An examination of Win10 ActivitiesCache.db database

Windows Timeline, is a new feature of Windows 10 introduced with version 1803.
It is part of the Connected Devices Platform

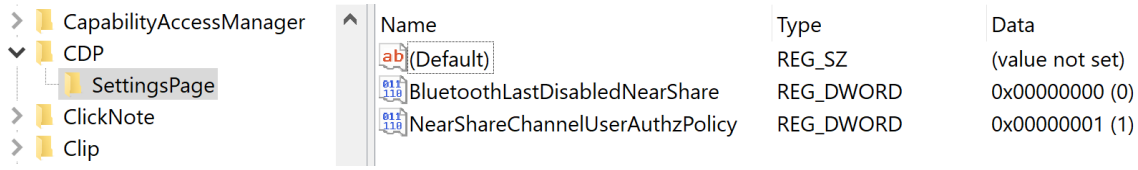
- *The Connected Devices Platform Service, is a Windows service that provides a way for devices such as PC's and smartphones to discover and send messages between each other.*
- *Connected Devices Platform Service (CDPSvc) Defaults in Windows 10.*

and the Microsoft Graph's Cross-device experience (Project Rome) .

The CDP settings for the Current User are stored in the registry at:
NTUSER.DAT -> 'Software\Microsoft\Windows\CurrentVersion\CDP'

Name	Type	Data
(Default)	REG_SZ	(value not set)
CdpSessionUserAuthzPolicy	REG_DWORD	0x00000001 (1)
CdpUserSettingsVersion	REG_SZ	RS4
EnableRemoteLaunchToast	REG_DWORD	0x00000001 (1)
NearShareChannelUserAuthzPolicy	REG_DWORD	0x00000000 (0)
RomeSdkChannelUserAuthzPolicy	REG_DWORD	0x00000001 (1)

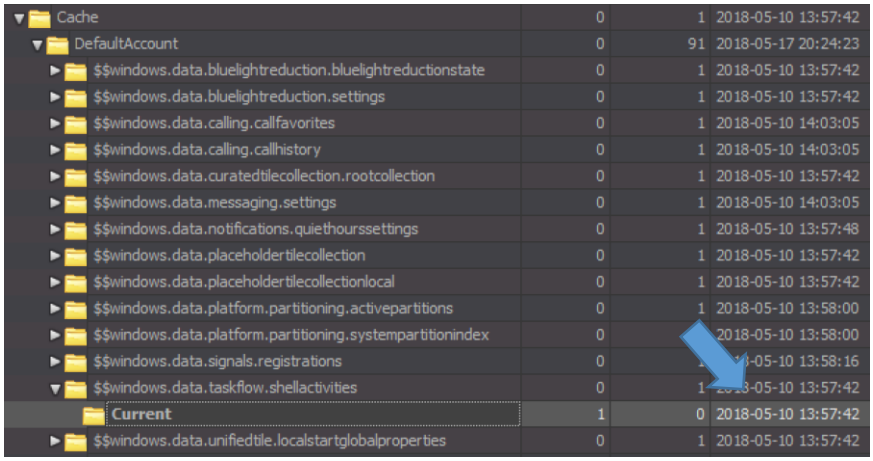
and



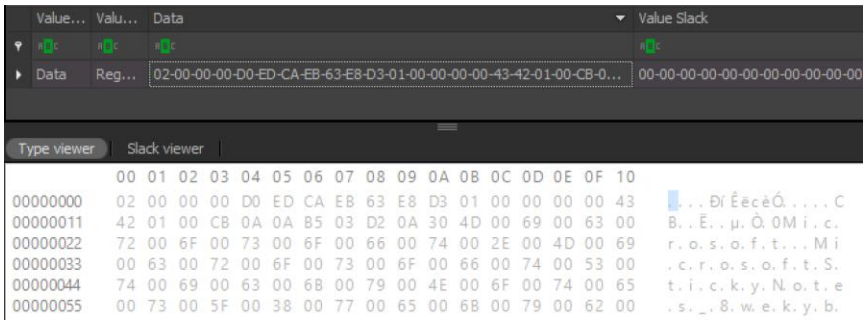
Before Windows 10 version 1803

The service and the 'ActivitiesCache.db' database existed before the 1803 upgrade (May 2018), but with limited functionality. Another possibly related* activity store location is at: '*Software\Microsoft\Windows\CurrentVersion\CloudStore\Store\Cache\DefaultAccount\$$windows.data.taskflow.shellactivities\Current*'

**(considering that the current ActivitiesCache.db uses taskflow to retrieve device information as seen further below in this document)*

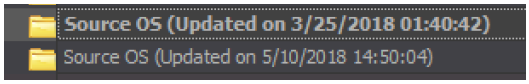


where there is a value named 'Data':

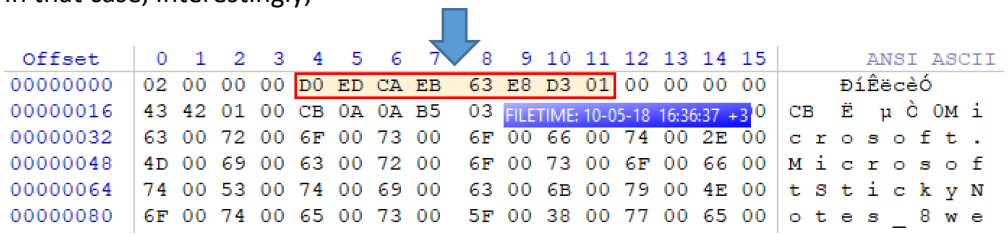


Its value is in hex and it seems to hold interesting information, including the Filetime of last update (which corresponds to the Last Write Timestamp of the registry key).

If Windows is updated to version 1803, this 'log' stops being updated. This can be checked by looking in the SYSTEM hive at the Setup key like:



In that case, interestingly,



this Filetime is very close to the date of the ntuser.dat.LOG files (*which coincides with the date the 1803 update occurred*), and that can also be seen from the last entry above:

Further examination shows a consistent pattern:

- 0xD2 14 = Start of Entry
- Next byte = length of block (x2)
- Start of path & executable
- 0xC6 1F = End of block
- Next 4 bytes = unknown
- 0xD2 23 = Executable Block
- Next byte = length of block (x2)
- Executable
- 0xD2 28 = Payload block
- Next byte = length of block (x2)
- Payload (eg email, URL etc.)
- 0xC6 32 = end of block
- Next 9 bytes = (A) is the same as (B) of the next entry (upwards)
- 0xC6 3C = Pointer to next entry
- Next 9 bytes = (B) is the same as (A) of the next entry (upwards) *
- 0x CA500000 = End of Entry

**Top most entry is the newest one, so for the last entry these 9 bytes are all 0xFF*

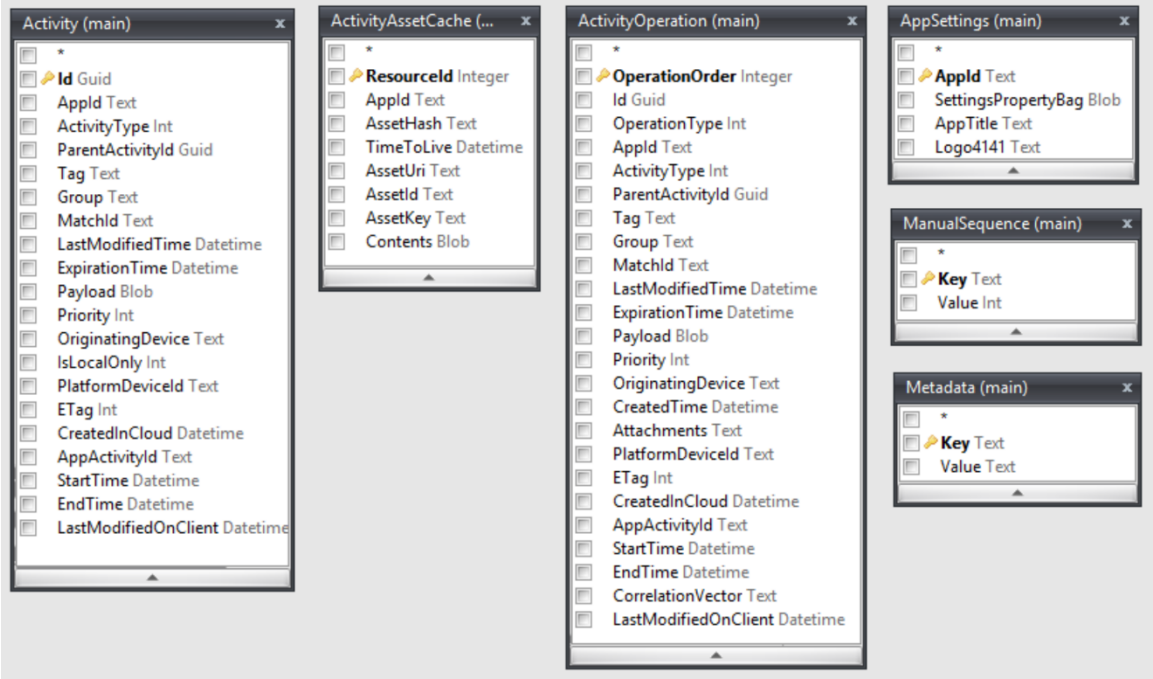
Offset	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
00000000	02	00	00	00	69	BC	79	90	8F	E9	D3	01	00	00	00	00
00000016	43	42	01	00	CB	0A	0A	91	03	D2	14	25	FILETIME: 12-05-18			
00000032	5C	00	24	00	57	00	49	00	4E	00	44	00	4F	00	57	00
00000048	53	00	2E	00	7E	00	42	00	54	00	5C	00	53	00	6F	00
00000064	75	00	72	00	63	00	65	00	73	00	5C	00	53	00	65	00
00000080	74	00	75	00	70	00	48	00	6F	00	73	00	74	00	2E	00
00000096	65	00	78	00	65	00	C6	1F	80	8D	DC	01	D2	23	0D	53
00000112	00	65	00	74	00	75	00	70	00	48	00	6F	00	73	00	74
00000128	00	2E	00	65	00	78	00	65	00	D2	28	10	57	00	69	00
00000144	6E	00	64	00	6F	00	77	00	73	00	20	00	31	00	30	00
00000160	20	00	53	00	65	00	74	00	75	00	70	00	C6	32	80	9E
00000176	9D	A9	F3	B1	FA	E9	01	C6	3C	FF	FF	FF	FF	FF	FF	FF
00000192	FF	FF	01	CA	50	00	00	D2	14	39	46	00	3A	00	5C	00
00000208	5F	00	46	00	6F	00	72	00	65	00	6E	00	73	00	69	00
00000224	63	00	20	00	54	00	6F	00	6F	00	6C	00	73	00	5C	00
00000240	64	00	6D	00	64	00	65	00	2D	00	70	00	72	00	6F	00
00000256	66	00	2D	00	32	00	2E	00	34	00	2E	00	36	00	2E	00
00000272	34	00	34	00	38	00	2D	00	77	00	69	00	6E	00	36	00
00000288	34	00	2D	00	67	00	75	00	69	00	5C	00	64	00	6D	00
00000304	64	00	65	00	2E	00	65	00	78	00	65	00	C6	1F	8E	9D
00000320	9C	01	D2	23	08	64	00	6D	00	64	00	65	00	2E	00	65
00000336	00	78	00	65	00	D2	28	17	44	00	4D	00	44	00	45	00
00000352	20	00	33	00	2E	00	34	00	2E	00	32	00	20	00	46	00
00000368	72	00	65	00	65	00	20	00	45	00	64	00	69	00	74	00
00000384	69	00	6F	00	6E	00	C6	32	E7	81	B1	91	F3	B1	FA	E9
00000400	01	C6	3C	80	9E	9D	A9	F3	B1	FA	E9	01	CA	50	00	00
00000416	D2	14	2C	43	00	3A	00	5C	00	50	00	72	00	6F	00	67
00000432	00	72	00	61	00	6D	00	20	00	46	00	69	00	6C	00	65

With a bit of tweaking in Notepad++, it shows web page titles, email (used in accounts of Outlook), File Explorer paths followed and name of the remote devices accessed with Teamviewer among other.

Back to the 'ActivitiesCache.db' database.

The location of both old and new dBs is at the "%userprofile%\appdata\local\ConnectedDevicesPlatform" folder.

The old dB table structure was similar to the new dB, but it included 6 tables + the master table (the 'Activity_PackageId' table was missing, and there were different fields):



The information held was also different:

E.g. the 'AppSettings' table in the old DB looked like this:

Table: AppSettings

	AppId	SettingsPropertyBag	AppTitle	Logo4141
	Filter	Filter	Filter	Filter
1	windows.immersivecontrolpanel_cw5n1h2txyewy!microsoft.windows.immersivecontrolpanel	BLOB	NULL	NULL
2	Microsoft.SkypeApp_kzf8qxf38zg5c!ppleae38af2e007f4358a809ac99a64a67c1	BLOB		NULL
3	Microsoft.SkypeApp_kzf8qxf38zg5c!App	BLOB	NULL	NULL
4	Microsoft.MicrosoftEdge_8wekyb3d8bbwe!MicrosoftEdge	BLOB	NULL	NULL
5	AD2F1837.HPPrinterControl_v10z8vjag6ke6!AD2F1837.HPPrinterControl	BLOB	NULL	NULL
6	Microsoft.BingNews_8wekyb3d8bbwe!AppexNews	BLOB	NULL	NULL
7	Microsoft.WindowsCamera_8wekyb3d8bbwe!App	BLOB	NULL	NULL
8	Microsoft.Windows.Photos_8wekyb3d8bbwe!App	BLOB	NULL	NULL
9	VirtualPulse.PlayerforMedia_nh7p8cqfc4t04!App	BLOB	NULL	NULL

And included UWP (*Universal Windows Platform*) Apps only.
The new dB does not have any entries in this table.

The 'Metadata' table was also different:

Table: Metadata

	Key	Value
	Filter	Filter
1	CurrentEtag	5b15de40-92c2-11e7-9117-01020305070d
2	CurrentSettings	{"ActivityTypes":[4,3,2,1,0],"Environment":"prod"}
3	PendingStrongAuth	{"pendingStrongAuth":true}

Looking at the entries in an L.username folder and a MS account id folder, the username (local account) dB has these entries:

Table: Metadata

	Key	Value
	Filter	Filter
1	CurrentSettings	{"ActivityTypes":[4,3,2,1,0],"Environment":"prod"}

And the Microsoft Account dB these:

Table: Metadata

	Key	Value
	Filter	Filter
1	CurrentSettings	{"ActivityTypes":[4,3,2,1,0,5,6],"Environment":"prod"}
2	CurrentEtag	12c3eb60-189a-11e8-9117-01020305070d

From this, we can deduce that 'CurrentSettings' is where the Activity Types of the entries populating the database are defined.

The Smartlookup view (query, included in the dB):

```
select
    [O].[Id],
    [O].[AppId],
    [O].[AppActivityId],
    [O].[ActivityType],
    [O].[ParentActivityId],
    [O].[Tag],
    [O].[Group],
    [O].[MatchId],
    [O].[LastModifiedTime],
    [O].[ExpirationTime],
    [O].[Payload],
    [O].[Priority],
    [O].[OriginatingDevice],
    [A].[IsLocalOnly],
    [A].[PlatformDeviceId],
    [A].[CreatedInCloud],
    [O].[StartTime],
    [O].[EndTime],
    [O].[LastModifiedOnClient],
    [O].[ETag]
from   [ActivityOperation] as [O]
    left outer join [Activity] as [A] on [O].[Id] = [A].[Id]
where  [O].[OperationType] <> 3
union
select
    [Id],
    [AppId],
    [AppActivityId],
    [ActivityType],
    [ParentActivityId],
    [Tag],
    [Group],
    [MatchId],
    [LastModifiedTime],
    [ExpirationTime],
    [Payload],
    [Priority],
    [OriginatingDevice],
    [IsLocalOnly],
    [PlatformDeviceId],
    [CreatedInCloud],
    [StartTime],
    [EndTime],
    [LastModifiedOnClient],
    [ETag]
from   [Activity]
where  [Id] not in (select [Id]
    from   [ActivityOperation])
```

Typical ActivityOperation table entries were of ActivityType 2 :

Table: ActivityOperation

	Id	OperationType	AppId	AppActivityId	ActivityType	ParentActivityId
	Filter	Filter	Filter	Filter	Filter	Filter
1	`elx aM`	1	{"alternateId":"Settings"…		2	BLOB
2	`elx aM`	3	{"alternateId":"Settings"…		2	BLOB

and were in fact Notifications, similar to the ones we can see in
%username%\AppData\Local\Microsoft\Windows\Notifications\wpndatabase.db

The AppID was a json blob like this:

Tag	Value
<object>	
alternateId	Settings
instanceId	0
packageId	windows.immersivecontrolpanel_cw5n1h2txyewy!microsoft.windows.immersivecontrolpanel
titleId	0
windows_universal	windows.immersivecontrolpanel_cw5n1h2txyewy!microsoft.windows.immersivecontrolpanel

And the Payload field

Tag	Group	MatchId	ıstModifiedTin	ExpirationTime	Payload
Filter	Filter	Filter	Filter	Filter	Filter
EditionUpgradeTag	EditionUpgradeGroup	NULL	1521896726	1522501525	<toast NotificationId="107" di…
EditionUpgradeTag	EditionUpgradeGroup	NULL	1521896726	1522501525	<toast NotificationId="107" di…

was an XML blob:

```
<toast NotificationId="107" displayTimestamp="131663703259843007" launch="page=SettingsPageActivate">
  <visual>
    <binding template="ToastText02">
      <text id="1">
        Success!
      </text>
      <text id="2">
        You're all done and your PC is ready to go.
      </text>
    </binding>
  </visual>
</toast>
```

From this, another deduction can be made, that ActitivityType 2 is for Toast Notification entries.

The **new** *(1803)* dB has different fields:

Table: Metadata

	Key	Value
	Filter	Filter
1	CurrentSettings	{"ActivityTypes":[4,3,2,1,0,5,13,6],"Environment":"prod"}
2	DatabaseInstanceId	38608
3	DatabaseInstanceIdUpdateTime	2018-05-10T14:00:55.845Z

After examination of various new 'ActivitiesCache.db' files, any entries seen in the new database have an 'ActivityType' (as *seen above*) of 5 or 6, which appear to represent '*Open App/File/Url*' and '*App In Focus*' respectively – type 13 entries were not observed in any dB yet.

The 'DatabaseInstanceIdUpdateTime' date seen above, is the date & time (in UTC) that the current dB file was created.

A Microsoft Account related DB includes one more field, the 'CurrentEtag' but instead of using an ETAG in the form found elsewhere in the dB, it lists it in the form of a GUID – that is the Cloud ETAG:

	Key	Value
	Filter	Filter
1	CurrentSettings	{"ActivityTypes":[4,3,2,1,0,5,13,6],"Environ...
2	DatabaseInstanceId	23919
3	DatabaseInstanceIdUpdateTime	2018-05-10T13:58:59.758Z
4	CurrentEtag	8df03b30-642c-11e8-9117-01020305070d

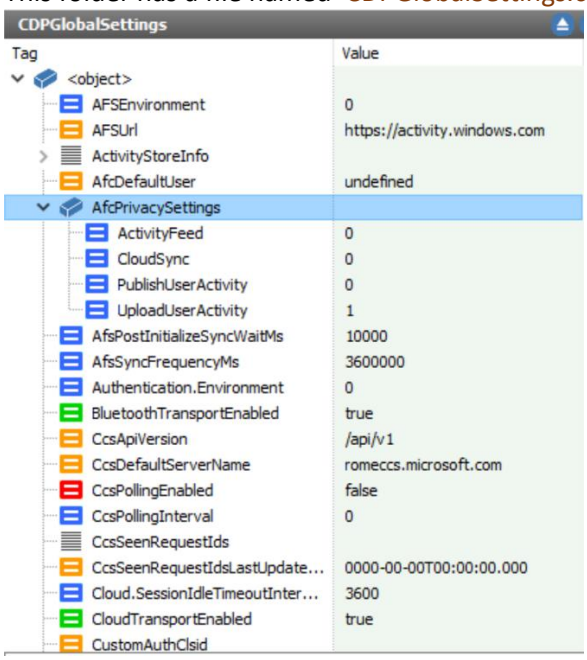
The ‘SmartLookUp’ view in the old DB was also different:

```
select
       [O].[Id],
       [O].[AppId],
       [O].[AppActivityId],
       [O].[ActivityType],
       [O].[ParentActivityId],
       [O].[Tag],
       [O].[Group],
       [O].[MatchId],
       [O].[LastModifiedTime],
       [O].[ExpirationTime],
       [O].[Payload],
       [O].[Priority],
       [O].[OriginatingDevice],
       [A].[IsLocalOnly],
       [A].[PlatformDeviceId],
       [A].[CreatedInCloud],
       [O].[StartTime],
       [O].[EndTime],
       [O].[LastModifiedOnClient],
       [O].[ETag]
from   [ActivityOperation] as [O]
       left outer join [Activity] as [A] on [O].[Id] = [A].[Id]
where  [O].[OperationType] <> 3
union
select
       [Id],
       [AppId],
       [AppActivityId],
       [ActivityType],
       [ParentActivityId],
       [Tag],
       [Group],
       [MatchId],
       [LastModifiedTime],
       [ExpirationTime],
       [Payload],
       [Priority],
       [OriginatingDevice],
       [IsLocalOnly],
       [PlatformDeviceId],
       [CreatedInCloud],
       [StartTime],
       [EndTime],
       [LastModifiedOnClient],
       [ETag]
from   [Activity]
where  [Id] not in (select [Id]
       from   [ActivityOperation])
```

The new Timeline & ActivitiesCache.db

The NEW (updated) database stores information for each user in the %LOCALAPPDATA% \ConnectedDevicesPlatform folder or more commonly familiar as: C:\users\username\appdata\local\ConnectedDevicesPlatform

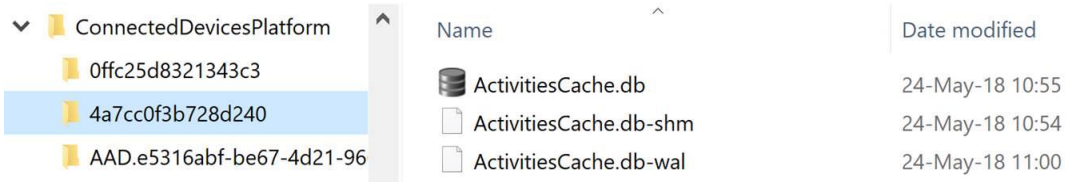
This folder has a file named 'CDPGlobalSettings.cdp' which is essentially a .json file



and includes information for the service including the store location for the database that holds the windows timeline entries for the current user.

The folder name may include one or more of:

- A Local account starting with an L.UserName, and/or
- folder(s) which appear to be name with random numbers but are the cid's of Microsoft accounts (e.g. Outlook.com, Live.com, Hotmail.com or MSN.com domains).



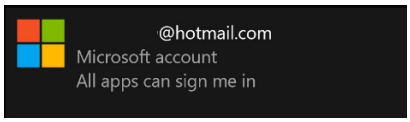
If a user logs in to Windows with a MS account, then the respective dB is populated. Information as to which online account has this specific ID can be found at:
NTUSER.DAT -> '*Software\Microsoft\IdentityCRL\UserExtendedProperties*'
Under each online account (email) the 'cid' Value contains the respective value for each Microsoft Account & folder.

If a user logs in with a local account, then the "L.UserName" database is populated.

A Microsoft Exchange (Office365 etc.) account starts with 'AAD' and is in the form of AAD.[sid]. AAD denotes a business account (*as in Azure Active Directory*) and information associated with this account 's [sid] can be found in NTUSER.dat at -> '*Software\Microsoft\MSOIdentityCRL\UserExtendedProperties'* and/or '*Software\Microsoft\OneDrive\Accounts\Business1'*

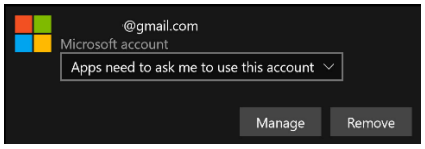
However, there are two cases when, even if a user continues to use a local account to sign in Windows 10 , the activities can still be synchronized across devices:

1. The User has set up a Microsoft Account at "Settings-> Accounts->Email&app accounts" and set it up so that all apps can sign in with this account:

   In this case the "L.UserName" folder is removed, and the active folder is the folder that corresponds to this account. All activities are synched across devices.

2. The User has set up a Microsoft Account at "Settings-> Accounts->Email&app accounts" and set it up so that Apps need permission to use this account:

   In this case, the local activities are stored in the "L.Username" folder, but any activity on other devices is stored in the respective folder that corresponds to this MS account used on these devices.

The timeline settings ('Settings –> Privacy –> Activity History') enable or not activity to be tracked in the 'ActivitiesCache.db'. In order for the activity to be shared across devices (*via the cloud*) you need to login with a Microsoft account, enable Windows Hello (i.e. create pin and or biometric/photo login).
https://support.microsoft.com/en-us/help/4026102/windows-10-about-sync-settings

To enable cross-device experiences, your app users must login with either a Microsoft Account or an Azure Active Directory account.

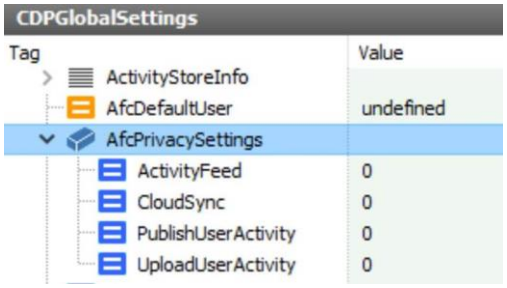
https://github.com/Microsoft/project-rome/blob/master/cross-device_app_configuration.md

https://github.com/microsoftgraph/microsoft-graph-docs/blob/master/api-reference/beta/resources/intune_deviceconfig_windows10generalconfiguration.md

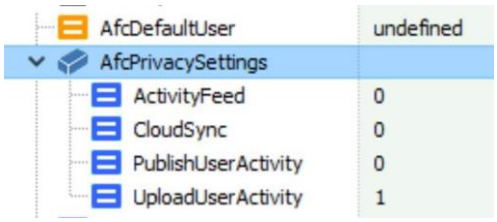
A list of settings that can be roamed or backed up (synced) across devices can be found here: https://docs.microsoft.com/en-us/azure/active-directory/active-directory-windows-enterprise-state-roaming-windows-settings-reference

The 'AfcPrivacySettings' in 'CDPGlobalSettings.cdp' depicts the relative settings in Windows 10 'Settings –> Privacy- >Activity History', for example:

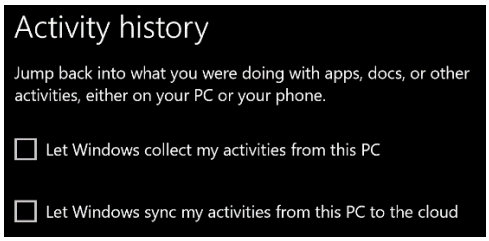
All settings ON:

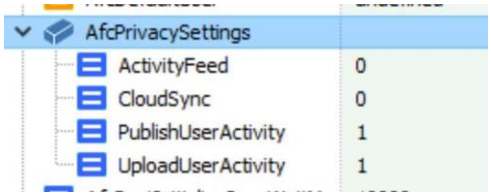


Upload to cloud off

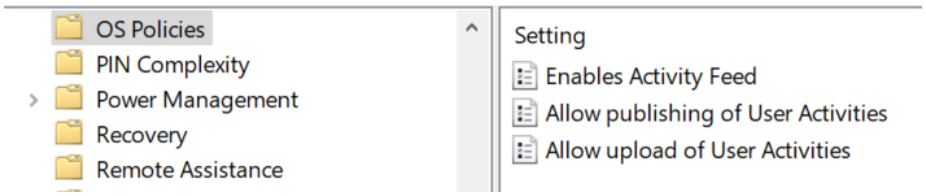


Publish off, cloud off



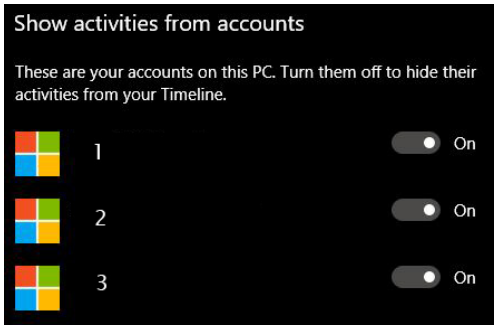


The same settings can also be configured through Group Policy at 'Computer Configuration -> Administrative Templates -> System ->OS Policies'



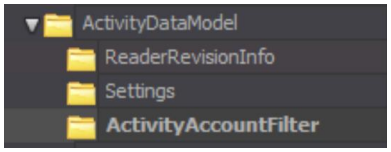
Opening the respective folder we can see the 'ActivitiesCache.db' (*and possibly also the ActivitiesCache.wal and ActivitiesCache.db-sdb files*) which is the storage of all timeline activity for the current user. When a user switches from a Local to a MS account, the 'L.UserName' is deleted and a new one is created (if it didn't exist before) under the respective MS account folder. Any previous entries in the 'L.UserName''s 'ActivitiesCache.db' now appear in the new 'ActivitiesCache.db' linked to the MS account, and sync to the cloud. Switching from a MS to a local account, the MS account related db is still available and holds timeline data.

When a user logs in Windows with a MS account, and the relevant check boxes in 'Settings –> Privacy- >Activity History' are set to On,

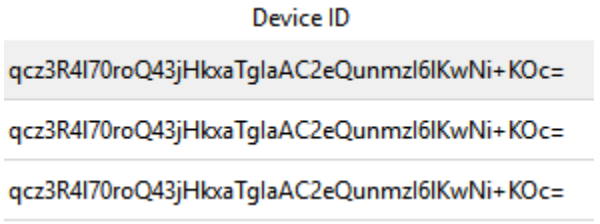


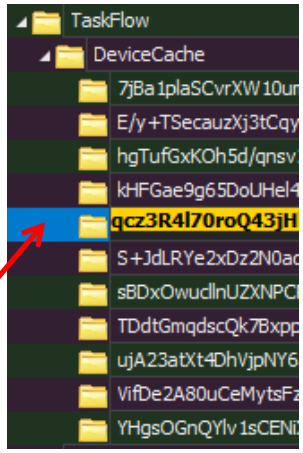
any activity created with his other MS account(s), is updated in the 'ActivitiesCache.db' in the respective '%LOCALAPPDATA% \ConnectedDevicesPlatform\' SubFolder, and can be seen in his timeline view .

Any -excluded from sync- accounts (*above setting set to off*) can be seen at the registry at:
NTUSER.dat
Software\Microsoft\Windows\CurrentVersion\ActivityDataModel\ActivityAccountFilter



The synchronized entries in a MS account related dB will show the 'Device ID' of the machine the entry originated from. The Device Name and Model of the originating machine can be seen in the NTUSER.dat's '*Software\Microsoft\Windows\CurrentVersion\TaskFlow\DeviceCache*':

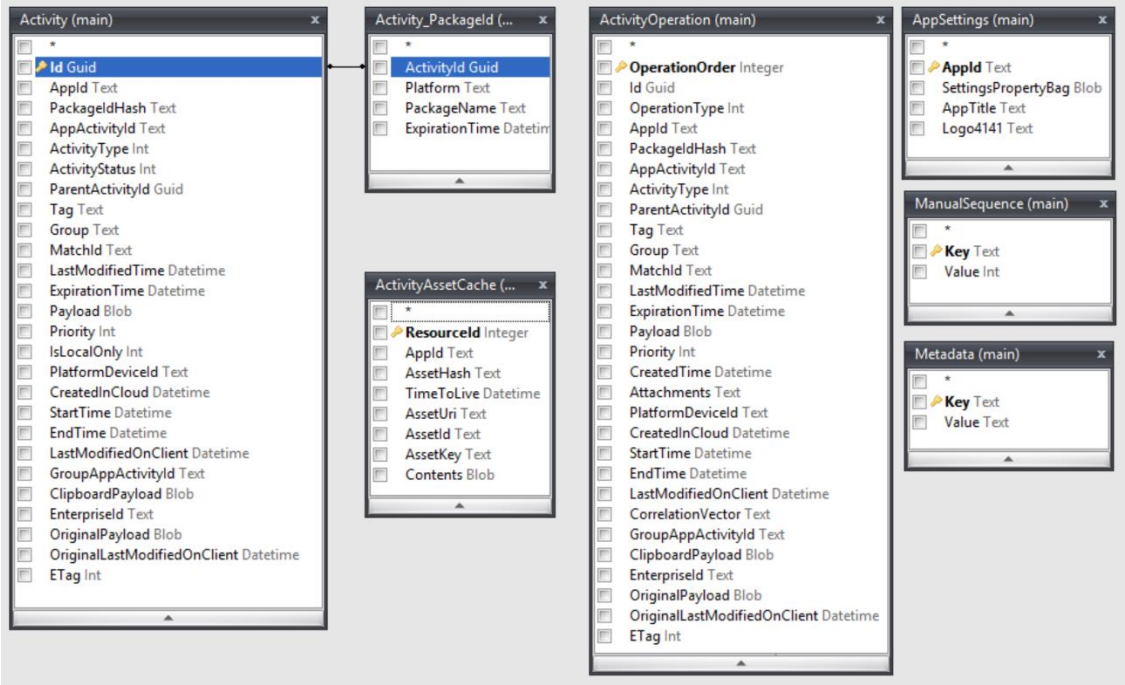




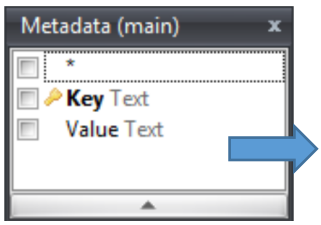
Even if a user logs in with a local account, when a MS Account was previously used for login, the entries of 'ActivitiesCache.db' of that account will also appear in the user's timeline (for the previous 7 days). So it may be prudent to examine all 'ActivitiesCache.db' databases in a system.

Following is the analysis of the new 'ActivitiesCache.db' file, using DB Browser for SQLite , SQLite Expert Professional, Notepad++ and JSON Viewer.

The database has the following structure (7 tables + the master table):



The 'Metadata' table includes the date/time the database was created by the system:



	Key	Value
	Filter	Filter
1	CurrentSettings	{"ActivityTypes":[4,3,2,1,0,5,13,6],"Environment":"prod"}
2	DatabaseInstanceId	3428
3	DatabaseInstanceIdUpdateTime	2018-05-24T08:16:50.365Z

Note: *see page 2 above for the differences with the old database*

The 'ManualSequence' table shows the last Activity (ETAG) recorded in the database:

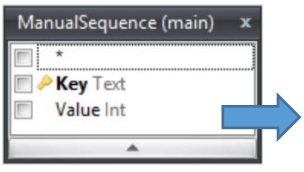
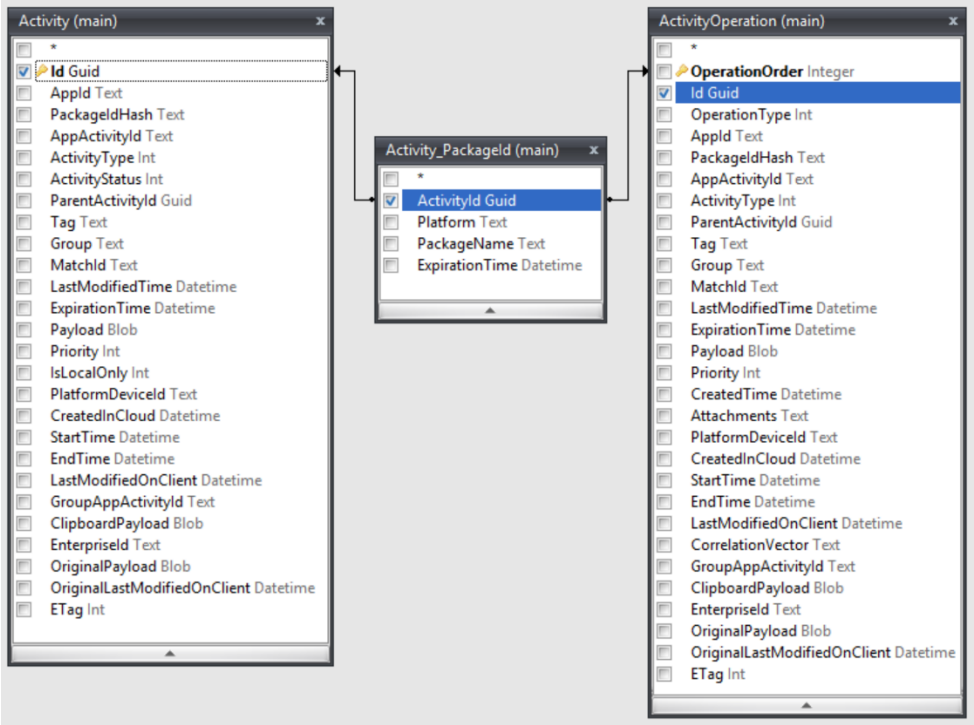


Table: ManualSequence

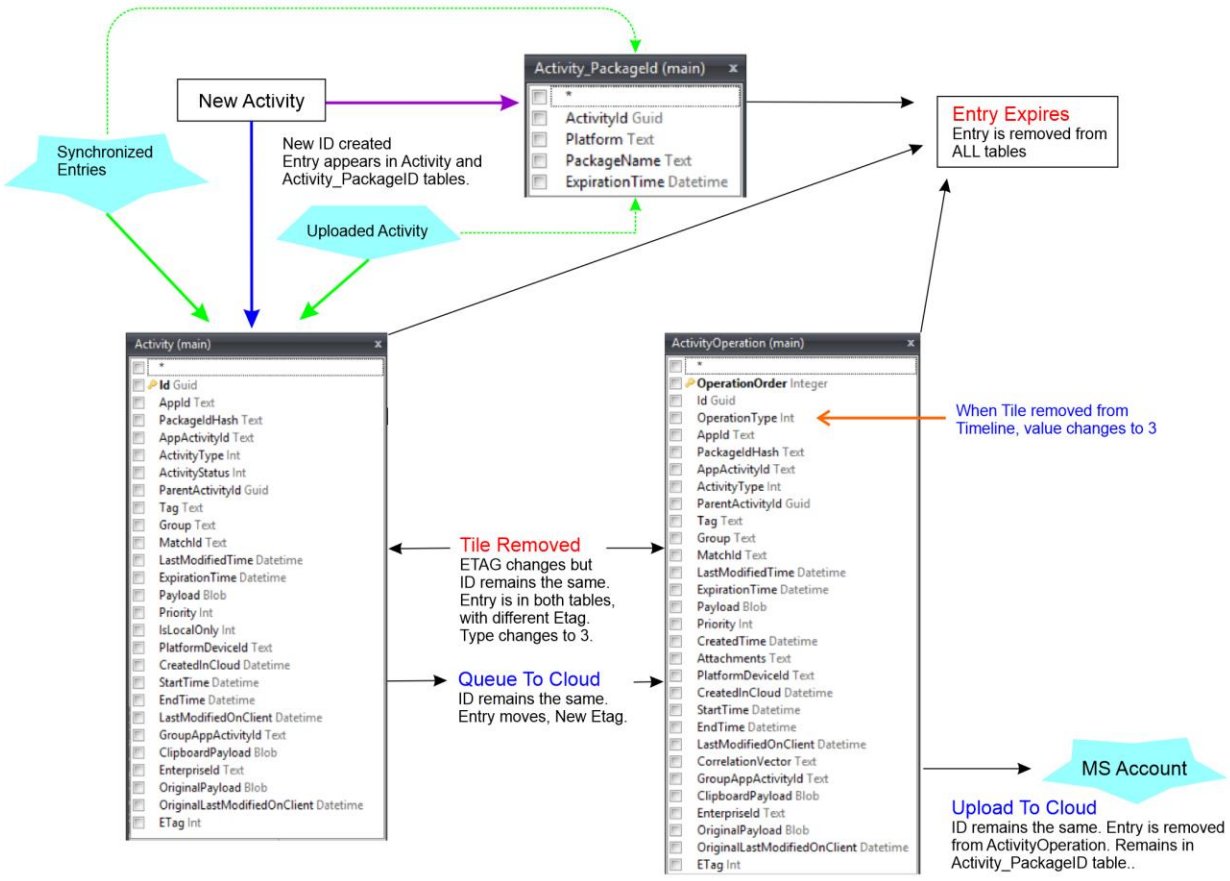
	Key	Value
	Filter	Filter
1	Activity	839

From the 7 tables above, only three hold information of user activities:

'Activity', 'ActivityOperation' and 'Activity_PackageID'



The Windows Timeline process looks like this:

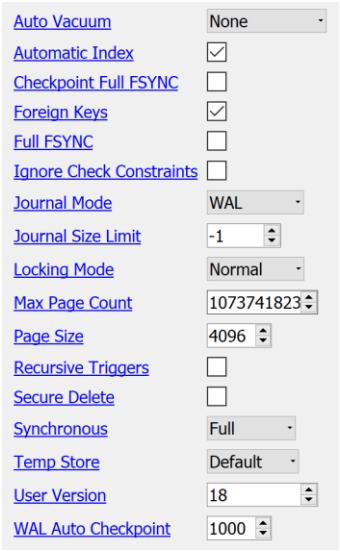


Any new application execution or focus change, triggers an entry to the 'Activity' table, and relevant entries in the 'Activity_PackageID' table.

Note: *It should be noted that any new entries/transactions are written first to the write ahead log ('ActivitiesCache.wal')*

Name	Date modified	Type	Size
ActivitiesCache.db	27-May-18 5:20 pm	DB File	4.196 KB
ActivitiesCache.db-shm	27-May-18 4:07 pm	DB-SHM File	32 KB
ActivitiesCache.db-wal	27-May-18 5:22 pm	DB-WAL File	528 KB

and the database is updated when the wal file reaches 1000 pages and commits the transactions. The default settings of the database show that each page is 4096 bytes long:



The query below (*which is in essence two united queries*) extracts all possible useful information from this database in a readable form. This query will not work properly in any SQLite browser that does not include support for the [json1 extension](#).

```
SELECT -- This the ActivityOperation Table Query
    ActivityOperation.ETag as 'Etag',
    json_extract(ActivityOperation.Payload, '$.appDisplayName') as 'Program Name',
    case
        when json_extract(ActivityOperation.AppId, '$[0].application') = '308046B0AF4A39CB'
            then 'Firefox-308046B0AF4A39CB'
        when json_extract(ActivityOperation.AppId, '$[1].application') = '308046B0AF4A39CB'
            then 'Firefox-308046B0AF4A39CB'
        when length (json_extract(ActivityOperation.AppId, '$[1].application')) > 17
            and length (json_extract(ActivityOperation.AppId, '$[1].application')) < 22
            then
            replace(replace(replace(replace(replace
            (json_extract(ActivityOperation.AppId, '$[0].application'),
            '{'||'6D809377-6AF0-444B-8957-A3773F02200E'||'}', '*ProgramFiles (x64)'),
            '{'||'7C5A40EF-A0FB-4BFC-874A-C0F2E0B9FA8E'||'}', '*ProgramFiles (x32)'),
            '{'||'1AC14E77-02E7-4E5D-B744-2EB1AE5198B7'||'}', '*System' ),
            '{'||'F38BF404-1D43-42F2-9305-67DE0B28FC23'||'}', '*Windows'),
            '{'||'D65231B0-B2F1-4857-A4CE-A8E7C6EA7D27'||'}', '*System32')
            else    replace(replace(replace(replace(replace(json_extract(ActivityOperation.AppId,
            '$[1].application'),
            '{'||'6D809377-6AF0-444B-8957-A3773F02200E'||'}', '*ProgramFiles (x64)' ),
            '{'||'7C5A40EF-A0FB-4BFC-874A-C0F2E0B9FA8E'||'}', '*ProgramFiles (x32)'),
            '{'||'1AC14E77-02E7-4E5D-B744-2EB1AE5198B7'||'}', '*System' ),
            '{'||'F38BF404-1D43-42F2-9305-67DE0B28FC23'||'}', '*Windows'),
            '{'||'D65231B0-B2F1-4857-A4CE-A8E7C6EA7D27'||'}', '*System32')
    end as 'Application',
    json_extract(ActivityOperation.Payload, '$.displayText')|| ' (' ||json_extract(ActivityOperation.Payload, '$.description')||')' as 'File/title/path
    opened',
    case when json_extract(ActivityOperation.Payload, '$.shellContentDescription') like '%FileShellLink%'
        then json_extract(ActivityOperation.Payload, '$.shellContentDescription.FileShellLink')
        else json_extract(ActivityOperation.Payload, '$.type')||' - ' ||json_extract(ActivityOperation.Payload,'$.userTimezone')
    end as 'Payload/Timezone',
    case ActivityOperation.ActivityType
        when 5 then 'Open App/File/Page' when 6 then 'App In Use/Focus'
        else 'Unknown yet'
    end as 'Activity_type',
    case json_extract(ActivityOperation.AppId, '$[0].platform')
        when 'afs_crossplatform' then 'Yes'
        when 'host' then
            (case json_extract(ActivityOperation.AppId, '$[1].platform')
            when 'afs_crossplatform' then 'Yes' else null end)
        else null
    end as 'Synced',
    case
        when json_extract(ActivityOperation.AppId, '$[0].platform') = 'afs_crossplatform'
            then json_extract(ActivityOperation.AppId, '$[1].platform')
        else json_extract(ActivityOperation.AppId, '$[0].platform')
    end as 'Platform',
    case ActivityOperation.OperationType
        when 1 then 'Active' when 2 then 'Updated' when 3 then 'Deleted' when 4 then 'Ignored'
    end as 'TileStatus',
```

```
 case
     when ActivityOperation.Id in
         (select Activity.Id from Activity where Activity.Id = ActivityOperation.Id)
         then 'Removed'
 end as 'WasRemoved',
 case
     when ActivityOperation.Id
         in(select Activity.Id from Activity where Activity.Id = ActivityOperation.Id)
         then null else 'In Queue'
 end as 'UploadQueue',
 coalesce(json_extract(ActivityOperation.Payload, '$.activationUri'),json_extract(ActivityOperation.Payload, '$.reportingApp')) as 'App/Uri',
ActivityOperation.Priority as 'Priority',
time(json_extract(ActivityOperation.Payload, '$.activeDurationSeconds'),'unixepoch') as 'Active Duration',
case
     when cast((ActivityOperation.EndTime - ActivityOperation.StartTime) as integer) < 0 then '-'
     else time(cast((ActivityOperation.EndTime - ActivityOperation.StartTime) as integer),'unixepoch')
end as 'Calculated Duration',
datetime(ActivityOperation.StartTime, 'unixepoch', 'localtime') as 'StartTime',
datetime(ActivityOperation.LastModifiedTime, 'unixepoch', 'localtime') as 'LastModified',
 case
     when ActivityOperation.OriginalLastModifiedOnClient > 0
         then datetime(ActivityOperation.OriginalLastModifiedOnClient, 'unixepoch', 'localtime')
         else '  -  '
 end as 'LastModifiedOnClient',
 case
     when ActivityOperation.EndTime > 0
         then datetime(ActivityOperation.EndTime, 'unixepoch', 'localtime')
         else null
 end as 'EndTime',
 case
     when ActivityOperation.CreatedInCloud > 0
         then datetime(ActivityOperation.CreatedInCloud, 'unixepoch', 'localtime')
         else null
 end as 'CreatedInCloud',
cast((ActivityOperation.ExpirationTime - ActivityOperation.LastModifiedTime)
 as integer) / '86400' as 'Expires In days',
datetime(Activity_PackageId.ExpirationTime, 'unixepoch', 'localtime') as 'Expiration on PackageID',
datetime(ActivityOperation.ExpirationTime, 'unixepoch', 'localtime') as 'Expiration',
ActivityOperation.PlatformDeviceId as 'Device ID',
ActivityOperation.PackageIdHash as 'Application_Hash',
  '{' || substr(hex(Activity_PackageId.ActivityId), 1, 8) || '-' ||
         substr(hex(Activity_PackageId.ActivityId), 9, 4) || '-' ||
         substr(hex(Activity_PackageId.ActivityId), 13, 4) || '-' ||
         substr(hex(Activity_PackageId.ActivityId), 17, 4) || '-' ||
substr(hex(Activity_PackageId.ActivityId), 21, 12) || '}' as 'ID',
json_extract(ActivityOperation.OriginalPayload, '$.appDisplayName') as 'Original Displayed Name',
json_extract(ActivityOperation.OriginalPayload, '$.displayText') as 'Original File/title opened',
json_extract(ActivityOperation.OriginalPayload, '$.description') as 'Original Full Path /Url',
coalesce(json_extract(ActivityOperation.OriginalPayload, '$.activationUri'),json_extract(ActivityOperation.OriginalPayload, '$.reportingApp')) as
'Original_App/Uri',
time(json_extract(ActivityOperation.OriginalPayload, '$.activeDurationSeconds'),'unixepoch') as 'Orig.Duration'
```

```
101
102 from Activity_PackageId
103 join ActivityOperation on Activity_PackageId.ActivityId = ActivityOperation.Id
104 where   Activity_PackageId.Platform = json_extract(ActivityOperation.AppId, '$[0].platform')
105     and Activity_PackageId.ActivityId = ActivityOperation.Id
106
107 union  -- Join Activity & ActivityOperation Queries to get results from both Tables
108
109 select -- This the Activity Table Query
110    Activity.ETag as 'Etag',
111    json_extract(Activity.Payload, '$.appDisplayName') AS 'Program Name',
112     case
113         when json_extract(Activity.AppId, '$[0].application') = '308046B0AF4A39CB'
114             then 'Firefox-308046B0AF4A39CB'
115         when json_extract(Activity.AppId, '$[1].application') = '308046B0AF4A39CB'
116             then 'Firefox-308046B0AF4A39CB'
117         when length (json_extract(Activity.AppId, '$[0].application')) > 17 and
118                 length(json_extract(Activity.AppId, '$[0].application')) < 22
119             then replace(replace(replace(replace(replace(json_extract(Activity.AppId, '$[1].application'),
120             '{'||'6D809377-6AF0-444B-8957-A3773F02200E'||'}', '*ProgramFiles (x64)' ),
121             '{'||'7C5A40EF-A0FB-4BFC-874A-C0F2E0B9FA8E'||'}', '*ProgramFiles (x32)'),
122             '{'||'1AC14E77-02E7-4E5D-B744-2EB1AE5198B7'||'}', '*System' ),
123             '{'||'F38BF404-1D43-42F2-9305-67DE0B28FC23'||'}', '*Windows'),
124             '{'||'D65231B0-B2F1-4857-A4CE-A8E7C6EA7D27'||'}', '*System32')
125        when json_extract(Activity.AppId, '$[0].application') = '308046B0AF4A39CB'
126             then 'Firefox-308046B0AF4A39CB'
127             else  replace(replace(replace(replace(replace
128             (json_extract(Activity.AppId, '$[0].application'),
129             '{'||'6D809377-6AF0-444B-8957-A3773F02200E'||'}', '*ProgramFiles (x64)'),
130             '{'||'7C5A40EF-A0FB-4BFC-874A-C0F2E0B9FA8E'||'}', '*ProgramFiles (x32)'),
131             '{'||'1AC14E77-02E7-4E5D-B744-2EB1AE5198B7'||'}', '*System'),
132             '{'||'F38BF404-1D43-42F2-9305-67DE0B28FC23'||'}', '*Windows'),
133             '{'||'D65231B0-B2F1-4857-A4CE-A8E7C6EA7D27'||'}', '*System32')
134     end as 'Application',
135    json_extract(Activity.Payload, '$.displayText')|| ' (' ||json_extract(Activity.Payload, '$.description')||')' as 'File/title/path opened',
136     case when json_extract(Activity.Payload, '$.shellContentDescription') like '%FileShellLink%'
137        then json_extract(Activity.Payload, '$.shellContentDescription.FileShellLink')
138        else json_extract(Activity.Payload, '$.type')||' - ' ||json_extract(Activity.Payload,'$.userTimezone')
139       end as 'Payload/Timezone',
140     case Activity.ActivityType
141         when 5 then 'Open App/File/Page' when 6 then 'App In Use/Focus'
142     else 'Unknown yet'
143     end as 'Activity_type',
144     case json_extract(Activity.AppId, '$[0].platform')
145         when 'afs_crossplatform' then 'Yes'
146         when 'host' then (case json_extract(Activity.AppId, '$[1].platform')
147         when 'afs_crossplatform' then'Yes' else null end) else null
148     end as 'Synced',
149     case
150         when json_extract(Activity.AppId, '$[0].platform') = 'afs_crossplatform'
```

```sql
        then json_extract(Activity.AppId, '$[1].platform')
        else json_extract(Activity.AppId, '$[0].platform')
    end as 'Platform',
    case Activity.ActivityStatus
        when 1 then 'Active' when 2 then 'Updated' when 3 then 'Deleted' when 4 then 'Ignored'
    end as 'TileStatus',
    null as 'WasRemoved',
    'No' as 'UploadQueue',
       coalesce(json_extract(Activity.Payload, '$.activationUri'),json_extract(Activity.Payload, '$.reportingApp')) as 'App/Uri',
    Activity.Priority as 'Priority',
    time(json_extract(Activity.Payload, '$.activeDurationSeconds'),'unixepoch') as 'Active Duration',
    case
        when cast ((Activity.EndTime - Activity.StartTime) as integer) < 0 then '-'
        else time(cast((Activity.EndTime - Activity.StartTime) as integer),'unixepoch')
    end as 'Calculated Duration',
    datetime(Activity.StartTime, 'unixepoch', 'localtime') as 'StartTime',
    datetime(Activity.LastModifiedTime, 'unixepoch', 'localtime') as 'LastModified',
    case
        when Activity.OriginalLastModifiedOnClient > 0
            THEN datetime(Activity.OriginalLastModifiedOnClient, 'unixepoch', 'localtime')
            ELSE '  -  '
    end as 'LastModifiedOnClient',
    case
        when Activity.EndTime > 0
            then datetime(Activity.EndTime, 'unixepoch', 'localtime')
        else "-"
    end as 'EndTime',
    case
        when Activity.CreatedInCloud > 0
            then datetime(Activity.CreatedInCloud, 'unixepoch', 'localtime')
            else "-"
    end as 'CreatedInCloud',
    cast((Activity.ExpirationTime - Activity.LastModifiedTime) as integer) / '86400' as 'Expires In days',
    datetime(Activity_PackageId.ExpirationTime, 'unixepoch', 'localtime') as 'Expiration on PackageID',
    datetime(Activity.ExpirationTime, 'unixepoch', 'localtime') as 'Expiration',
    Activity.PlatformDeviceId as 'Device ID',
    Activity.PackageIdHash as 'Application_Hash',
          '{' || substr(hex(Activity_PackageId.ActivityId), 1, 8) || '-' ||
                 substr(hex(Activity_PackageId.ActivityId), 9, 4) || '-' ||
                 substr(hex(Activity_PackageId.ActivityId), 13, 4) || '-' ||
                 substr(hex(Activity_PackageId.ActivityId), 17, 4) || '-' ||
                 substr(hex(Activity_PackageId.ActivityId), 21, 12) || '}' as 'ID',
                    json_extract(Activity.OriginalPayload, '$.appDisplayName') as 'Original Program Name',
    json_extract(Activity.OriginalPayload, '$.displayText') as 'Original File/title opened',
    json_extract(Activity.OriginalPayload, '$.description') as 'Original Full Path /Url',
    coalesce(json_extract(Activity.OriginalPayload, '$.activationUri'),json_extract(Activity.OriginalPayload, '$.reportingApp')) as 'Original_App/Uri',
    time(json_extract(Activity.OriginalPayload, '$.activeDurationSeconds'),'unixepoch' ) as 'Orig.Duration'

from Activity_PackageId
join Activity on Activity_PackageId.ActivityId = Activity.Id
where   Activity_PackageId.Platform = json_extract(Activity.AppId, '$[0].platform')
    and Activity_PackageId.ActivityId = Activity.Id

order by Etag desc;  -- Edit this line to change the sorting
```

An updated version of this query can be found online at:
https://kacos2000.github.io/WindowsTimeline/

The above query pulls information from the 'Activity' , 'ActivityOperation' and 'Activity_PackageId' tables. The 'Activity_PackageId' table is more or less a 'cache' of the unique IDs of each application execution and its expiration time.

Some field explanations provided by Microsoft:

Name	Type	Description
status	EnumType	Set by the server. A status code used to identify valid objects. Values: active, updated, deleted, ignored.
userTimezone	String	Optional. The timezone in which the user's device used to generate the activity was located at activity creation time. Values supplied as Olson IDs in order to support cross-platform representation.
createdDateTime	DateTimeOffset	Set by the server. DateTime in UTC when the object was created on the server.
lastModifiedDateTime	DateTimeOffset	Set by the server. DateTime in UTC when the object was modified on the server.
id	String	Required. Client-set GUID for the **historyItem** object.
startedDateTime	DateTimeOffset	Required. UTC DateTime when the **historyItem** (activity session) was started. Required for timeline history.
lastActiveDateTime	DateTimeOffset	Optional. UTC DateTime when the **historyItem** (activity session) was last understood as active or finished - if null, **historyItem** status should be Ongoing.
expirationDateTime	DateTimeOffset	Optional. UTC DateTime when the **historyItem** will undergo hard-delete. Can be set by the client.
activeDurationSeconds	int	Optional. The duration of active user engagement. if not supplied, this is calculated from the **startedDateTime** and **lastActiveDateTime**.

The Activity' table's 'ID' (*Primary key*) field is a unique value:
[Activity]([Id] GUID PRIMARY KEY NOT NULL

It is the unique ID of each entry/user activity. The same ID can be seen more than 2 times in the Activity_PackageID table depending on the 'Platform' field which has the following possible values (*Note: most of project Rome is still undocumented, so not all entries can be defined*):

- "Host" *(is listed as many times as the number of entries in the Activity table),*
- "packageid"**, *(is listed as many times as the number of entries and includes the executable and its path for all x_exe & windows_win32 apps, as seen in the* Activity_PackageID's PackageName *field)*
- "x_exe_path" for Programs called from a specific path (e.g. Standalone executables)

** as seen below:

ETag	ID	Activity_PackageId.PackageName	Activity_json_Packageid
41723	3254D1271207F6C50CED...	*System\cmd.exe	*System\cmd.exe
41722	2FB37475807AA6C1D3C9...	*System\snippingtool.exe	*System\SnippingTool.exe
41721	3A99ABF8D3BA3ABE6B31...	microsoft.office.desktop_8wekyb3d8bbwe!powerpoint	NULL
41720	935EB39CF7CE0C170659...	*ProgramFiles (x64)\lsoft technologies\active@ disk editor...	*ProgramFiles (x64)\LSoft Technologies\Active@ Disk Edi...
41719	2922B987D85B0B6FA4ED...	*ProgramFiles (x64)\tracker software\pdf viewer\pdfxcview...	*ProgramFiles (x64)\Tracker Software\PDF Viewer\PDFXC...
41718	F13910B8FE851B13E14D...	microsoft.windowscalculator_8wekyb3d8bbwe!app	Microsoft.WindowsCalculator_8wekyb3d8bbwe!App
41717	FF1241976D7A557AEA1E...	microsoft.windowscalculator_8wekyb3d8bbwe!app	Microsoft.WindowsCalculator_8wekyb3d8bbwe!App
41715	D222BC19A52035C3398E...	*System\snippingtool.exe	*System\SnippingTool.exe
41713	5A61C68F4DE1C99F14A4...	*System\snippingtool.exe	*System\SnippingTool.exe
41707	587C1298F7A2D926DBD...	microsoft.windows.explorer	Microsoft.Windows.Explorer
41706	68547C5BDBFD068D2F3F...	microsoft.windows.explorer	Microsoft.Windows.Explorer
41704	A7B05CED895ABC4DCCF...	*System\notepad.exe	*System\notepad.exe

By running the following query:

```
select
Activity.ETag,

hex(Activity_PackageId.ActivityId) as 'ID',

replace(replace(replace(replace(replace(replace(
                                Activity_PackageId.PackageName,
                                lower('308046B0AF4A39CB'), 'Mozilla Firefox'),
                                '{'||lower('6D809377-6AF0-444B-8957-A3773F02200E')||'}', '*ProgramFiles (x64)'),
                                '{'||lower('7C5A40EF-A0FB-4BFC-874A-C0F2E0B9FA8E')||'}', '*ProgramFiles (x32)'),
                                '{'||lower('1AC14E77-02E7-4E5D-B744-2EB1AE5198B7')||'}', '*System'),
                                '{'||lower('F38BF404-1D43-42F2-9305-67DE0B28FC23')||'}', '*Windows'),
                                '{'||lower('D65231B0-B2F1-4857-A4CE-A8E7C6EA7D27')||'}', '*System32') as
'Activity_PackageId.PackageName',

case
          when json_extract(Activity.AppId, '$[0].platform') like '%packageid%' then
replace(replace(replace(replace(replace(replace
                                (json_extract(Activity.AppId, '$[0].application'),
                                '308046B0AF4A39CB', 'Mozilla Firefox'),
                                '{'||'6D809377-6AF0-444B-8957-A3773F02200E'||'}', '*ProgramFiles (x64)'),
                                '{'||'7C5A40EF-A0FB-4BFC-874A-C0F2E0B9FA8E'||'}', '*ProgramFiles (x32)'),
                                '{'||'1AC14E77-02E7-4E5D-B744-2EB1AE5198B7'||'}', '*System'),
                                '{'||'F38BF404-1D43-42F2-9305-67DE0B28FC23'||'}', '*Windows'),
                                '{'||'D65231B0-B2F1-4857-A4CE-A8E7C6EA7D27'||'}', '*System32')
          when json_extract(Activity.AppId, '$[1].platform') like '%packageid%' then
replace(replace(replace(replace(replace(replace
                                (json_extract(Activity.AppId, '$[1].application'),
                                '308046B0AF4A39CB', 'Mozilla Firefox'),
                                '{'||'6D809377-6AF0-444B-8957-A3773F02200E'||'}', '*ProgramFiles (x64)'),
                                '{'||'7C5A40EF-A0FB-4BFC-874A-C0F2E0B9FA8E'||'}', '*ProgramFiles (x32)'),
                                '{'||'1AC14E77-02E7-4E5D-B744-2EB1AE5198B7'||'}', '*System'),
                                '{'||'F38BF404-1D43-42F2-9305-67DE0B28FC23'||'}', '*Windows'),
                                '{'||'D65231B0-B2F1-4857-A4CE-A8E7C6EA7D27'||'}', '*System32')
          when json_extract(Activity.AppId, '$[2].platform') like '%packageid%' then
replace(replace(replace(replace(replace(replace
                                (json_extract(Activity.AppId, '$[2].application'),
                                '308046B0AF4A39CB', 'Mozilla Firefox'),
                                '{'||'6D809377-6AF0-444B-8957-A3773F02200E'||'}', '*ProgramFiles (x64)'),
                                '{'||'7C5A40EF-A0FB-4BFC-874A-C0F2E0B9FA8E'||'}', '*ProgramFiles (x32)'),
                                '{'||'1AC14E77-02E7-4E5D-B744-2EB1AE5198B7'||'}', '*System'),
                                '{'||'F38BF404-1D43-42F2-9305-67DE0B28FC23'||'}', '*Windows'),
                                '{'||'D65231B0-B2F1-4857-A4CE-A8E7C6EA7D27'||'}', '*System32')
          when json_extract(Activity.AppId, '$[3].platform') like '%packageid%' then
replace(replace(replace(replace(replace(replace
                                (json_extract(Activity.AppId, '$[3].application'),
                                '308046B0AF4A39CB', 'Mozilla Firefox'),
                                '{'||'6D809377-6AF0-444B-8957-A3773F02200E'||'}', '*ProgramFiles (x64)'),
                                '{'||'7C5A40EF-A0FB-4BFC-874A-C0F2E0B9FA8E'||'}', '*ProgramFiles (x32)'),
                                '{'||'1AC14E77-02E7-4E5D-B744-2EB1AE5198B7'||'}', '*System'),
                                '{'||'F38BF404-1D43-42F2-9305-67DE0B28FC23'||'}', '*Windows'),
                                '{'||'D65231B0-B2F1-4857-A4CE-A8E7C6EA7D27'||'}', '*System32')
          when json_extract(Activity.AppId, '$[4].platform') like '%packageid%' then
replace(replace(replace(replace(replace(replace
                                (json_extract(Activity.AppId, '$[4].application'),
                                '308046B0AF4A39CB', 'Mozilla Firefox'),
                                '{'||'6D809377-6AF0-444B-8957-A3773F02200E'||'}', '*ProgramFiles (x64)'),
                                '{'||'7C5A40EF-A0FB-4BFC-874A-C0F2E0B9FA8E'||'}', '*ProgramFiles (x32)'),
                                '{'||'1AC14E77-02E7-4E5D-B744-2EB1AE5198B7'||'}', '*System'),
                                '{'||'F38BF404-1D43-42F2-9305-67DE0B28FC23'||'}', '*Windows'),
                                '{'||'D65231B0-B2F1-4857-A4CE-A8E7C6EA7D27'||'}', '*System32')
```

```
          when json_extract(Activity.AppId, '$[5].platform') like '%packageid%' then
replace(replace(replace(replace(replace(replace
                                (json_extract(Activity.AppId, '$[5].application'),
                                '308046B0AF4A39CB', 'Mozilla Firefox'),
                                '{'||'6D809377-6AF0-444B-8957-A3773F02200E'||'}', '*ProgramFiles (x64)'),
                                '{'||'7C5A40EF-A0FB-4BFC-874A-C0F2E0B9FA8E'||'}', '*ProgramFiles (x32)'),
                                '{'||'1AC14E77-02E7-4E5D-B744-2EB1AE5198B7'||'}', '*System'),
                                '{'||'F38BF404-1D43-42F2-9305-67DE0B28FC23'||'}', '*Windows'),
                                '{'||'D65231B0-B2F1-4857-A4CE-A8E7C6EA7D27'||'}', '*System32')
          when json_extract(Activity.AppId, '$[6].platform') like '%packageid%' then
replace(replace(replace(replace(replace(replace
                                (json_extract(Activity.AppId, '$[6].application'),
                                '308046B0AF4A39CB', 'Mozilla Firefox'),
                                '{'||'6D809377-6AF0-444B-8957-A3773F02200E'||'}', '*ProgramFiles (x64)'),
                                '{'||'7C5A40EF-A0FB-4BFC-874A-C0F2E0B9FA8E'||'}', '*ProgramFiles (x32)'),
                                '{'||'1AC14E77-02E7-4E5D-B744-2EB1AE5198B7'||'}', '*System'),
                                '{'||'F38BF404-1D43-42F2-9305-67DE0B28FC23'||'}', '*Windows'),
                                '{'||'D65231B0-B2F1-4857-A4CE-A8E7C6EA7D27'||'}', '*System32')
          when json_extract(Activity.AppId, '$[7].platform') like '%packageid%' then
replace(replace(replace(replace(replace(replace
                                (json_extract(Activity.AppId, '$[7].application'),
                                '308046B0AF4A39CB', 'Mozilla Firefox'),
                                '{'||'6D809377-6AF0-444B-8957-A3773F02200E'||'}', '*ProgramFiles (x64)'),
                                '{'||'7C5A40EF-A0FB-4BFC-874A-C0F2E0B9FA8E'||'}', '*ProgramFiles (x32)'),
                                '{'||'1AC14E77-02E7-4E5D-B744-2EB1AE5198B7'||'}', '*System'),
                                '{'||'F38BF404-1D43-42F2-9305-67DE0B28FC23'||'}', '*Windows'),
                                '{'||'D65231B0-B2F1-4857-A4CE-A8E7C6EA7D27'||'}', '*System32')
          when json_extract(Activity.AppId, '$[8].platform') like '%packageid%' then
replace(replace(replace(replace(replace(replace
                                (json_extract(Activity.AppId, '$[8].application'),
                                '308046B0AF4A39CB', 'Mozilla Firefox'),
                                '{'||'6D809377-6AF0-444B-8957-A3773F02200E'||'}', '*ProgramFiles (x64)'),
                                '{'||'7C5A40EF-A0FB-4BFC-874A-C0F2E0B9FA8E'||'}', '*ProgramFiles (x32)'),
                                '{'||'1AC14E77-02E7-4E5D-B744-2EB1AE5198B7'||'}', '*System'),
                                '{'||'F38BF404-1D43-42F2-9305-67DE0B28FC23'||'}', '*Windows'),
                                '{'||'D65231B0-B2F1-4857-A4CE-A8E7C6EA7D27'||'}', '*System32') end as 'Activity_json_Packageid'

from Activity_PackageId
join Activity on  Activity.Id    = Activity_PackageId.ActivityId
where Activity_PackageId.ActivityId = Activity.Id and Activity_PackageId.Platform = 'packageid'
Order by etag desc
```

plus one or more of the following (platform-specific application IDs):

- “windows_win32” for Installed Software (non UWP) Applications
- “windows_universal’ for Windows UWP Apps
- “msa”,
- “ios”,
- “android”, and
- “web”

As seen by this MS example:

Example:

```
{"platform":"windows_universal", "application":"Microsoft.Contoso_8wekyb3d8bbwe"},
{"platform":"windows_win32", "application":"DefaultBrowser_NOPUBLISHERID!Microsoft.Contoso.Default"},
{"platform":"android","application":"com.example.myapp"},
{"platform":"ios", "application":"com.example.myapp"},
{"platform":"web", "application":"https://contoso.com"},
{"platform":"web", "application":"https://chat.contoso.com"},
{"platform":"msa", "application":"00000000603E0BF"},
{"platform":"msa", "application":"48932b46-98b1-4020-9be4-cc7a65643c9e"},
]
```

If the Sync activity is enabled (user logs in with a MS Account) then another entry may also be seen: "afs_crossplatform" which shows a cloud sync enabled activity, and is an additional entry to the same ones seen when using a local account.

When using a MS account:

5251	���% c�...	afs_crossplatform	6082723978844556501	1529741627
5252	���% c�...	windows_win32	{7c5a40ef-a0fb-4bfc-874a-c0f2e0b9fa8e}\foobar2000\f...	1529741627
5253	���% c�...	packageid	{7c5a40ef-a0fb-4bfc-874a-c0f2e0b9fa8e}\foobar2000\f...	1529741627
5254	���% c�...	host		1529741627

When using a Local account there is NO 'afs_crossplatform' entry:

79	e% ❒ @❒I❒...	windows_win32	microsoft.window...	1529742843
80	e% ❒ @❒I❒...	packageid	microsoft.window...	1529742843
81	e% ❒ @❒I❒...	host		1529742843

As can also be seen below (*these are for a single ID of a Microsoft Word entry*):

ActivityId	Platform	PackageName	ExpirationTime
CA06838559F87AE076659BF18C593CF9	host	word.activity.windows.com	2018-06-29 16:39:49
CA06838559F87AE076659BF18C593CF9	afs_crossplatform	16883319693718197224	2018-06-29 16:39:49
CA06838559F87AE076659BF18C593CF9	windows_universal	microsoft.office.word_8wekyb3d8bbwe	2018-06-29 16:39:49
CA06838559F87AE076659BF18C593CF9	windows_universal	microsoft.office.desktop_8wekyb3d8bbwe	2018-06-29 16:39:49
CA06838559F87AE076659BF18C593CF9	android	com.microsoft.office.word	2018-06-29 16:39:49
CA06838559F87AE076659BF18C593CF9	ios	com.microsoft.office.word	2018-06-29 16:39:49
CA06838559F87AE076659BF18C593CF9	windows_win32	microsoft.office.winword.exe.15	2018-06-29 16:39:49
CA06838559F87AE076659BF18C593CF9	windows_win32	{7c5a40ef-a0fb-4bfc-874a-c0f2e0b9fa8e}\microsoft office\office15\winword.exe	2018-06-29 16:39:49
CA06838559F87AE076659BF18C593CF9	windows_win32	{6d809377-6af0-444b-8957-a3773f02200e}\microsoft office\office15\winword.exe	2018-06-29 16:39:49
CA06838559F87AE076659BF18C593CF9	windows_win32	{7c5a40ef-a0fb-4bfc-874a-c0f2e0b9fa8e}\microsoft office\office14\winword.exe	2018-06-29 16:39:49
CA06838559F87AE076659BF18C593CF9	windows_win32	{6d809377-6af0-444b-8957-a3773f02200e}\microsoft office\office14\winword.exe	2018-06-29 16:39:49
CA06838559F87AE076659BF18C593CF9	msa	000000000003edf6	2018-06-29 16:39:49

The above can be seen by using this query:

```
Select
hex(Activity_PackageId.ActivityId) as 'ActivityId',
       Activity_PackageId.Platform ,
       Activity_PackageId.PackageName ,
       datetime (Activity_PackageId.ExpirationTime , 'unixepoch') as 'ExpirationTime'
FROM Activity_PackageId
join Activity on Activity_PackageId.ActivityId = Activity.Id
order by Activity.ActivityId
```

An example of the entry of Microsoft YourPhone's app:

[{"application":"mmxsdktest.azurewebsites.net","platform":"host"},
{"application":"16815419600048394801","platform":"afs_crossplatform"},
{"application":"000000004018945C","platform":"msa"},
{"application":"","platform":"packageId"},
{"application":"","platform":"alternateId"},
{"application":"","platform":"windows_universal"}]

The afs_crossplatform field has been observed to contain a numeric representation of the application used (?), with the exception of MS Office applications and MS Edge:

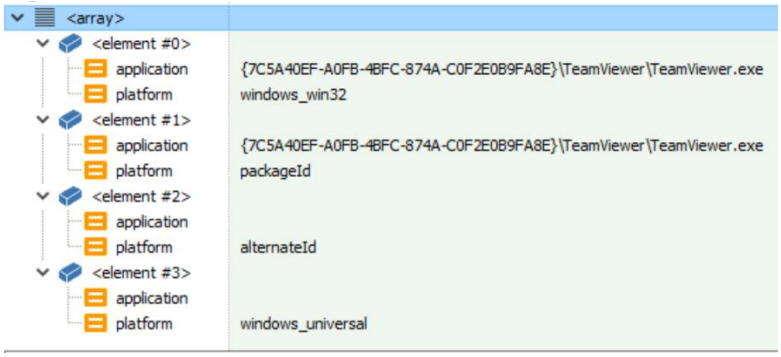
Activity_json_afs_crossplatform
9553497022742795366
9616461484989533944
9726032056939584244
972940661883734646
9751790172484571661
9792636623328491085
edge.activity.windows.com
excel.activity.windows.com
powerpoint.activity.windows.com
word.activity.windows.com

As seen by running the query below:

```
select
case
    when json_extract(Activity.AppId, '$[0].platform') like '%afs_crossplatform%' then json_extract(Activity.AppId, '$[0].application')
    when json_extract(Activity.AppId, '$[1].platform') like '%afs_crossplatform%' then json_extract(Activity.AppId, '$[0].application')
    when json_extract(Activity.AppId, '$[2].platform') like '%afs_crossplatform%' then json_extract(Activity.AppId, '$[0].application')
    when json_extract(Activity.AppId, '$[3].platform') like '%afs_crossplatform%' then json_extract(Activity.AppId, '$[0].application')
    when json_extract(Activity.AppId, '$[4].platform') like '%afs_crossplatform%' then json_extract(Activity.AppId, '$[0].application')
    when json_extract(Activity.AppId, '$[5].platform') like '%afs_crossplatform%' then json_extract(Activity.AppId, '$[0].application')
    when json_extract(Activity.AppId, '$[6].platform') like '%afs_crossplatform%' then json_extract(Activity.AppId, '$[0].application')
    when json_extract(Activity.AppId, '$[7].platform') like '%afs_crossplatform%' then json_extract(Activity.AppId, '$[0].application')
    when json_extract(Activity.AppId, '$[8].platform') like '%afs_crossplatform%' then json_extract(Activity.AppId, '$[0].application')
    end as 'Activity_json_afs_crossplatform'
from Activity
group by Activity_json_afs_crossplatform
```

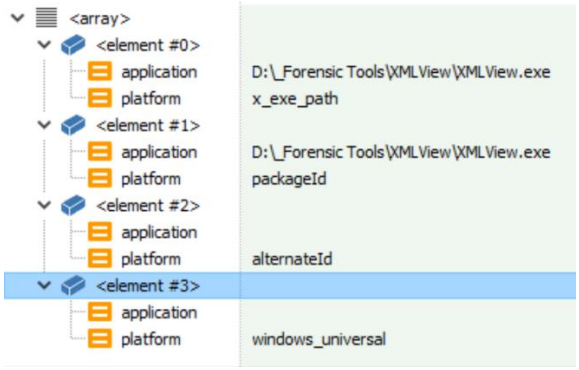
The ‘Activity_PackageId’ table seemingly has more information than the ‘Activity’ table. That is not true though, as the ‘Activity’ table’s ‘AppID’ field holds this information and a lot more. The ‘Activity' and ‘ActivityOperation’ table 'AppID' fields are in fact Binary Large Objects (BLOB) in ‘json array’ format e.g.:

'AppID' entry for an Installed Application in Windows:

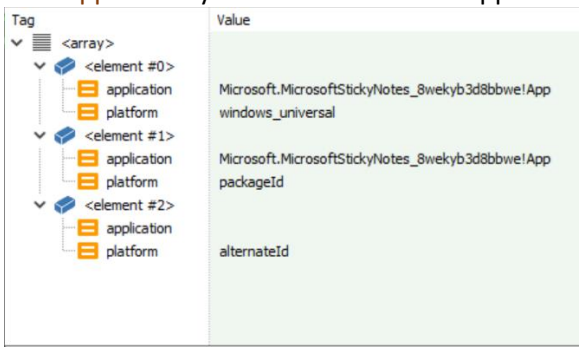


Note: *Notice that the path shown above is in the form of a GUID. It is a KNOWNFOLDERID used by windows for standard known folders like 'program files'. In the json file above, this is the GUID for ProgramFilesX86 (C:\Program Files (x86)\) folder. There are various lists of CLSIDs in the internet like https://msdn.microsoft.com/en-us/library/windows/desktop/dd378457(v=vs.85).aspx*

'AppID' entry for a standalone executable:



and 'AppID' entry for a Windows UWP app



Since this is a json array, we can do a query to see what values it holds in the 'application' and 'platform' fields. The `$[x].` depicts the number of the element in the array, and 'platform' or 'application' the respective field name:

```
-- List all entries in the AppID json array

select
hex(Activity.ID) as 'ID',
json_extract(Activity.AppId, '$[0].platform')  as 'p0' ,
json_extract(Activity.AppId, '$[0].application') as '0' ,
json_extract(Activity.AppId, '$[1].platform')  as 'p1' ,
json_extract(Activity.AppId, '$[1].application') as '1' ,
json_extract(Activity.AppId, '$[2].platform')  as 'p2' ,
json_extract(Activity.AppId, '$[2].application') as '2'  ,
json_extract(Activity.AppId, '$[3].platform')  as 'p3' ,
json_extract(Activity.AppId, '$[3].application') as '3' ,
json_extract(Activity.AppId, '$[4].platform')  as 'p4' ,
json_extract(Activity.AppId, '$[4].application') as '4',
json_extract(Activity.AppId, '$[5].platform')  as 'p5' ,
json_extract(Activity.AppId, '$[5].application') as '5' ,
json_extract(Activity.AppId, '$[6].platform')  as 'p6' ,
```

```
json_extract(Activity.AppId, '$[6].application') as '6' ,
json_extract(Activity.AppId, '$[7].platform')  as 'p7' ,
json_extract(Activity.AppId, '$[7].application') as '7' ,
json_extract(Activity.AppId, '$[8].platform')  as 'p8' ,
json_extract(Activity.AppId, '$[8].application') as '8'

from Activity
order by ID asc
```

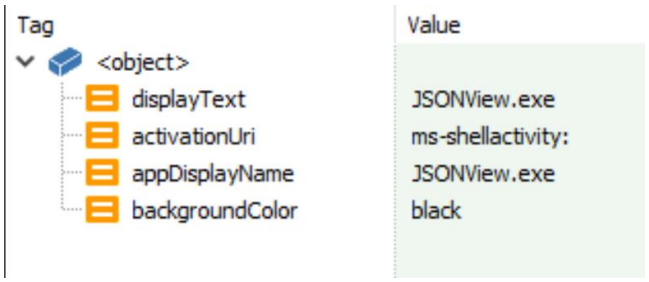
	A0	P0	A1	P1	A2	P2	A3	P3
19	{7C5A40EF-A0FB-4BFC-874A-C0F2E0B9FA8E}\Acronis\TrueImageHome\TrueImage.exe	x_exe_path	{7C5A40EF-A0FB-4BFC-874A-C0F2...	packageId		alternateId		windows_universal
20	Microsoft.Office.OUTLOOK.EXE.15	windows_win32	Microsoft.Office.OUTLOOK.EXE.15	packageId		alternateId		windows_universal
21	{6D809377-6AF0-444B-8957-A3773F02200E}\VOW Software\plist Editor Pro\plistEditor.exe	windows_win32	{6D809377-6AF0-444B-8957-A377...	packageId		alternateId		windows_universal
22	{7C5A40EF-A0FB-4BFC-874A-C0F2E0B9FA8E}\Acronis\TrueImageHome\TrueImage.exe	x_exe_path	{7C5A40EF-A0FB-4BFC-874A-C0F2...	packageId		alternateId		windows_universal
23	{6D809377-6AF0-444B-8957-A3773F02200E}\SQLite Expert\Professional 5\SQLiteExpertP...	windows_win32	{6D809377-6AF0-444B-8957-A377...	packageId		alternateId		windows_universal
24	Microsoft.Office.OUTLOOK.EXE.15	windows_win32	Microsoft.Office.OUTLOOK.EXE.15	packageId		alternateId		windows_universal

Or

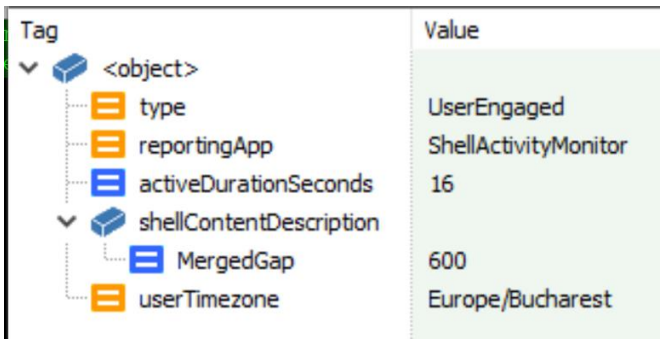
	2	p3	3	p4	4	p5	5	p6	6	p7	7	p8	8
1	osoftEdge_8wekyb3d8bbwe!MicrosoftEdge	msa	f44b1140-bc5e-48c6-8dc0-5cf5a53c0e34	msa	000000004C1BC462	android	com.microsoft.emmx.daily	android	com.microsoft.emmx.selfhost	android	com.microsoft.emmx	ios	com.microsoft.emmx.daily-df
2	osoftEdge_8wekyb3d8bbwe!MicrosoftEdge	msa	f44b1140-bc5e-48c6-8dc0-5cf5a53c0e34	msa	000000004C1BC462	android	com.microsoft.emmx.daily	android	com.microsoft.emmx.selfhost	android	com.microsoft.emmx	ios	com.microsoft.emmx.daily-df
3	osoftEdge_8wekyb3d8bbwe!MicrosoftEdge	msa	f44b1140-bc5e-48c6-8dc0-5cf5a53c0e34	msa	000000004C1BC462	android	com.microsoft.emmx.daily	android	com.microsoft.emmx.selfhost	android	com.microsoft.emmx	ios	com.microsoft.emmx.daily-df
4	osoftEdge_8wekyb3d8bbwe!MicrosoftEdge	msa	f44b1140-bc5e-48c6-8dc0-5cf5a53c0e34	msa	000000004C1BC462	android	com.microsoft.emmx.daily	android	com.microsoft.emmx.selfhost	android	com.microsoft.emmx	ios	com.microsoft.emmx.daily-df
5	osoftEdge_8wekyb3d8bbwe!MicrosoftEdge	msa	f44b1140-bc5e-48c6-8dc0-5cf5a53c0e34	msa	000000004C1BC462	android	com.microsoft.emmx.daily	android	com.microsoft.emmx.selfhost	android	com.microsoft.emmx	ios	com.microsoft.emmx.daily-df

Similarly, the 'Activity' and the 'ActivityOperation' table 'payload' fields (blob) are also in json format with different entries related to the different platform type as follows:

For "x_exe_path" , "windows_win32" and "windows_universal" it doesn't include duration when an app is first executed:



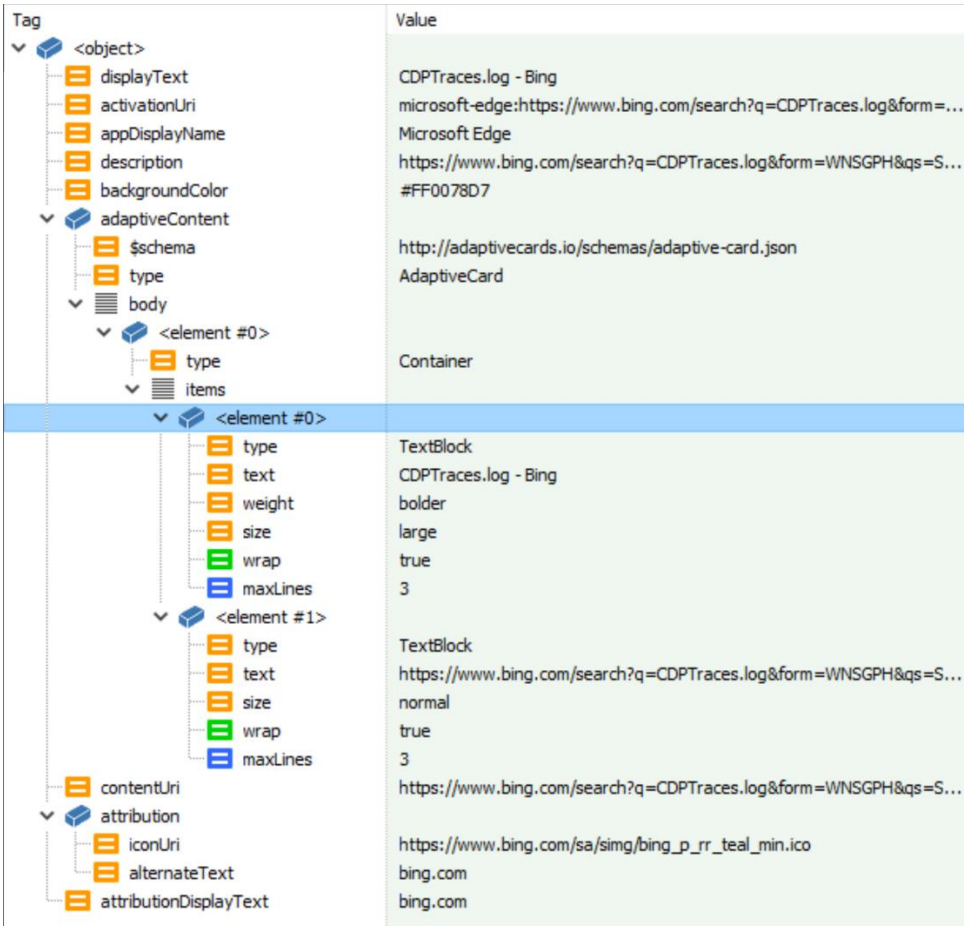
but includes it in subsequent entries:



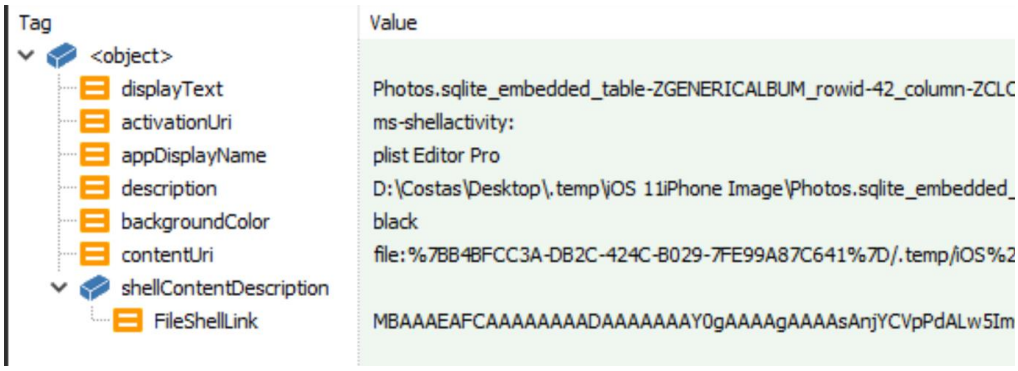
Having included my own duration calculation (calculated by subtracting the ‘StartTime’ from the ‘EndTime’), the duration is sometimes different than the one included in the json blob. A longer calculated duration could indicate that the app is in focus but idle i.e. the user does not interact with it.

When "windows_universal" or "windows_win32" applications open a file, the 'payload' field includes quite a bit of information.

"windows_universal" (In this case MS Edge - which uses the Adaptive Card framework - bing search for CDPTraces.log) can be seen below:



And ‘windows_win32’ here:



The 'ExpirationTime' fields in both Activity and Activity_PackageId tables are the same for each 'ID' and 'ActivityId' respectively (Unique field entry GUID).

All Dates/Times are stored by the database in UTC. To get the local times, we can adjust the query by using, 'localtime' e.g. :

```
datetime(Activity.StartTime , 'unixepoch', 'localtime'),
```

The 'ExpirationTime' is exactly 2592000 seconds or 30 Days from the relevant entry's 'LastModified' time, and is easily seen by using the following:

```
Select
(Activity.ExpirationTime - Activity.LastModifiedTime) as 'Expires in'
From Activity
```

Sorting the query by the 'ETAG' field gives a historical list (sort of a timeline) according to the Events recorded in the db, but is not the same as if sorted by Start, End or Expiry datetimes. The ETAG can change for a particular entry's GUID depending on the current action the database has recorded for that ID (e.g. user removed Tile from timeline).

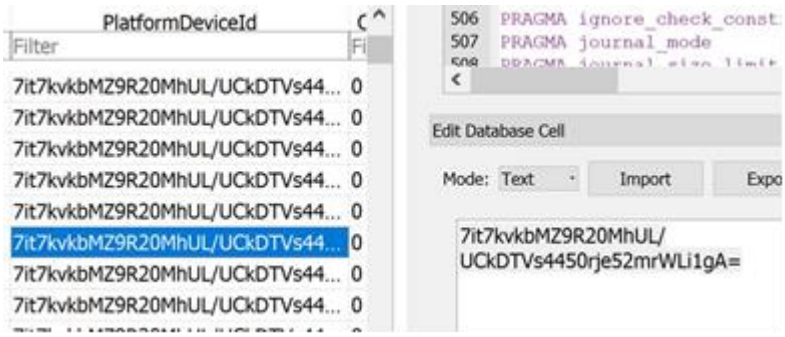
An example that an ID can have multiple ETAGs associated with it, is shown below:

	ID	Program Name	Nr_of_ETAGs_per_ID
1	14A18F08264CCBEEE1F87294159CC174	Microsoft.MicrosoftEdge_8wekyb3d8bbwe!MicrosoftEdge	12
2	E410C45C9351D584F5FF8771FB79EBE0	Microsoft.MicrosoftEdge_8wekyb3d8bbwe!MicrosoftEdge	12
3	3850384E31582BB4D7444A87238EBE71	Microsoft.MicrosoftEdge_8wekyb3d8bbwe!MicrosoftEdge	11
4	7FBCA86B1284531AB13714378DE462BF	Microsoft.MicrosoftEdge_8wekyb3d8bbwe!MicrosoftEdge	11
5	AF83A1D79E8018D88E34C6DA0367D8D2	Microsoft.MicrosoftEdge_8wekyb3d8bbwe!MicrosoftEdge	11
6	005A5B3C02AF18D3D743923C12A6A1A4	{1AC14E77-02E7-4E5D-B744-2EB1AE5198B7}\SnippingTool.exe	4
7	00AEEED61A3676A61C4683F4ADF956DC	{6D809377-6AF0-444B-8957-A3773F02200E}\Windows NT\Accessories\wordpad...	4
8	0197B6BDC361072CAE085484AF9E9D13	{6D809377-6AF0-444B-8957-A3773F02200E}\Windows NT\Accessories\wordpad...	4
9	019F2517AFD0B40206B668B4B979C5F3	Chrome	4
10	026D393D2A3C851046DD8296FFFFA0C1	Chrome	4

by running this query against a MS account's 'ActivitiesCache.db':

```sql
select
hex(Activity.id) as 'ID',
json_extract(Activity.AppId, '$[2].application') as 'Program Name',
count(activity.etag) as 'Nr_of_ETAGs_per_ID'
from Activity
join Activity_PackageId on activity.id = Activity_PackageId.ActivityId
group by ID
order by Nr_of_ETAGs_per_ID desc
```

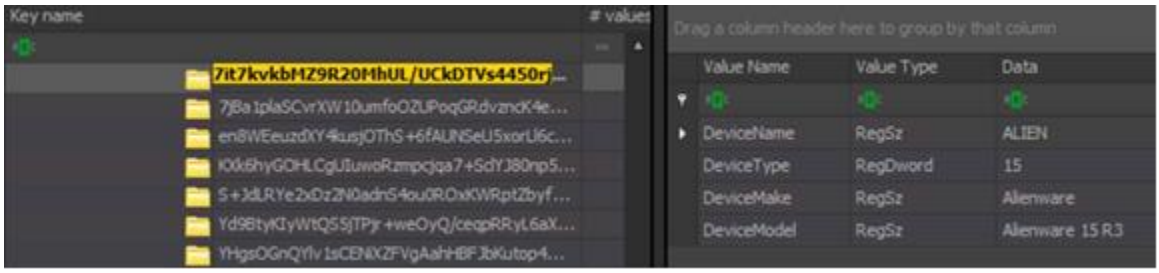
The 'PlatformDeviceID' seen in the 'Activity' & 'ActivityOperations' tables:



can be found in the user's NTUSER.dat at

"Software\Microsoft\Windows\CurrentVersion\TaskFlow\DeviceCache\".

As seen below:

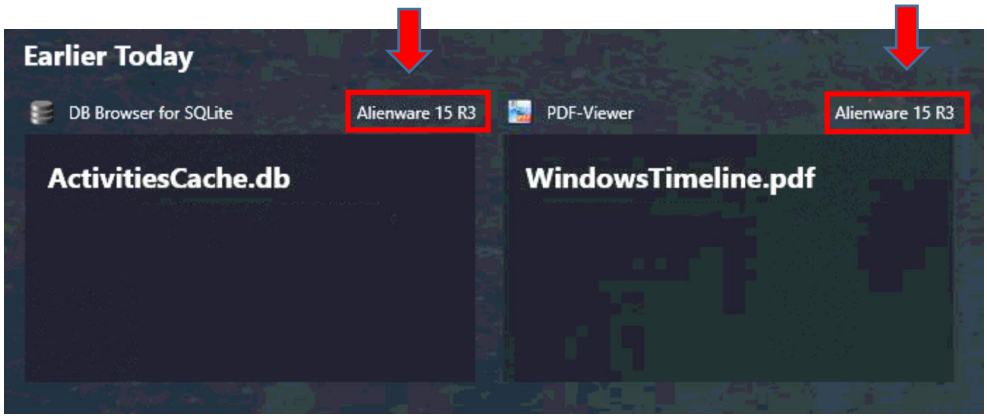


But it is not fixed - it looks encoded with the QuickXorHash Algorithm, similar to the 'FileShellLink' in the 'Payload' field blob - and it changes occasionally,

	Device ID
190	TDdtGmqdscQk7BxppyGhb2yzThGYW8Ldm8tsq+GJ9n4=
191	TDdtGmqdscQk7BxppyGhb2yzThGYW8Ldm8tsq+GJ9n4=
192	TDdtGmqdscQk7BxppyGhb2yzThGYW8Ldm8tsq+GJ9n4=
193	TDdtGmqdscQk7BxppyGhb2yzThGYW8Ldm8tsq+GJ9n4=
194	Yd9BtyKIyWtQS5jTPjr+weOyQ/ceqpRRyL6aX0XAiro=
195	Yd9BtyKIyWtQS5jTPjr+weOyQ/ceqpRRyL6aX0XAiro=
196	Yd9BtyKIyWtQS5jTPjr+weOyQ/ceqpRRyL6aX0XAiro=

still depicting the same Machine (*as seen at the relevant registry entries*). I have not yet found the pattern as to why or when it changes when a user logs in with a local account.

It is used to show the Device* origin of a Tile in the Timeline view, such as:



**(if no device name is seen in one or more tiles in the user's Timeline view, then the activity is local)*

The device name seen above is derived from the "DeviceModel" entry in the registry for the specific DeviceID. That information originates from the OEM information value in 'SystemProductName' at "HKLM\SYSTEM\ControlSet001\Control\SystemInformation" which is usually filled by the device manufacturer, or is blank when the computer is user assembled.

The 'AppActivityId' field has 3 possible observed values:

- ECB32AF3-1440-4086-94E3-5311F97F89C4 which looks like a GUID but having checked 4 different computers of different users except my own ones, this GUID remains the same in all of them .
- An alphanumeric identifier (Hash?) following the above GUID, which is specific to a file opened, or
- A URL opened by MS Edge (on MS Account related 'ActivitiesCache.db' databases).

This can be seen by running the following:

```
select
case when Activity.AppActivityId not like '%-%-%-%-%\%' then Activity.AppActivityId
when Activity.AppActivityId not like '%-%-%-%-%' then Activity.AppActivityId
else substr(Activity.AppActivityId , 38)
end as 'DeviceID',
datetime(Activity.StartTime, 'unixepoch', 'localtime') AS 'StartTime',
json_extract(Activity.Payload, '$.displayText') as 'File_Name'
from Activity
join Activity_PackageId on activity.id = Activity_PackageId.ActivityId
group by File_Name
order by StartTime asc
```

	DeviceID	StartTime	File_Name
13	ECB32AF3-1440-4086-94E3-5311F97F89C4	2018-05-01 07:20:10	7-Zip File Manager
14	ECB32AF3-1440-4086-94E3-5311F97F89C4	2018-05-01 07:24:15	SystemPropertiesAdvanced.exe
15	ECB32AF3-1440-4086-94E3-5311F97F89C4	2018-05-01 07:28:48	Opera Browser
16	ECB32AF3-1440-4086-94E3-5311F97F89C4	2018-05-01 07:35:45	ESEDatabaseView.exe
17	ECB32AF3-1440-4086-94E3-5311F97F89C4	2018-05-01 07:45:59	jre-8u171-windows-x64.exe
18	4cc59f0fe7ab8e7280b2c4228bcd76193b3e5f3f	2018-05-01 07:58:11	backup.tar
19	fc1379ad2d57897a2013f92a6e5d53e0dbd1e0f8	2018-05-01 08:01:38	tealium.db
20	b6e7e75f16f5d0fddf4260be2a2e1058bcfb619a	2018-05-01 08:05:13	flixster_dc2.db

The 'PackageIDHash' field is a unique value related to each application. It appears to be the 'QuickXorHash' of the executable – with this query:

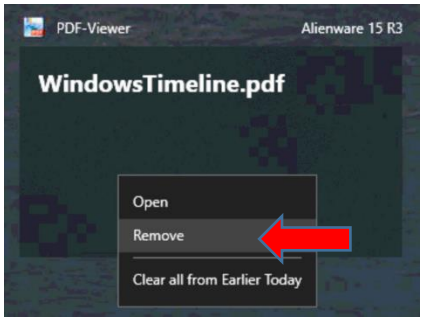
```
select
        Activity.PackageIdHash as 'Hash',
        Activity_PackageId.PackageName as 'Name',
        datetime(Activity.StartTime, 'unixepoch', 'localtime') AS 'StartTime'
        from Activity
        join Activity_PackageId on activity.id = Activity_PackageId.ActivityId
group by Hash
order by StartTime desc
```

we can see that different versions of the same application have a different Hash value:

	Hash	Name	StartTime
1	LpMbiNsaIvhwz9RKScqy+21v9qKArm8vsmGRxfqVh8k=	d:_forensic tools\dmde-3.2.0.692-win32-gui\dmde.exe	2018-05-28 19:44:18
2	83TnlWHEKIgYDl4QLfHkrWYjNrlRwf7OP4R6Djg6TXI=	d:_forensic tools\dmde-3.0.6.648-win32-gui\dmde.exe	2018-05-28 19:44:00

The 'Activity' table's 'ActivityStatus' and 'ActivityOperation' tables's 'OperationType' have 3 observed values ranging from 1 to 3 and depict the related Tile Status as:
1 -> Active (means it is still an open application)
2-> Updated (means the entry is an update for a previously Active entry)
3-> Deleted (means the Tile is removed from the Timeline)
And there could be a 4th entry with a value of **4**, meaning that the entry is 'Ignored'.

When a Tile is removed from the Timeline by the user,



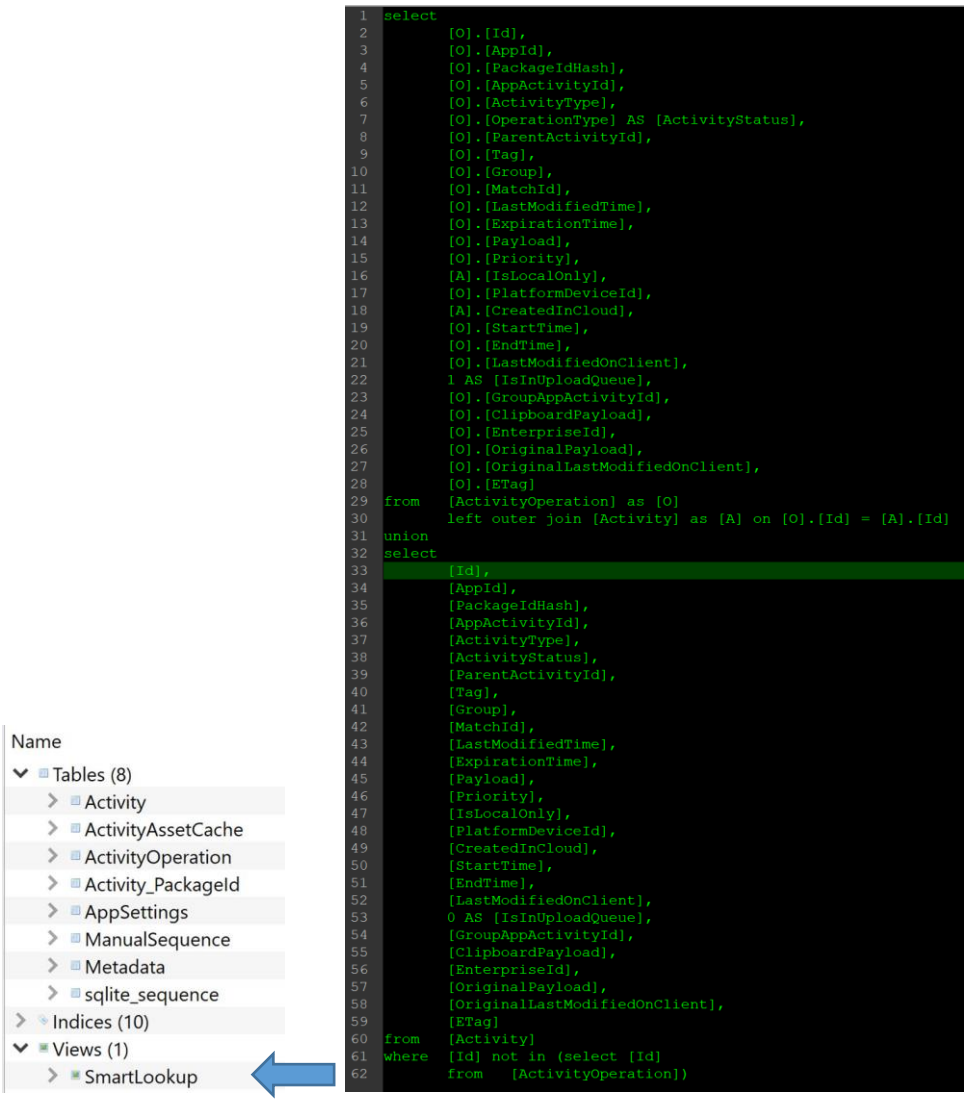
the associated ID(s) to this Tile remain the same, but the entries are copied from the 'Activity' to the 'ActivityOperation' table with a NEW 'Etag' and new type/status value:

```
select
activity.etag as 'Activity Etag',
hex(activity.id) as 'Activity ID',
Activity.ActivityStatus as 'Type',
ActivityOperation.ETag as 'ActivityOperation Etag',
hex(ActivityOperation.Id) as 'ActivityOperation ID',
ActivityOperation.OperationType as 'Type'
from Activity
join ActivityOperation on Activity.Id = ActivityOperation.Id
```

	Activity Etag	Activity ID	Type	ActivityOperation Etag	ActivityOperation ID	Type
1	19255	942964941C4A1FC75A837A1CFC8CFF92	1	20098	942964941C4A1FC75A837A1CFC8CFF92	3
2	19264	0DE4C1CFA7AD59E7B9F9A3A0509D21CA	1	20099	0DE4C1CFA7AD59E7B9F9A3A0509D21CA	3
3	19267	4B8DDEC337073252145BE8B622D2A619	1	20100	4B8DDEC337073252145BE8B622D2A619	3
4	19270	3704910DA81C809DB04126F03E300092	1	20101	3704910DA81C809DB04126F03E300092	3
5	19410	289D11B903A8BC64FE6305B96BC46750	1	20102	289D11B903A8BC64FE6305B96BC46750	3

When the user logs in with a local account, and a tile is removed from the Timeline, the associated entries for that are copied from the 'Activity' to the 'ActivityOperation' table with a different 'ETAG' value, and stay there until expiration time.

An easy way to figure out which entries are User Removed can be derived from viewing the 'SmartLookup' view (*automatically created query included in the database*) which, in essence, is the source of the actual timeline a user observes:



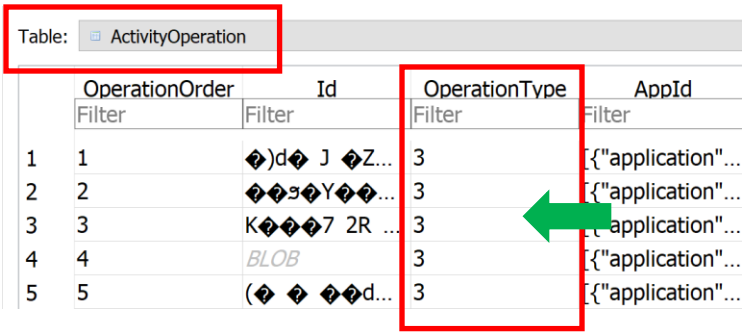
The key here is the line: FROM [Activity] WHERE [Id] NOT IN (SELECT [Id] FROM [ActivityOperation])

If we check the 'SmartLookup' query data view, it lists all 'Activity' table entries plus all 'ActivityOperation' table entries minus the 'Activity' table entries that appear in both tables with the same ID. Why? Because when the ActivityOperation.Id is also found in the Activity.Id then the entry has been (user) removed from the timeline.

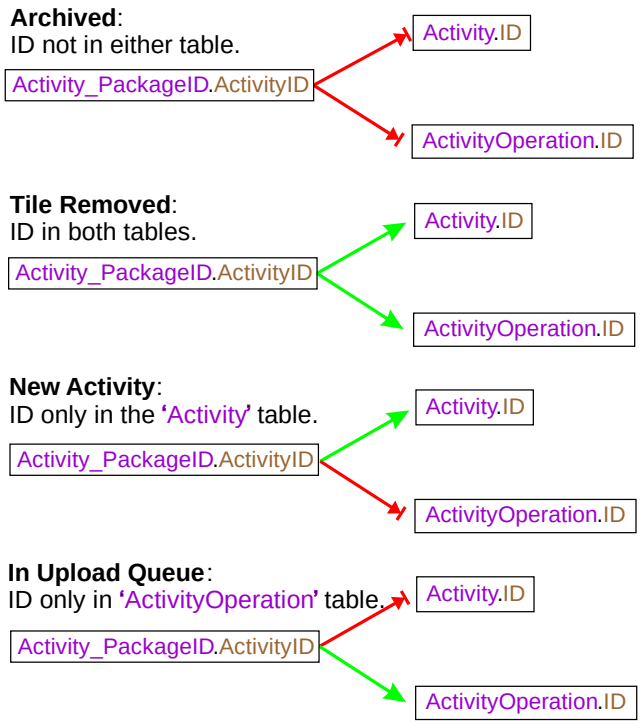
What this query also does, is to mark (and list) all entries in the 'Activity' table with a value of 0 in the field [IsInUploadQueue], and all entries in the 'ActivityOperations with a value of 1 in the [IsInUploadQueue]. What this means, is that the entries in the 'ActivityOperations' table are in the 'Upload to Cloud Queue' unless they also appear in the 'Activity' table.

However, when a user is logged in with a MS Account, and the user removes a tile from the Timeline, the respective entries are copied to the 'ActivityOperation' table with a new 'Etag' value and a new type/status of 3 (*Deleted*) momentarily until they are synced, and then they are

moved to the 'Activity' table until they expire. The type/status value 3 tells the other synchronized devices not to display this tile in their Timeline. This may be confusing when examining an offline system:



The following query checks every ID on 'Activity_PackageID' against both 'Activity' and 'ActivityOperation' tables and provides the relevant results:




```
select
case
        when
                Activity_PackageId.ActivityId in (select Activity.Id from activity) and
                Activity_PackageId.ActivityId in (select ActivityOperation.Id
                                                  from ActivityOperation)
        then 'Tile Removed - '||hex(Activity_PackageId.ActivityId)
        else
                case
                when     Activity_PackageId.ActivityId  not in
                                (select Activity.Id from activity) and
                                Activity_PackageId.ActivityId  not in
                                (select ActivityOperation.Id from ActivityOperation)
                then 'Is Archived - '||hex(Activity_PackageId.ActivityId)
                else
```

```
                        case
                        when Activity_PackageId.ActivityId in
                        (select Activity.Id from activity) and
                        Activity_PackageId.ActivityId not in
                        (select ActivityOperation.Id from ActivityOperation)
                                then 'New Activity - '||hex(Activity_PackageId.ActivityId)
                                else
                                case
                                        when Activity_PackageId.ActivityId
                                        not in (select Activity.Id from Activity)
                                        and  Activity_PackageId.ActivityId
                                        in (select ActivityOperation.Id from ActivityOperation)
                                        then '
        In Upload Queue - '||hex(Activity_PackageId.ActivityId)
                        end
                        end
        end
end as 'Status_ID', -- This field includes both the Status and the unique ID of the associated activity
Activity_PackageId.PackageName as 'PackageName', -- The program/ associated with the above ID
datetime(Activity_PackageId.ExpirationTime, 'unixepoch', 'localtime') as 'ExpirationTime',
Activity_PackageId.Platform

from Activity_PackageId
where Activity_PackageId.Platform in ('windows_win32', 'windows_universal', 'x_exe_path')
group by Status_ID
order by ExpirationTime asc
```

We can see which ID's entry is a:

- 'New activity'
- 'Had the associated timeline tile removed'
- 'In the Upload Queue'
- Archived' *(until expiration time)*

	Status_ID	PackageName	ExpirationTime	Platform
2464	New Activity - FAC3BF8F86CC8D737E2912333C1B480B	microsoft.office.outlook.exe.15	2018-08-21 18:29:32	windows_win32
2465	New Activity - A082487B90E1920C1E794CCE485D46D6	microsoft.office.outlook.exe.15	2018-08-21 18:29:54	windows_win32
2466	Is Archived - AA02B8BF0A259DEAE764099B3E5BCB8B	{6d809377-6af0-444b-8957-a3773f02200e}\db browser for sqlite\db browser for sqlite.exe	2018-08-24 10:30:25	windows_win32
2467	Is Archived - 5D82FFF1A179FFEAC9A59CE52FC48ACA	windows.immersivecontrolpanel_cw5n1h2txyewy	2018-08-24 10:30:44	windows_universal
2468	New Activity - E4D4D3EE8FF161D4D330C2C5FAAEECF2	{6d809377-6af0-444b-8957-a3773f02200e}\db browser for sqlite\db browser for sqlite.exe	2018-08-24 10:30:44	windows_win32
2469	Is Archived - F48D10A0C52199D9D35BDB1EE68CBC4E	windows.immersivecontrolpanel_cw5n1h2txyewy	2018-09-25 23:06:50	windows_universal
2470	Is Archived - 65D2974DC6A859499B8B20FA926146BE	microsoft.office.outlook.exe.15	2018-11-21 17:29:58	windows_win32
2471	Is Archived - 732C5C66B18DBB39B19AAE2D48AA8C65	windows.immersivecontrolpanel_cw5n1h2txyewy	2018-11-21 17:29:59	windows_universal

Another view of the timeline and the items discussed above can be seen with this query: https://kacos2000.github.io/WindowsTimeline/WindowsTimeline2.sql

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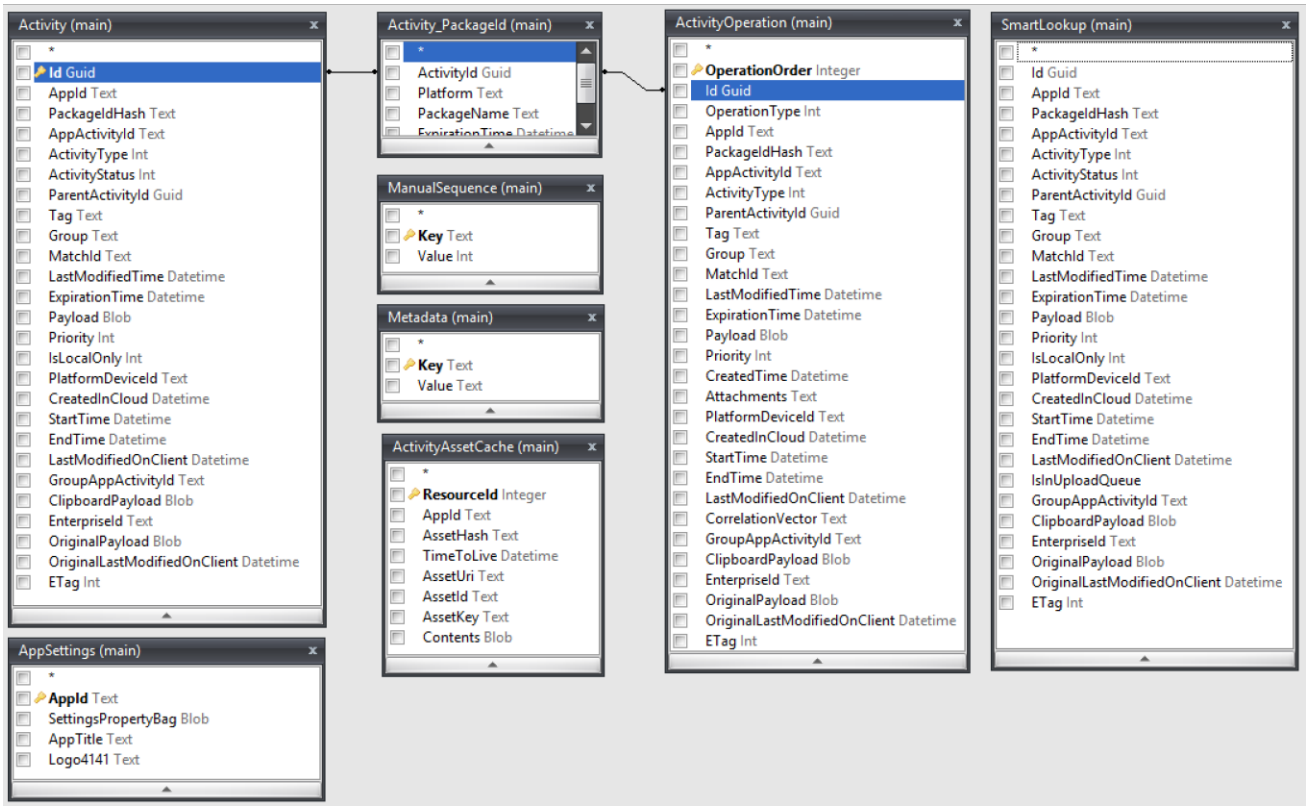
Upcoming changes with Windows 10 version 1809 *(October 2018 update)*

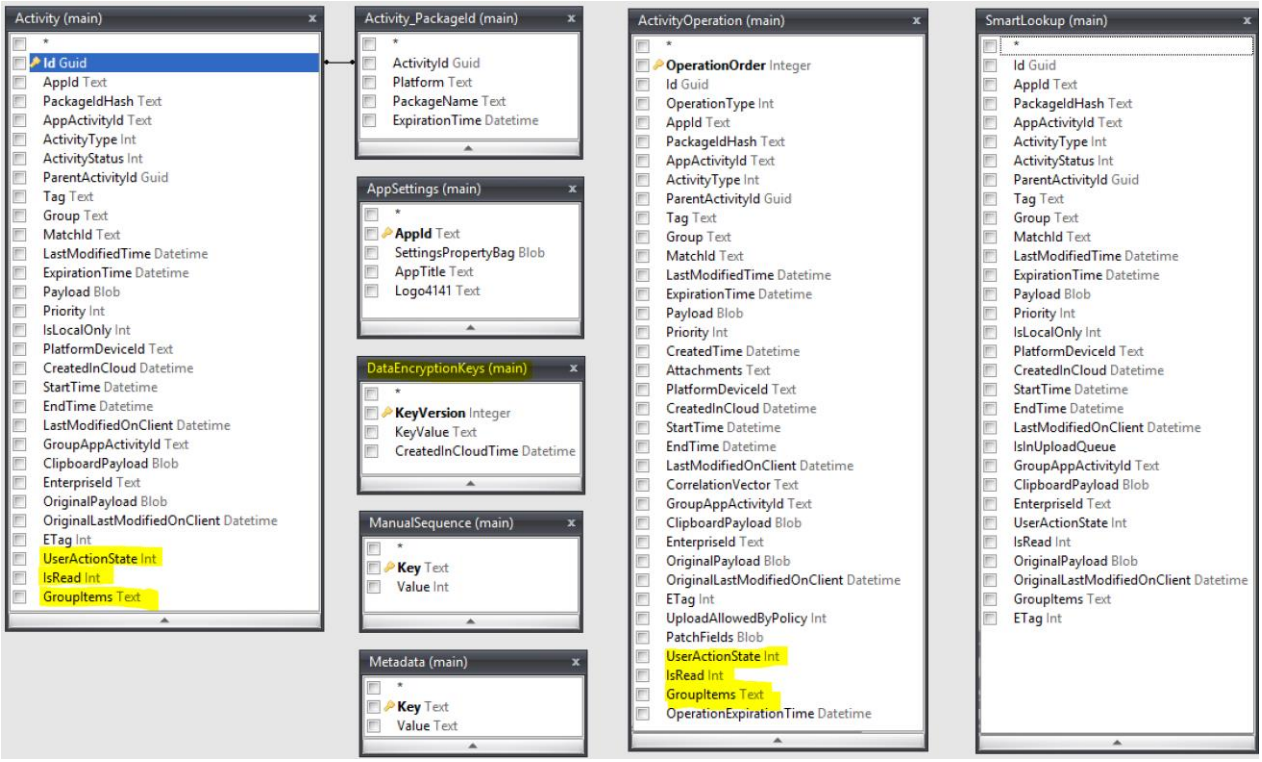
(The following in based on Win10 Insider's build 17744.rc5_release.180818-1845)

The previous (1803) was structured like this:



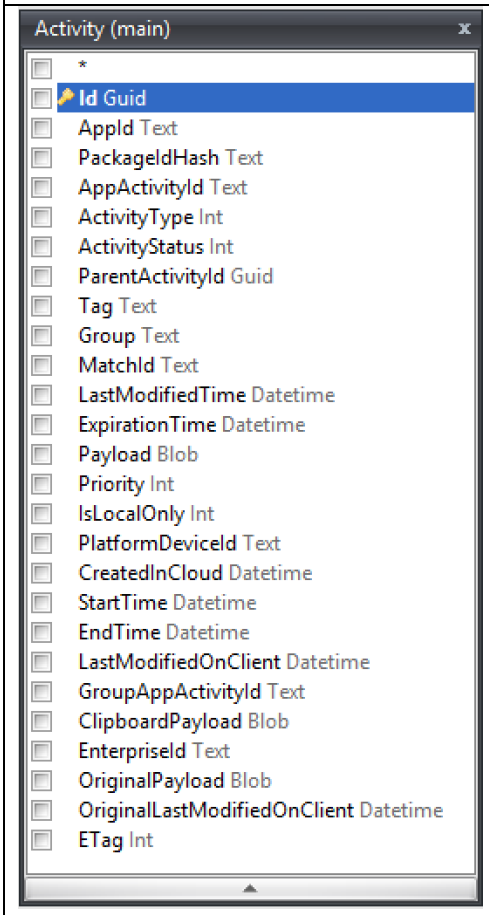
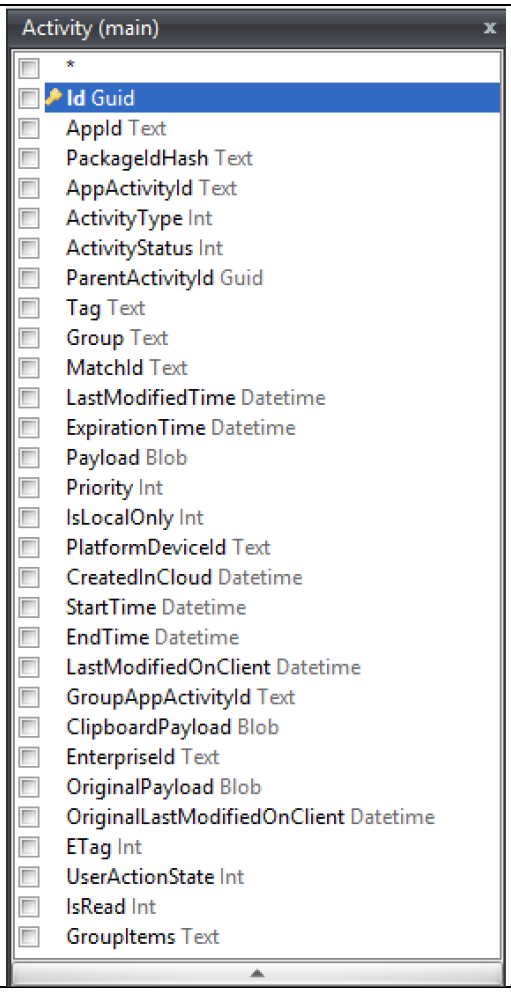
With the main tables being 'Activities' and 'ActivitiesOperation', while 'Activities_PackageID' was the link and archive of all the activity entries.

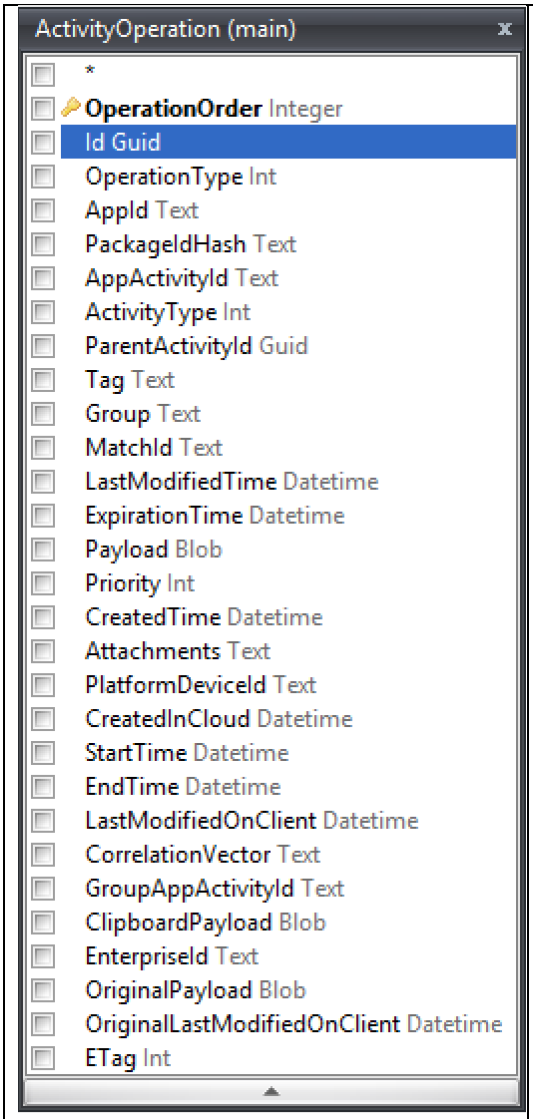
The database structure has changed a bit with the new October 2018 Windows 10 update (version 1809). A new table is introduced:



As well as new fields in both Activity & ActivityOperation tables:

Activity	**ActivityOperation**
	UploadAllowedByPolicy
UserActionState	UserActionState
IsRead	IsRead
GroupItems	GroupItems

Before (1803)	After (1809)
	



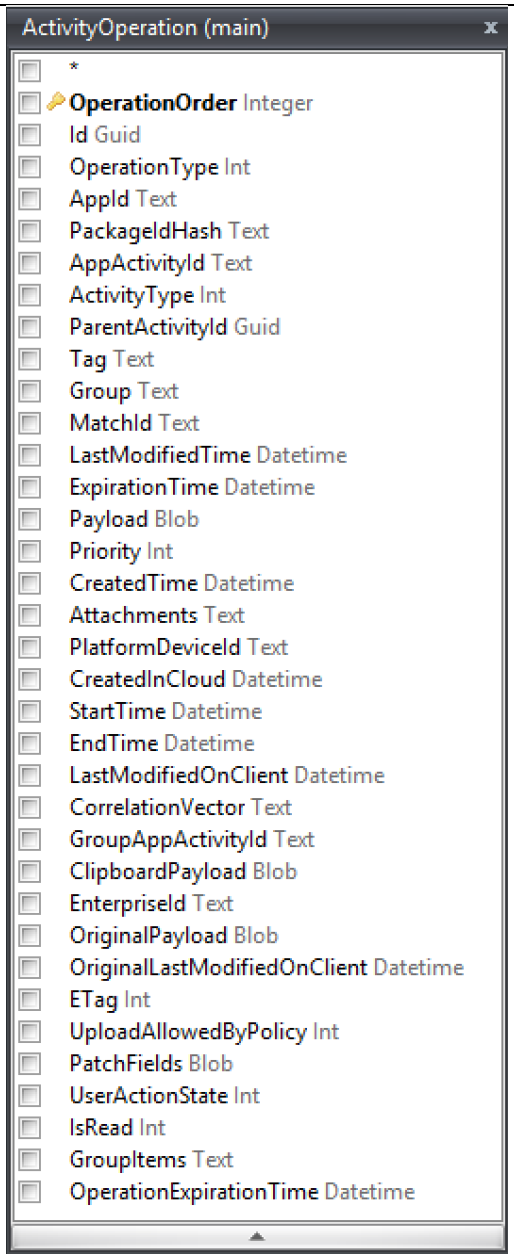


Table: ManualSequence

	Key	Value
	Filter	Filter
1	Activity	126910

Table: ManualSequence

	Key	Value
	Filter	Filter
1	Activity	127355

Table: Metadata

	Key	Value
	Filter	Filter
1	CurrentSettings	{"ActivityTypes":[4,3,2,1,0,5,13,6],"Environment":"prod"}
2	DatabaseInstanceId	23919
3	DatabaseInstanceIdUpdateTime	2018-05-10T13:58:59.758Z
4	CurrentEtag	bbaa7770-adbf-11e8-9117-01020305070d

Table: Metadata

	Key	Value
	Filter	Filter
1	CurrentSettings	{"ActivityTypes":[0,1,2,3,4,5,6,7,11,12,13,15],"Environment":"prod"}
2	DatabaseInstanceId	23919
3	DatabaseInstanceIdUpdateTime	2018-05-10T13:58:59.758Z
4	CurrentEtag	ec9c6840-add6-11e8-9117-01020305070d
5	DatabaseNotificationSubscriptionInfo	{"partialSyncToken":"","publisherFilters":[{"activityTypes":[0,1,2,3,4,5,6,7,13,15],"application":"*"},{"activit...
6	DatabaseActivityPolicies	{"AllowedSubscriptionSyncScopes":[{"allowedTypes":[0,1,2,3,4,5,6,7,10,13,15],"application":"*"},{"allowed...
7	PendingActivityTypes	{"activityTypes":[]}

The Metadata table is the one major change. The Current Settings key, as previously, is where the allowed Activity Types are listed:

1	CurrentSettings	{"ActivityTypes":[0,1,2,3,4,5,6,7,11,12,13,15],"Environment":"prod"}

1	CurrentSettings	{"ActivityTypes":[0,1,2,3,4,5,6,7,13,15],"Environment":"prod"}

New Keys are introduced:

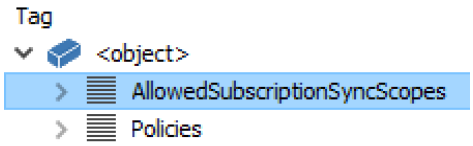
- DatabaseNotificationSubscriptionInfo,
- DatabaseActivityPolicies and
- PendingActivityTypes

as well as new ActivityTypes & Policies:

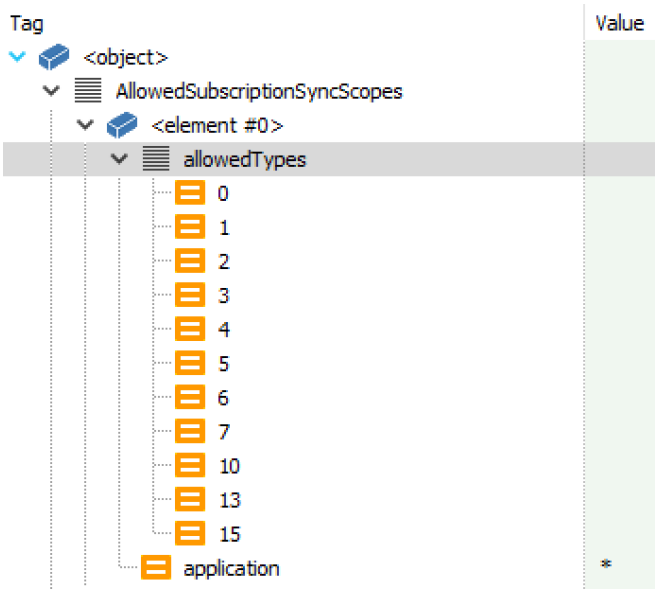
Table: Metadata

	Key	Value
	Filter	Filter
1	CurrentSettings	{"ActivityTypes":[0,1,2,3,4,5,6,7,11,12,13,15],"Environment":"prod"}
2	DatabaseInstanceId	23919
3	DatabaseInstanceIdUpdateTime	2018-05-10T13:58:59.758Z
4	CurrentEtag	ec9c6840-add6-11e8-9117-01020305070d
5	DatabaseNotificationSubscriptionInfo	{"partialSyncToken":"","publisherFilters":[{"activityTypes":[0,1,2,3,4,5,6,7,13,15],"application":"*"},{"activit...
6	DatabaseActivityPolicies	{"AllowedSubscriptionSyncScopes":[{"allowedTypes":[0,1,2,3,4,5,6,7,10,13,15],"application":"*"},{"allowed...
7	PendingActivityTypes	{"activityTypes":[]}

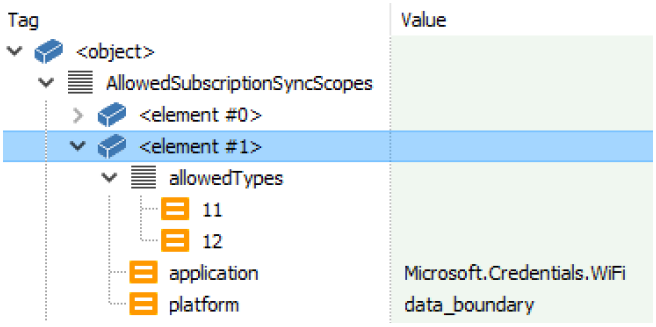
In the 'DatabaseActivityPolicies' key's value (json field), we can see "AllowedSubscriptionSyncScopes" and "Policies" as the main fields:



"AllowedSubscriptionSyncScopes"'s Elements is where the Allowed Activity Types (*to be synched across devices*) are listed as well as the respective application & platform. For example:

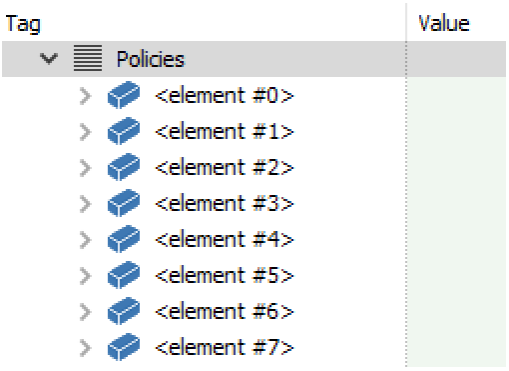


ActivityTypes 0-7 and 10, 13 and 15 are allowed for (*) all applications, but

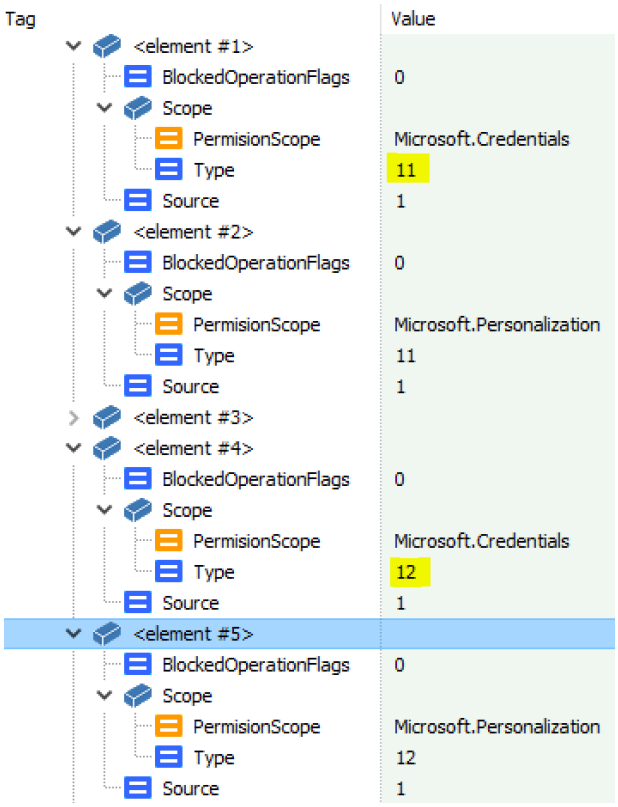


Activity Types 11 and 12 are only allowed for the application “Microsoft.Credentials.WiFi” and only for the Platform entry “data_boundary”.

The Policies field

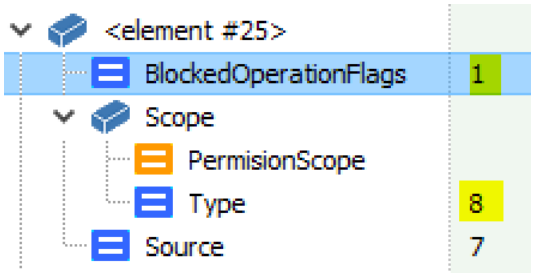


Has entries like this in each Element:

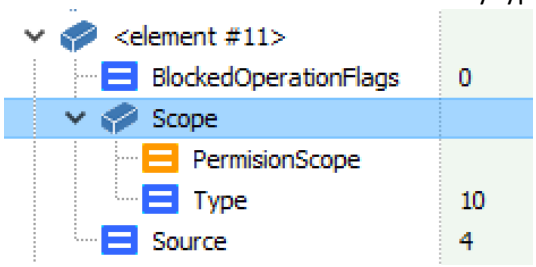


Where the PermissionScope is the Application, and Type is the ActivityType blocked for this application. BlockedOperationFlags has seen with values 0, 1 and 7. In the above screenshot, MicrosoftPersonalization and Microsoft.Credentials apps are NOT blocked for ActivityTypes 11 and 12.

BlockedOperationFlags value 1 means that this Element is Blocked for example, ActivityType 8 is blocked (*we can see that in the AllowedTypes as well*):

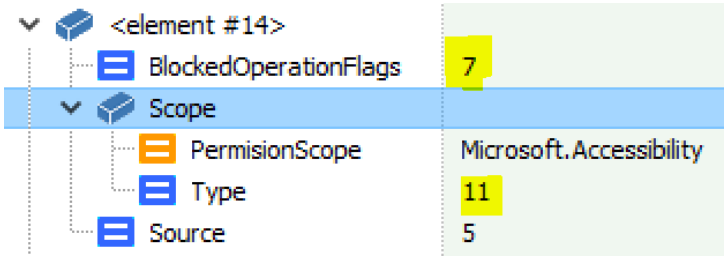


Whereas value 0 means that this ActivityType is NOT blocked:



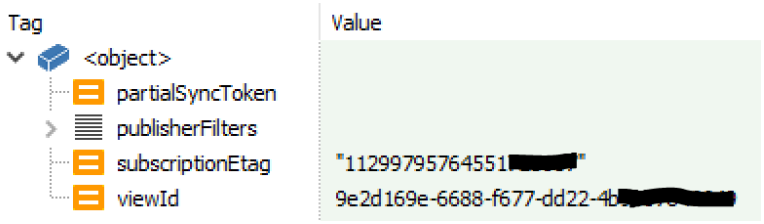
(ActivityType 10 is in listed in the AllowedTypes).

However a BlockedOperationFlags with value 7

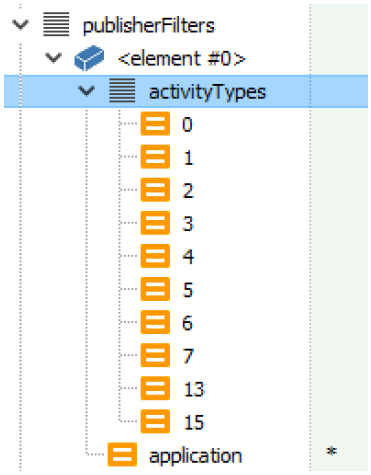


Is not yet explained. I suspect that it means that this is user configurable from “Sync your Settings”, but not sure yet.

The key “DatabaseNotificationSubscriptionInfo” is also a JSON blob:



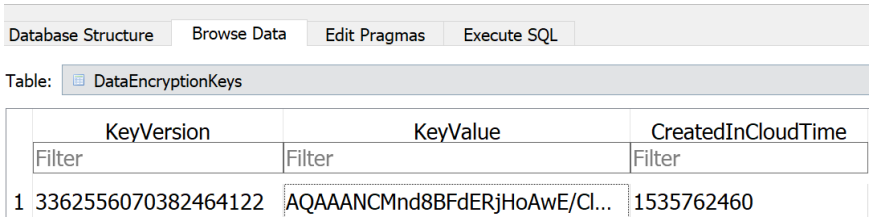
where in the ‘publisherFilters’ we see



that ActivitiyTypes 0-7, 13 and 15 are allowed for (*) all applications.

Finally ‘PendingActivityTypes’ value is also a JSON blob, but empty at this time.

Back to the ActivitiesCaches.db changes, there is also a new table, DataEncryptionKeys:



The Smartlookup view (query) view changed:

Smartlookup (1803)	**Smartlookup (1809)**
select	select
[O].[Id],	[O].[Id],
[O].[AppId],	[O].[AppId],
[O].[PackageIdHash],	[O].[PackageIdHash],
[O].[AppActivityId],	[O].[AppActivityId],
[O].[ActivityType],	[O].[ActivityType],
[O].[OperationType] AS [ActivityStatus],	[O].[OperationType] AS [ActivityStatus],
[O].[ParentActivityId],	[O].[ParentActivityId],
[O].[Tag],	[O].[Tag],
[O].[Group],	[O].[Group],
[O].[MatchId],	[O].[MatchId],
[O].[LastModifiedTime],	[O].[LastModifiedTime],
[O].[ExpirationTime],	[O].[ExpirationTime],
[O].[Payload],	[O].[Payload],
[O].[Priority],	[O].[Priority],
[A].[IsLocalOnly],	[A].[IsLocalOnly],
[O].[PlatformDeviceId],	[O].[PlatformDeviceId],
[A].[CreatedInCloud],	[A].[CreatedInCloud],
[O].[StartTime],	[O].[StartTime],
[O].[EndTime],	[O].[EndTime],
[O].[LastModifiedOnClient],	[O].[LastModifiedOnClient],
1 AS [IsInUploadQueue],	1 AS [IsInUploadQueue],
[O].[GroupAppActivityId],	[O].[GroupAppActivityId],
[O].[ClipboardPayload],	[O].[ClipboardPayload],
[O].[EnterpriseId],	[O].[EnterpriseId],
[O].[OriginalPayload],	[O].[UserActionState],
[O].[OriginalLastModifiedOnClient],	[O].[IsRead],
[O].[ETag]	[O].[OriginalPayload],
from [ActivityOperation] as [O]	[O].[OriginalLastModifiedOnClient],
left outer join [Activity] as [A] on [O].[Id] = [A].[Id]	[O].[GroupItems],
union	[O].[ETag]
select	from [ActivityOperation] as [O]
[Id],	left outer join [Activity] as [A] on [O].[Id] = [A].[Id]
[AppId],	union
[PackageIdHash],	select
[AppActivityId],	[Id],
[ActivityType],	[AppId],
[ActivityStatus],	[PackageIdHash],
[ParentActivityId],	[AppActivityId],
[Tag],	[ActivityType],
[Group],	[ActivityStatus],
[MatchId],	[ParentActivityId],
[LastModifiedTime],	[Tag],
[ExpirationTime],	[Group],
[Payload],	[MatchId],
[Priority],	[LastModifiedTime],
[IsLocalOnly],	[ExpirationTime],
[PlatformDeviceId],	[Payload],
[CreatedInCloud],	[Priority],
[StartTime],	[IsLocalOnly],
[EndTime],	[PlatformDeviceId],

[LastModifiedOnClient],	[CreatedInCloud],
0 AS [IsInUploadQueue],	[StartTime],
[GroupAppActivityId],	[EndTime],
[ClipboardPayload],	[LastModifiedOnClient],
[EnterpriseId],	0 AS [IsInUploadQueue],
[OriginalPayload],	[GroupAppActivityId],
[OriginalLastModifiedOnClient],	[ClipboardPayload],
[ETag]	[EnterpriseId],
from [Activity]	[UserActionState],
where [Id] not in (select [Id]	[IsRead],
from [ActivityOperation])	[OriginalPayload],
	[OriginalLastModifiedOnClient],
	[GroupItems],
	[ETag]
	from [Activity]
	where [Id] not in (select [Id]
	from [ActivityOperation])

We also see a new PlatformID entry: “data_boundary”

ETag	p0	p1	p2	p3
127201	data_boundary	packageId	alternateId	NULL
127203	data_boundary	packageId	alternateId	NULL
127205	data_boundary	packageId	alternateId	NULL
127207	data_boundary	packageId	alternateId	NULL
127209	data_boundary	packageId	alternateId	NULL
127211	data_boundary	packageId	alternateId	NULL
127213	data_boundary	packageId	alternateId	NULL

Associated with Activity types 11 and 12:

AppId	PackageIdHash	AppActivityId	Activity type	ActivityStatus
[{"application":"Microsoft.Credentials.WiFi","platform":"data_boundary"},...	YNLZe4hPeNt2TsD3m2/J...	default$windows.data.nl...	11	Active
[{"application":"Microsoft.Credentials.WiFi","platform":"data_boundary"},...	YNLZe4hPeNt2TsD3m2/J...	default$windows.data.nl...	11	Active
[{"application":"Microsoft.Credentials.WiFi","platform":"data_boundary"},...	YNLZe4hPeNt2TsD3m2/J...	default$windows.data.nl...	11	Active
[{"application":"Microsoft.Credentials.WiFi","platform":"data_boundary"},...	YNLZe4hPeNt2TsD3m2/J...	default$windows.data.nl...	11	Active
[{"application":"Microsoft.Credentials.WiFi","platform":"data_boundary"},...	YNLZe4hPeNt2TsD3m2/J...	default$windows.data.nl...	11	Active
[{"application":"Microsoft.Credentials.WiFi","platform":"data_boundary"},...	YNLZe4hPeNt2TsD3m2/J...	default$windows.data.wifi...	12	Updated
[{"application":"Microsoft.Credentials.WiFi","platform":"data_boundary"},...	YNLZe4hPeNt2TsD3m2/J...	default$windows.data.wifi...	12	Updated

Whose payload is encoded/encrypted.

And one entry associated with Activity type 15:

AppId	PackageIdHash	AppActivityId	Activity type
[{"application":"dek.encrypted.settings","platform":"alternateId"},{"application":"","...	aFEhkMTLDtGKXWcGe0U...		15

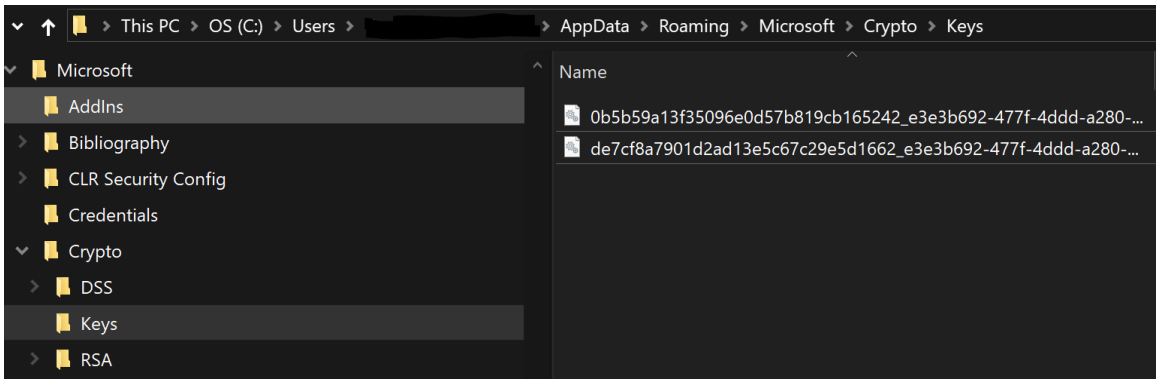
whose Payload field is encoded with Base64, and encrypted. Using https://gchq.github.io/CyberChef/#recipe=From_Base64('A-Za-z0-9%2B/%3D',true) I was able to see the email (*Microsoft account*) associated with this Win 10 installation.

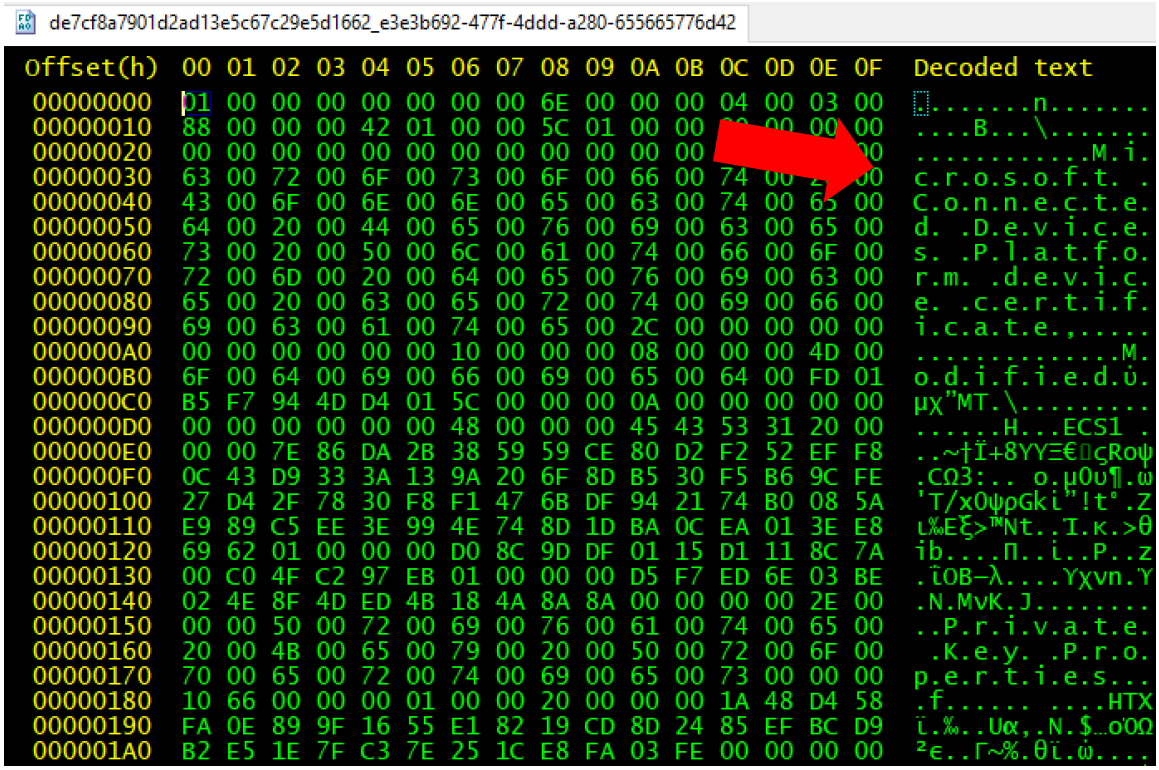
In the ActivityOperation table, a new column (field) named “UploadAllowedByPolicy” is introduced:

ETag	UploadAllowedByPolicy
Filter	Filter
130207	1
130208	1

With observed values 0 and 1. The obvious deduction is that entries with value 1 are Yes and entries with value 0 are No. The Metadata table is where these policies are defined.

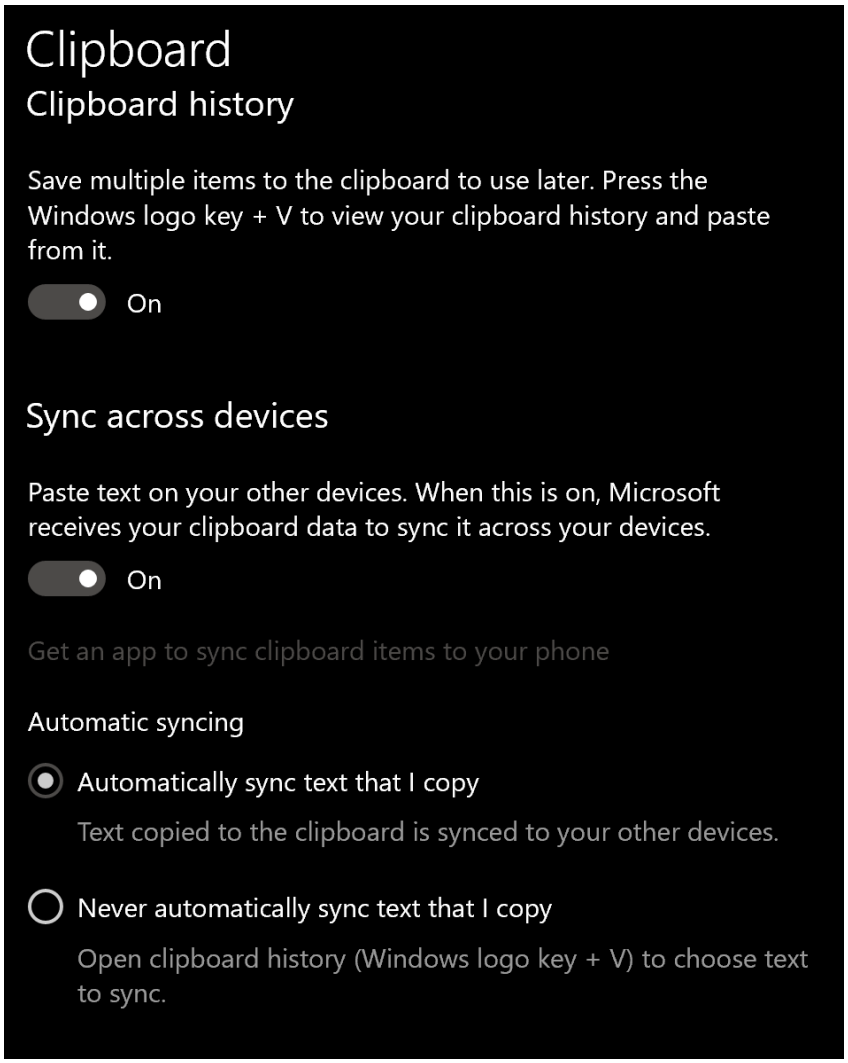
Note: The encryption (?) certificates are store at
C:\Users\%Username%\AppData\Roaming\Microsoft\Crypto\Keys





Update (Win 10 version 1903 OS Build 18875.1000)

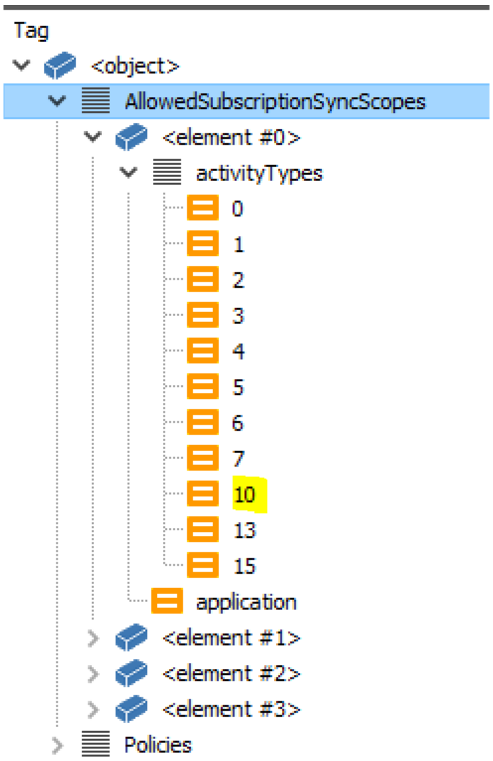
In the latest update, we have a new “ActivityType” -> 10 which is clipboard data
(I have only observed clipboard text).



The Metadata table now includes ActivityType 10 :

Table: Metadata

	Key	
	Filter	Filter
1	DatabaseNotificationSubscriptionInfo	{"ddsDeviceId":"","partialSyncToken":"","publisherFilters":[{"activityTyp
2	PendingActivityTypes	{"activityTypes":[]}
3	DatabaseActivityPolicies	{"AllowedSubscriptionSyncScopes":[{"activityTypes":[0,1,2,3,4,5,6,7,10,13
4	CurrentSettings	{"ActivityTypes":[0,1,2,3,4,5,6,7,10,11,13,15],"Environment":"prod"}
5	PendingFirstDEKUpload	false
6	CurrentEtag	cbacde20-5d0e-11e9-9117-01020305070d
7	DatabaseInstanceId	23919
8	DatabaseInstanceIdUpdateTime	2018-05-10T13:58:59.758Z



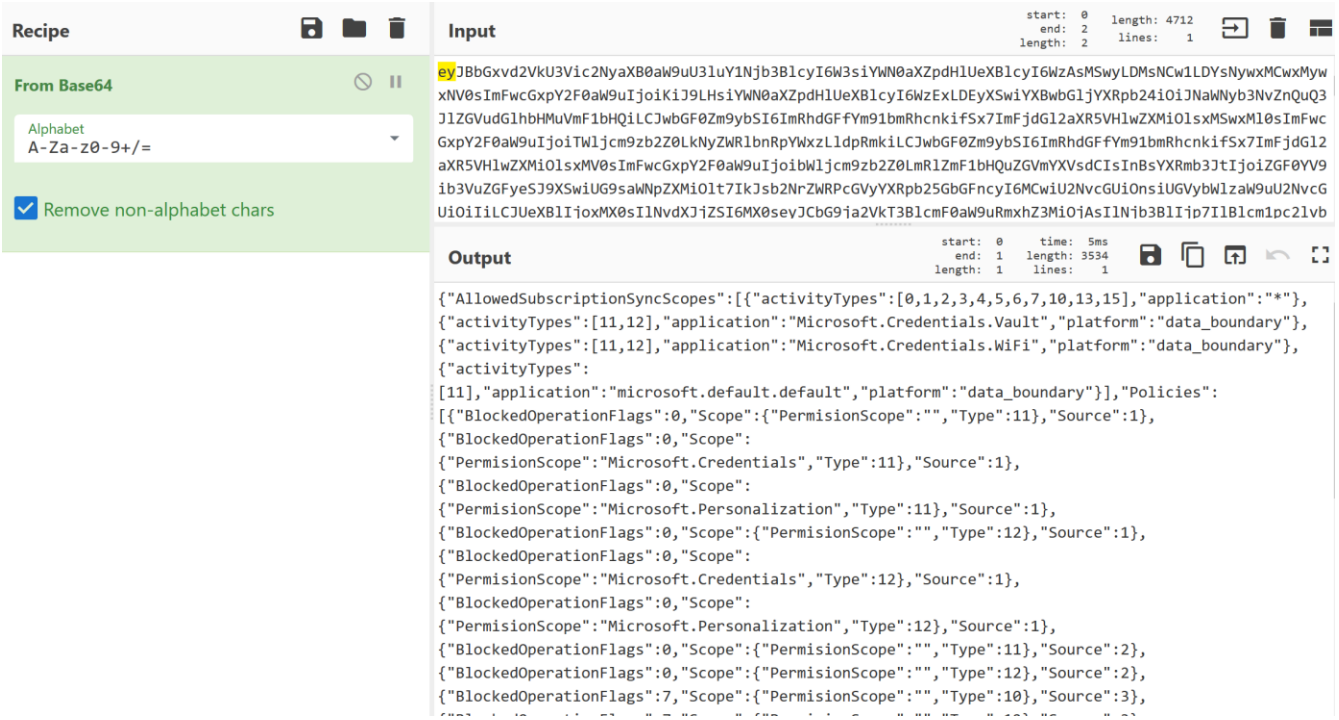
The field “ClipboardPayload” (JSON blob) of entries with ActivityType 10 (Clipboard text) contain the copied text in Base64 encoding in the form:

[{"content":"eyJBbGxvd2VkU3Vic2NyaXB0aW9uU3luY1Njb3BlcyI6W3siYWN0aXZpdHlUeXBlcyI6
WzAsMSwyLDMsNCw1LDYsNywxMCwxMywxNV0sImFwcGxpY2F0aW9uIjoiKiJ9LHsiYWN0aXZpd
HlUeXBlcyI6WzExLDEyXSwiYXBwbGljYXRpb24iOiJNaWNyb3NvZnQuQ3JlZGVudGlhbHMuVmF1bH
QiLCJwbGF0Zm9ybSI6ImRhdGFfYm91bmRhcnkifSx7ImFjdGl2aXR5VHlwZXMiOlsxMSwxMl0sImF
wcGxpY2F0aW9uIjoiTWljcm9zb2Z0LkNyZWRlbnRpYWxzLldpRmkiLCJwbGF0Zm9ybSI6ImRhdGFfY
m91bmRhcnkifSx7ImFjdGl2aXR5VHlwZXMiOlsxMV0sImFwcGxpY2F0aW9uIjoibWljcm9zb2Z0LmR
lZmF1bHQuZGVmYXVsdCIsInBsYXRmb3JtIjoiZGF0YV9ib3VuZGFyeSJ9XSwiUG9saWNpZXMiOlt7IkJ
sb2NrZWRPcGVyYXRpb25GbGFncyI6MCwiU2NvcGUiOnsiUGVybWlzaW9uU2NvcGUiOiIiLCJUeXBl
IjoxMX0sIlNvdXJjZSI6MX0seyJCbG9ja2VkT3BlcmF0aW9uRmxhZ3MiOjAsIlNjb3BlIjp7IlBlcm1pc2lv
blNjb3BlIjoiTWljcm9zb2Z0LkNyZWRlbnRpYWxzIiwiVHlwZSI6MTF9LCJTb3VyY2UiOjF9LHsiQmxvY2
tlZE9wZXJhdGlvbkZsYWdzIjowLCJTY29wZSI6eyJQZXJtaXNpb25TY29wZSI6Ik1pY3Jvc29mdC5QZXJ
zb25hbGl6YXRpb24iLCJUeXBlIjoxMX0sIlNvdXJjZSI6MX0seyJCbG9ja2VkT3BlcmF0aW9uRmxhZ3Mi
OjAsIlNjb3BlIjp7IlBlcm1pc2lvblNjb3BlIjoiIiwiVHlwZSI6MTJ9LCJTb3VyY2UiOjF9LHsiQmxvY2tlZE9w
ZXJhdGlvbkZsYWdzIjowLCJTY29wZSI6eyJQZXJtaXNpb25TY29wZSI6Ik1pY3Jvc29mdC5DcmVkZW5
0aWFscyIsIlR5cGUiOjEyfSwiU291cmNlIjoxfSx7IkJsb2NrZWRPcGVyYXRpb25GbGFncyI6MCwiU2Nv
cGUiOnsiUGVybWlzaW9uU2NvcGUiOiJNaWNyb3NvZnQuUGVyc29uYWxpemF0aW9uIiwiVHlwZS
I6MTJ9LCJTb3VyY2UiOjF9LHsiQmxvY2tlZE9wZXJhdGlvbkZsYWdzIjowLCJTY29wZSI6eyJQZXJtaXNp
b25TY29wZSI6IiIsIlR5cGUiOjExfSwiU291cmNlIjoyfSx7IkJsb2NrZWRPcGVyYXRpb25GbGFncyI6MC
wiU2NvcGUiOnsiUGVybWlzaW9uU2NvcGUiOiIiLCJUeXBlIjoxMn0sIlNvdXJjZSI6Mn0seyJCbG9ja2V
kT3BlcmF0aW9uRmxhZ3MiOjcsIlNjb3BlIjp7IlBlcm1pc2lvblNjb3BlIjoiIiwiVHlwZSI6MTB9LCJTb3Vy
Y2UiOjN9LHsiQmxvY2tlZE9wZXJhdGlvbkZsYWdzIjo3LCJTY29wZSI6eyJQZXJtaXNpb25TY29wZSI6IiI

sIlR5cGUiOjEyfSwiU291cmNlIjozfSx7IkJsb2NrZWRPcGVyYXRpb25GbGFncyI6NywiU2NvcGUiOnsi
UGVybWlzaW9uU2NvcGUiOiIiLCJUeXBlIjoxNX0sIlNvdXJjZSI6M30seyJCbG9ja2VkT3BlcmF0aW9uR
mxhZ3MiOjAsIlNjb3BlIjp7IlBlcm1pc2lvblNjb3BlIjoiIiwiVHlwZSI6MTB9LCJTb3VyY2UiOjR9LHsiQmx
vY2tlZE9wZXJhdGlvbkZsYWdzIjowLCJTY29wZSI6eyJQZXJtaXNpb25TY29wZSI6IiIsIlR5cGUiOjEwfSw
iU291cmNlIjo1fSx7IkJsb2NrZWRPcGVyYXRpb25GbGFncyI6MCwiU2NvcGUiOnsiUGVybWlzaW9u
U2NvcGUiOiIiLCJUeXBlIjoxMX0sIlNvdXJjZSI6NX0seyJCbG9ja2VkT3BlcmF0aW9uRmxhZ3MiOjcsIlN
jb3BlIjp7IlBlcm1pc2lvblNjb3BlIjoiTWljcm9zb2Z0LkFjY2Vzc2liaWxpdHkiLCJUeXBlIjoxMX0sIlNvdXJj
ZSI6NX0seyJCbG9ja2VkT3BlcmF0aW9uRmxhZ3MiOjcsIlNjb3BlIjp7IlBlcm1pc2lvblNjb3BlIjoiTWljc
m9zb2Z0LkNyZWRlbnRpYWxzIiwiVHlwZSI6MTF9LCJTb3VyY2UiOjV9LHsiQmxvY2tlZE9wZXJhdGlv
bkZsYWdzIjowLCJTY29wZSI6eyJQZXJtaXNpb25TY29wZSI6Ik1pY3Jvc29mdC5EZWZhdWx0IiwiVHlw
ZSI6MTF9LCJTb3VyY2UiOjV9LHsiQmxvY2tlZE9wZXJhdGlvbkZsYWdzIjowLCJTY29wZSI6eyJQZXJtaX
Npb25TY29wZSI6Ik1pY3Jvc29mdC5MYW5ndWFnZSIsIlR5cGUiOjExfSwiU291cmNlIjo1fSx7IkJsb2N
rZWRPcGVyYXRpb25GbGFncyI6NywiU2NvcGUiOnsiUGVybWlzaW9uU2NvcGUiOiJNaWNyb3NvZnQuUGVyc29uYWxp
emF0aW9uIiwiVHlwZSI6MTF9LCJTb3VyY2UiOjV9LHsiQmxvY2tlZE9wZXJhdGlvbkZsYWdzIjowLCJTY29wZ
SI6eyJQZXJtaXNpb25TY29wZSI6IlsIlR5cGUiOjExfSwiU291cmNlIjo1fSx7IkJsb2NrZWRPcGVyYXRp
b25GbGFncyI6NywiU2NvcGUiOnsiUGVybWlzaW9uU2NvcGUiOiJNaWNyb3NvZnQuQ3JlZGVudGl
hbHMiLCJUeXBlIjoxMn0sIlNvdXJjZSI6NX0seyJCbG9ja2VkT3BlcmF0aW9uRmxhZ3MiOjAsIlNjb3BlIj
p7IlBlcm1pc2lvblNjb3BlIjoiTWljcm9zb2Z0LkRlZmF1bHQiLCJUeXBlIjoxMn0sIlNvdXJjZSI6NX0seyJC
bG9ja2VkT3BlcmF0aW9uRmxhZ3MiOjcsIlNjb3BlIjp7IlBlcm1pc2lvblNjb3BlIjoiTWljcm9zb2Z0Lkxhb
md1YWdlIiwiVHlwZSI6MTJ9LCJTb3VyY2UiOjV9LHsiQmxvY2tlZE9wZXJhdGlvbkZsYWdzIjo3LCJTY2
9wZSI6eyJQZXJtaXNpb25TY29wZSI6Ik1pY3Jvc29mdC5QZXJzb25hbGl6YXRpb24iLCJUeXBlIjoxMn0
sIlNvdXJjZSI6NX0seyJCbG9ja2VkT3BlcmF0aW9uRmxhZ3MiOjEsIlNjb3BlIjp7IlBlcm1pc2lvblNjb3BlIjoi
joiIiwiVHlwZSI6OH0sIlNvdXJjZSI6N30seyJCbG9ja2VkT3BlcmF0aW9uRmxhZ3MiOjEsIlNjb3BlIjp7Il
Blcm1pc2lvblNjb3BlIjoiIiwiVHlwZSI6OX0sIlNvdXJjZSI6N30seyJCbG9ja2VkT3BlcmF0aW9uRmxhZ3
MiOjAsIlNjb3BlIjp7IlBlcm1pc2lvblNjb3BlIjoiIiwiVHlwZSI6MTB9LCJTb3VyY2UiOjd9LHsiQmxvY2tlZE
9wZXJhdGlvbkZsYWdzIjowLCJTY29wZSI6eyJQZXJtaXNpb25TY29wZSI6IlsIlR5cGUiOjExfSwiU291c
mNlIjo3fSx7IkJsb2NrZWRPcGVyYXRpb25GbGFncyI6MCwiU2NvcGUiOnsiUGVybWlzaW9uU2NvcGUiOiIiLCJU
UiOiIiLCJUeXBlIjoxMn0sIlNvdXJjZSI6N30seyJCbG9ja2VkT3BlcmF0aW9uRmxhZ3MiOjAsIlNjb3BlIjp
7IlBlcm1pc2lvblNjb3BlIjoiIiwiVHlwZSI6MTV9LCJTb3VyY2UiOjd9LHsiQmxvY2tlZE9wZXJhdGlvbkZs
YWdzIjowLCJTY29wZSI6eyJQZXJtaXNpb25TY29wZSI6IlsIlR5cGUiOjV9LCJTb3VyY2UiOjh9LHsiQmx
vY2tlZE9wZXJhdGlvbkZsYWdzIjowLCJTY29wZSI6eyJQZXJtaXNpb25TY29wZSI6IlsIlR5cGUiOjEwfSwiU2
9jZSI6OH0seyJCbG9ja2VkT3BlcmF0aW9uRmxhZ3MiOjAsIlNjb3BlIjp7IlBlcm1pc2lvblNjb3BlIjoiIiwiVH
Tb3VyY2UiOjh9LHsiQmxvY2tlZE9wZXJhdGlvbkZsYWdzIjowLCJTY29wZSI6eyJQZXJtaXNpb25TY29wZSI6IlsIlR5cGUiOjEwfSwiU291cmNlIjo5fV19","formatName":"Text"}]

content	T	W3siY29udGVudCI6ImV5SkJiR3h2ZDJWa1UzVmljMk55YVhC
formatName	T	Text

(Translated below:)



.

The payload of the above entry is:

{"gdprType":"ProductAndServiceUsage","clipboardDataId":"{B268A259-DAAD-47FA-A089-55E3BB298BCB}"}

Another new ‘ActivityType’ 16 contains data on the application from where data was copied/pasted from/to, and the ‘Group’ field shows what action was operated:

AppActivityId	ActivityType	ActivityStatus	arentActivityI	Tag	Group
Filter	Filter	Filter	Filter	Filter	Filter
ECB32AF3-1440…	16	1	BLOB	NULL	Copy
ECB32AF3-1440…	6	2	BLOB	NULL	NULL

And where it was pasted:

AppId	PackageIdHash	AppActivityId	ActivityType	ActivityStatus	arentActivityI	Tag	Group
Filter	Filter	Filter	Filter	Filter	Filter	Filter	Filter
[{"applicatio…	RgBDLH4/nR45L…		10	1	BLOB	NULL	NULL
[{"applicatio…	deglsgqOfpSkY…	ECB32AF3-1440…	6	1	BLOB	NULL	NULL
[{"applicatio…	bwfyZ5c003AQa…	ECB32AF3-1440…	16	1	BLOB	NULL	Paste
[{"applicatio…	Ts0+SH7DZfSHh…	ECB32AF3-1440…	6	1	BLOB	NULL	NULL

We can now see copy pasted operations:

Group	GroupAppActivityId	GroupItems	Is_Read	EnterpriseId	ParentActivityId
Paste			No		4233DA52CE1FF43168B53…
Copy			No		EF261D0B550FC22F26BD2…
Copy			No		EF261D0B550FC22F26BD2…
Paste			No		4233DA52CE1FF43168B53…
Copy			No		EF261D0B550FC22F26BD2…
Copy			No		EF261D0B550FC22F26BD2…
Paste			No		4233DA52CE1FF43168B53…
Copy			No		EF261D0B550FC22F26BD2…
Copy			No		EF261D0B550FC22F26BD2…
Copy			No		EF261D0B550FC22F26BD2…
Copy			No		EF261D0B550FC22F26BD2…
Copy			No		EF261D0B550FC22F26BD2…
Paste			No		4233DA52CE1FF43168B53…
Copy			No		EF261D0B550FC22F26BD2…
Copy			No		EF261D0B550FC22F26BD2…

The copy paste operations can be linked with the 'clipboardDataId' value in the Payload field (JSON) eg:

{"gdprType":"ProductAndServiceUsage","clipboardDataId":"{BA306A6E-2B7B-483B-B9B6-76BB7AF64D12}"}

Activity_type	Group	GroupAppActivityId	GroupItems	ParentActivityId	DdsDeviceId	Device ID	Expires In days	clipboardDataId
Copy/Paste	Paste			A7A0DBC58DD13A75E991D…	NULL	dpRc3VX485JVH95n3ZaaJ…	31	{BA306A6E-2B7B-483B-B9B6-76BB7AF64D1…
Clipboard	NULL			000000000000000000000…	NULL	dpRc3VX485JVH95n3ZaaJ…	0	NULL
Copy/Paste	Copy			9B1C816547035726A2181…	NULL	dpRc3VX485JVH95n3ZaaJ…	31	{BA306A6E-2B7B-483B-B9B6-76BB7AF64D1…
Clipboard	NULL			000000000000000000000…	NULL	dpRc3VX485JVH95n3ZaaJ…	0	NULL
Copy/Paste	Copy			A7A0DBC58DD13A75E991D…	NULL	dpRc3VX485JVH95n3ZaaJ…	31	{91FAD9DC-6A43-475C-8034-7929148F41E…
Clipboard	NULL			000000000000000000000…	NULL	dpRc3VX485JVH95n3ZaaJ…	0	NULL
Copy/Paste	Copy			78009A0829A4BAD23D5A8…	NULL	dpRc3VX485JVH95n3ZaaJ…	31	{4BA8B44B-6EF6-49F7-8742-A0BAF8F8D35…
Copy/Paste	Paste			78009A0829A4BAD23D5A8…	NULL	dpRc3VX485JVH95n3ZaaJ…	31	{3DB5D8D1-0518-4B03-AD8D-082F6BF3451…
Copy/Paste	Paste			78009A0829A4BAD23D5A8…	NULL	dpRc3VX485JVH95n3ZaaJ…	31	{3DB5D8D1-0518-4B03-AD8D-082F6BF3451…
Copy/Paste	Paste			78009A0829A4BAD23D5A8…	NULL	dpRc3VX485JVH95n3ZaaJ…	31	{3DB5D8D1-0518-4B03-AD8D-082F6BF3451…
Copy/Paste	Paste			78009A0829A4BAD23D5A8…	NULL	dpRc3VX485JVH95n3ZaaJ…	31	{3DB5D8D1-0518-4B03-AD8D-082F6BF3451…
Copy/Paste	Paste			78009A0829A4BAD23D5A8…	NULL	dpRc3VX485JVH95n3ZaaJ…	31	{3DB5D8D1-0518-4B03-AD8D-082F6BF3451…
Copy/Paste	Paste			78009A0829A4BAD23D5A8…	NULL	dpRc3VX485JVH95n3ZaaJ…	31	{3DB5D8D1-0518-4B03-AD8D-082F6BF3451…
Clipboard	NULL			000000000000000000000…	NULL	dpRc3VX485JVH95n3ZaaJ…	0	NULL
Copy/Paste	Copy			78009A0829A4BAD23D5A8…	NULL	dpRc3VX485JVH95n3ZaaJ…	31	{3DB5D8D1-0518-4B03-AD8D-082F6BF3451…

However, it appears the Clipboard text has a duration (ExpirationTime - LastModifiedTime) of 0 days (it disappears ~ the next day):

Text(Base64)	ClipboardPayload	Activity_type	Group	GroupAppActivityId	GroupItems	ParentActivityId	DdsDeviceId	Device ID	Expires In days
	NULL	Copy/Paste	Paste			A7A0DBC58DD13A75E991D…	NULL	dpRc3VX485JVH95n3ZaaJ…	31
U09GVFdBUkVcQ2xpZW50c…	[{"content":"U09GVFdB…	Clipboard	NULL			000000000000000000000…	NULL	dpRc3VX485JVH95n3ZaaJ…	0
	NULL	Copy/Paste	Copy			9B1C816547035726A2181…	NULL	dpRc3VX485JVH95n3ZaaJ…	31
MzA4MDQ2QjBBRjRBMzlDQ…	[{"content":"MzA4MDQ2…	Clipboard	NULL			000000000000000000000…	NULL	dpRc3VX485JVH95n3ZaaJ…	0
	NULL	Copy/Paste	Copy			A7A0DBC58DD13A75E991D…	NULL	dpRc3VX485JVH95n3ZaaJ…	31
PGJyPg==	[{"content":"PGJyPg==…	Clipboard	NULL			000000000000000000000…	NULL	dpRc3VX485JVH95n3ZaaJ…	0
	NULL	Copy/Paste	Copy			78009A0829A4BAD23D5A8…	NULL	dpRc3VX485JVH95n3ZaaJ…	31
	NULL	Copy/Paste	Paste			78009A0829A4BAD23D5A8…	NULL	dpRc3VX485JVH95n3ZaaJ…	31
	NULL	Copy/Paste	Paste			78009A0829A4BAD23D5A8…	NULL	dpRc3VX485JVH95n3ZaaJ…	31
	NULL	Copy/Paste	Paste			78009A0829A4BAD23D5A8…	NULL	dpRc3VX485JVH95n3ZaaJ…	31
	NULL	Copy/Paste	Paste			78009A0829A4BAD23D5A8…	NULL	dpRc3VX485JVH95n3ZaaJ…	31
	NULL	Copy/Paste	Paste			78009A0829A4BAD23D5A8…	NULL	dpRc3VX485JVH95n3ZaaJ…	31
	NULL	Copy/Paste	Paste			78009A0829A4BAD23D5A8…	NULL	dpRc3VX485JVH95n3ZaaJ…	31
PGJyPg==	[{"content":"PGJyPg==…	Clipboard	NULL			000000000000000000000…	NULL	dpRc3VX485JVH95n3ZaaJ…	0
	NULL	Copy/Paste	Copy			78009A0829A4BAD23D5A8…	NULL	dpRc3VX485JVH95n3ZaaJ…	31
	NULL	Copy/Paste	Paste			78009A0829A4BAD23D5A8…	NULL	dpRc3VX485JVH95n3ZaaJ…	31
DQogICAgV2luZG93cyBJb…	[{"content":"DQogICAg…	Clipboard	NULL			000000000000000000000…	NULL	dpRc3VX485JVH95n3ZaaJ…	0
	NULL	Copy/Paste	Copy			78009A0829A4BAD23D5A8…	NULL	dpRc3VX485JVH95n3ZaaJ…	31
	NULL	Copy/Paste	Paste			78009A0829A4BAD23D5A8…	NULL	dpRc3VX485JVH95n3ZaaJ…	31
Q1NleDJTWTFocHBkNWxOT…	[{"content":"Q1NleDJT…	Clipboard	NULL			000000000000000000000…	NULL	dpRc3VX485JVH95n3ZaaJ…	0

To be updated