

**NATIONAL TRANSPORTATION SAFETY BOARD**  
Vehicle Recorder Division  
Washington, D.C. 20594

August 20, 2018

## **Personal Electronic Device Test**

### **Specialist's Device Study By Jane Foster**

#### **1. EVENT SUMMARY**

Location: Concan, Texas  
Date: March 29, 2017  
Vehicle: 2007 Dodge Ram 3500  
Operator: Private  
NTSB Number: HWY17MH011

For a summary of the crash, refer to the *Crash Summary Report* in the docket for this investigation.

#### **2. DETAILS OF INVESTIGATION**

The following personal electronic device (PED) from the driver of the 2007 Dodge Ram 3500 was recovered by the Texas Department of Public Safety (DPS):

Device Manufacturer/Model: LG K371 Phoenix 2  
Serial Number: 609CYGW577919

##### **2.1. Device Description**

The LG K371 Phoenix 2 is a touch-screen smart-phone capable of voice calling, text messaging, email, photo/video recording, audio (music) playback, and numerous other specialized functions depending on configuration. Specialized functions are supported by additional user-installed program applications. Application data is stored in non-volatile memory and may include call logs, text messaging logs, image, video, and position location information. In addition, the specialized application data may be stored in a proprietary file structure using numerous files. The amount and type of data stored varies based on the software version and configuration of the specific device.

##### **2.2. Data Recovery**

On March 31, 2017, the Texas DPS recovered the truck driver's LG K371 Phoenix 2 from the scene of the Concan crash. The Texas DPS imaged the content of the device at their facility using Cellebrite software. The NTSB was provided a copy of the data recovered by Cellebrite from the device and used the provided data to conduct some tests on a

surrogate device. Figures 1 and 2 show the driver's device as received by the Texas DPS.

**Figure 1. The driver's LG K371 Phoenix 2 as received by Texas DPS.**



Figure 2. The driver's LG K371 Phoenix 2 as received by Texas DPS.




### 3. DEVICE INVESTIGATION

#### 3.1. Driver's LG K371 Phoenix 2

According to a forensic analysis of the truck driver's phone using the Cellebrite software, conducted by the Texas Department of Public Safety, the driver read a text from a friend at 11:25 a.m., and accessed Spotify at 11:53 a.m CDT. An application on the phone passively pinged the Concan cell tower at 12:12 p.m. CDT, and again at 12:19 p.m CDT. In addition to these activities, a modification to the Spotify application at 12:19 p.m. CDT was also recorded.

**Figure 3. Spotify activity on driver's phone prior to the crash.**

File Info		Additional file info		Thumbnail	Deleted	
Name:	<a href="#">1167_task_thumbnail.png</a>	Size (bytes):	45583			
Path:	userdata (ExtX)/Root/system/recent_images/1167_task_thumbnail.png	Created:	3/29/2017 11:53:48 AM(UTC-5)			
MD5:	d72430b8409f0669a83e0d19b441ed7e	Modified:	3/29/2017 12:19:04 PM(UTC-5)			
		Accessed:	3/29/2017 11:53:48 AM(UTC-5)			
		Source Extraction	Physical (2)			
197	Images		Important	4/19/2017 2:09:02 PM	4/19/2017 2:09:02 PM	▲

Cellebrite was contacted to determine the meaning of this modification, and provided the following explanation:

#### Last accessed date:

Indicates when a file was accessed the last time. This attribute differs from modified date. While the modification date indicates the last changes in the file content, the last accessed date does not necessarily presuppose changes of content. When a file is modified, modification and last accessed date is set to the same value. However, if the file is only opened for viewing, copied, moved, or in other words - if the file or folder is used in any way, last accessed date is changed to current date. Like all file attributes, last accessed date is recorded in the file system, not in the file contents. This file property does not interfere with the date stamps that are stored in the file itself. Various applications put their own date and time records in the file contents or meta-tags.

#### Modified time:

A file's modification time describes when the content of the file most recently changed. Because most file systems do not compare data written to a file with what is already there, if a program overwrites part of a file with the same data as previously existed in that location, the modification time will be updated even though the contents did not technically change.

#### Created/captured time:

A file's actual creation time within the file system. The capture time (the time when a file was captured as indicated in the file meta data) is similar to the creation time of the file.

### 3.2. Testing Purpose

The purpose of this test was to determine when the truck driver last accessed and modified an application on his phone. This test could not rule out if the driver picked up and viewed his phone prior to the crash.

Based on staff correspondences with Cellebrite, it appears that the “Modified” timestamp may be changed without user input. Any user input, such as viewing, copying, or moving a file within the application, would seem to result in changes to both the “Accessed” and “Modified” timestamps. To definitively determine if this is the case, a surrogate cell phone of the same make and model as the driver’s phone was used for testing.

### 3.3. Testing Method

In the crash, the phone battery was separated from the rest of the phone by the force of the collision; therefore, the test phone was set to allow the battery to be easily and quickly disconnected. The test phone was not password protected, since the original phone was not password protected. Six different tests (described below) were used to determine the circumstances in which the Spotify “Modified” timestamp changes without a corresponding change to either the “Created” or “Accessed” timestamp. Tests 0 through 4 were conducted on the same day. Tests 5 and 6 were conducted on a different day.

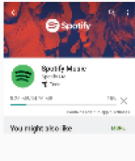
### 3.4. Testing Limitations

Limitations of this test include the lack of repetitive trials, the focus on only one phone model, the different versions of the Spotify software most likely used, the tests conducted by only two different users, and other limitations not discussed in this report.

### 3.5. Test 0

During Test 0 the phone was powered on and Spotify was installed. The phone was then physically imaged using Cellebrite. The image showed that Spotify was installed at 03:20:07 UTC on January 30, 2107. The following image was created:


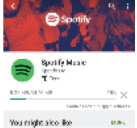
**Figure 4. Images on surrogate phone associated with test 0.**

#	File Info	Additional file info	Thumbnail	Deleted
1	<p>Name: <a href="#">19_task_thumbnail.png</a></p> <p>Path: userdata (ExtX)/Root/system/recent_images/19_task_thumbnail.png</p> <p>MD5: 8ac8a9293d3aa8f4bdd7aefaff91a3c5</p>	<p>Size (bytes): 161408</p> <p>Created: 1/30/2018 3:17:56 PM(UTC+0)</p> <p>Modified: 1/30/2018 3:20:30 PM(UTC+0)</p> <p>Accessed: 1/30/2018 3:17:56 PM(UTC+0)</p> <p>Source file userdata (ExtX)/Root/system/recent_images/19_task_thumbnail.png : 0x0 (Size: 161408 bytes)</p>		

### 3.6. Test 1

For Test 1, the Spotify application ran for 10 minutes without further input from the user. The phone screen timed out during this time. The test was started at 16:07:00 UTC and ended at 16:17:00 UTC. After 10 minutes, the battery was removed, powering off the phone. Cellebrite was used to create a physical image of the phone. The following images associated with Spotify were found on the phone:


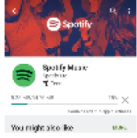
**Figure 5. Images on surrogate phone associated with test 1.**

#	File Info	Additional file info	Thumbnail	Deleted
1	<b>Name:</b> <a href="#">30_task_thumbnail.png</a> <b>Path:</b> userdata (ExtX)/Root/system/recent_images/ 30_task_thumbnail.png <b>MD5:</b> f7ced237b0690bae661cd9ad38444a6e	<b>Size (bytes):</b> 106726 <b>Created:</b> 1/30/2018 4:07:32 PM(UTC+0) <b>Modified:</b> 1/30/2018 4:07:32 PM(UTC+0) <b>Accessed:</b> 1/30/2018 4:07:32 PM(UTC+0) <b>Source file</b> userdata (ExtX)/Root/system/recent_images/ 30_task_thumbnail.png : 0x0 (Size: 106726 bytes)		
2	<b>Name:</b> <a href="#">19_task_thumbnail.png</a> <b>Path:</b> userdata (ExtX)/Root/system/recent_images/ 19_task_thumbnail.png <b>MD5:</b> 8ac8a9293d3aa8f4bdd7aefaff91a3c5	<b>Size (bytes):</b> 161408 <b>Created:</b> 1/30/2018 3:17:56 PM(UTC+0) <b>Modified:</b> 1/30/2018 3:20:30 PM(UTC+0) <b>Accessed:</b> 1/30/2018 3:17:56 PM(UTC+0) <b>Source file</b> userdata (ExtX)/Root/system/recent_images/ 19_task_thumbnail.png : 0x0 (Size: 161408 bytes)		

### 3.7. Test 2

For Test 2, the Spotify application ran for 11 minutes. Throughout that time, the user scrolled through Spotify and manipulated the screen without changing the song or the volume. The phone screen timed out during this time. Spotify was started at 19:29:00 UTC and the battery was pulled at 19:40:00 UTC. After 11 minutes, the battery was removed, powering off the phone. Cellebrite was used to create a physical image of the phone. The following images associated with Spotify were found on the phone:

**Figure 6. Images on surrogate phone associated with test 2.**

#	File Info	Additional file info	Thumbnail	Deleted
1	<b>Name:</b> <a href="#">34_task_thumbnail.png</a> <b>Path:</b> userdata (ExtX)/Root/system/recent_images/ 34_task_thumbnail.png <b>MD5:</b> f7ced237b0690bae661cd9ad38444a6e	<b>Size (bytes):</b> 106726 <b>Created:</b> 1/30/2018 7:29:32 PM(UTC+0) <b>Modified:</b> 1/30/2018 7:29:32 PM(UTC+0) <b>Accessed:</b> 1/30/2018 7:29:32 PM(UTC+0) <b>Source file</b> userdata (ExtX)/Root/system/recent_images/ 34_task_thumbnail.png : 0x0 (Size: 106726 bytes)		
2	<b>Name:</b> <a href="#">19_task_thumbnail.png</a> <b>Path:</b> userdata (ExtX)/Root/system/recent_images/ 19_task_thumbnail.png <b>MD5:</b> 8ac8a9293d3aa8f4bdd7aefaff91a3c5	<b>Size (bytes):</b> 161408 <b>Created:</b> 1/30/2018 3:17:56 PM(UTC+0) <b>Modified:</b> 1/30/2018 3:20:30 PM(UTC+0) <b>Accessed:</b> 1/30/2018 3:17:56 PM(UTC+0) <b>Source file</b> userdata (ExtX)/Root/system/recent_images/ 19_task_thumbnail.png : 0x0 (Size: 161408 bytes)		

### 3.8. Test 3

Test 3 was conducted after Test 4. For Test 3, the Spotify application ran for 8 minutes. Throughout that time, the user manipulated the volume buttons. The phone screen timed out during this time. Table 1 shows the times the user made inputs to the phone.


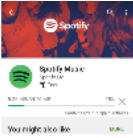


**Table 1. Activity associated with Test 3.**

Activity	Time (UTC)	Notes
Start Spotify	20:35:00	
Start playing music	20:36:00	
Change volume	20:38:00	Screen powered on and used volume buttons on back of phone
Change volume	20:40:00	Only used volume buttons on back of phone
Change volume	20:42:00	Only used volume buttons on back of phone
Battery Pull	20:43:00	

After 10 minutes, the battery was removed, powering off the phone. Cellebrite was used to create a physical image of the phone. The following images associated with Spotify were found on the phone:

**Figure 7. Images on surrogate phone associated with test 3.**

#	File Info	Additional file info	Thumbnail	Deleted
1	<p>Name: <a href="#">48_task_thumbnail.png</a></p> <p>Path: userdata (ExtX)/Root/system/recent_images/48_task_thumbnail.png</p> <p>MD5: 20506fa268732bdec11d543dedce450b</p>	<p>Size (bytes): 184310</p> <p>Created: 1/30/2018 8:36:35 PM(UTC+0)</p> <p>Modified: 1/30/2018 8:39:01 PM(UTC+0)</p> <p>Accessed: 1/30/2018 8:36:35 PM(UTC+0)</p> <p>Source file: userdata (ExtX)/Root/system/recent_images/48_task_thumbnail.png : 0x0 (Size: 184310 bytes)</p>		
2	<p>Name: <a href="#">19_task_thumbnail.png</a></p> <p>Path: userdata (ExtX)/Root/system/recent_images/19_task_thumbnail.png</p> <p>MD5: 8ac8a9293d3aa8f4bdd7aefaff91a3c5</p>	<p>Size (bytes): 161408</p> <p>Created: 1/30/2018 3:17:56 PM(UTC+0)</p> <p>Modified: 1/30/2018 3:20:30 PM(UTC+0)</p> <p>Accessed: 1/30/2018 3:17:56 PM(UTC+0)</p> <p>Source file: userdata (ExtX)/Root/system/recent_images/19_task_thumbnail.png : 0x0 (Size: 161408 bytes)</p>		

### 3.9. Test 4


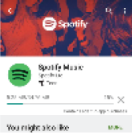
Test 4 was conducted before Test 3. For Test 4, the Spotify application ran for 10 minutes. Throughout that time, the user changed the song that was playing using the Spotify application. A playlist was selected and the song was changed using the next song (skip) button displayed on the screen. The phone screen timed out during this time. Table 2 shows the activity associated with test 4.

**Table 2. Activity associated with Test 4.**

Activity	Time (UTC)	Notes
Start Spotify	20:03:00	
Start playing music	20:04:00	Accidentally hit exterior volume button
Change song	20:06:00	
Change song	20:08:00	
Change song	20:10:00	
Change song	20:12:00	
Battery Pull	20:13:00	

After 10 minutes, the battery was removed, powering off the phone. Cellebrite was used to create a physical image of the phone. The following images associated with Spotify were found on the phone:

**Figure 8. Images on surrogate phone associated with test 4.**

#	File Info	Additional file info	Thumbnail	Deleted
1	<b>Name:</b> <a href="#">41_task_thumbnail.png</a> <b>Path:</b> userdata (ExtX)/Root/system/recent_images/ 41_task_thumbnail.png <b>MD5:</b> 846e2a2eecbea08418d442dc212f dffa	<b>Size (bytes):</b> 203114 <b>Created:</b> 1/30/2018 8:04:47 PM(UTC+0) <b>Modified:</b> 1/30/2018 8:12:34 PM(UTC+0) <b>Accessed:</b> 1/30/2018 8:04:47 PM(UTC+0) <b>Source file</b> userdata (ExtX)/Root/system/recent_images/ 41_task_thumbnail.png : 0x0 (Size: 203114 bytes)		
2	<b>Name:</b> <a href="#">19_task_thumbnail.png</a> <b>Path:</b> userdata (ExtX)/Root/system/recent_images/ 19_task_thumbnail.png <b>MD5:</b> 8ac8a9293d3aa8f4bdd7aefaff91a3 c5	<b>Size (bytes):</b> 161408 <b>Created:</b> 1/30/2018 3:17:56 PM(UTC+0) <b>Modified:</b> 1/30/2018 3:20:30 PM(UTC+0) <b>Accessed:</b> 1/30/2018 3:17:56 PM(UTC+0) <b>Source file</b> userdata (ExtX)/Root/system/recent_images/ 19_task_thumbnail.png : 0x0 (Size: 161408 bytes)		

### 3.10. Test 5

After conducting tests 1-4, additional tests were deemed necessary. Additional unmonitored use of the Spotify application occurred between the tests. Test 5 and 6 were conducted on the same day. For Test 5, the Spotify application ran for 10 minutes. Throughout that time, the user continually manipulated the Spotify application to make sure the screen did not time out. The songs were selected rather than skipping through a playlist. Table 3 shows the activity associated with test 5.


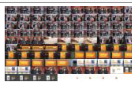
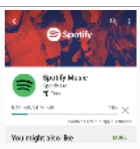
**Table 3. Spotify activity associated with test 5.**

Activity	Time (UTC)	Notes
Start Spotify, play song	15:23:30	Manipulated exterior volume buttons
Picked new song	15:25:30	Ad plays with video
Picked new song	15:29:30	
Picked new song	15:32:00	Ad plays
Battery Pull	15:33:30	

After 10 minutes, the battery was removed, powering off the phone. Cellebrite was used to create a physical image of the phone. The following images associated with Spotify tests were found on the phone:



**Figure 9. Images on surrogate phone associated with test 5.**

#	File Info	Additional file info	Thumbnail	Deleted
1	<b>Name:</b> <a href="#">5c7794aa3e1b48a71cb1f589e1eb8178.1</a> <b>Path:</b> userdata (ExtX)/Root/data/com.spotify.music/cache/picasso-cache/5c7794aa3e1b48a71cb1f589e1eb8178.1 <b>MD5:</b> 02d52955c4bfd2f1d554e16871c9dd1	<b>Size (bytes):</b> 420181 <b>Created:</b> 2/16/2018 3:32:05 PM(UTC+0) <b>Modified:</b> 2/16/2018 3:32:07 PM(UTC+0) <b>Accessed:</b> 2/16/2018 3:32:05 PM(UTC+0) <b>Source file</b> userdata (ExtX)/Root/data/com.spotify.music/cache/picasso-cache/5c7794aa3e1b48a71cb1f589e1eb8178.1 : 0x0 (Size: 420181 bytes)		
2	<b>Name:</b> <a href="#">644bff2d01e84767bcd2ac6adbccf356.1</a> <b>Path:</b> userdata (ExtX)/Root/data/com.spotify.music/cache/picasso-cache/644bff2d01e84767bcd2ac6adbccf356.1 <b>MD5:</b> b609d96cc8b6e7e0c4e17bee0a05110e	<b>Size (bytes):</b> 222311 <b>Created:</b> 2/16/2018 3:25:05 PM(UTC+0) <b>Modified:</b> 2/16/2018 3:25:06 PM(UTC+0) <b>Accessed:</b> 2/16/2018 3:25:05 PM(UTC+0) <b>Source file</b> userdata (ExtX)/Root/data/com.spotify.music/cache/picasso-cache/644bff2d01e84767bcd2ac6adbccf356.1 : 0x0 (Size: 222311 bytes)		
3	<b>Name:</b> <a href="#">19_task_thumbnail.png</a> <b>Path:</b> userdata (ExtX)/Root/system/recent_images/19_task_thumbnail.png <b>MD5:</b> 8ac8a9293d3aa8f4bdd7aefaff91a3c5	<b>Size (bytes):</b> 161408 <b>Created:</b> 1/30/2018 3:17:56 PM(UTC+0) <b>Modified:</b> 1/30/2018 3:20:30 PM(UTC+0) <b>Accessed:</b> 1/30/2018 3:17:56 PM(UTC+0) <b>Source file</b> userdata (ExtX)/Root/system/recent_images/19_task_thumbnail.png : 0x0 (Size: 161408 bytes)		

### 3.11. Test 6

For Test 6, the Spotify application ran for 10 minutes and 30 seconds. During that time, the user opened Spotify and started a playlist. The user then transferred to a different application (Google Chrome) and remained actively using the new application while Spotify ran in the background. The phone screen did not time out during the duration of the test. Table 4 shows the Spotify activity associated with test 6.

**Table 4. Spotify activity associated with test 6.**

Activity	Time (UTC)	Notes
Start Spotify	16:10:30	Needed to log into Spotify application
Played song	16:12:00	
Went to home screen and launched Chrome	16:13:00	Continually used chrome to prevent screen timeout while Spotify ran in the background
Battery Pull	16:21:00	

After 10 minutes, the battery was removed, powering off the phone. Cellebrite was used to create a physical image of the phone. The following images associated with Spotify tests were found on the phone:

Figure 10. Images on surrogate phone associated with test 6.

#	File Info	Additional file info	Thumbnail	Deleted
1	<b>Name:</b> <a href="#">94d680e7276351c4127c10708ab8c4a7.1</a> <b>Path:</b> userdata (ExtX)/Root/data/com.spotify.music/cache/picasso-cache/94d680e7276351c4127c10708ab8c4a7.1 <b>MD5:</b> ab382d5acd3634c0048d1ce533bad979	<b>Size (bytes):</b> 147228 <b>Created:</b> 2/16/2018 4:16:03 PM(UTC+0) <b>Modified:</b> 2/16/2018 4:16:03 PM(UTC+0) <b>Accessed:</b> 2/16/2018 4:16:03 PM(UTC+0) <b>Source file</b> userdata (ExtX)/Root/data/com.spotify.music/cache/picasso-cache/94d680e7276351c4127c10708ab8c4a7.1 : 0x0 (Size: 147228 bytes)		
2	<b>Name:</b> <a href="#">69_task_thumbnail.png</a> <b>Path:</b> userdata (ExtX)/Root/system/recent_images/69_task_thumbnail.png <b>MD5:</b> afeb59be8e8c9f132141a53a421f0800	<b>Size (bytes):</b> 121907 <b>Created:</b> 2/16/2018 4:13:03 PM(UTC+0) <b>Modified:</b> 2/16/2018 4:13:03 PM(UTC+0) <b>Accessed:</b> 2/16/2018 4:13:03 PM(UTC+0) <b>Source file</b> userdata (ExtX)/Root/system/recent_images/69_task_thumbnail.png : 0x0 (Size: 121907 bytes)		
3	<b>Name:</b> <a href="#">d964894b6292452c4f1c7efabdfc2af.1</a> <b>Path:</b> userdata (ExtX)/Root/data/com.spotify.music/cache/picasso-cache/d964894b6292452c4f1c7efabdfc2af.1 <b>MD5:</b> 24c45440a3983d73436f801e7d9e2c91	<b>Size (bytes):</b> 11846 <b>Created:</b> 2/16/2018 4:12:06 PM(UTC+0) <b>Modified:</b> 2/16/2018 4:12:06 PM(UTC+0) <b>Accessed:</b> 2/16/2018 4:12:06 PM(UTC+0) <b>Source file</b> userdata (ExtX)/Root/data/com.spotify.music/cache/picasso-cache/d964894b6292452c4f1c7efabdfc2af.1 : 0x0 (Size: 11846 bytes)		
4	<b>Name:</b> <a href="#">16d76f2728cbbf7364c0aa7fe969ecd5.1</a> <b>Path:</b> userdata (ExtX)/Root/data/com.spotify.music/cache/picasso-cache/16d76f2728cbbf7364c0aa7fe969ecd5.1 <b>MD5:</b> 2415eb5f7ab436247e5dc5bcd38bf808	<b>Size (bytes):</b> 12982 <b>Created:</b> 2/16/2018 4:12:06 PM(UTC+0) <b>Modified:</b> 2/16/2018 4:12:06 PM(UTC+0) <b>Accessed:</b> 2/16/2018 4:12:06 PM(UTC+0) <b>Source file</b> userdata (ExtX)/Root/data/com.spotify.music/cache/picasso-cache/16d76f2728cbbf7364c0aa7fe969ecd5.1 : 0x0 (Size: 12982 bytes)		
5	<b>Name:</b> <a href="#">40fb2a08214f750a251e0e0781fdabe0.1</a> <b>Path:</b> userdata (ExtX)/Root/data/com.spotify.music/cache/picasso-cache/40fb2a08214f750a251e0e0781fdabe0.1 <b>MD5:</b> 546705640d0d0c7820981254880ac4f9	<b>Size (bytes):</b> 14056 <b>Created:</b> 2/16/2018 4:12:06 PM(UTC+0) <b>Modified:</b> 2/16/2018 4:12:06 PM(UTC+0) <b>Accessed:</b> 2/16/2018 4:12:06 PM(UTC+0) <b>Source file</b> userdata (ExtX)/Root/data/com.spotify.music/cache/picasso-cache/40fb2a08214f750a251e0e0781fdabe0.1 : 0x0 (Size: 14056 bytes)		
6	<b>Name:</b> <a href="#">7452f7e2de8d89ffa13ea352515b9907.1</a> <b>Path:</b> userdata (ExtX)/Root/data/com.spotify.music/cache/picasso-cache/7452f7e2de8d89ffa13ea352515b9907.1 <b>MD5:</b> d4746ec7955f680c9b205369ff83cb79	<b>Size (bytes):</b> 11818 <b>Created:</b> 2/16/2018 4:12:06 PM(UTC+0) <b>Modified:</b> 2/16/2018 4:12:06 PM(UTC+0) <b>Accessed:</b> 2/16/2018 4:12:06 PM(UTC+0) <b>Source file</b> userdata (ExtX)/Root/data/com.spotify.music/cache/picasso-cache/7452f7e2de8d89ffa13ea352515b9907.1 : 0x0 (Size: 11818 bytes)		
7	<b>Name:</b> <a href="#">5c7794aa3e1b48a71cb1f589e1eb8178.1</a> <b>Path:</b> userdata (ExtX)/Root/data/com.spotify.music/cache/picasso-cache/5c7794aa3e1b48a71cb1f589e1eb8178.1 <b>MD5:</b> 02d52955c4fbd2f1d554e16871c9dd1	<b>Size (bytes):</b> 420181 <b>Created:</b> 2/16/2018 3:32:05 PM(UTC+0) <b>Modified:</b> 2/16/2018 3:32:07 PM(UTC+0) <b>Accessed:</b> 2/16/2018 3:32:05 PM(UTC+0) <b>Source file</b> userdata (ExtX)/Root/data/com.spotify.music/cache/picasso-cache/5c7794aa3e1b48a71cb1f589e1eb8178.1 : 0x0 (Size: 420181 bytes)		
8	<b>Name:</b> <a href="#">644bff2d01e84767bcd2ac6adbcff356.1</a> <b>Path:</b> userdata (ExtX)/Root/data/com.spotify.music/cache/picasso-cache/644bff2d01e84767bcd2ac6adbcff356.1 <b>MD5:</b> b609d96cc8b6e7e0d4e17bee0a05110e	<b>Size (bytes):</b> 222311 <b>Created:</b> 2/16/2018 3:25:05 PM(UTC+0) <b>Modified:</b> 2/16/2018 3:25:06 PM(UTC+0) <b>Accessed:</b> 2/16/2018 3:25:05 PM(UTC+0) <b>Source file</b> userdata (ExtX)/Root/data/com.spotify.music/cache/picasso-cache/644bff2d01e84767bcd2ac6adbcff356.1 : 0x0 (Size: 222311 bytes)		
9	<b>Name:</b> <a href="#">19_task_thumbnail.png</a> <b>Path:</b> userdata (ExtX)/Root/system/recent_images/19_task_thumbnail.png <b>MD5:</b> 8ac8a9293d3aa8f4bdd7aefaff91a3c5	<b>Size (bytes):</b> 161408 <b>Created:</b> 1/30/2018 3:17:56 PM(UTC+0) <b>Modified:</b> 1/30/2018 3:20:30 PM(UTC+0) <b>Accessed:</b> 1/30/2018 3:17:56 PM(UTC+0) <b>Source file</b> userdata (ExtX)/Root/system/recent_images/19_task_thumbnail.png : 0x0 (Size: 161408 bytes)		

### 3.12. Testing Summary

The purpose of this testing was to determine the difference between created, accessed, and modified time on a Cellebrite physical image for an LG Phoenix 2 using the Spotify application. Some limitations of these tests include users' lack of familiarity with this particular phone. This caused some small timing errors in manipulation of the phone interface. Times are reported when the activity started, not when the activity was completed.

Test 0 created a new task thumbnail during the installation process of the Spotify application. No new task thumbnails were created in relation to the use of the application, because the application was not used during this test.

Test 1 still had the task thumbnail from the installation of Spotify. This task thumbnail remained on the phone for the rest of the tests. There was also a new task thumbnail that was generated during the test. The created, modified, and accessed times were all the same for this test, 16:07:32 UTC. This thumbnail was generated about 30 seconds after the last user input (16:07:00 UTC). This is consistent with the time out of the surrogate phone (30 seconds). This is the default setting of the phone. The created, modified, and accessed times of the task thumbnail file in this test is consistent with last user input time plus the additional screen timeout time.

Test 2 confirmed that the task thumbnail created, accessed and modified times were all similar to the results that were found in test 1. Manipulation of the screen and the app without changing the song or volume did not have an effect on the times of the task thumbnail.

Test 3 showed a difference in the created, modified, and accessed times. The created and accessed times were the same (similar to the driver's phone associated with the crash) and the modified time was different. The task thumbnail was created and accessed 30 seconds (duration of the screen time out) when the phone screen first timed out for this test. Music was started on the phone at 20:36:00 UTC and the task thumbnail was created and accessed at 20:36:35 UTC (about 30 seconds later). The modified time is associated with any additional screen power ups and timeouts during the test. After 20:38:00 UTC, the phone screen was accidentally powered up. The volume buttons were used to manipulate the volume and then the phone was set down. Shortly after (30 seconds later), the screen timed out. The task thumbnail was modified at 20:39:01 UTC.

Test 4 also confirmed what was found in test 3. The created and accessed times were the same, and these times were consistent with the first screen timeout of the phone. Music was started at 20:04:00 UTC and the task thumbnail was generated about thirty seconds later, at 20:04:47 UTC. The song was changed every two minutes and the phone screen was allowed to timeout. The last manipulation of the phone with the screen powered on was at 20:12:00 UTC. The task thumbnail file was modified thirty seconds later when the phone timed out at 20:12:34 UTC.

Test 5 generated no task thumbnails. This was consistent with previous tests, because the screen was constantly manipulated preventing it from timing out. Additional images

associated with this test were generated due to advertisements displayed on the screen during the manipulation of the application.

Test 6 did generate task thumbnails despite the screen never timing out. The task thumbnail was created, modified, and accessed at 16:13:03 UTC. This is consistent with the time that the Spotify application was left to start using a different application (in this case, Google Chrome). The Spotify application was left at about 16:13:00 UTC. Unless described above, it is unknown why the additional images were created during this test.

This test gave some insight into why the modified time may differ from the created and accessed time for task thumbnails located in the userdata partition. The created and accessed time are consistent with an initial screen timeout or a change of application. The modified time is consistent with the last screen timeout or change of application.

The surrogate test phone had a screen timeout set to the default, 30 seconds. The driver's phone in the crash had a screen timeout set to 5 minutes. The task thumbnail on the driver's phone was created and accessed at 11:53:48 CDT. Based on the limited data found in this test, the driver either first manipulated his phone around 11:48:48 CDT or switched to a different application at 11:53:48 CDT. The task thumbnail on the driver's phone was modified at 12:19:04 CDT. Based on the limited data found in this test, the driver either last manipulated his phone around 12:14:04 CDT or switched to a different application at 12:19:04 CDT.