

Computer & Network Forensics

Lab 2

Using FTK Imager

Questions

1. Drive Image File System Identification:

What can we deduce about the file system in use on the drive based on the hex content of the drive image?

FAT16

- The hex content of the drive image indicates that the file system in use is FAT16. This is confirmed by the FTK Imager “Properties” tab under the image tree, where “200801102 [FAT16]” is shown. FAT16 was commonly used on small storage devices, which aligns with the fact that this is a thumb drive.

The screenshot shows the FTK Imager interface. On the left, the Evidence Tree panel displays a hierarchy of disk partitions and unpartitioned space. A specific entry, "200801102 [FAT16]", is selected. On the right, the Properties panel is open, showing the "File System Information" tab. Key details include Cluster Size (16,384), Cluster Count (61,551), and Volume Label (200801102). The "File System Information" tab is highlighted.

2. Drive Image Properties Analysis:

Extracting information from the image file properties, what are the sector count and image type associated with the drive image?

Sector Count: 444,160

Image Type: Raw (dd)

The screenshot shows the FTK Imager Properties tab for a disk image. Under the "Disk" section, the "Drive Geometry" subsection is expanded, showing "Bytes per Sec" as 512 and "Sector Count" as 444,160. The "Image" subsection shows "Image Type" as "Raw (dd)".

3. File System Examination:

Investigating the file system properties within the image, what is the cluster size?

How many clusters are currently in use, and how many remain free?

Cluster Size: 16,384

Clusters in Use: $61,551 - 61,501 = 50$ ('Cluster Count' - 'Free Cluster Count')

Free Cluster Count: 61,501

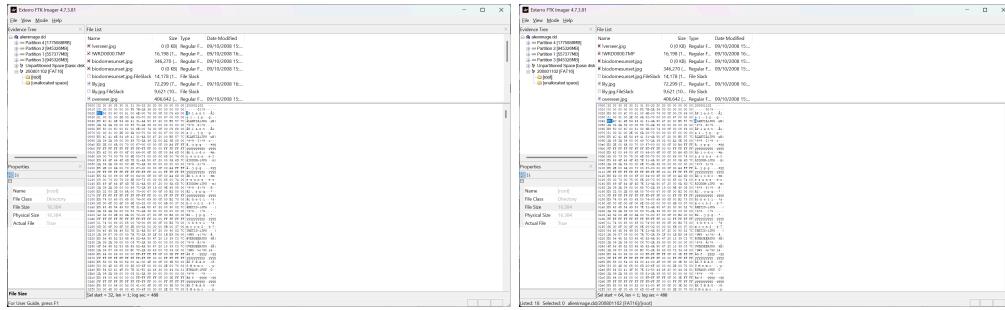
Properties	Properties	Properties
File System Information	File System Information	File System Information
Cluster Size 16,384	Cluster Size 16,384	Cluster Size 16,384
Cluster Count 61,551	Cluster Count 61,551	Cluster Count 61,551
Free Cluster Count 61,501	Free Cluster Count 61,501	Free Cluster Count 61,501
Volume Label 200801102	Volume Label 200801102	Volume Label 200801102
Volume Serial N C486-CCC7	Volume Serial N C486-CCC7	Volume Serial N C486-CCC7
UTC Timestamp: False	UTC Timestamp: False	UTC Timestamp: False
Cluster Size	Cluster Count	Free Cluster Count

4. Interpreting Hexadecimal Patterns:

In the hex view of the directory, what is the significance of the recurring "E5" pattern, often appearing as the first character of a filename?

If the entry is deleted the first byte is changed to E5

- The recurring “E5” in hex denotes a deleted file entry. In FAT file systems, when a file is deleted, the first byte of the filename is replaced with “E5” to mark it as deleted while leaving the rest of the entry intact until it is overwritten.



5. Timeline Construction:

When examining the MAC-times (Modified, Accessed, Created) for all files in the root directory, do these timestamps align with the narrative presented by the UFO group?

overseer.jpg and thetismoon2k72.jpg

- When analyzing the MAC times of files such as overseer.jpg and thetismoon2k72.jpg, I observed inconsistencies. For example, overseer.jpg shows a Modified time of 09/10/2008 15:37:56 but a Created time of 09/10/2008 15:38:06 (10 seconds later). Similarly, thetismoon2k72.jpg was Modified at 15:35:52 but Created at 15:36:05.

File List			
Name	Size	Type	Date Modified
✓ overseer.jpg	0.0 KB	Regular F...	09/10/2008 15...
✗ IWRD00000.TMP	16,198 (1,	Regular F...	09/10/2008 16...
✗ biodomunesunset.jpg	0.0 KB	Regular F...	09/10/2008 15...
✗ biodomunesunset.jpg	346,270 (Regular F...	09/10/2008 15...
✗ biodomunesunset.jpg.FileSlack	14,179 (1,	File Slack	09/10/2008 15...
✗ lily.jpg	72,299 (7,	Regular F...	09/10/2008 16...
✗ lily.jpg.FileSlack	9,621 (10,	File Slack	09/10/2008 16...
✗ overseer.jpg	406,642 (Regular F...	09/10/2008 15...
✗ Plantab1.jpg	0.0 KB	Regular F...	09/10/2008 15...
✗ Plantab1.jpg	364,194 (Regular F...	09/10/2008 15...
✗ Plantab1.jpg.FileSlack	12,638 (1,	File Slack	09/10/2008 15...
✗ thetismoon2x72.jpg	0.0 KB	Regular F...	09/10/2008 15...
✗ thetismoon2x72.jpg	320,795 (Regular F...	09/10/2008 15...
✗ XTRAOPSMemo.docx	0.0 KB	Regular F...	09/10/2008 16...
✗ XTRAOPSMemo.pdf	0.0 KB	Regular F...	09/10/2008 16...
✗ XTRAOPSMemo.pdf	0.0 KB	Regular F...	09/10/2008 16...
✗ XTRAOPSMemo.pdf	72,299 (7,	Regular F...	09/10/2008 16...
✗ XTRAOPSMemo.pdf	16,198 (1,	Regular F...	09/10/2008 16...

Properties			
✗ 11			
Name	overseer.jpg	File Class	Regular File
File Size	406,642	File Size	406,642
Physical Size	409,600	Physical Size	409,600
Start Cluster	67	Start Cluster	67
Date Created	09/10/2008 15:36	Date Created	09/10/2008 15:36
Date Modified	09/10/2008 15:37	Date Modified	09/10/2008 15:37
Actual File	True	Actual File	True
Start Sector	2,600	Start Sector	2,600
Date Accessed	2008-10-23	Date Accessed	2008-10-23

Properties			
✗ 11			
Name	overseer.jpg	File Class	Regular File
File Size	406,642	File Size	406,642
Physical Size	409,600	Physical Size	409,600
Start Cluster	67	Start Cluster	67
Date Created	09/10/2008 15:36	Date Created	09/10/2008 15:36
Date Modified	09/10/2008 15:37	Date Modified	09/10/2008 15:37
Actual File	True	Actual File	True
Start Sector	2,600	Start Sector	2,600
Date Accessed	2008-10-23	Date Accessed	2008-10-23

Properties			
✗ 11			
Name	overseer.jpg	File Class	Regular File
File Size	406,642	File Size	406,642
Physical Size	409,600	Physical Size	409,600
Start Cluster	67	Start Cluster	67
Date Created	09/10/2008 15:36	Date Created	09/10/2008 15:36
Date Modified	09/10/2008 15:37	Date Modified	09/10/2008 15:37
Actual File	True	Actual File	True
Start Sector	2,600	Start Sector	2,600
Date Accessed	2008-10-23	Date Accessed	2008-10-23

All images were created on the same day - 09/10/2008

– The MAC-times (Modified, Accessed, Created) mostly cluster around similar dates, which appear manually manipulated rather than natural use. While they could align with the UFO group's narrative of a “rushed attempt to destroy data,” the suspicious uniformity and lack of normal variation suggest the timestamps may not be reliable.

File List			
Name	Size	Type	Date Modified
✓ overseer.jpg	0.0 KB	Regular F...	09/10/2008 15...
✗ IWRD00000.TMP	16,198 (1,	Regular F...	09/10/2008 16...
✗ biodomunesunset.jpg	0.0 KB	Regular F...	09/10/2008 15...
✗ biodomunesunset.jpg	346,270 (Regular F...	09/10/2008 15...
✗ biodomunesunset.jpg.FileSlack	14,179 (1,	File Slack	09/10/2008 15...
✗ lily.jpg	72,299 (7,	Regular F...	09/10/2008 16...
✗ lily.jpg.FileSlack	9,621 (10,	File Slack	09/10/2008 16...
✗ overseer.jpg	406,642 (Regular F...	09/10/2008 15...
✗ Plantab1.jpg	0.0 KB	Regular F...	09/10/2008 15...
✗ Plantab1.jpg	364,194 (Regular F...	09/10/2008 15...
✗ Plantab1.jpg.FileSlack	12,638 (1,	File Slack	09/10/2008 15...
✗ thetismoon2x72.jpg	0.0 KB	Regular F...	09/10/2008 15...
✗ thetismoon2x72.jpg	320,795 (Regular F...	09/10/2008 15...
✗ XTRAOPSMemo.docx	0.0 KB	Regular F...	09/10/2008 16...
✗ XTRAOPSMemo.pdf	0.0 KB	Regular F...	09/10/2008 16...
✗ XTRAOPSMemo.pdf	0.0 KB	Regular F...	09/10/2008 16...
✗ XTRAOPSMemo.pdf	72,299 (7,	Regular F...	09/10/2008 16...
✗ XTRAOPSMemo.pdf	16,198 (1,	Regular F...	09/10/2008 16...

Properties			
✗ 11			
Name	thetismoon2x72.j	File Class	Regular File
File Size	320,795	File Size	320,795
Physical Size	327,680	Physical Size	327,680
Start Cluster	47	Start Cluster	47
Date Created	09/10/2008 15:36	Date Created	09/10/2008 15:36
Date Modified	09/10/2008 15:37	Date Modified	09/10/2008 15:37
Actual File	True	Actual File	True
Start Sector	1,960	Start Sector	1,960
Date Accessed	2008-10-23	Date Accessed	2008-10-23

Properties			
✗ 11			
Name	thetismoon2x72.j	File Class	Regular File
File Size	320,795	File Size	320,795
Physical Size	327,680	Physical Size	327,680
Start Cluster	47	Start Cluster	47
Date Created	09/10/2008 15:36	Date Created	09/10/2008 15:36
Date Modified	09/10/2008 15:37	Date Modified	09/10/2008 15:37
Actual File	True	Actual File	True
Start Sector	1,960	Start Sector	1,960
Date Accessed	2008-10-23	Date Accessed	2008-10-23

Properties			
✗ 11			
Name	thetismoon2x72.j	File Class	Regular File
File Size	320,795	File Size	320,795
Physical Size	327,680	Physical Size	327,680
Start Cluster	47	Start Cluster	47
Date Created	09/10/2008 15:36	Date Created	09/10/2008 15:36
Date Modified	09/10/2008 15:37	Date Modified	09/10/2008 15:37
Actual File	True	Actual File	True
Start Sector	1,960	Start Sector	1,960
Date Accessed	2008-10-23	Date Accessed	2008-10-23

TOP SECRET file – Date in “lily.pdf” file is 03Jun2008, but the file was created at 09/10/2008 16:08:45 (10Sep2008)

File List			
Name	Size	Type	Date Modified
✓ overseer.jpg	0.0 KB	Regular F...	09/10/2008 15...
✗ IWRD00000.TMP	16,198 (1,	Regular F...	09/10/2008 16...
✗ biodomunesunset.jpg	0.0 KB	Regular F...	09/10/2008 15...
✗ biodomunesunset.jpg	346,270 (Regular F...	09/10/2008 15...
✗ biodomunesunset.jpg.FileSlack	14,179 (1,	File Slack	09/10/2008 15...
✗ lily.jpg	72,299 (7,	Regular F...	09/10/2008 16...
✗ lily.jpg.FileSlack	9,621 (10,	File Slack	09/10/2008 16...
✗ overseer.jpg	406,642 (Regular F...	09/10/2008 15...
✗ Plantab1.jpg	0.0 KB	Regular F...	09/10/2008 15...
✗ Plantab1.jpg	364,194 (Regular F...	09/10/2008 15...
✗ Plantab1.jpg.FileSlack	12,638 (1,	File Slack	09/10/2008 15...
✗ thetismoon2x72.jpg	0.0 KB	Regular F...	09/10/2008 15...
✗ thetismoon2x72.jpg	320,795 (Regular F...	09/10/2008 15...
✗ XTRAOPSMemo.docx	0.0 KB	Regular F...	09/10/2008 16...
✗ XTRAOPSMemo.pdf	0.0 KB	Regular F...	09/10/2008 16...
✗ XTRAOPSMemo.pdf	0.0 KB	Regular F...	09/10/2008 16...
✗ XTRAOPSMemo.pdf	72,299 (7,	Regular F...	09/10/2008 16...
✗ XTRAOPSMemo.pdf	16,198 (1,	Regular F...	09/10/2008 16...

Properties			
✗ 11			
Name	lily.jpg	File Class	Regular File
File Size	72,299	File Size	72,299
Physical Size	81,920	Physical Size	81,920
Start Cluster	92	Start Cluster	92
Date Created	09/10/2008 16:08:45	Date Created	09/10/2008 16:08:45
Date Modified	09/10/2008 16:08:45	Date Modified	09/10/2008 16:08:45
Actual File	True	Actual File	True
Start Sector	3,400	Start Sector	3,400
Date Accessed	2008-10-23	Date Accessed	2008-10-23

Properties			
✗ 11			
Name	lily.jpg	File Class	Regular File
File Size	72,299	File Size	72,299
Physical Size	81,920	Physical Size	81,920
Start Cluster	92	Start Cluster	92
Date Created	09/10/2008 16:08:45	Date Created	09/10/2008 16:08:45
Date Modified	09/10/2008 16:08:45	Date Modified	09/10/2008 16:08:45
Actual File	True	Actual File	True
Start Sector	3,400	Start Sector	3,400
Date Accessed	2008-10-23	Date Accessed	2008-10-23

Properties			
✗ 11			
Name	lily.jpg	File Class	Regular File
File Size	72,299	File Size	72,299
Physical Size	81,920	Physical Size	81,920
Start Cluster	92	Start Cluster	92
Date Created	09/10/2008 16:08:45	Date Created	09/10/2008 16:08:45
Date Modified	09/10/2008 16:08:45	Date Modified	09/10/2008 16:08:45
Actual File	True	Actual File	True
Start Sector	3,400	Start Sector	3,400
Date Accessed	2008-10-23	Date Accessed	2008-10-23

TOP SECRET XTRAOPS

MEN

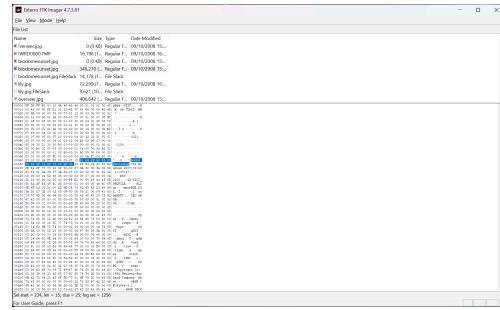
To: R. Adm. Julian Phelps, XTOps
 From: Maj. Gen. Arthur Johannsen
 Date: 03Jun2008
 Re: Latest Photographs

6. EXIF Data Insights:

Analysing the EXIF information found within some of the photographs, what conclusions can be drawn regarding their origin and history?

biodomesunset.jpg

- The image file contained EXIF metadata showing they were edited in Adobe Photoshop. This undermines claims that the images are “raw alien evidence”, since they have been manipulated.



7. File Signature Mismatch:

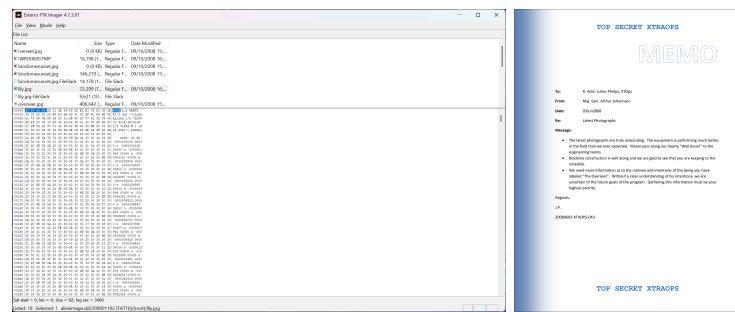
Does the file "lily.jpg" exhibit a signature mismatch?

If so, does the content of this file provide any substantial insights that influence our overall conclusions?

lily.jpg → lily.pdf

- Yes, “lily.jpg” shows a file signature mismatch. Its extension is “.jpg”, but its hex header begins with “%PDF”, which identifies a PDF file.

When renamed and opened as “lily.pdf”, it displays a PDF document. This shows intentional obfuscation, suggesting sensitive information was hidden under misleading extensions.



8. Assessing UFO Group Claims:

Based on the images that have been recovered, what conclusions can be drawn regarding the UFO group's suspicions regarding off-world activities by a secret government organization?

No

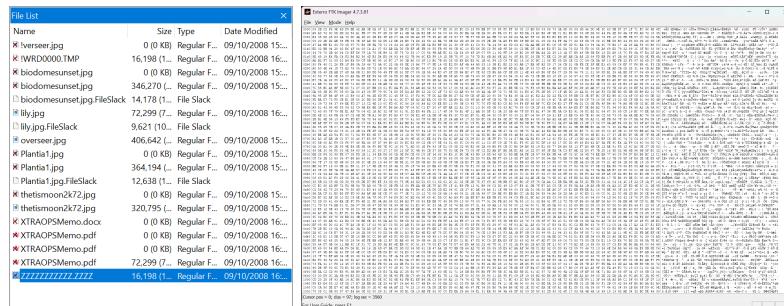
– The images and documents recovered do not provide credible proof of extraterrestrial contact. Instead, they show signs of editing, hidden PDFs, and mismatched metadata. This suggests that while the files may be part of a hoax or cover operation, there is no verifiable evidence of alien technology.

9. Detecting Secure Deletion:

While examining the files within the image, can any traces of a secure deletion utility be identified?

ZZZZZZZZZZ.ZZZZ

– During analysis, a suspicious file named ZZZZZZZZZ.ZZZZ was discovered on the drive image. This naming pattern is consistent with the behavior of the Sysinternals “SDelete” utility, which not only overwrites file contents but also renames deleted files with repetitive or placeholder names (such as ZZZZ...) to obscure the original filename in the file system metadata. Therefore, it can be reasonably concluded that a secure deletion tool, likely SDelete, was used on this thumb drive.



Hint: Consider researching the operation of the "sdelete" utility, available from the Sysinternals website.

10. Metadata Analysis:

What additional information can be gleaned from metadata within the image, such as file owner details, permissions, and file attributes?

File Permissions: All files exhibit permissions of -rw-----, meaning they are only accessible for read/write by the owner.

lily.jpg	
File Metadata	
<small>File Type: image/jpeg Error: 0 Upload Size: 72298 extTool:</small>	
Name	Value
ExtTool Version Number	12.25
File Name	phpMy7Lbn
Directory	/tmp
File Size	71 kB
File Modification Date/Time	2025-10-02 13:32:01+00:00
File Access Date/Time	2025-10-02 13:32:01+00:00
File Inode Change Date/Time	2025-10-02 13:32:01+00:00
File Permissions	rw-r--r--
File Type	PDF

Author/Creator Information: The file lily.jpg (actually identified as a PDF) lists its author/creator as Richard, providing a personal attribution link to the file's origin. This may indicate the system user who created the document.

Format	application/pdf
Creator	Richard
Title	
Page Count	1
Page Layout	OneColumn
Language	EN-US
Author	Richard

Format	application/pdf
Creator	Richard
Title	
Page Count	1
Page Layout	OneColumn
Language	EN-US
Author	Richard

EXIF/Software Metadata: Examination of biodomesunset.jpg shows it was modified using Adobe Photoshop CS2 on Windows, with a Hewlett-Packard color profile embedded. This reinforces earlier findings that the images were edited and are unlikely to be untouched “evidence.”

Software	Adobe Photoshop CS2 Windows
Modify Date	2007-06-09 11:37:27
<hr/>	
Device Manufacturer	Hewlett-Packard
Device Model	sRGB
Device Attributes	Reflective, Glossy, Positive, Color
Rendering Intent	Media-Relative Colorimetric
Connection Space Illuminant	0.9642 1 0.82491
Profile Creator	Hewlett-Packard
Profile ID	0
Profile Copyright	Copyright (c) 1998 Hewlett-Packard Company
Profile Description	sRGB IEC61966-2.1

DOS/File Attributes: FAT-based attributes (such as archive, hidden, and read-only flags) are present but reveal nothing unusual. They simply indicate normal file handling.

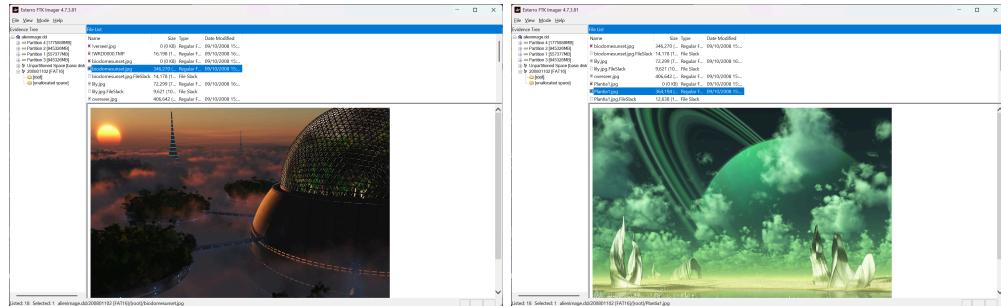
Properties	
8.3 Short Filena	IIODOM~1.JPG
Hidden	False
System	False
Read only	False
Archive	True
DOS Attributes	

11. Recovery Potential:

Are there any signs of data fragments or remnants in unallocated space that may be recoverable or relevant to the investigation?

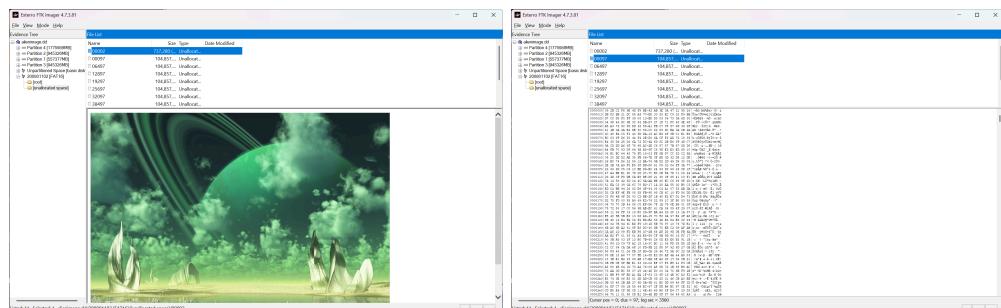
Yes, there is some deleted files in root

- In the drive image, several deleted files were identified with sizes greater than 0 KB. Since these files still point to valid cluster allocations, they may be partially or fully recoverable depending on whether their data blocks have been overwritten.



Unallocated Space

- There is also img file and unreadable file (looks like ZZZZZZZZZZZZ.ZZZZ – secure deleted)



12. Correlation with Dead Drop Location:

Can any information within the image provide insights into the whereabouts or fate of the agent who left the thumb drive at the dead drop location?

No

- Analysis of the thumb drive image revealed no direct location data (such as GPS coordinates) within EXIF metadata of the recovered images. For example, biomesunset.jpg and other photographs lacked GPS fields, and instead showed signs of post-processing in Adobe Photoshop, which would normally strip or overwrite camera metadata.

The only identifiable attribution metadata was the author field ("Richard") in the lily.jpg (PDF) file. While this links the file to a potential user, it provides no geographic correlation.

No filenames, metadata fields, or recovered content from unallocated space revealed references to geographic locations or the supposed dead drop. The presence of overwritten/deleted files suggests deliberate removal of sensitive content, which may have originally contained such data.

13. Imaging Tools

List four different forensic imaging tools that are available.

- FTK Imager by Accessdata
- Encase Forensic Imager by OpenText
- Belkasoft Acquisition Tool by Belkasoft
- Paladin by Sumuri
- Guymager by Guy Voncken
- OSFClone by PassMark