

December 2023

**Test Results for File Carving Tool:
BelkaSoft Version 2.0.13277**

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1 Introduction

The Computer Forensics Tool Testing (CFTT) program is a joint project of the U.S. Department of Homeland Security's (DHS) Science and Technology Directorate (S&T), the National Institute of Justice, and the National Institute of Standards and Technology's (NIST) Special Programs Office and Information Technology Laboratory. CFTT is supported by other organizations, including the Federal Bureau of Investigation, the U.S. Department of Defense Cyber Crime Center, the U.S. Internal Revenue Service's Criminal Investigation Division Electronic Crimes Program, and DHS' U.S. Immigration and Customs Enforcement, U.S. Customs and Border Protection and the U.S. Secret Service. The objective of the CFTT program is to provide measurable assurance to practitioners, researchers, and other applicable users that the tools used in computer forensics investigations provide accurate results. Accomplishing this requires the development of specifications and test methods for computer forensics tools and subsequent testing of specific tools against those specifications.

Test results provide the information necessary for developers to improve tools, users to make informed choices, and the legal community and others to understand the tools' capabilities. The CFTT approach to testing computer forensics tools is based on well-recognized methodologies for conformance and quality testing. Interested parties in the computer forensics community can review and comment on the specifications and test methods posted on the CFTT website (<https://www.cftt.nist.gov/>).

This document reports the results from testing BelkaSoft Version 2.0.13277.

Test results from other tools can be found on the DHS S&T-sponsored digital forensics webpage, <http://www.dhs.gov/science-and-technology/nist-cftt-reports>.

2 How to Read This Report

This report is organized into the following sections:

1. **Introduction:** This section presents a brief introduction to the CFTT project.
2. **How to read this report:** This section lists the main sections of the report.
3. **Tested Tool Description:** This section lists the tool name, version, and vendor information.
4. **Testing Organization:** This section includes the name and contact information for the organization testing the tool.
5. **Results Summary:** This section provides a summary of the major results revealed by the testing.
6. **Testing Environment:** This section describes the hardware used for testing the tool.
7. **Appendix -- Test Results Details:** This appendix presents the details of each test run as a series of tables. The appendix is the raw data that is used as a basis for the conclusions presented in the Results Summary section. For each file type, there is a subsection with one table to describe all the source files of the given type. Then there are several variations on

arranging chunks of the source files in the test image file. There is a table describing the layout of each image file, a summary table of the carved results and an analysis table of the carved results.

Test Results for File Carving Tool

3 Tested Tool Description

Tested Tool Name: BelkaSoft

Tool Version: 2.0.13277

Supplier: Belkasoft

Address: 702 San Conrado Terrace, Unit 1
Sunnyvale, CA 94085 USA

Phone: +1 (650) 272-0384

Contact Information: sales@belkasoft.com

Web Site: <https://belkasoft.com/x>

Tool Description: BelkaSoft is a multi-function digital forensic tool for mobile devices that provides a variety of forensic functions for the tool user with file carving just one of the provided functions. This report only addresses testing the file carving feature of graphic files.

4 Testing Organization

Testing Organization: NIST/CFTT

Contact Information: cftt@nist.gov

5 Results Summary

The tool was tested for carving graphic files from an unformatted image file in various layouts. The following file types of files were tested: HEIC, PNG, JPG, BMP, TIFF, and GIF. Three layouts were tested for each file type:

1. Contiguous: layout of six files separated with various amounts of benign fill between files. All files are aligned on sector boundaries within the image file.
2. Non-aligned: layout of six files separated with various amounts of benign fill between files. None of the source files are aligned on sector boundaries within the image file.
3. Fragmented: layout of six files separated with various amounts of benign fill between files. In addition, each file is fragmented into several fragments with benign fill inserted between them. Details of the fragmentation are presented in the Appendix (section 7). All files are aligned on sector boundaries within the image file.

5.1 Observations and Anomalies

- JPG files had no anomalies for the contiguous and non-aligned layouts.
- Nothing was carved from any of the three layouts for HEIC, PNG, or TIFF files.
- One file, a “smoked chicken,” was consistently missed from all three layouts of the BMP files.
- All file signatures for GIF files were identified in all three layouts. For three files less than 1% of the original file was carved and for the other three files 50% of the original file was carved.
- For the fragmented layout of JPG files, the carved files included all the fragments and the fill between fragments. For example, if a file originally consisting of 1,000 blocks is fragmented into two pieces with 100 blocks between the two fragments, the carved file would be 1,100 blocks long, and the carved file would include the 100 blocks of fill.
- For the fragmented layout of BMP files, the carved files included the fill between fragments and were missing the same amount of content from the end of the carved file. For example, if a file originally consisting of 1,000 blocks is fragmented into two pieces with 100 blocks between the two fragments, the carved file would be 1,000 blocks long, the carved file would include the 100 blocks of fill and would be missing the last 100 blocks from the last fragment of the original file.
- For the BMP files, one block of unknown origin was included in the carved files.

5.2 Optional Features

Three embedded thumbnails were extracted by this tool from JPG files.

6 Test Environment and Test Cases

This section describes the test hardware, test data sets, and tool settings used.

6.1 Test Hardware Used

Test Hardware was an Apple iMac 3.6 GHz 10-Core Intel Core i9 running macOS Ventura 13.5

6.2 Test Data Sets Used

The test data is a set of image files that can be found in the CFReDS repository (<https://cfreds.nist.gov/>) under the title **File Carving Graphic Files** with date of **2023**.

6.3 Tool Settings Used

The following tool settings were used:

Artifacts types:

- All
- Audios
- Browsers
- Chats
- Cloud services
- Documents
- Drones data
- Files
- Geolocation data
- Mails
- Multi-user online games
- Other mobile applications
- P2P
- Payment systems
- Pictures
- Social networks
- Standard mobile applications
- System files
- Thumbnails
- Videos

Applications and formats:

- All
- 3gp
- 8svx
- aa
- aac
- aax
- act
- aifc
- aiff
- amr
- ape
- au
- awb
- cda
- dct
- dss
- dvf
- flac
- gsm
- iklax
- ivs
- m4a
- m4b
- m4p
- mid
- midi
- mmf
- mogg
- mp3
- mpc
- msv
- oga
- ogg
- opus
- qcp
- ra
- raw
- rm
- rmi
- sln
- spx
- tta
- wav
- webm
- wma
- wmv
- vox

Do not extract data, perform profile search only
(Use this option for triage)

Analyze carved and embedded data

Filter:

7 Appendix: Test Result Details

This section describes the test results more in depth using a series of tables:

For each type of file to be carved there is a table of source file profiles to describe the size of each source file of the given file type.

Each image file to be carved is made up of the source files in one of several possible layouts. The layout table describes the layout of each image file used as input to the carving tool.

The analysis of the file carving is presented in three tables:

The first table presents the results of a manual inspection and classification of each carved file.

A second table presents a summary of the characteristics of the carved files.

A third table presents a detailed analysis of the source of the content for each carved file.

7.1 Results for carving HEIC

No HEIC files were carved for any layout.

7.2 Results for carving PNG

No PNG files were carved for any layout.

7.3 Results for carving JPG

This section describes details on how the JPG data set images were created. The section also includes a description of the source files used, the layout of each image file used, and an analysis of carved files returned by the tested tool from each image file.

7.3.1 Source File Profile for JPG

This section describes the source files used to build the image files for testing carving of JPG files. The block size is 512 bytes. Spill is the number of data bytes in the last block. Slack is the number of bytes remaining in the last block. Spill + Slack = 512. If the Thumb source file has an embedded thumbnail in the Exif data, the Thumb column has a "yes."

JPG Source File Size in Bytes & 512 Byte Blocks

Source File	Size in Bytes	Blocks	Spill	Slack	Thumb
dino.jpg	3,424,980	6,690	212	300	no
grizzly.jpg	2,785,455	5,441	175	337	no
jump.jpg	2,015,880	3,938	136	376	no
leaf.jpg	798,064	1,559	368	144	yes
oak-snow.jpg	1,370,140	2,677	28	484	yes
stonehenge.jpg	1,236,401	2,415	433	79	yes

7.3.2 Image Layout for JPG Contiguous

The following table describes the layout of an image file. The image file is constructed from chunks of data from the source files, separated by chunks of fill data. All chunks are multiples of 512 bytes.

The Chunk column is the chunk identifier. The Source File column is the name of the file providing data. The Bytes column is the size of the chunk in bytes. The Spill column is the number of data bytes in the last block in the chunk (if less than 512). The Blocks column is the number of blocks in the chunk. The "%" column is the percentage of the file in the chunk. The Fill Blocks column is the number of blocks of fill data in the next chunk.

Layout for Contiguous Image of JPG Files

Chunk	Source_file	Bytes	Spill	Blocks	%	Fill_Blocks
0	dino.jpg	3,424,980	212	6,690	100.00	1
2	grizzly.jpg	2,785,455	175	5,441	100.00	2
4	jump.jpg	2,015,880	136	3,938	100.00	0
6	leaf.jpg	798,064	368	1,559	100.00	5
8	oak-snow.jpg	1,370,140	28	2,677	100.00	34
10	stonehenge.jpg	1,236,401	433	2,415	100.00	21

7.3.3 Analysis of Carving Results for JPG Contiguous

The following table presents the results of the manual inspection of carved files. The Tool Generated File Name column presents the names of the carved files as assigned by the tested tool. Because the name assigned to each carved file may be rather long, a short abbreviation is assigned to each file name. The abbreviation presented in the Abbreviation column is used to identify each carved file in the following two tables. The Evaluation column presents the evaluation assigned to the carved file during a manual examination of the file. A value of "pending" is given if the file has not yet been examined.

Inspection Results for Contiguous Image of JPG Files

Tool Generated File Name	Abbreviation	Evaluation
picture 00000001000.jpg	C001	Complete no flaws
picture 000000345600.jpg	C002	Complete no flaws
picture 0000005EDC00.jpg	C003	Complete no flaws
picture 0000007DA000.jpg	C004	Complete no flaws
picture 0000007DAA4C.jpg	C005	Complete no flaws
picture 00000089D800.jpg	C006	Complete no flaws
picture 00000089E24C.jpg	C007	Complete no flaws
picture 0000009F0600.jpg	C008	Complete no flaws
picture 0000009F104C.jpg	C009	Complete no flaws

The following table presents the size in bytes and 512-byte blocks of each carved file. The source of the first block is also noted. The file is identified by the short abbreviation defined in the table above.

Description of Carved Files From Contiguous Image of JPG Files

File_Abbreviation	Bytes	Spill	Blocks	fill	unknown	FirstSource
C001	3,424,980	212	6,690	0	0	dino.jpg
C002	2,785,455	175	5,441	0	0	grizzly.jpg
C003	2,015,880	136	3,938	0	0	jump.jpg
C004	798,064	368	1,559	0	0	leaf.jpg
C005	2,808	248	6	0	0	thumb-leaf.jpg
C006	1,370,140	28	2,677	0	0	oak-snow.jpg
C007	3,601	17	8	0	0	thumb-oak-snow.jpg
C008	1,236,401	433	2,415	0	0	stonehenge.jpg

File_Abbreviation	Bytes	Spill	Blocks	fill	unknown	FirstSource
C009	4,377	281	9	0	0	thumb-stonehenge.jpg

6 JPG signatures were found in the Contiguous image, 6 expected, no file signatures from an unknown source. No files were missed.

3 EXIF embedded thumbnails found, 3 expected.

The following table presents a detailed analysis of the content of each carved file. For each carved file one or more rows follow with an analysis of each source that contributed to the carved file (identified by the file name abbreviation). The source file name is in the column labeled Src. The number of bytes from that source is listed in the Bytes_seen column. The number of 512-byte blocks from that source is in the Blocks column. The percent of the source file included in the carved file is in the "%" column. A count of ambiguous blocks that could belong to more than one source file is in the Multi column. The number of blocks missing from the source file, i.e., not carved, is in the Missing column.

Detailed Analysis of Carved Files From Contiguous Image of JPG Files

Carved	Src	Bytes_seen	Blocks	%	Multi	Missing
C001	dino.jpg	3,425,280	6,690	100.00	0	0
C002	grizzly.jpg	2,785,792	5,441	100.00	0	0
C003	jump.jpg	2,016,256	3,938	100.00	0	0
C004	leaf.jpg	797,696	1,558	100.00	1	0
C006	oak-snow.jpg	1,370,112	2,676	100.00	1	0
C008	stonehenge.jpg	1,235,968	2,414	100.00	1	0

7.3.4 Image Layout for JPG Non-Aligned on Clusters

The following table describes the layout of an image file. The image file is constructed from chunks of data from the source files, separated by chunks of fill data. All chunks are multiples of 512 bytes.

The Chunk column is the chunk identifier. The Source File column is the name of the file providing data. The Bytes column is the size of the chunk in bytes. The Spill column is the number of data bytes in the last block in the chunk (if less than 512). The Blocks column is the number of blocks in the chunk. The "%" column is the percentage of the file in the chunk. The Fill Blocks column is the number of blocks of fill data in the next chunk.

Layout for Non-Aligned on Clusters Image (Offset 313 bytes) of JPG Files

Chunk	Source_file	Bytes	Spill	Blocks	%	Fill_Blocks
0	dino.jpg	3,424,980	212	6,690	100.00	1
2	grizzly.jpg	2,785,455	175	5,441	100.00	2
4	jump.jpg	2,015,880	136	3,938	100.00	0
6	leaf.jpg	798,064	368	1,559	100.00	5
8	oak-snow.jpg	1,370,140	28	2,677	100.00	34

Chunk	Source_file	Bytes	Spill	Blocks	%	Fill_Blocks
10	stonehenge.jpg	1,236,401	433	2,415	100.00	21

7.3.5 Analysis of Carving Results for JPG Non-Aligned on Clusters

The following table presents the results of the manual inspection of carved files. The Tool Generated File Name column presents the names of the carved files as assigned by the tested tool. Because the name assigned to each carved file may be rather long, a short abbreviation is assigned to each file name. The abbreviation presented in the Abbreviation column is used to identify each carved file in the following two tables. The Evaluation column presents the evaluation assigned to the carved file during a manual examination of the file. A value of "pending" is given if the file has not yet been examined.

Inspection Results for Non-Aligned on Clusters Image of JPG Files

Tool Generated File Name	Abbreviation	Evaluation
picture 00000001139.jpg	C001	Complete no flaws
picture 000000345739.jpg	C002	Complete no flaws
picture 0000005EDD39.jpg	C003	Complete no flaws
picture 0000007DA139.jpg	C004	Complete no flaws
picture 0000007DAB85.jpg	C005	Complete no flaws
picture 00000089D939.jpg	C006	Complete no flaws
picture 00000089E385.jpg	C007	Complete no flaws
picture 0000009F0739.jpg	C008	Complete no flaws
picture 0000009F1185.jpg	C009	Complete no flaws

The following table presents the size in bytes and 512-byte blocks of each carved file. The source of the first block is also noted. The file is identified by the short abbreviation defined in the table above.

Description of Carved Files From Non-Aligned on Clusters Image of JPG Files

File_Abbreviation	Bytes	Spill	Blocks	fill	unknown	FirstSource
C001	3,424,980	212	6,690	0	0	dino.jpg
C002	2,785,455	175	5,441	0	0	grizzly.jpg
C003	2,015,880	136	3,938	0	0	jump.jpg
C004	798,064	368	1,559	0	0	leaf.jpg
C005	2,808	248	6	0	0	thumb-leaf.jpg
C006	1,370,140	28	2,677	0	0	oak-snow.jpg
C007	3,601	17	8	0	0	thumb-oak-snow.jpg
C008	1,236,401	433	2,415	0	0	stonehenge.jpg
C009	4,377	281	9	0	0	thumb-stonehenge.jpg

6 JPG signatures were found in the Non-Aligned on Clusters image, 6 expected, no file signatures from an unknown source. No files were missed.

3 EXIF embedded thumbnails found, 3 expected.

The following table presents a detailed analysis of the content of each carved file. For each carved file one or more rows follow with an analysis of each source that contributed to the carved file (identified by the file name abbreviation). The source file name is in the column labeled Src. The number of bytes from that source is listed in the Bytes_seen column. The number of 512-byte blocks from that source is in the Blocks column. The percent of the source file included in the carved file is in the "%" column. A count of ambiguous blocks that could belong to more than one source file is in the Multi column. The number of blocks missing from the source file, i.e., not carved, is in the Missing column.

Detailed Analysis of Carved Files From Non-Aligned on Clusters Image of JPG Files

Carved	Src	Bytes_seen	Blocks	%	Multi	Missing
C001	dino.jpg	3,425,280	6,690	100.00	0	0
C002	grizzly.jpg	2,785,792	5,441	100.00	0	0
C003	jump.jpg	2,016,256	3,938	100.00	0	0
C004	leaf.jpg	797,696	1,558	100.00	1	0
C006	oak-snow.jpg	1,370,112	2,676	100.00	1	0
C008	stonehenge.jpg	1,235,968	2,414	100.00	1	0

7.3.6 Image Layout for JPG Fragmented in Order

The following table describes the layout of an image file. The image file is constructed from chunks of data from the source files, separated by chunks of fill data. All chunks are multiples of 512 bytes.

The Chunk column is the chunk identifier. The Source File column is the name of the file providing data. The Bytes column is the size of the chunk in bytes. The Spill column is the number of data bytes in the last block in the chunk (if less than 512). The Blocks column is the number of blocks in the chunk. The "%" column is the percentage of the file in the chunk. The Fill Blocks column is the number of blocks of fill data in the next chunk.

Layout for Fragmented in Order Image of JPG Files

Chunk	Seq	Source_file	Bytes	Spill	Blocks	%	Fill_Blocks
0	1	dino.jpg	3,082,240	0	6,020	89.99	100
2	2	dino.jpg	342,740	212	670	10.01	2
4	1	grizzly.jpg	1,392,640	0	2,720	49.99	300
6	2	grizzly.jpg	1,392,815	175	2,721	50.00	50
8	1	jump.jpg	402,944	0	787	19.98	80
10	2	jump.jpg	1,612,936	136	3,151	80.00	13
12	1	leaf.jpg	199,168	0	389	24.95	210
14	2	leaf.jpg	239,104	0	467	29.96	100
16	3	leaf.jpg	318,976	0	623	39.96	2
18	4	leaf.jpg	40,816	368	80	5.11	300
20	1	oak-snow.jpg	1,232,896	0	2,408	89.95	50

Chunk	Seq	Source_file	Bytes	Spill	Blocks	%	Fill_Blocks
22	2	oak-snow.jpg	137,244	28	269	10.01	80
24	1	stonehenge.jpg	617,984	0	1,207	49.98	13
26	2	stonehenge.jpg	618,417	433	1,208	50.01	210

7.3.7 Analysis of Carving Results for JPG Fragmented in Order

The following table presents the results of the manual inspection of carved files. The Tool Generated File Name column presents the names of the carved files as assigned by the tested tool. Because the name assigned to each carved file may be rather long, a short abbreviation is assigned to each file name. The abbreviation presented in the Abbreviation column is used to identify each carved file in the following two tables. The Evaluation column presents the evaluation assigned to the carved file during a manual examination of the file. A value of "pending" is given if the file has not yet been examined.

Inspection Results for Fragmented in Order Image of JPG Files

Tool Generated File Name	Abbreviation	Evaluation
picture 00000001000.jpg	C001	Usable minor flaws
picture 000000352000.jpg	C002	Usable minor flaws
picture 000000625E00.jpg	C003	Incomplete major flaws
picture 00000081DC00.jpg	C004	Incomplete major flaws
picture 00000081E64C.jpg	C005	Complete no flaws
picture 00000092D200.jpg	C006	Usable minor flaws
picture 00000092DC4C.jpg	C007	Complete no flaws
picture 000000A8C000.jpg	C008	Usable minor flaws
picture 000000A8CA4C.jpg	C009	Complete no flaws

The following table presents the size in bytes and 512-byte blocks of each carved file. The source of the first block is also noted. The file is identified by the short abbreviation defined in the table above.

Description of Carved Files From Fragmented in Order Image of JPG Files

File_Abbreviation	Bytes	Spill	Blocks	fill	unknown	FirstSource
C001	3,476,180	212	6,790	100	0	dino.jpg
C002	2,939,055	175	5,741	300	0	grizzly.jpg
C003	2,056,840	136	4,018	80	0	jump.jpg
C004	957,808	368	1,871	312	0	leaf.jpg
C005	2,808	248	6	0	0	thumb-leaf.jpg
C006	1,395,740	28	2,727	50	0	oak-snow.jpg
C007	3,601	17	8	0	0	thumb-oak-snow.jpg
C008	1,243,057	433	2,428	13	0	stonehenge.jpg
C009	4,377	281	9	0	0	thumb-stonehenge.jpg

6 JPG signatures were found in the Fragmented in Order image, 6 expected, no file signatures from an unknown source. No files were missed.
 3 EXIF embedded thumbnails found, 3 expected.

The following table presents a detailed analysis of the content of each carved file. For each carved file one or more rows follow with an analysis of each source that contributed to the carved file (identified by the file name abbreviation). The source file name is in the column labeled Src. The number of bytes from that source is listed in the Bytes_seen column. The number of 512-byte blocks from that source is in the Blocks column. The percent of the source file included in the carved file is in the "%" column. A count of ambiguous blocks that could belong to more than one source file is in the Multi column. The number of blocks missing from the source file, i.e., not carved, is in the Missing column.

Detailed Analysis of Carved Files From Fragmented in Order Image of JPG Files

Carved	Src	Bytes_seen	Blocks	%	Multi	Missing
C001	dino.jpg	3,425,280	6,690	100.00	0	0
C002	grizzly.jpg	2,785,792	5,441	100.00	0	0
C003	jump.jpg	2,016,256	3,938	100.00	0	0
C004	leaf.jpg	797,696	1,558	100.00	1	0
C006	oak-snow.jpg	1,370,112	2,676	100.00	1	0
C008	stonehenge.jpg	1,235,968	2,414	100.00	1	0

7.4 Results for carving BMP

This section describes details on how the BMP data set images were created. The section also includes a description of the source files used, the layout of each image file used, and an analysis of carved files returned by the tested tool from each image file.

7.4.1 Source File Profile for BMP

This section describes the source files used to build the image files for testing carving of BMP files. The block size is 512 bytes. Spill is the number of data bytes in the last block. Slack is the number of bytes remaining in the last block. Spill + Slack = 512. If the Thumb source file has an embedded thumbnail in the Exif data, the Thumb column has a "yes."

BMP Source File Size in Bytes & 512 Byte Blocks

Source File	Size in Bytes	Blocks	Spill	Slack	Thumb
amalfi.bmp	921,654	1,801	54	458	no
boudicca.bmp	8,798,374	17,185	166	346	no
iris-lavender.bmp	14,953,734	29,207	262	250	no
shoot.bmp	9,969,174	19,472	22	490	no
smoked-chicken.bmp	19,938,310	38,943	6	506	no
zen.bmp	25,747,254	50,288	310	202	no

7.4.2 Image Layout for BMP Contiguous

The following table describes the layout of an image file. The image file is constructed from chunks of data from the source files, separated by chunks of fill data. All chunks are multiples of 512 bytes.

The Chunk column is the chunk identifier. The Source File column is the name of the file providing data. The Bytes column is the size of the chunk in bytes. The Spill column is the number of data bytes in the last block in the chunk (if less than 512). The Blocks column is the number of blocks in the chunk. The "%" column is the percentage of the file in the chunk. The Fill Blocks column is the number of blocks of fill data in the next chunk.

Layout for Contiguous Image of BMP Files

Chunk	Source_file	Bytes	Spill	Blocks	%	Fill_Blocks
0	amalfi.bmp	921,654	54	1,801	100.00	1
2	boudicca.bmp	8,798,374	166	17,185	100.00	2
4	iris-lavender.bmp	14,953,734	262	29,207	100.00	0
6	shoot.bmp	9,969,174	22	19,472	100.00	5
8	smoked-chicken.bmp	19,938,310	6	38,943	100.00	34
10	zen.bmp	25,747,254	310	50,288	100.00	21

7.4.3 Analysis of Carving Results for BMP Contiguous

The following table presents the results of the manual inspection of carved files. The Tool Generated File Name column presents the names of the carved files as assigned by the tested tool. Because the name assigned to each carved file may be rather long, a short abbreviation is assigned to each file name. The abbreviation presented in the Abbreviation column is used to identify each carved file in the following two tables. The Evaluation column presents the evaluation assigned to the carved file during a manual examination of the file. A value of "pending" is given if the file has not yet been examined.

Inspection Results for Contiguous Image of BMP Files

Tool Generated File Name	Abbreviation	Evaluation
picture 00000001000.bmp	C001	Complete no flaws
picture 0000000E2400.bmp	C002	Complete no flaws
picture 000000946A00.bmp	C003	Complete no flaws
picture 000001789800.bmp	C004	Complete no flaws
picture 000003414400.bmp	C005	Complete no flaws

The following table presents the size in bytes and 512-byte blocks of each carved file. The source of the first block is also noted. The file is identified by the short abbreviation defined in the table above.

Description of Carved Files From Contiguous Image of BMP Files

File_Abbreviation	Bytes	Spill	Blocks	fill	unknown	FirstSource
C001	921,654	54	1,801	0	0	amalfi.bmp
C002	8,798,374	166	17,185	0	0	boudicca.bmp
C003	14,953,734	262	29,207	0	0	iris-lavender.bmp
C004	9,969,174	22	19,472	0	0	shoot.bmp
C005	25,747,254	310	50,288	0	0	zen.bmp

5 BMP signatures were found in the Contiguous image, 6 expected, no file signatures from an unknown source. 1 file was missed:

smoked-chicken.bmp

0 EXIF embedded thumbnails found, 0 expected.

The following table presents a detailed analysis of the content of each carved file. For each carved file one or more rows follow with an analysis of each source that contributed to the carved file (identified by the file name abbreviation). The source file name is in the column labeled Src. The number of bytes from that source is listed in the Bytes_seen column. The number of 512-byte blocks from that source is in the Blocks column. The percent of the source file included in the carved file is in the "%" column. A count of ambiguous blocks that could belong to more than one source file is in the Multi column. The number of blocks missing from the source file, i.e., not carved, is in the Missing column.

Detailed Analysis of Carved Files From Contiguous Image of BMP Files

Carved	Src	Bytes_seen	Blocks	%	Multi	Missing
C001	amalfi.bmp	922,112	1,801	100.00	0	0
C002	boudicca.bmp	8,798,720	17,185	100.00	0	0
C003	iris-lavender.bmp	14,953,984	29,207	100.00	0	0
C004	shoot.bmp	9,969,664	19,472	100.00	0	0
C005	zen.bmp	25,747,456	50,288	100.00	0	0

7.4.4 Image Layout for BMP Non-Aligned on Clusters

The following table describes the layout of an image file. The image file is constructed from chunks of data from the source files, separated by chunks of fill data. All chunks are multiples of 512 bytes.

The Chunk column is the chunk identifier. The Source File column is the name of the file providing data. The Bytes column is the size of the chunk in bytes. The Spill column is the number of data bytes in the last block in the chunk (if less than 512). The Blocks column is the number of blocks in the chunk. The "%" column is the percentage of the file in the chunk. The Fill Blocks column is the number of blocks of fill data in the next chunk.

Layout for Non-Aligned on Clusters Image (Offset 313 bytes) of BMP Files

Chunk	Source_file	Bytes	Spill	Blocks	%	Fill_Blocks
0	amalfi.bmp	921,654	54	1,801	100.00	1

Chunk	Source_file	Bytes	Spill	Blocks	%	Fill_Blocks
2	boudicca.bmp	8,798,374	166	17,185	100.00	2
4	iris-lavender.bmp	14,953,734	262	29,207	100.00	0
6	shoot.bmp	9,969,174	22	19,472	100.00	5
8	smoked-chicken.bmp	19,938,310	6	38,943	100.00	34
10	zen.bmp	25,747,254	310	50,288	100.00	21

7.4.5 Analysis of Carving Results for BMP Non-Aligned on Clusters

The following table presents the results of the manual inspection of carved files. The Tool Generated File Name column presents the names of the carved files as assigned by the tested tool. Because the name assigned to each carved file may be rather long, a short abbreviation is assigned to each file name. The abbreviation presented in the Abbreviation column is used to identify each carved file in the following two tables. The Evaluation column presents the evaluation assigned to the carved file during a manual examination of the file. A value of "pending" is given if the file has not yet been examined.

Inspection Results for Non-Aligned on Clusters Image of BMP Files

Tool Generated File Name	Abbreviation	Evaluation
picture 00000001139.bmp	C001	Complete no flaws
picture 0000000E2539.bmp	C002	Complete no flaws
picture 000000946B39.bmp	C003	Complete no flaws
picture 000001789939.bmp	C004	Complete no flaws
picture 000003414539.bmp	C005	Complete no flaws

The following table presents the size in bytes and 512-byte blocks of each carved file. The source of the first block is also noted. The file is identified by the short abbreviation defined in the table above.

Description of Carved Files From Non-Aligned on Clusters Image of BMP Files

File_Abbreviation	Bytes	Spill	Blocks	fill	unknown	FirstSource
C001	921,654	54	1,801	0	0	amalfi.bmp
C002	8,798,374	166	17,185	0	0	boudicca.bmp
C003	14,953,734	262	29,207	0	0	iris-lavender.bmp
C004	9,969,174	22	19,472	0	0	shoot.bmp
C005	25,747,254	310	50,288	0	0	zen.bmp

5 BMP signatures were found in the Non-Aligned on Clusters image, 6 expected, no file signatures from an unknown source. 1 file was missed:

smoked-chicken.bmp

0 EXIF embedded thumbnails found, 0 expected.

The following table presents a detailed analysis of the content of each carved file. For each carved file one or more rows follow with an analysis of each source that contributed to the

carved file (identified by the file name abbreviation). The source file name is in the column labeled Src. The number of bytes from that source is listed in the Bytes_seen column. The number of 512-byte blocks from that source is in the Blocks column. The percent of the source file included in the carved file is in the "%" column. A count of ambiguous blocks that could belong to more than one source file is in the Multi column. The number of blocks missing from the source file, i.e., not carved, is in the Missing column.

Detailed Analysis of Carved Files From Non-Aligned on Clusters Image of BMP Files

Carved	Src	Bytes_seen	Blocks	%	Multi	Missing
C001	amalfi.bmp	922,112	1,801	100.00	0	0
C002	boudicca.bmp	8,798,720	17,185	100.00	0	0
C003	iris-lavender.bmp	14,953,984	29,207	100.00	0	0
C004	shoot.bmp	9,969,664	19,472	100.00	0	0
C005	zen.bmp	25,747,456	50,288	100.00	0	0

7.4.6 Image Layout for BMP Fragmented in Order

The following table describes the layout of an image file. The image file is constructed from chunks of data from the source files, separated by chunks of fill data. All chunks are multiples of 512 bytes.

The Chunk column is the chunk identifier. The Source File column is the name of the file providing data. The Bytes column is the size of the chunk in bytes. The Spill column is the number of data bytes in the last block in the chunk (if less than 512). The Blocks column is the number of blocks in the chunk. The "%" column is the percentage of the file in the chunk. The Fill Blocks column is the number of blocks of fill data in the next chunk.

Layout for Fragmented in Order Image of BMP Files

Chunk	Seq	Source_file	Bytes	Spill	Blocks	%	Fill_Blocks
0	1	amalfi.bmp	829,440	0	1,620	89.95	100
2	2	amalfi.bmp	92,214	54	181	10.00	2
4	1	boudicca.bmp	4,399,104	0	8,592	50.00	300
6	2	boudicca.bmp	4,399,270	166	8,593	50.00	50
8	1	iris-lavender.bmp	2,990,592	0	5,841	20.00	80
10	2	iris-lavender.bmp	11,963,142	262	23,366	80.00	13
12	1	shoot.bmp	2,491,904	0	4,867	24.99	210
14	2	shoot.bmp	2,990,592	0	5,841	30.00	100
16	3	shoot.bmp	3,987,456	0	7,788	40.00	2
18	4	shoot.bmp	499,222	22	976	5.01	300
20	1	smoked-chicken.bmp	17,944,064	0	35,047	90.00	50
22	2	smoked-chicken.bmp	1,994,246	6	3,896	10.00	80
24	1	zen.bmp	12,873,216	0	25,143	50.00	13
26	2	zen.bmp	12,874,038	310	25,145	50.00	210

7.4.7 Analysis of Carving Results for BMP Fragmented in Order

The following table presents the results of the manual inspection of carved files. The Tool Generated File Name column presents the names of the carved files as assigned by the tested tool. Because the name assigned to each carved file may be rather long, a short abbreviation is assigned to each file name. The abbreviation presented in the Abbreviation column is used to identify each carved file in the following two tables. The Evaluation column presents the evaluation assigned to the carved file during a manual examination of the file. A value of "pending" is given if the file has not yet been examined.

Inspection Results for Fragmented in Order Image of BMP Files

Tool Generated File Name	Abbreviation	Evaluation
picture 000000001000.bmp	C001	Usable minor flaws
picture 00000000EEE00.bmp	C002	Usable minor flaws
picture 00000097EC00.bmp	C003	Usable minor flaws
picture 0000017CD400.bmp	C004	Usable minor flaws
picture 0000034AFE00.bmp	C005	Usable minor flaws

The following table presents the size in bytes and 512-byte blocks of each carved file. The source of the first block is also noted. The file is identified by the short abbreviation defined in the table above.

Description of Carved Files From Fragmented in Order Image of BMP Files

File_Abbreviation	Bytes	Spill	Blocks	fill	unknown	FirstSource
C001	921,654	54	1,801	100	1	amalfi.bmp
C002	8,798,374	166	17,185	300	1	boudicca.bmp
C003	14,953,734	262	29,207	80	1	iris-lavender.bmp
C004	9,969,174	22	19,472	312	1	shoot.bmp
C005	25,747,254	310	50,288	13	1	zen.bmp

5 BMP signatures were found in the Fragmented in Order image, 6 expected, no file signatures from an unknown source. 1 file was missed:

smoked-chicken.bmp

0 EXIF embedded thumbnails found, 0 expected.

The following table presents a detailed analysis of the content of each carved file. For each carved file one or more rows follow with an analysis of each source that contributed to the carved file (identified by the file name abbreviation). The source file name is in the column labeled Src. The number of bytes from that source is listed in the Bytes_seen column. The number of 512-byte blocks from that source is in the Blocks column. The percent of the source file included in the carved file is in the "%" column. A count of ambiguous blocks that could belong to more than one source file is in the Multi column. The number of blocks missing from the source file, i.e., not carved, is in the Missing column.

Detailed Analysis of Carved Files From Fragmented in Order Image of BMP Files

Carved	Src	Bytes_seen	Blocks	%	Multi	Missing
C001	amalfi.bmp	870,400	1,700	94.40	0	101
C002	boudicca.bmp	8,644,608	16,884	98.25	0	301
C003	iris-lavender.bmp	14,912,512	29,126	99.73	0	81
C004	shoot.bmp	9,809,408	19,159	98.40	0	313
C005	zen.bmp	25,740,288	50,274	99.98	0	14

7.5 Results for carving TIFF

No TIFF files were carved for any layout.

7.6 Results for carving GIF

This section describes details on how the GIF data set images were created. The section also includes a description of the source files used, the layout of each image file used, and an analysis of carved files returned by the tested tool from each image file.

7.6.1 Source File Profile for GIF

This section describes the source files used to build the image files for testing carving of GIF files. The block size is 512 bytes. Spill is the number of data bytes in the last block. Slack is the number of bytes remaining in the last block. Spill + Slack = 512. If the Thumb source file has an embedded thumbnail in the Exif data, the Thumb column has a "yes."

GIF Source File Size in Bytes & 512 Byte Blocks

Source File	Size in Bytes	Blocks	Spill	Slack	Thumb
bamboo-clump-anamated.gif	6,717,692	13,121	252	260	no
barn.gif	3,352,929	6,549	353	159	no
blini.gif	2,125,114	4,151	314	198	no
tapas.gif	2,242,264	4,380	216	296	no
tomatoes.gif	2,240,548	4,377	36	476	no
wat.gif	32,186	63	442	70	no

7.6.2 Image Layout for GIF Contiguous

The following table describes the layout of an image file. The image file is constructed from chunks of data from the source files, separated by chunks of fill data. All chunks are multiples of 512 bytes.

The Chunk column is the chunk identifier. The Source File column is the name of the file providing data. The Bytes column is the size of the chunk in bytes. The Spill column is the number of data bytes in the last block in the chunk (if less than 512). The Blocks column is the number of blocks in the chunk. The "%" column is the percentage of the file in the chunk. The Fill Blocks column is the number of blocks of fill data in the next chunk.

Layout for Contiguous Image of GIF Files

Chunk	Source_file	Bytes	Spill	Blocks	%	Fill_Blocks
0	bamboo-clump-anamated.gif	6,717,692	252	13,121	100.00	1
2	barn.gif	3,352,929	353	6,549	100.00	2
4	blini.gif	2,125,114	314	4,151	100.00	0
6	tapas.gif	2,242,264	216	4,380	100.00	5
8	tomatoes.gif	2,240,548	36	4,377	100.00	34
10	wat.gif	32,186	442	63	100.00	21

7.6.3 Analysis of Carving Results for GIF Contiguous

The following table presents the results of the manual inspection of carved files. The Tool Generated File Name column presents the names of the carved files as assigned by the tested tool. Because the name assigned to each carved file may be rather long, a short abbreviation is assigned to each file name. The abbreviation presented in the Abbreviation column is used to identify each carved file in the following two tables. The Evaluation column presents the evaluation assigned to the carved file during a manual examination of the file. A value of "pending" is given if the file has not yet been examined.

Inspection Results for Contiguous Image of GIF Files

Tool Generated File Name	Abbreviation	Evaluation
picture 000000001000.gif	C001	Incomplete major flaws
picture 000000669400.gif	C002	Incomplete major flaws
picture 00000099C200.gif	C003	Failed to display
picture 000000BA3000.gif	C004	Failed to display
picture 000000DC7200.gif	C005	Failed to display
picture 000000FEE800.gif	C006	Incomplete major flaws

The following table presents the size in bytes and 512-byte blocks of each carved file. The source of the first block is also noted. The file is identified by the short abbreviation defined in the table above.

Description of Carved Files From Contiguous Image of GIF Files

File_Abbreviation	Bytes	Spill	Blocks	fill	unknown	FirstSource
C001	82,633	201	162	0	1	bamboo-clump-anamated.gif
C002	52,958	222	104	0	1	barn.gif
C003	1,929	393	4	0	1	blini.gif
C004	1,929	393	4	0	1	tapas.gif
C005	1,929	393	4	0	1	tomatoes.gif
C006	16,913	17	34	0	1	wat.gif

6 GIF signatures were found in the Contiguous image, 6 expected, no file signatures from an unknown source. No files were missed.

0 EXIF embedded thumbnails found, 0 expected.

The following table presents a detailed analysis of the content of each carved file. For each carved file one or more rows follow with an analysis of each source that contributed to the carved file (identified by the file name abbreviation). The source file name is in the column labeled Src. The number of bytes from that source is listed in the Bytes_seen column. The number of 512-byte blocks from that source is in the Blocks column. The percent of the source file included in the carved file is in the "%" column. A count of ambiguous blocks that could belong to more than one source file is in the Multi column. The number of blocks missing from the source file, i.e., not carved, is in the Missing column.

Detailed Analysis of Carved Files From Contiguous Image of GIF Files

Carved	Src	Bytes_seen	Blocks	%	Multi	Missing
C001	bamboo-clump-anamated.gif	82,432	161	1.23	0	12,960
C002	barn.gif	52,736	103	1.58	0	6,446
C003	blini.gif	1,024	2	0.08	1	4,148
C004	tapas.gif	1,024	2	0.07	1	4,377
C005	tomatoes.gif	1,024	2	0.07	1	4,374
C006	wat.gif	16,896	33	52.39	0	30

7.6.4 Image Layout for GIF Non-Aligned on Clusters

The following table describes the layout of an image file. The image file is constructed from chunks of data from the source files, separated by chunks of fill data. All chunks are multiples of 512 bytes.

The Chunk column is the chunk identifier. The Source File column is the name of the file providing data. The Bytes column is the size of the chunk in bytes. The Spill column is the number of data bytes in the last block in the chunk (if less than 512). The Blocks column is the number of blocks in the chunk. The "%" column is the percentage of the file in the chunk. The Fill Blocks column is the number of blocks of fill data in the next chunk.

Layout for Non-Aligned on Clusters Image (Offset 313 bytes) of GIF Files

Chunk	Source_file	Bytes	Spill	Blocks	%	Fill_Blocks
0	bamboo-clump-anamated.gif	6,717,692	252	13,121	100.00	1
2	barn.gif	3,352,929	353	6,549	100.00	2
4	blini.gif	2,125,114	314	4,151	100.00	0
6	tapas.gif	2,242,264	216	4,380	100.00	5
8	tomatoes.gif	2,240,548	36	4,377	100.00	34
10	wat.gif	32,186	442	63	100.00	21

7.6.5 Analysis of Carving Results for GIF Non-Aligned on Clusters

The following table presents the results of the manual inspection of carved files. The Tool Generated File Name column presents the names of the carved files as assigned by the tested tool. Because the name assigned to each carved file may be rather long, a short abbreviation is

assigned to each file name. The abbreviation presented in the Abbreviation column is used to identify each carved file in the following two tables. The Evaluation column presents the evaluation assigned to the carved file during a manual examination of the file. A value of "pending" is given if the file has not yet been examined.

Inspection Results for Non-Aligned on Clusters Image of GIF Files

Tool Generated File Name	Abbreviation	Evaluation
picture 000000001139.gif	C001	Incomplete major flaws
picture 000000669539.gif	C002	Incomplete major flaws
picture 00000099C339.gif	C003	Failed to display
picture 000000BA3139.gif	C004	Failed to display
picture 000000DC7339.gif	C005	Failed to display
picture 000000FEE939.gif	C006	Incomplete major flaws

The following table presents the size in bytes and 512-byte blocks of each carved file. The source of the first block is also noted. The file is identified by the short abbreviation defined in the table above.

Description of Carved Files From Non-Aligned on Clusters Image of GIF Files

File_Abbreviation	Bytes	Spill	Blocks	fill	unknown	FirstSource
C001	82,633	201	162	0	1	bamboo-clump-anamated.gif
C002	52,958	222	104	0	1	barn.gif
C003	1,929	393	4	0	1	blini.gif
C004	1,929	393	4	0	1	tapas.gif
C005	1,929	393	4	0	1	tomatoes.gif
C006	16,913	17	34	0	1	wat.gif

6 GIF signatures were found in the Non-Aligned on Clusters image, 6 expected, no file signatures from an unknown source. No files were missed.
 0 EXIF embedded thumbnails found, 0 expected.

The following table presents a detailed analysis of the content of each carved file. For each carved file one or more rows follow with an analysis of each source that contributed to the carved file (identified by the file name abbreviation). The source file name is in the column labeled Src. The number of bytes from that source is listed in the Bytes_seen column. The number of 512-byte blocks from that source is in the Blocks column. The percent of the source file included in the carved file is in the "%" column. A count of ambiguous blocks that could belong to more than one source file is in the Multi column. The number of blocks missing from the source file, i.e., not carved, is in the Missing column.

Detailed Analysis of Carved Files From Non-Aligned on Clusters Image of GIF Files

Carved	Src	Bytes_seen	Blocks	%	Multi	Missing
C001	bamboo-clump-anamated.gif	82,432	161	1.23	0	12,960

Carved	Src	Bytes_seen	Blocks	%	Multi	Missing
C002	barn.gif	52,736	103	1.58	0	6,446
C003	blini.gif	1,024	2	0.08	1	4,148
C004	tapas.gif	1,024	2	0.07	1	4,377
C005	tomatoes.gif	1,024	2	0.07	1	4,374
C006	wat.gif	16,896	33	52.39	0	30

7.6.6 Image Layout for GIF Fragmented in Order

The following table describes the layout of an image file. The image file is constructed from chunks of data from the source files, separated by chunks of fill data. All chunks are multiples of 512 bytes.

The Chunk column is the chunk identifier. The Source File column is the name of the file providing data. The Bytes column is the size of the chunk in bytes. The Spill column is the number of data bytes in the last block in the chunk (if less than 512). The Blocks column is the number of blocks in the chunk. The "%" column is the percentage of the file in the chunk. The Fill Blocks column is the number of blocks of fill data in the next chunk.

Layout for Fragmented in Order Image of GIF Files

Chunk	Seq	Source_file	Bytes	Spill	Blocks	%	Fill_Blocks
0	1	bamboo-clump-anamated.gif	6,045,696	0	11,808	89.99	100
2	2	bamboo-clump-anamated.gif	671,996	252	1,313	10.00	2
4	1	barn.gif	1,676,288	0	3,274	49.99	300
6	2	barn.gif	1,676,641	353	3,275	50.00	50
8	1	blini.gif	424,960	0	830	20.00	80
10	2	blini.gif	1,700,154	314	3,321	80.00	13
12	1	tapas.gif	560,128	0	1,094	24.98	210
14	2	tapas.gif	672,256	0	1,313	29.98	100
16	3	tapas.gif	896,512	0	1,751	39.98	2
18	4	tapas.gif	113,368	216	222	5.06	300
20	1	tomatoes.gif	2,016,256	0	3,938	89.97	50
22	2	tomatoes.gif	224,292	36	439	10.01	80
24	1	wat.gif	15,872	0	31	49.21	13
26	2	wat.gif	16,314	442	32	50.58	210

7.6.7 Analysis of Carving Results for GIF Fragmented in Order

The following table presents the results of the manual inspection of carved files. The Tool Generated File Name column presents the names of the carved files as assigned by the tested tool. Because the name assigned to each carved file may be rather long, a short abbreviation is assigned to each file name. The abbreviation presented in the Abbreviation column is used to identify each carved file in the following two tables. The Evaluation column presents the evaluation assigned to the carved file during a manual examination of the file. A value of

"pending" is given if the file has not yet been examined.

Inspection Results for Fragmented in Order Image of GIF Files

Tool Generated File Name	Abbreviation	Evaluation
picture 000000001000.gif	C001	Incomplete major flaws
picture 000000675E00.gif	C002	Incomplete major flaws
picture 0000009D4400.gif	C003	Failed to display
picture 000000BE6C00.gif	C004	Failed to display
picture 000000E56C00.gif	C005	Failed to display
picture 00000108A200.gif	C006	Incomplete major flaws

The following table presents the size in bytes and 512-byte blocks of each carved file. The source of the first block is also noted. The file is identified by the short abbreviation defined in the table above.

Description of Carved Files From Fragmented in Order Image of GIF Files

File_Abbreviation	Bytes	Spill	Blocks	fill	unknown	FirstSource
C001	82,633	201	162	0	1	bamboo-clump-anamated.gif
C002	52,958	222	104	0	1	barn.gif
C003	1,929	393	4	0	1	blini.gif
C004	1,929	393	4	0	1	tapas.gif
C005	1,929	393	4	0	1	tomatoes.gif
C006	23,569	17	47	13	1	wat.gif

6 GIF signatures were found in the Fragmented in Order image, 6 expected, no file signatures from an unknown source. No files were missed.
0 EXIF embedded thumbnails found, 0 expected.

The following table presents a detailed analysis of the content of each carved file. For each carved file one or more rows follow with an analysis of each source that contributed to the carved file (identified by the file name abbreviation). The source file name is in the column labeled Src. The number of bytes from that source is listed in the Bytes_seen column. The number of 512-byte blocks from that source is in the Blocks column. The percent of the source file included in the carved file is in the "%" column. A count of ambiguous blocks that could belong to more than one source file is in the Multi column. The number of blocks missing from the source file, i.e., not carved, is in the Missing column.

Detailed Analysis of Carved Files From Fragmented in Order Image of GIF Files

Carved	Src	Bytes_seen	Blocks	%	Multi	Missing
C001	bamboo-clump-anamated.gif	82,432	161	1.23	0	12,960
C002	barn.gif	52,736	103	1.58	0	6,446
C003	blini.gif	1,024	2	0.08	1	4,148
C004	tapas.gif	1,024	2	0.07	1	4,377

Carved	Src	Bytes_seen	Blocks	%	Multi	Missing
C005	tomatoes.gif	1,024	2	0.07	1	4,374
C006	wat.gif	16,896	33	52.39	0	30

*This report created by: gen_fc_report.py (%Z% %M% %I% Created %G% at %U%)
at 2023-12-19 Tue 12:53*