11-15 21:19:17.301279+00:00
10	☐	2022-11-15 21:19:25.359259+00:00	ts	MSEDGEWIN10		VMwareIOHelperService
24	☐	2022-11-15 21:20:05.746927+00:00	mtime_regf	MSEDGEWIN10		2022-11-15 21:20:05.746927+00:00
3	☐	ts	ts_description	hostname	domain	name
7	☐	ts	ts_description	hostname	domain	name

D:\Learning\FORENSICS\Cases\SysInternalsCase\combined.csv Total lines 24 Visible lines 24 Open files: 1 Search options

To flesh things out more like a proper timeline, I also did a target-dump of the mft, usnjrnl, browser.-downloads, browser.history and evtx plugins, which took about 30 minutes, and followed the above steps to narrow down to the 3 minutes of interest. This resulted in about 18,000 rows in the CSV, good enough to start straining the eyes. Parsing the MFT or USN journal always takes forever, but you get so much more data than you might expect. For example, if I run the Prefetch plugin on this E01, or do a target-shell and go to the Prefetch folder, there's no output (or .pf files found). Yet, the parsed MFT was able to show that they were created at the time (not for SysInternals.exe itself, though):


Timeline Explorer v1.3.0.0
File
Tools
Tabs
View
Help
combined.csv
Drag a column header here to group by that column
Enter text to search...
Find
Not last_modified In A ts_start ts_type
Edit Filter
Search options

```
index
c:\Users\Public\Downloads\SysInternals.exe.rojkz1j.partial
c:\Users\Public\Downloads\SysInternals.exe.rojkz1j.partial
c:\Users\Public\Downloads\SysInternals.exe.rojkz1j.partial
c:\Users\Public\Downloads\SysInternals.exe
c:\Users\Public\Downloads\SysInternals.exe.rojkz1j.partial
c:\Users\Public\Downloads\SysInternals.exe
c:\Users\Public\Downloads\SysInternals.exe
c:\Users\Public\Downloads\SysInternals.exe
c:\Users\Public\Downloads\SYSINT~1.EXE
124567
124567
124567
124567
124567
124567
124567
124567
c:\Windows\Prefetch\DLLHOST.EXE-E3B2D152.pf
c:\Windows\Prefetch\DLLHOST.EXE-E3B2D152.pf
c:\Windows\Prefetch\DLLHOST.EXE-E3B2D152.pf
```

```
D:\Learning\FORENSICS\Cases\SysInternalsCase\combined.csv   Total lines 17,778   Visible lines 9,130   Open files: 1
```

Although the column says "index," in the MFT events these are full paths.

Conclusions and Recommendations

Next time, we can turn towards actually tackling the challenge with dissect. My recommendation for the time being is to set up dissect in an Ubuntu environment, separating it from other tools with a python virtual environment under pipx. I also recommend dumping plugin output to files at the beginning to save time when debugging or playing around.

For this challenge, I'm dumping the output of relevant plugins using target-dump and making a CSV mini-super-timeline of the couple of minutes surrounding the incident, just to get a general idea, then working the timeline forward as needed. I want to stick with text instead of jumping into the Python API just in case data isn't in its proper field. In Part 2, we'll attempt to reconstruct the story and focus on solving the challenge.

Also, apologies for all of the screenshots of shell output and CSVs! I'll attempt to use the formatting tools in both dissect and WordPress in Part 2 to select particular columns and make it more readable. Thanks for reading!

November 28, 2023 hein0us Uncategorized