

October 23, 2020

BY FACSIMILE AND EMAIL: 718-613-2546

Honorable Nicholas G. Garaufis
United States District Judge
Eastern District of New York
225 Cadman Plaza East
Brooklyn, New York 11201

Re: United States v. Keith Raniere, 18 Cr. 204 (NGG)

Dear Judge Garaufis:

We are writing to make you aware of and present to you relevant and important information in the instant case.

It was recently shown that a key piece of evidence used in the trial (i.e., the hard drive to evidence the underlying overt act of possession of child pornography and sexual exploitation of a minor) was tampered with while in the possession of the government and/or prosecutors. The proof of tampering is supported by four independent forensic experts. The forensic experts demonstrated that the government and their expert witness lied and/or misrepresented the reliability of this key information, and that this evidence should never have been admitted as part of the trial. (See attached Exhibit 1). The reason we are sharing this information is because the child pornography evidence was greatly prejudicial in Keith Raniere's trial and his media coverage. This ultimately resulted in several co-defendants taking plea deals. Ultimately, this charge was used to destroy a great community of people, their reputations, livelihoods and families.

We ask you to consider postponing Keith Raniere's sentencing so the evidence and proof of tampering can be reviewed in more detail to shed light on these crimes, gross misconduct and/or prosecutorial misconduct. We are in a time of strong distrust in the government and legal system. There is a strong call to action, a demand and need for social justice and judicial reform. To proceed with Keith Raniere's sentencing in light of this new evidence would be interpreted by the public, media and citizens everywhere that it does not matter if the government or prosecution cheated, lied or committed crimes to convict a person. This must not be allowed to continue. While the judicial system cannot be changed overnight, the direction of change to improve it can be changed by your choosing to consider this new evidence and ask the government and prosecution why they lied and committed crimes? To ignore such egregious behavior and pretend that this criminal behavior by the prosecution and/or government does not make a difference, would be to condone such behavior and make everyone who is aware complicit in this criminal behavior.

We are a group of concerned citizens who are dedicated to exposing prosecutorial misconduct with the ultimate goal of improving the judicial system. We are sharing this information with you because we strongly believe, as Martin Luther King stated, "Injustice anywhere is a threat to justice everywhere." By exposing this egregious example of prosecutorial misconduct, your decision on this matter could have

long-term ramifications throughout the legal system by giving prosecutors and the government officials across the nation notice that such misconduct will not go unnoticed and that it will not be allowed to continue as it currently does.

We respectfully ask you to consider this information and order the government and prosecution to be held accountable and respond. Please do not condone corruption or injustice by allowing the sentencing to continue.

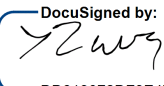
Thank you for your time and consideration.

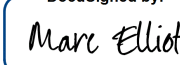
Respectfully,

Make Justice Blind

Attachments:

cc: Richard Donoghue
Mark Lesko
Tanya Hajjar
Moir Kim Penza
Seth DuCharme
Marc Agnifilo
Teny Geragos
Paul DerOhannesian

DocuSigned by:

DD813072DF8E472...
Eduardo Asunsolo

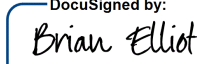
DocuSigned by:

42CDDA42A9A341E...
Marc Elliot

DocuSigned by:

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Michele Hatchette

DocuSigned by:

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Suneel Chakravorty

DocuSigned by:

F09283AAF86A4A6...
Brian Elliot

DocuSigned by:

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Justin Elliot

DocuSigned by:

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Linda Chung

Forensic experts show extensive, calculated tampering on Ranieri's devices that allegedly contained child pornography

If egregious and irrefutable evidence were exposed that America's most hated defendant was framed, would people care? If you agree with Dr. Martin Luther King Jr. that "injustice anywhere is a threat to justice everywhere," then a corruption of massive proportions of the justice system should be of grave concern, regardless of who is the target.

Overt acts of possession and production of child pornography and sexual exploitation of a minor were used to support a conviction of racketeering of Keith Ranieri on June 19, 2019, among other charges. The prosecution alleged he had 22 nude images on a device of an underage girl (identified in the trial as a woman named Camila, now age 30) who, according to the government, was 15 at the time they were taken.

Dr. Keshava Munegowda¹ reviewed file system data of Ranieri's two devices. Dr. Munegowda holds a PhD in Computer Science, 5 related patents², has been published and cited in peer reviewed journals³, and wrote a book⁴ on analyzing computer file systems. Dr. Munegowda issued a comprehensive report⁵, which includes certifications from 2 other forensic experts, with the summary analysis dated October 23, 2020. To date, 3 additional digital forensics experts⁶ reviewed statements from the report and corroborated its conclusions. One of those corroborators, Steven Abrams, J.D., M.S.⁷ of Abrams Cyber Law & Forensics, is an award-winning forensics expert and a litigation attorney licensed to practice in South Carolina, District of Columbia, and New York.

The report contains detailed technical analyses that clearly show:

¹Exhibit 25

²<https://patents.justia.com/inventor/keshava-munegowda>

³https://scholar.google.com/scholar?hl=en&as_sdt=0%2C16&q=Keshava+Munegowda&btnG=

⁴https://www.amazon.com/Books-Keshava-Munegowda/s?rh=n%3A283155%2Cp_27%3AKeshava+Munegowda

⁵ Exhibit 1

⁶ Exhibit 2

⁷ Exhibit 24

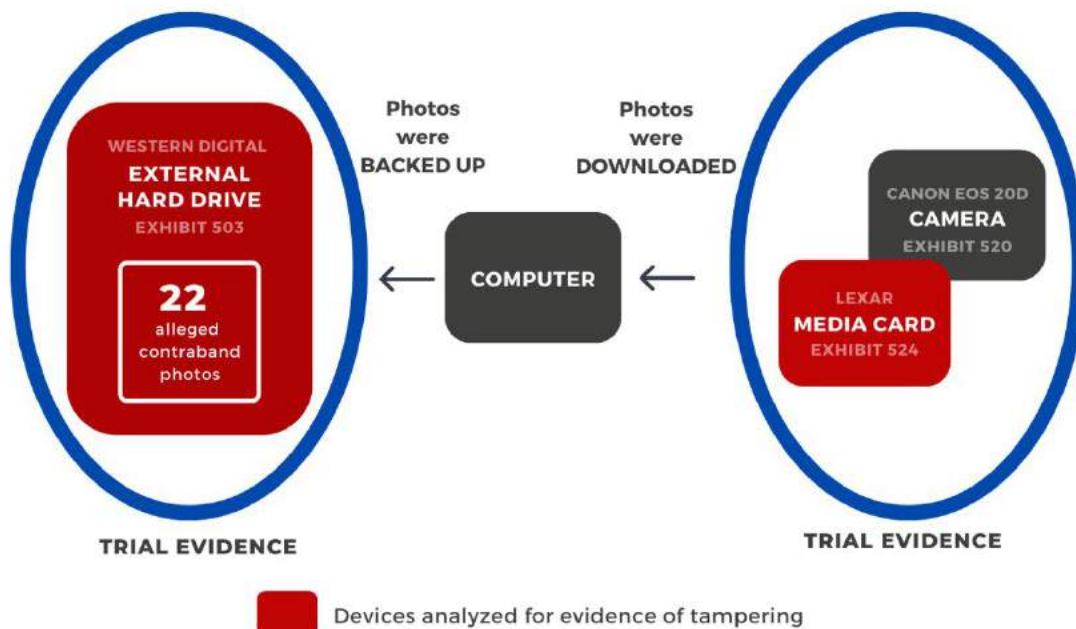
- There was "extensive and calculated fabrication" on the hard drive, which contained the 22 images of alleged child pornography.
- The prosecution's FBI computer expert witness made a false statement to the jury about how difficult it is to tamper with a specific data type in question.

These facts are now also coupled with the following irregularities of the trial:

- **The prosecution's FBI witness testified that an unknown person accessed Ranieri's device while it was in FBI custody.**
- **After being asked, the government did not provide the defense a forensic clone of the devices. Forensic clones make tampering much easier to reveal.**

The devices and files that the report deems as "manually altered" were used as evidence of overt acts (possession and production of child pornography and sexual exploitation of a minor) to support a conviction of racketeering. Twenty-two images on those devices were key evidence that the prosecution used to argue that the photos were taken in 2005⁸, when the subject would have been underage.

DIAGRAM OF DEVICES



⁸ Exhibit 3

Dr. Munegowda summarizes his report by saying, "It is my expert opinion that the government, or someone in concert with the government, likely tampered with the hard drive and media card ." In a summary corroboration statement, Mr. Abrams issues an even further statement saying that **the evidence had an "invalidated chain of custody," that "the dates and times associated with those digital photos cannot be . . . assumed to be accurate," that the FBI "either purposely misled the fact finders or is not sufficiently knowledgeable about the facts to which he testified," that the prosecution "purposefully misled the jury about the reliability of the digital photo evidence," and that the government was "intentionally dishonest in its closing statement to the jury."**⁹

A summary of the report's key findings are below, and the full technical report is available for the public to review here¹⁰. Corroborations of the technical statements are here¹¹.

Summary

- **The camera's media card was modified while in FBI custody by an unknown person before it was sent to the lab for analysis.**
 - FBI Examiner Brian Booth testified at the trial that Raniere's media card was accessed by an unknown person on September 19, 2018¹², which was after it was seized by the government on March 27, 2018¹³.
 - **The FBI witness also confirmed that an unknown person changed the media card's file system data¹⁴ while it was in FBI custody, and there is no record of who changed it. This shows a break in the chain of custody.**
 - A forensics tool to prevent changes to the device files and metadata is called a write blocker¹⁵. It allows for viewing of a device without modifying files or file system data. The FBI witness's testimony shows that a write blocker must not have been used¹⁶ at least once when the device was accessed while in FBI custody. This must be true because he testified above that the file system data was altered.

⁹ Exhibit 24

¹⁰ Exhibit 1

¹¹ Exhibit 2

¹² Exhibit 4

¹³ Exhibit 5

¹⁴ Exhibit 6

¹⁵ <https://www.geeksforgeeks.org/write-blockers-an-introduction/>

¹⁶ Exhibit 7

- The dates in the testimony reveal that tampering happened after the device was seized on March 27, 2018, but before it reached the FBI's forensics lab on February 22, 2019¹⁷.
 - The above facts show that the media card was **accessed and changed 6 months after** the FBI took possession, and the FBI has no official record or explanation of who accessed the card and how that happened.
- **In a "breach of proper handling of electronic data"¹⁸, the camera and media card arrived at the FBI forensics lab in an open, unsealed box and bag; this was after an unknown person had accessed the media card months prior.**
 - FBI Examiner Booth testified multiple times that Raniere's camera arrived in an unsealed box and bag, and the media card arrived in an unsealed bag¹⁹.
- **According to the report's Statement 1A²⁰, "at least 94 pictures on the hard drive" were "altered." These pictures are on the same hard drive and under the same folder that contained the 22 allegedly contraband photos.**
 - The report shows that the person who altered the photos made several errors with respect to calculating and accounting for Daylight Savings Time:
 - First, the report shows that the camera, a Canon EOS 20D, is "not time zone aware."²¹ This means the camera "does not store any information on the compact flash card that would allow the time to be adjusted from one time zone to another." The specific file systems on the media card (FAT-16) and hard drive (FAT-32) are also not time-zone aware.
 - File modified times were shifted back 1 hour before Daylight Savings Time ended, 2 hours for some pictures on the very day that Day Light Savings ended, 0 hours for others on that day, and then 0 hours after that day.
 - All of the pictures were copied to the hard drive in a 2 minute period, which means someone could not have crossed time zones multiple times when the files were backed up to the hard drive.

¹⁷ Exhibit 8

¹⁸ Exhibit 26

¹⁹ Exhibit 9

²⁰ Exhibit 10

²¹ Exhibit 11

- As noted in Statement 1B²², an addendum to Statement 1A, the only rational explanation for the time shifts is that someone tried to make it look like Daylight Savings Time adjusted the times naturally, but the tamperer made human errors.
- **According to the report's Statement 5²³ and Statement 10²⁴, someone made one picture look like it had originated from Ranieri's camera. This alteration suggests it may have come from another source from what the government report indicates.**
 - A photo on the hard drive was edited after it was downloaded from the media card. This is known because the file's metadata (EXIF data) showed that Photoshop had been used on the photo.
 - When a photo gets taken, the file creation and last file modified date are typically very close, within seconds.
 - In a highly technical explanation, the report explains how, for this particular photo, the file's last modified date must have been "altered manually."
 - The report further explains that this manual alteration was likely done to give the appearance that the photo came from the camera. That the alteration was done suggests it may not have.
- **According to the report's Statement 7²⁵, the FBI's computer expert witness made four false statements to the jury, incorrectly stating that tampering with photo metadata (which includes photo creation dates) is difficult.**
 - Dr. Munegowda's report states that FBI Examiner Booth "knowingly lied" under oath about the difficulty of changing metadata on photos (EXIF²⁶ data, like dates/times) when he said: "it's not easy to change."²⁷
 - The report further states that the exact opposite is true by saying, "EXIF data being easily modifiable is a well-known fact that anyone familiar with technology, especially a forensic examiner, would know." The report goes on to say a "simple Google or YouTube search" proves how easy it is for even a "lay person" to change EXIF data (see: sample Google search here)

²² Exhibit 12

²³ Exhibit 13

²⁴ Exhibit 14

²⁵ Exhibit 15

²⁶ <https://photographylife.com/what-is-exif-data#what-is-exif-data>

²⁷ Exhibit 16

- The report includes an additional opinion²⁹ from another forensics examiner, Steven Burgess of Burgess Forensics, who corroborates the claim that EXIF data is, in fact, easy to alter.
- **The government did not provide the defense with a "forensic image" of Ranieri's devices. According to the report³⁰, by not providing "forensic images" of the devices in question, the defense was given "forensically unreliable" evidence.**
 - According to the report, forensic images are "the gold standard" to make a "bit-by-bit copy" of all the contents of the device.
 - A forensic image is a frozen-in-time copy and it allows both the prosecution and the defense to have access to the same data-rich evidence to examine.
 - The defense requested a forensic image of Ranieri's devices (in a confidential email on April 18, 2019), with specific instructions on how to redact the 22 allegedly contraband images.
 - The prosecution never gave the defense forensic images of the devices (evidence of this exists in a confidential email sent on October 5, 2020). Instead, the defense only received PDF reports of the file system of the media card and a simple copy of the hard drive.
 - This letter in the report³¹ states that having only a copy of the hard drive is "not a forensically reliable way to preserve the contents of a hard drive or storage device and is of little value when there is a dispute about the reliability of the data or questions about metadata such as date and time stamps."
 - In addition to not having a forensic copy of the devices, according to a motion filed by Ranieri's attorneys 15 days before the start of the trial³², the defense still had not provided "reports concerning the search of the backup hard drive from which the child pornography was allegedly recovered," even though the defense had repeatedly asked.
- **The devices in question were critical elements of the arguments the**

²⁸ <https://www.google.com/search?q=how+to+change+exif+data+on+a+photo>

²⁹ Exhibit 17

³⁰ Exhibit 18

³¹ Exhibit 19

³² Exhibit 20

prosecution used to convict Raniere of Racketeering Counts 2, 3, and 4.

- In the prosecution's closing statements for Counts 2 and 3 (Sexual Exploitation of a Child), the prosecution established Camila's age using the lack of an appearance of a scar on her body (which she did not have when she was a minor) and the creation dates of the files.
 - Regarding the creation dates of the files, the prosecution told the jury that the photos "were taken exactly when the folders stated they were taken."³³ The prosecution's FBI expert witness said **the exact opposite** of this statement in his earlier testimony by saying, "the file system metadata for those dates and times are not accurate."³⁴
 - Regarding the absence of the scar to prove Camila was underage, the tampering of the photo with the Photoshop tag outlined in the report, along with other tampering on the hard drive, raises real questions of the authenticity of the 22 photos' contents.
- In the prosecution's closing statements for Count 4 (Possession of Child Pornography), the prosecution argued that Raniere had "control over the images . . . [and] you know the defendant did, because again, the defendant took those photos."³⁵
 - Given the extensive tampering uncovered in the report, the validity of this argument is also affected by the questionable data integrity of the devices.

Expert Conclusions

Dr. Munegowda concludes³⁶ that:

"Considering the above points and that the only beneficiary of the tampering is the party that brings the charge – the government – **it is my opinion that the government, or someone in concert with the government, likely tampered with the hard drive and media card.**"

"The only purpose that such an extensive and calculated fabrication would serve

³³ Exhibit 21

³⁴ Exhibit 22

³⁵ Exhibit 23

³⁶ Exhibit 14

is to support the allegation that 22 contraband pictures were found on the hard drive as presented. **That such a fabrication was necessary implies that the contraband pictures were not found as presented [by the government]."**

He also explains the likely motivation the tamperer had to alter files on both devices:

"It is my opinion that these alterations were done to make it seem that the dates of the pictures on the hard drive were authentic and the pictures came from the media card. "

In his conclusion, Steven Abrams J.D., M.S.³⁷, writes the following:

"In conclusion, it is my expert opinion that the digital photo evidence, based on the abovementioned materials I reviewed, **was tampered with and should have been excluded as unreliable, and should not have been used to support any charges.** Further, based on my reviews of the above mentioned materials it appears that the **government ... was intentionally dishonest about the reliability of said digital photo evidence in its closing statement to the jury.**"

The irregularities of the evidence handling by the FBI and Dr. Munegowda's analysis of tampering raise serious questions about the validity of the evidence used to convict Raniere of three counts of racketeering on the basis of production and possession of child pornography. Notably, **this child pornography "evidence" had a major impact on the case**, not just for Raniere but for his co-defendants. All of Raniere's co-defendants but one plead guilty AFTER the child pornography charge was publicly announced. If the defense had been provided forensic images of Raniere's devices before the trial, perhaps their team would have been able to expose the likely tampering of evidence that a world-class expert was only able to figure out after the trial had ended.

Had a hard drive and media card been taken from Raniere upon arrest, sealed and kept in a secure chain of custody, and taken to a crime lab where they found child pornography on it (using photo dates to show the woman's age) . . . those clean facts, if true, would likely have meant Raniere committed a serious crime. However, the reality was far from that scenario: The devices were seized from Raniere, were left by the FBI in an open box and an unsealed evidence bag, were accessed by an unknown person before being analyzed, and then months later, child pornography was found on the hard

³⁷ Exhibit 24

drive when it was analyzed for the first time. In addition, Dr. Munegowda's corroborated report shows the devices the FBI analyzed had manually altered photos, had tampering with a file that had been edited in Photoshop, and had manually altered photo dates. The prosecution later argued that the photo dates showed the woman's age based on the creation dates shown in the devices, which is the opposite of what the prosecution's witness testified. In addition, that same FBI computer expert witness gave false statements on the stand with regards to the difficulty of tampering.

Based on Dr. Munegowda's report showing proof of tampering, with corroborations by Steven Abrams J.D., M.S. and other experts, and the irregularities in the handling of Raniere's devices, including a break in their chain of custody, the reliability of the devices that held the alleged contraband photos is now called into question. The contents on these devices were used to establish that the subject in the photos was underage, and as outlined above, technical findings now show that the evidence presented to the Court to convict Keith Raniere was certifiably compromised.

EXHIBIT 1

Dr. Keshava Munegowda

Author and File Systems Expert

10/23/2020

Expert Statement #10: Summary

In Expert Statements #1A, #1B and #5, it was shown that at least 95 of the 168 pictures under the "Studies" folder were manually altered.

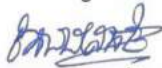
It is my opinion that these alterations were done to make it seem that the dates of the pictures on the hard drive were authentic and the pictures came from the media card. That is tampering.

Tampering is typically not done unless necessary. Because the only charge involving these devices is the charge regarding the alleged 22 contraband pictures, the only purpose that such an extensive and calculated fabrication would serve is to support that the alleged 22 contraband pictures were found on the hard drive as presented. That such fabrication was done suggests that the contraband pictures were not found on the hard drive as presented.

I have reviewed the transcript excerpts in Transcript Summary #1 and the ones appended to Expert Statement #7. Based on the transcripts, which I am assuming are accurate as presented, the following are true:

1. The media card was accessed without a write-blocker and file system data altered in the process, while it was in government custody but before it arrived at the lab for forensic analysis.
2. The government's forensic examiner knowingly lied on the stand multiple times about a well-known technical fact, stating that EXIF data was difficult to change.
3. The government had access to the devices.

Considering the above points and that the only beneficiary of the tampering is the party that brings the charge – the government – it is my opinion that the government, or someone in concert with the government, likely tampered with the hard drive and media card.



Dr. Keshava Munegowda, PhD

- **Education Qualifications:**

- PhD Computer Science and Engineering, Visvesvaraya Technological University, 2016. Research domain is File systems.
- Master of technology in Computer Science and Engineering, Visvesvaraya Technological University, 2004.
- Bachelor of Engineering in Computer Science and Engineering, Bangalore University, INDIA, 2001.

- **Book on FAT File systems:**

- "ExFAT and FAT File System Internals", November 2016, Amazon publications.

- **Granted US patents on FAT File systems:**

1. USPTO application number: 12326915 entitled "Storage Optimizations by Directory compaction in FAT File system", US patent number: 8429331.
2. USPTO application number: 12762829 entitled "FAT file in reserved cluster entry with ready entry state", US patent number: 8452734.
3. USPTO application number: 13870344, entitled "IC updating File system meta data with log record data", US patent number: 9043286.
4. USPTO application number: 14075757 entitled "File access method and system there of", US patent number: 9569447.
5. USPTO application number: 15413058 entitled "Method and System for File storage and access", US patent number: 9817837.

10/7/2020

EXPERT STATEMENT #7

FBI Examiner Brian Booth made the following statements (the public trial transcripts are included in this report):

- "...with EXIF data, once it's embedded in a picture, it doesn't matter how many times you move it around. It stays in that photo and **it's very hard to remove.**" (Pg 4819)
- In response to the question, "Is there a particular reason why EXIF data is more difficult to alter?", Booth responds **"They purposely designed it that way."** (Pg 4820)
- "Well, the best reference [for when a photograph is taken] is the EXIF data because that gets put into the JPEG file and **it's not easily modifiable.**" (Pg 4830)
- "... when it comes to EXIF data, it used to be it would only be hard-coded in. You couldn't modify it... when it comes to photos, they still keep you from changing dates and times. **It's not easy to change those.**" (Pg 4977)

I affirm that all of the above statements are false. EXIF data is not difficult to change. A simple Google or YouTube search reveals that there exist many online tools that a lay person can use to easily change EXIF data. EXIF data being easily modifiable is a well-known fact that anyone familiar with technology, especially forensic examiner, would know.

Therefore, I strongly believe that Mr. Booth knowingly lied to the court.



Dr. Keshava Munegowda, PhD

- **Education Qualifications:**

- PhD Computer Science and Engineering, Visvesvaraya Technological University, 2016. Research domain is File systems.
- Master of technology in Computer Science and Engineering, Visvesvaraya Technological University, 2004.
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5. USPTO application number: 15413058 entitled "Method and System for File storage and access", US patent number: 9817837

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BURGESS FORENSICS
COMPUTER & DIGITAL FORENSICS / EXPERT WITNESS SERVICES

EXPERT STATEMENT ON EXIF DATA

EXIF metadata is not difficult to change. On the contrary, EXIF data is easy to change.

Some EXIF metadata can be changed right from Windows with no special tools by right-clicking on the file and selecting "Properties, and then clicking on the "Details" tab. One can then simply replace data by typing into one of the following fields: Authors, Date taken, Program name, Date acquired, Copyright.

There are many tools for both the Windows and Macintosh platforms that allow one to change EXIF data.

One such is a freely downloadable piece of software that is a fairly technical tool called "ExifTool by Phil Harvey."

However, there is a Graphical User Interface version of this tool called, "ExifToolGUI for Windows," that is easier to use.

In addition, there are many online and consumer tools that allow even a non-technical person to add, remove and change EXIF data.

For instance, there is "EXIF Date Changer,) which has the purpose of changing the dates within a file's EXIF metadata and is very simple to use. It has the capability of performing batch changes, that is, to change the dates of many files at once.

Another such is "AnalogExif," which can change many EXIF metadata fields and also as a batch process.

One more is called, "Photo Date Changer," that allows user to easily change EXIF date and times and also to do so as a batch process. The program allows the user to change the date and time to a specific value, or to batch add/subtract a certain amount of time to a set of files.


Steve Burgess, Burgess Forensics

10/07/2020

Expert Statement #1A: The Time Shifts

Suppose we have a set of pictures on a FAT-32 hard drive that were taken on a FAT-16 compact flash card, downloaded onto a Windows computer and then backed up to a FAT-32 hard drive. Also suppose these pictures are taken by a camera, a Canon EOS 20D, which does not record time-zone information.¹

Assumption:

When a picture is taken with the Canon EOS 20D and the FAT-16 CF card, the EXIF DateTimeOriginal is within a few seconds of the FAT Date Modified.²

Observation:

Table 1 contains the timestamp data for these pictures on the hard drive. In that table, we observe the following:

- From IMG_0138.JPG onwards ("Group 1"): the EXIF DateTimeOriginal is within a few seconds of the FAT Modified Date, as expected.
- For IMG_0043.JPG – IMG_0126.JPG ("Group 2"), excluding IMG_0114.JPG which is not present on the hard drive: the EXIF DateTimeOriginal is ahead of the FAT Modified date by one hour, within a few seconds.
- For IMG_0127.JPG – IMG_0137.JPG ("Group 3"): the EXIF DateTimeOriginal is ahead of the FAT Modified date by two hours, within a few seconds.

Possible Explanations:

Here are possible explanations for the time differences observed in Groups 2 and 3:

1. **Automatic:** The computer automatically applied a time-zone shift to the FAT Date Modified, which could have occurred
 - a. During the copy operation from the CF card to the computer
 - b. By using normal computer programs to modify the file groups
 - c. During the copy operation from the computer to the hard drive
2. **Manual:** The FAT Date Modified or the EXIF DateTimeOriginal were manually altered after the pictures had been copied from the CF card.

Let us disprove Explanations 1a-c below.

Disproving Explanation 1a:

In order for the computer to adjust for time-zone when copying from the CF card, there would need to be time-zone information in the source data. However, FAT-16 does not store time-zone information in the file system and, as previously stated, the Canon EOS 20D camera does not store time-zone information either. Therefore, Explanation 1a is not valid.

Disproving Explanation 1b:

For the FAT Modified Dates to be almost exactly one hour or two hours behind the EXIF DateTimeOriginals (within a few seconds), the computer clock would need to be set back for each of the 94 pictures and modified exactly one hour (if Group 2) or two hours (if Group 3) before the corresponding EXIF DateTimeOriginal. That would involve up to 94 clock changes. This would not occur automatically, especially not as the result of an automatic time-zone shift.

¹ See enclosed letter from Mr. Steven Alexander dated October 9, 2020.

² See enclosed letter from Mr. Steven Alexander dated October 11, 2020.


[Dr. KESHAVA MUNEGOWDA]

Dr. Keshava Munegowda

Author and File Systems Expert

10/23/2020

Additionally, this being done manually is exceedingly implausible, if not unprecedented, especially considering these pictures appear to be taken over multiple months.

Disproving Explanation 1c:

Because the hard-drive (FAT-32) does not store time-zone information, the only way that the copy operation to the hard drive would introduce different time-zone shifts is if the computer time-zone was different between Groups 1, 2 and 3.

Table 2 shows the order in which the pictures were copied to the hard drive. As the table shows, the time-zone would need to have been changed 5 times during the copy operation.

Table 3 shows the FAT Create Dates for all of the contents of "Studies", the folder in which all the pictures reside. The pictures are organized into subfolders under "Studies." From the FAT Create Date we see that the entire directory was copied in a bulk operation that took less than two minutes, with no time gaps, from 7/26/03 11:05:03 AM to 11:06:38 AM. Those datetimes are from the computer clock.

The computer could not have been moved across multiple time-zones in less than two minutes. Therefore, someone would have needed to change the time-zone five times within two minutes, sometimes taking 11 seconds or so to change the time-zone twice (see IMG_0223.JPG – IMG_0099.JPG in Table 2) This would be exceedingly difficult to do manually, and it would be highly implausible that someone could do this or would attempt this.

Conclusion

Having ruled Explanations 1a-c as invalid or highly implausible, the only remaining explanation is Explanation 2: Someone manually altered either the FAT Date Modified and/or EXIF DateTimeOriginal for at least 94 pictures (Groups 2 and 3) present on the hard drive, after they had been copied from the CF card.



Dr. Keshava Munegowda, PhD

- **Education Qualifications:**

- PhD Computer Science and Engineering, Visvesvaraya Technological University, 2016. Research domain is File systems.
- Master of technology in Computer Science and Engineering, Visvesvaraya Technological University, 2004.
- Bachelor of Engineering in Computer Science and Engineering, Bangalore University, INDIA, 2001.

- **Book on FAT File systems:**

- "ExFAT and FAT File System Internals", November 2016, Amazon publications.

- **Granted US patents on FAT File systems:**

1. USPTO application number: 12326915 entitled "Storage Optimizations by Directory compaction in FAT File system", US patent number: 8429331.

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2. USPTO application number: 12762829 entitled "FAT file in reserved cluster entry with ready entry state", US patent number: 8452734.
3. USPTO application number: 13870344, entitled "IC updating File system meta data with log record data", US patent number: 9043286
4. USPTO application number: 14075757 entitled "File access method and system there of", US patent number: 9569447
5. USPTO application number: 15413058 entitled "Method and System for File storage and access", US patent number: 9817837

Table 1 : Pictures on hard drive, sorted by EXIF DateTimeOriginal

FILE_NAME	HD FAT Modified Date	HD EXIF DateTimeOriginal	HD FAT Create Date	Time Shift Between FAT Modified and EXIF DateTimeOriginal (up to a few seconds)
IMG_0043.JPG	10/16/05 11:30:04 PM	10/17/05 12:30:04 AM	7/26/03 11:05:58 AM	1
IMG_0044.JPG	10/17/05 3:53:24 PM	10/17/05 4:53:22 PM	7/26/03 11:05:58 AM	1
IMG_0045.JPG	10/17/05 3:53:40 PM	10/17/05 4:53:40 PM	7/26/03 11:05:59 AM	1
IMG_0046.JPG	10/17/05 3:54:08 PM	10/17/05 4:54:09 PM	7/26/03 11:05:59 AM	1
IMG_0047.JPG	10/17/05 3:54:24 PM	10/17/05 4:54:24 PM	7/26/03 11:05:59 AM	1
IMG_0048.JPG	10/17/05 3:54:38 PM	10/17/05 4:54:38 PM	7/26/03 11:06:00 AM	1
IMG_0049.JPG	10/17/05 3:54:54 PM	10/17/05 4:54:54 PM	7/26/03 11:06:00 AM	1
IMG_0050.JPG	10/17/05 3:55:04 PM	10/17/05 4:55:05 PM	7/26/03 11:06:00 AM	1
IMG_0051.JPG	10/17/05 3:55:28 PM	10/17/05 4:55:28 PM	7/26/03 11:06:01 AM	1
IMG_0052.JPG	10/17/05 3:55:42 PM	10/17/05 4:55:41 PM	7/26/03 11:06:02 AM	1
IMG_0053.JPG	10/17/05 3:55:54 PM	10/17/05 4:55:52 PM	7/26/03 11:06:02 AM	1
IMG_0054.JPG	10/17/05 3:55:58 PM	10/17/05 4:55:59 PM	7/26/03 11:06:02 AM	1
IMG_0055.JPG	10/17/05 3:56:24 PM	10/17/05 4:56:25 PM	7/26/03 11:06:03 AM	1
IMG_0056.JPG	10/17/05 3:56:36 PM	10/17/05 4:56:36 PM	7/26/03 11:06:03 AM	1
IMG_0057.JPG	10/17/05 3:56:48 PM	10/17/05 4:56:48 PM	7/26/03 11:06:03 AM	1
IMG_0058.JPG	10/17/05 3:56:58 PM	10/17/05 4:56:58 PM	7/26/03 11:06:04 AM	1
IMG_0059-1.JPG	10/17/05 9:00:58 PM	10/17/05 10:00:57 PM	7/26/03 11:06:14 AM	1
IMG_0060-1.JPG	10/17/05 9:01:06 PM	10/17/05 10:01:07 PM	7/26/03 11:06:15 AM	1
IMG_0061-1.JPG	10/17/05 9:01:12 PM	10/17/05 10:01:13 PM	7/26/03 11:06:15 AM	1
IMG_0062-1.JPG	10/17/05 9:01:24 PM	10/17/05 10:01:24 PM	7/26/03 11:06:16 AM	1
IMG_0063-1.JPG	10/17/05 9:01:32 PM	10/17/05 10:01:32 PM	7/26/03 11:06:16 AM	1
IMG_0064-1.JPG	10/17/05 9:02:00 PM	10/17/05 10:02:00 PM	7/26/03 11:06:17 AM	1
IMG_0065-1.JPG	10/17/05 9:02:08 PM	10/17/05 10:02:07 PM	7/26/03 11:06:17 AM	1
IMG_0066-1.JPG	10/17/05 9:02:14 PM	10/17/05 10:02:13 PM	7/26/03 11:06:17 AM	1
IMG_0067-1.JPG	10/17/05 9:02:34 PM	10/17/05 10:02:34 PM	7/26/03 11:06:18 AM	1
IMG_0068-1.JPG	10/17/05 9:03:02 PM	10/17/05 10:03:01 PM	7/26/03 11:06:19 AM	1
IMG_0069-1.JPG	10/17/05 9:03:10 PM	10/17/05 10:03:10 PM	7/26/03 11:06:19 AM	1
IMG_0070-1.JPG	10/17/05 9:03:24 PM	10/17/05 10:03:24 PM	7/26/03 11:06:20 AM	1
IMG_0071.JPG	10/18/05 7:32:06 PM	10/18/05 8:32:06 PM	7/26/03 11:05:26 AM	1
IMG_0072.JPG	10/18/05 7:32:26 PM	10/18/05 8:32:26 PM	7/26/03 11:05:26 AM	1
IMG_0073.JPG	10/18/05 7:32:36 PM	10/18/05 8:32:36 PM	7/26/03 11:05:27 AM	1
IMG_0074.JPG	10/18/05 7:32:44 PM	10/18/05 8:32:44 PM	7/26/03 11:05:27 AM	1
IMG_0075.JPG	10/18/05 7:33:08 PM	10/18/05 8:33:09 PM	7/26/03 11:05:28 AM	1
IMG_0076.JPG	10/18/05 7:33:14 PM	10/18/05 8:33:15 PM	7/26/03 11:05:28 AM	1
IMG_0077.JPG	10/18/05 7:33:22 PM	10/18/05 8:33:22 PM	7/26/03 11:05:29 AM	1
IMG_0078.JPG	10/18/05 7:33:30 PM	10/18/05 8:33:30 PM	7/26/03 11:05:29 AM	1
IMG_0079.JPG	10/19/05 5:54:08 PM	10/19/05 6:54:09 PM	7/26/03 11:05:20 AM	1
IMG_0080.JPG	10/19/05 5:54:22 PM	10/19/05 6:54:23 PM	7/26/03 11:05:21 AM	1
IMG_0081.JPG	10/19/05 5:54:32 PM	10/19/05 6:54:33 PM	7/26/03 11:05:21 AM	1


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IMG_0082.JPG	10/19/05 5:54:56 PM	10/19/05 6:54:57 PM	7/26/03 11:05:21 AM	1
IMG_0083.JPG	10/19/05 5:55:10 PM	10/19/05 6:55:10 PM	7/26/03 11:05:22 AM	1
IMG_0084.JPG	10/19/05 5:55:36 PM	10/19/05 6:55:37 PM	7/26/03 11:05:22 AM	1
IMG_0085.JPG	10/19/05 5:55:48 PM	10/19/05 6:55:49 PM	7/26/03 11:05:23 AM	1
IMG_0086.JPG	10/19/05 5:55:56 PM	10/19/05 6:55:57 PM	7/26/03 11:05:23 AM	1
IMG_0087.JPG	10/19/05 5:56:08 PM	10/19/05 6:56:09 PM	7/26/03 11:05:24 AM	1
IMG_0088.JPG	10/19/05 5:56:24 PM	10/19/05 6:56:24 PM	7/26/03 11:05:24 AM	1
IMG_0089.JPG	10/19/05 5:56:34 PM	10/19/05 6:56:34 PM	7/26/03 11:05:24 AM	1
IMG_0090.JPG	10/19/05 6:32:52 PM	10/19/05 7:32:51 PM	7/26/03 11:06:08 AM	1
IMG_0091.JPG	10/19/05 6:32:58 PM	10/19/05 7:32:57 PM	7/26/03 11:06:08 AM	1
IMG_0092.JPG	10/19/05 6:33:08 PM	10/19/05 7:33:09 PM	7/26/03 11:06:09 AM	1
IMG_0093.JPG	10/19/05 6:33:18 PM	10/19/05 7:33:18 PM	7/26/03 11:06:09 AM	1
IMG_0094.JPG	10/19/05 6:33:26 PM	10/19/05 7:33:25 PM	7/26/03 11:06:10 AM	1
IMG_0095.JPG	10/19/05 6:33:30 PM	10/19/05 7:33:29 PM	7/26/03 11:06:10 AM	1
IMG_0096.JPG	10/19/05 6:33:52 PM	10/19/05 7:33:51 PM	7/26/03 11:06:10 AM	1
IMG_0097.JPG	10/19/05 6:33:58 PM	10/19/05 7:33:57 PM	7/26/03 11:06:11 AM	1
IMG_0098.JPG	10/19/05 6:34:08 PM	10/19/05 7:34:08 PM	7/26/03 11:06:11 AM	1
IMG_0099.JPG	10/20/05 3:20:12 PM	10/20/05 4:20:13 PM	7/26/03 11:05:45 AM	1
IMG_0100.JPG	10/20/05 3:20:30 PM	10/20/05 4:20:31 PM	7/26/03 11:05:46 AM	1
IMG_0101.JPG	10/20/05 3:20:44 PM	10/20/05 4:20:44 PM	7/26/03 11:05:46 AM	1
IMG_0102.JPG	10/20/05 3:21:02 PM	10/20/05 4:21:02 PM	7/26/03 11:05:46 AM	1
IMG_0103.JPG	10/20/05 3:21:28 PM	10/20/05 4:21:28 PM	7/26/03 11:05:47 AM	1
IMG_0104.JPG	10/20/05 3:25:14 PM	10/20/05 4:25:14 PM	7/26/03 11:05:47 AM	1
IMG_0105.JPG	10/20/05 3:26:56 PM	10/20/05 4:26:56 PM	7/26/03 11:05:47 AM	1
IMG_0106.JPG	10/20/05 3:27:04 PM	10/20/05 4:27:03 PM	7/26/03 11:05:48 AM	1
IMG_0107.JPG	10/20/05 3:49:24 PM	10/20/05 4:49:23 PM	7/26/03 11:05:48 AM	1
IMG_0108.JPG	10/20/05 3:49:26 PM	10/20/05 4:49:26 PM	7/26/03 11:05:49 AM	1
IMG_0109.JPG	10/20/05 3:49:30 PM	10/20/05 4:49:29 PM	7/26/03 11:05:49 AM	1
IMG_0110.JPG	10/29/05 4:11:16 AM	10/29/05 5:11:16 AM	7/26/03 11:05:51 AM	1
IMG_0111.JPG	10/29/05 4:11:42 AM	10/29/05 5:11:43 AM	7/26/03 11:05:51 AM	1
IMG_0112.JPG	10/29/05 4:43:36 AM	10/29/05 5:43:36 AM	7/26/03 11:05:52 AM	1
IMG_0113.JPG	10/29/05 4:43:54 AM	10/29/05 5:43:54 AM	7/26/03 11:05:52 AM	1
IMG_0115.JPG	10/29/05 4:44:52 AM	10/29/05 5:44:52 AM	7/26/03 11:05:52 AM	1
IMG_0116.JPG	10/29/05 4:44:56 AM	10/29/05 5:44:55 AM	7/26/03 11:05:53 AM	1
IMG_0117.JPG	10/29/05 4:45:06 AM	10/29/05 5:45:06 AM	7/26/03 11:05:53 AM	1
IMG_0118.JPG	10/29/05 4:45:20 AM	10/29/05 5:45:20 AM	7/26/03 11:05:54 AM	1
IMG_0119.JPG	10/29/05 4:45:26 AM	10/29/05 5:45:25 AM	7/26/03 11:05:54 AM	1
IMG_0120.JPG	10/29/05 4:45:40 AM	10/29/05 5:45:40 AM	7/26/03 11:05:55 AM	1
IMG_0121.JPG	10/29/05 4:45:50 AM	10/29/05 5:45:50 AM	7/26/03 11:05:55 AM	1
IMG_0122.JPG	10/29/05 4:46:00 AM	10/29/05 5:46:00 AM	7/26/03 11:05:55 AM	1
IMG_0123.JPG	10/29/05 4:47:00 AM	10/29/05 5:46:59 AM	7/26/03 11:05:56 AM	1
IMG_0124.JPG	10/29/05 4:47:06 AM	10/29/05 5:47:05 AM	7/26/03 11:05:56 AM	1
IMG_0125.JPG	10/29/05 4:47:10 AM	10/29/05 5:47:11 AM	7/26/03 11:05:57 AM	1
IMG_0126.JPG	10/29/05 4:47:24 AM	10/29/05 5:47:24 AM	7/26/03 11:05:57 AM	1
IMG_0127.JPG	10/30/05 2:34:20 AM	10/30/05 4:34:20 AM	7/26/03 11:05:40 AM	2
IMG_0128.JPG	10/30/05 2:35:14 AM	10/30/05 4:35:14 AM	7/26/03 11:05:40 AM	2
IMG_0129.JPG	10/30/05 2:36:06 AM	10/30/05 4:36:05 AM	7/26/03 11:05:41 AM	2
IMG_0130.JPG	10/30/05 2:36:42 AM	10/30/05 4:36:42 AM	7/26/03 11:05:41 AM	2
IMG_0131.JPG	10/30/05 2:36:54 AM	10/30/05 4:36:55 AM	7/26/03 11:05:42 AM	2
IMG_0132.JPG	10/30/05 2:37:12 AM	10/30/05 4:37:12 AM	7/26/03 11:05:42 AM	2
IMG_0133.JPG	10/30/05 2:37:44 AM	10/30/05 4:37:45 AM	7/26/03 11:05:43 AM	2
IMG_0134.JPG	10/30/05 2:37:58 AM	10/30/05 4:37:58 AM	7/26/03 11:05:43 AM	2
IMG_0135.JPG	10/30/05 2:38:00 AM	10/30/05 4:38:00 AM	7/26/03 11:05:44 AM	2
IMG_0136.JPG	10/30/05 3:39:00 AM	10/30/05 5:39:00 AM	7/26/03 11:05:44 AM	2
IMG_0137.JPG	10/30/05 3:39:06 AM	10/30/05 5:39:06 AM	7/26/03 11:05:45 AM	2
IMG_0138.JPG	10/30/05 4:55:42 PM	10/30/05 4:55:41 PM	7/26/03 11:06:22 AM	0


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IMG_0139.JPG	10/30/05 4:55:52 PM	10/30/05 4:55:51 PM	7/26/03 11:06:23 AM	0
IMG_0140.JPG	10/30/05 4:56:20 PM	10/30/05 4:56:21 PM	7/26/03 11:06:23 AM	0
IMG_0141.JPG	10/30/05 4:56:46 PM	10/30/05 4:56:46 PM	7/26/03 11:06:24 AM	0
IMG_0142.JPG	10/30/05 4:57:12 PM	10/30/05 4:57:12 PM	7/26/03 11:06:24 AM	0
IMG_0143.JPG	10/30/05 6:01:08 PM	10/30/05 6:01:08 PM	7/26/03 11:06:24 AM	0
IMG_0144.JPG	10/30/05 6:01:14 PM	10/30/05 6:01:14 PM	7/26/03 11:06:25 AM	0
IMG_0145.JPG	10/30/05 6:01:20 PM	10/30/05 6:01:19 PM	7/26/03 11:06:25 AM	0
IMG_0146.JPG	10/30/05 6:01:28 PM	10/30/05 6:01:28 PM	7/26/03 11:06:26 AM	0
IMG_0147.JPG	10/30/05 6:02:08 PM	10/30/05 6:02:08 PM	7/26/03 11:06:26 AM	0
IMG_0148.JPG	10/30/05 6:02:14 PM	10/30/05 6:02:15 PM	7/26/03 11:06:26 AM	0
IMG_0149.JPG	10/30/05 6:02:22 PM	10/30/05 6:02:22 PM	7/26/03 11:06:27 AM	0
IMG_0150.JPG	11/2/05 5:59:16 PM	11/02/05 5:59:16 PM	7/26/03 11:05:11 AM	0
IMG_0151.JPG	11/2/05 5:59:26 PM	11/02/05 5:59:25 PM	7/26/03 11:05:12 AM	0
IMG_0152.JPG	11/2/05 5:59:30 PM	11/02/05 5:59:30 PM	7/26/03 11:05:12 AM	0
IMG_0153.JPG	11/2/05 5:59:34 PM	11/02/05 5:59:34 PM	7/26/03 11:05:12 AM	0
IMG_0154.JPG	11/2/05 5:59:48 PM	11/02/05 5:59:47 PM	7/26/03 11:05:13 AM	0
IMG_0155.JPG	11/2/05 6:00:22 PM	11/02/05 6:00:22 PM	7/26/03 11:05:13 AM	0
IMG_0156.JPG	11/2/05 6:00:30 PM	11/02/05 6:00:29 PM	7/26/03 11:05:14 AM	0
IMG_0157.JPG	11/2/05 6:00:38 PM	11/02/05 6:00:38 PM	7/26/03 11:05:14 AM	0
IMG_0158.JPG	11/2/05 6:00:48 PM	11/02/05 6:00:49 PM	7/26/03 11:05:14 AM	0
IMG_0159.JPG	11/2/05 6:01:10 PM	11/02/05 6:01:10 PM	7/26/03 11:05:15 AM	0
IMG_0160.JPG	11/2/05 6:01:18 PM	11/02/05 6:01:18 PM	7/26/03 11:05:15 AM	0
IMG_0161.JPG	11/2/05 6:09:00 PM	11/02/05 6:08:59 PM	7/26/03 11:05:15 AM	0
IMG_0162.JPG	11/2/05 6:09:02 PM	11/02/05 6:09:02 PM	7/26/03 11:05:16 AM	0
IMG_0163.JPG	11/2/05 6:09:10 PM	11/02/05 6:09:11 PM	7/26/03 11:05:16 AM	0
IMG_0164.JPG	11/10/05 8:22:18 PM	11/10/05 8:22:18 PM	7/26/03 11:06:29 AM	0
IMG_0165.JPG	11/10/05 8:22:30 PM	11/10/05 8:22:30 PM	7/26/03 11:06:29 AM	0
IMG_0168.JPG	11/10/05 8:23:12 PM	11/10/05 8:23:12 PM	7/26/03 11:06:29 AM	0
IMG_0169.JPG	11/10/05 8:23:26 PM	11/10/05 8:23:26 PM	7/26/03 11:06:30 AM	0
IMG_0172.JPG	11/10/05 8:24:20 PM	11/10/05 8:24:19 PM	7/26/03 11:06:30 AM	0
IMG_0174.JPG	11/10/05 8:24:48 PM	11/10/05 8:24:47 PM	7/26/03 11:06:31 AM	0
IMG_0175.JPG	11/10/05 8:25:04 PM	11/10/05 8:25:04 PM	7/26/03 11:06:31 AM	0
IMG_0176.JPG	11/10/05 8:25:10 PM	11/10/05 8:25:11 PM	7/26/03 11:06:31 AM	0
IMG_0177.JPG	11/10/05 8:25:36 PM	11/10/05 8:25:35 PM	7/26/03 11:06:32 AM	0
IMG_0178.JPG	11/10/05 8:25:54 PM	11/10/05 8:25:54 PM	7/26/03 11:06:32 AM	0
IMG_0179.JPG	11/10/05 8:26:04 PM	11/10/05 8:26:04 PM	7/26/03 11:06:33 AM	0
IMG_0180.JPG	11/10/05 8:26:22 PM	11/10/05 8:26:22 PM	7/26/03 11:06:33 AM	0
IMG_0181.JPG	11/10/05 8:26:26 PM	11/10/05 8:26:25 PM	7/26/03 11:06:33 AM	0
IMG_0182.JPG	11/10/05 8:26:30 PM	11/10/05 8:26:29 PM	7/26/03 11:06:34 AM	0
IMG_0183.JPG	11/10/05 8:27:34 PM	11/10/05 8:27:33 PM	7/26/03 11:06:34 AM	0
IMG_0184.JPG	11/24/05 9:07:50 PM	11/24/05 9:07:50 PM	7/26/03 11:05:08 AM	0
IMG_0185.JPG	11/24/05 9:07:56 PM	11/24/05 9:07:55 PM	7/26/03 11:05:09 AM	0
IMG_0186.JPG	11/24/05 9:08:08 PM	11/24/05 9:08:07 PM	7/26/03 11:05:09 AM	0
IMG_0187.JPG	11/24/05 9:09:52 PM	11/24/05 9:09:52 PM	7/26/03 11:05:09 AM	0
IMG_0188.JPG	11/24/05 9:10:08 PM	11/24/05 9:10:08 PM	7/26/03 11:05:10 AM	0
IMG_0189.JPG	11/24/05 9:10:22 PM	11/24/05 9:10:23 PM	7/26/03 11:05:10 AM	0
IMG_0190.JPG	11/24/05 9:10:28 PM	11/24/05 9:10:28 PM	7/26/03 11:05:10 AM	0
IMG_0191.JPG	11/24/05 9:10:38 PM	11/24/05 9:10:37 PM	7/26/03 11:05:11 AM	0
IMG_0194.JPG	12/18/05 12:37:58 AM	12/18/05 12:37:58 AM	7/26/03 11:05:18 AM	0
IMG_0197.JPG	12/18/05 12:38:20 AM	12/18/05 12:38:20 AM	7/26/03 11:05:19 AM	0
IMG_0198.JPG	12/18/05 12:38:28 AM	12/18/05 12:38:28 AM	7/26/03 11:05:19 AM	0
IMG_0199.JPG	12/18/05 12:38:56 AM	12/18/05 12:38:55 AM	7/26/03 11:05:20 AM	0
IMG_0203.JPG	12/25/05 2:59:44 AM	12/25/05 2:59:44 AM	7/26/03 11:06:36 AM	0
IMG_0204.JPG	12/25/05 2:59:50 AM	12/25/05 2:59:50 AM	7/26/03 11:06:36 AM	0
IMG_0205.JPG	12/25/05 3:00:42 AM	12/25/05 3:00:42 AM	7/26/03 11:06:37 AM	0
IMG_0206.JPG	12/25/05 3:00:50 AM	12/25/05 3:00:49 AM	7/26/03 11:06:37 AM	0

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IMG_0207.JPG	12/25/05 3:01:40 AM	12/25/05 3:01:40 AM	7/26/03 11:06:37 AM	0
IMG_0208.JPG	12/25/05 3:01:46 AM	12/25/05 3:01:46 AM	7/26/03 11:06:38 AM	0
IMG_0209.JPG	12/30/05 5:56:06 PM	12/30/05 5:56:05 PM	7/26/03 11:05:34 AM	0
IMG_0210.JPG	12/30/05 5:56:12 PM	12/30/05 5:56:11 PM	7/26/03 11:05:34 AM	0
IMG_0211.JPG	12/30/05 5:56:16 PM	12/30/05 5:56:15 PM	7/26/03 11:05:34 AM	0
IMG_0212.JPG	12/30/05 5:56:20 PM	12/30/05 5:56:20 PM	7/26/03 11:05:35 AM	0
IMG_0213.JPG	12/30/05 5:56:46 PM	12/30/05 5:56:46 PM	7/26/03 11:05:35 AM	0
IMG_0214.JPG	12/30/05 5:56:54 PM	12/30/05 5:56:53 PM	7/26/03 11:05:36 AM	0
IMG_0215.JPG	12/30/05 5:56:56 PM	12/30/05 5:56:56 PM	7/26/03 11:05:36 AM	0
IMG_0216.JPG	12/30/05 5:57:00 PM	12/30/05 5:56:59 PM	7/26/03 11:05:37 AM	0
IMG_0217.JPG	12/30/05 5:58:50 PM	12/30/05 5:58:50 PM	7/26/03 11:05:37 AM	0
IMG_0218.JPG	12/30/05 5:59:00 PM	12/30/05 5:58:59 PM	7/26/03 11:05:37 AM	0
IMG_0219.JPG	12/30/05 5:59:08 PM	12/30/05 5:59:07 PM	7/26/03 11:05:38 AM	0
IMG_0220.JPG	12/30/05 5:59:18 PM	12/30/05 5:59:18 PM	7/26/03 11:05:38 AM	0
IMG_0221.JPG	12/30/05 5:59:56 PM	12/30/05 5:59:56 PM	7/26/03 11:05:39 AM	0
IMG_0222.JPG	12/30/05 6:00:08 PM	12/30/05 6:00:08 PM	7/26/03 11:05:39 AM	0
IMG_0223.JPG	12/30/05 6:00:24 PM	12/30/05 6:00:24 PM	7/26/03 11:05:39 AM	0

Table 2: Pictures on hard drive, sorted by FAT Date Created

FILE_NAME	HD FAT Modified Date	HD EXIF DateTimeOriginal	HD FAT Create Date	Time Shift Between FAT Modified and EXIF DateTimeOriginal (up to a few seconds)
IMG_0184.JPG	11/24/05 9:07:50 PM	11/24/05 9:07:50 PM	7/26/03 11:05:08 AM	0
IMG_0185.JPG	11/24/05 9:07:56 PM	11/24/05 9:07:55 PM	7/26/03 11:05:09 AM	0
IMG_0186.JPG	11/24/05 9:08:08 PM	11/24/05 9:08:07 PM	7/26/03 11:05:09 AM	0
IMG_0187.JPG	11/24/05 9:09:52 PM	11/24/05 9:09:52 PM	7/26/03 11:05:09 AM	0
IMG_0188.JPG	11/24/05 9:10:08 PM	11/24/05 9:10:08 PM	7/26/03 11:05:10 AM	0
IMG_0189.JPG	11/24/05 9:10:22 PM	11/24/05 9:10:23 PM	7/26/03 11:05:10 AM	0
IMG_0190.JPG	11/24/05 9:10:28 PM	11/24/05 9:10:28 PM	7/26/03 11:05:10 AM	0
IMG_0191.JPG	11/24/05 9:10:38 PM	11/24/05 9:10:37 PM	7/26/03 11:05:11 AM	0
IMG_0150.JPG	11/2/05 5:59:16 PM	11/02/05 5:59:16 PM	7/26/03 11:05:11 AM	0
IMG_0151.JPG	11/2/05 5:59:26 PM	11/02/05 5:59:25 PM	7/26/03 11:05:12 AM	0
IMG_0152.JPG	11/2/05 5:59:30 PM	11/02/05 5:59:30 PM	7/26/03 11:05:12 AM	0
IMG_0153.JPG	11/2/05 5:59:34 PM	11/02/05 5:59:34 PM	7/26/03 11:05:12 AM	0
IMG_0154.JPG	11/2/05 5:59:48 PM	11/02/05 5:59:47 PM	7/26/03 11:05:13 AM	0
IMG_0155.JPG	11/2/05 6:00:22 PM	11/02/05 6:00:22 PM	7/26/03 11:05:13 AM	0
IMG_0156.JPG	11/2/05 6:00:30 PM	11/02/05 6:00:29 PM	7/26/03 11:05:14 AM	0
IMG_0157.JPG	11/2/05 6:00:38 PM	11/02/05 6:00:38 PM	7/26/03 11:05:14 AM	0
IMG_0158.JPG	11/2/05 6:00:48 PM	11/02/05 6:00:49 PM	7/26/03 11:05:14 AM	0
IMG_0159.JPG	11/2/05 6:01:10 PM	11/02/05 6:01:10 PM	7/26/03 11:05:15 AM	0
IMG_0160.JPG	11/2/05 6:01:18 PM	11/02/05 6:01:18 PM	7/26/03 11:05:15 AM	0
IMG_0161.JPG	11/2/05 6:09:00 PM	11/02/05 6:08:59 PM	7/26/03 11:05:15 AM	0
IMG_0162.JPG	11/2/05 6:09:02 PM	11/02/05 6:09:02 PM	7/26/03 11:05:16 AM	0
IMG_0163.JPG	11/2/05 6:09:10 PM	11/02/05 6:09:11 PM	7/26/03 11:05:16 AM	0
IMG_0194.JPG	12/18/05 12:37:58 AM	12/18/05 12:37:58 AM	7/26/03 11:05:18 AM	0
IMG_0197.JPG	12/18/05 12:38:20 AM	12/18/05 12:38:20 AM	7/26/03 11:05:19 AM	0
IMG_0198.JPG	12/18/05 12:38:28 AM	12/18/05 12:38:28 AM	7/26/03 11:05:19 AM	0
IMG_0199.JPG	12/18/05 12:38:56 AM	12/18/05 12:38:55 AM	7/26/03 11:05:20 AM	0
IMG_0079.JPG	10/19/05 5:54:08 PM	10/19/05 6:54:09 PM	7/26/03 11:05:20 AM	1
IMG_0080.JPG	10/19/05 5:54:22 PM	10/19/05 6:54:23 PM	7/26/03 11:05:21 AM	1
IMG_0081.JPG	10/19/05 5:54:32 PM	10/19/05 6:54:33 PM	7/26/03 11:05:21 AM	1


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IMG_0082.JPG	10/19/05 5:54:56 PM	10/19/05 6:54:57 PM	7/26/03 11:05:21 AM	1
IMG_0083.JPG	10/19/05 5:55:10 PM	10/19/05 6:55:10 PM	7/26/03 11:05:22 AM	1
IMG_0084.JPG	10/19/05 5:55:36 PM	10/19/05 6:55:37 PM	7/26/03 11:05:22 AM	1
IMG_0085.JPG	10/19/05 5:55:48 PM	10/19/05 6:55:49 PM	7/26/03 11:05:23 AM	1
IMG_0086.JPG	10/19/05 5:55:56 PM	10/19/05 6:55:57 PM	7/26/03 11:05:23 AM	1
IMG_0087.JPG	10/19/05 5:56:08 PM	10/19/05 6:56:09 PM	7/26/03 11:05:24 AM	1
IMG_0088.JPG	10/19/05 5:56:24 PM	10/19/05 6:56:24 PM	7/26/03 11:05:24 AM	1
IMG_0089.JPG	10/19/05 5:56:34 PM	10/19/05 6:56:34 PM	7/26/03 11:05:24 AM	1
IMG_0071.JPG	10/18/05 7:32:06 PM	10/18/05 8:32:06 PM	7/26/03 11:05:26 AM	1
IMG_0072.JPG	10/18/05 7:32:26 PM	10/18/05 8:32:26 PM	7/26/03 11:05:26 AM	1
IMG_0073.JPG	10/18/05 7:32:36 PM	10/18/05 8:32:36 PM	7/26/03 11:05:27 AM	1
IMG_0074.JPG	10/18/05 7:32:44 PM	10/18/05 8:32:44 PM	7/26/03 11:05:27 AM	1
IMG_0075.JPG	10/18/05 7:33:08 PM	10/18/05 8:33:09 PM	7/26/03 11:05:28 AM	1
IMG_0076.JPG	10/18/05 7:33:14 PM	10/18/05 8:33:15 PM	7/26/03 11:05:28 AM	1
IMG_0077.JPG	10/18/05 7:33:22 PM	10/18/05 8:33:22 PM	7/26/03 11:05:29 AM	1
IMG_0078.JPG	10/18/05 7:33:30 PM	10/18/05 8:33:30 PM	7/26/03 11:05:29 AM	1
IMG_0209.JPG	12/30/05 5:56:06 PM	12/30/05 5:56:05 PM	7/26/03 11:05:34 AM	0
IMG_0210.JPG	12/30/05 5:56:12 PM	12/30/05 5:56:11 PM	7/26/03 11:05:34 AM	0
IMG_0211.JPG	12/30/05 5:56:16 PM	12/30/05 5:56:15 PM	7/26/03 11:05:34 AM	0
IMG_0212.JPG	12/30/05 5:56:20 PM	12/30/05 5:56:20 PM	7/26/03 11:05:35 AM	0
IMG_0213.JPG	12/30/05 5:56:46 PM	12/30/05 5:56:46 PM	7/26/03 11:05:35 AM	0
IMG_0214.JPG	12/30/05 5:56:54 PM	12/30/05 5:56:53 PM	7/26/03 11:05:36 AM	0
IMG_0215.JPG	12/30/05 5:56:56 PM	12/30/05 5:56:56 PM	7/26/03 11:05:36 AM	0
IMG_0216.JPG	12/30/05 5:57:00 PM	12/30/05 5:56:59 PM	7/26/03 11:05:37 AM	0
IMG_0217.JPG	12/30/05 5:58:50 PM	12/30/05 5:58:50 PM	7/26/03 11:05:37 AM	0
IMG_0218.JPG	12/30/05 5:59:00 PM	12/30/05 5:58:59 PM	7/26/03 11:05:37 AM	0
IMG_0219.JPG	12/30/05 5:59:08 PM	12/30/05 5:59:07 PM	7/26/03 11:05:38 AM	0
IMG_0220.JPG	12/30/05 5:59:18 PM	12/30/05 5:59:18 PM	7/26/03 11:05:38 AM	0
IMG_0221.JPG	12/30/05 5:59:56 PM	12/30/05 5:59:56 PM	7/26/03 11:05:39 AM	0
IMG_0222.JPG	12/30/05 6:00:08 PM	12/30/05 6:00:08 PM	7/26/03 11:05:39 AM	0
IMG_0223.JPG	12/30/05 6:00:24 PM	12/30/05 6:00:24 PM	7/26/03 11:05:39 AM	0
IMG_0127.JPG	10/30/05 2:34:20 AM	10/30/05 4:34:20 AM	7/26/03 11:05:40 AM	2
IMG_0128.JPG	10/30/05 2:35:14 AM	10/30/05 4:35:14 AM	7/26/03 11:05:40 AM	2
IMG_0129.JPG	10/30/05 2:36:06 AM	10/30/05 4:36:05 AM	7/26/03 11:05:41 AM	2
IMG_0130.JPG	10/30/05 2:36:42 AM	10/30/05 4:36:42 AM	7/26/03 11:05:41 AM	2
IMG_0131.JPG	10/30/05 2:36:54 AM	10/30/05 4:36:55 AM	7/26/03 11:05:42 AM	2
IMG_0132.JPG	10/30/05 2:37:12 AM	10/30/05 4:37:12 AM	7/26/03 11:05:42 AM	2
IMG_0133.JPG	10/30/05 2:37:44 AM	10/30/05 4:37:45 AM	7/26/03 11:05:43 AM	2
IMG_0134.JPG	10/30/05 2:37:58 AM	10/30/05 4:37:58 AM	7/26/03 11:05:43 AM	2
IMG_0135.JPG	10/30/05 2:38:00 AM	10/30/05 4:38:00 AM	7/26/03 11:05:44 AM	2
IMG_0136.JPG	10/30/05 3:39:00 AM	10/30/05 5:39:00 AM	7/26/03 11:05:44 AM	2
IMG_0137.JPG	10/30/05 3:39:06 AM	10/30/05 5:39:06 AM	7/26/03 11:05:45 AM	2
IMG_0099.JPG	10/20/05 3:20:12 PM	10/20/05 4:20:13 PM	7/26/03 11:05:45 AM	1
IMG_0100.JPG	10/20/05 3:20:30 PM	10/20/05 4:20:31 PM	7/26/03 11:05:46 AM	1
IMG_0101.JPG	10/20/05 3:20:44 PM	10/20/05 4:20:44 PM	7/26/03 11:05:46 AM	1
IMG_0102.JPG	10/20/05 3:21:02 PM	10/20/05 4:21:02 PM	7/26/03 11:05:46 AM	1
IMG_0103.JPG	10/20/05 3:21:28 PM	10/20/05 4:21:28 PM	7/26/03 11:05:47 AM	1
IMG_0104.JPG	10/20/05 3:25:14 PM	10/20/05 4:25:14 PM	7/26/03 11:05:47 AM	1
IMG_0105.JPG	10/20/05 3:26:56 PM	10/20/05 4:26:56 PM	7/26/03 11:05:47 AM	1
IMG_0106.JPG	10/20/05 3:27:04 PM	10/20/05 4:27:03 PM	7/26/03 11:05:48 AM	1
IMG_0107.JPG	10/20/05 3:49:24 PM	10/20/05 4:49:23 PM	7/26/03 11:05:48 AM	1
IMG_0108.JPG	10/20/05 3:49:26 PM	10/20/05 4:49:26 PM	7/26/03 11:05:49 AM	1
IMG_0109.JPG	10/20/05 3:49:30 PM	10/20/05 4:49:29 PM	7/26/03 11:05:49 AM	1
IMG_0110.JPG	10/29/05 4:11:16 AM	10/29/05 5:11:16 AM	7/26/03 11:05:51 AM	1
IMG_0111.JPG	10/29/05 4:11:42 AM	10/29/05 5:11:43 AM	7/26/03 11:05:51 AM	1

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10/23/2020

IMG_0112.JPG	10/29/05 4:43:36 AM	10/29/05 5:43:36 AM	7/26/03 11:05:52 AM	1
IMG_0113.JPG	10/29/05 4:43:54 AM	10/29/05 5:43:54 AM	7/26/03 11:05:52 AM	1
IMG_0115.JPG	10/29/05 4:44:52 AM	10/29/05 5:44:52 AM	7/26/03 11:05:52 AM	1
IMG_0116.JPG	10/29/05 4:44:56 AM	10/29/05 5:44:55 AM	7/26/03 11:05:53 AM	1
IMG_0117.JPG	10/29/05 4:45:06 AM	10/29/05 5:45:06 AM	7/26/03 11:05:53 AM	1
IMG_0118.JPG	10/29/05 4:45:20 AM	10/29/05 5:45:20 AM	7/26/03 11:05:54 AM	1
IMG_0119.JPG	10/29/05 4:45:26 AM	10/29/05 5:45:25 AM	7/26/03 11:05:54 AM	1
IMG_0120.JPG	10/29/05 4:45:40 AM	10/29/05 5:45:40 AM	7/26/03 11:05:55 AM	1
IMG_0121.JPG	10/29/05 4:45:50 AM	10/29/05 5:45:50 AM	7/26/03 11:05:55 AM	1
IMG_0122.JPG	10/29/05 4:46:00 AM	10/29/05 5:46:00 AM	7/26/03 11:05:55 AM	1
IMG_0123.JPG	10/29/05 4:47:00 AM	10/29/05 5:46:59 AM	7/26/03 11:05:56 AM	1
IMG_0124.JPG	10/29/05 4:47:06 AM	10/29/05 5:47:05 AM	7/26/03 11:05:56 AM	1
IMG_0125.JPG	10/29/05 4:47:10 AM	10/29/05 5:47:11 AM	7/26/03 11:05:57 AM	1
IMG_0126.JPG	10/29/05 4:47:24 AM	10/29/05 5:47:24 AM	7/26/03 11:05:57 AM	1
IMG_0043.JPG	10/16/05 11:30:04 PM	10/17/05 12:30:04 AM	7/26/03 11:05:58 AM	1
IMG_0044.JPG	10/17/05 3:53:24 PM	10/17/05 4:53:22 PM	7/26/03 11:05:58 AM	1
IMG_0045.JPG	10/17/05 3:53:40 PM	10/17/05 4:53:40 PM	7/26/03 11:05:59 AM	1
IMG_0046.JPG	10/17/05 3:54:08 PM	10/17/05 4:54:09 PM	7/26/03 11:05:59 AM	1
IMG_0047.JPG	10/17/05 3:54:24 PM	10/17/05 4:54:24 PM	7/26/03 11:05:59 AM	1
IMG_0048.JPG	10/17/05 3:54:38 PM	10/17/05 4:54:38 PM	7/26/03 11:06:00 AM	1
IMG_0049.JPG	10/17/05 3:54:54 PM	10/17/05 4:54:54 PM	7/26/03 11:06:00 AM	1
IMG_0050.JPG	10/17/05 3:55:04 PM	10/17/05 4:55:05 PM	7/26/03 11:06:00 AM	1
IMG_0051.JPG	10/17/05 3:55:28 PM	10/17/05 4:55:28 PM	7/26/03 11:06:01 AM	1
IMG_0052.JPG	10/17/05 3:55:42 PM	10/17/05 4:55:41 PM	7/26/03 11:06:02 AM	1
IMG_0053.JPG	10/17/05 3:55:54 PM	10/17/05 4:55:52 PM	7/26/03 11:06:02 AM	1
IMG_0054.JPG	10/17/05 3:55:58 PM	10/17/05 4:55:59 PM	7/26/03 11:06:02 AM	1
IMG_0055.JPG	10/17/05 3:56:24 PM	10/17/05 4:56:25 PM	7/26/03 11:06:03 AM	1
IMG_0056.JPG	10/17/05 3:56:36 PM	10/17/05 4:56:36 PM	7/26/03 11:06:03 AM	1
IMG_0057.JPG	10/17/05 3:56:48 PM	10/17/05 4:56:48 PM	7/26/03 11:06:03 AM	1
IMG_0058.JPG	10/17/05 3:56:58 PM	10/17/05 4:56:58 PM	7/26/03 11:06:04 AM	1
IMG_0090.JPG	10/19/05 6:32:52 PM	10/19/05 7:32:51 PM	7/26/03 11:06:08 AM	1
IMG_0091.JPG	10/19/05 6:32:58 PM	10/19/05 7:32:57 PM	7/26/03 11:06:08 AM	1
IMG_0092.JPG	10/19/05 6:33:08 PM	10/19/05 7:33:09 PM	7/26/03 11:06:09 AM	1
IMG_0093.JPG	10/19/05 6:33:18 PM	10/19/05 7:33:18 PM	7/26/03 11:06:09 AM	1
IMG_0094.JPG	10/19/05 6:33:26 PM	10/19/05 7:33:25 PM	7/26/03 11:06:10 AM	1
IMG_0095.JPG	10/19/05 6:33:30 PM	10/19/05 7:33:29 PM	7/26/03 11:06:10 AM	1
IMG_0096.JPG	10/19/05 6:33:52 PM	10/19/05 7:33:51 PM	7/26/03 11:06:10 AM	1
IMG_0097.JPG	10/19/05 6:33:58 PM	10/19/05 7:33:57 PM	7/26/03 11:06:11 AM	1
IMG_0098.JPG	10/19/05 6:34:08 PM	10/19/05 7:34:08 PM	7/26/03 11:06:11 AM	1
IMG_0059-1.JPG	10/17/05 9:00:58 PM	10/17/05 10:00:57 PM	7/26/03 11:06:14 AM	1
IMG_0060-1.JPG	10/17/05 9:01:06 PM	10/17/05 10:01:07 PM	7/26/03 11:06:15 AM	1
IMG_0061-1.JPG	10/17/05 9:01:12 PM	10/17/05 10:01:13 PM	7/26/03 11:06:15 AM	1
IMG_0062-1.JPG	10/17/05 9:01:24 PM	10/17/05 10:01:24 PM	7/26/03 11:06:16 AM	1
IMG_0063-1.JPG	10/17/05 9:01:32 PM	10/17/05 10:01:32 PM	7/26/03 11:06:16 AM	1
IMG_0064-1.JPG	10/17/05 9:02:00 PM	10/17/05 10:02:00 PM	7/26/03 11:06:17 AM	1
IMG_0065-1.JPG	10/17/05 9:02:08 PM	10/17/05 10:02:07 PM	7/26/03 11:06:17 AM	1
IMG_0066-1.JPG	10/17/05 9:02:14 PM	10/17/05 10:02:13 PM	7/26/03 11:06:17 AM	1
IMG_0067-1.JPG	10/17/05 9:02:34 PM	10/17/05 10:02:34 PM	7/26/03 11:06:18 AM	1
IMG_0068-1.JPG	10/17/05 9:03:02 PM	10/17/05 10:03:01 PM	7/26/03 11:06:19 AM	1
IMG_0069-1.JPG	10/17/05 9:03:10 PM	10/17/05 10:03:10 PM	7/26/03 11:06:19 AM	1
IMG_0070-1.JPG	10/17/05 9:03:24 PM	10/17/05 10:03:24 PM	7/26/03 11:06:20 AM	1
IMG_0138.JPG	10/30/05 4:55:42 PM	10/30/05 4:55:41 PM	7/26/03 11:06:22 AM	0
IMG_0139.JPG	10/30/05 4:55:52 PM	10/30/05 4:55:51 PM	7/26/03 11:06:23 AM	0
IMG_0140.JPG	10/30/05 4:56:20 PM	10/30/05 4:56:21 PM	7/26/03 11:06:23 AM	0
IMG_0141.JPG	10/30/05 4:56:46 PM	10/30/05 4:56:46 PM	7/26/03 11:06:24 AM	0


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Dr. Keshava Munegowda

Author and File Systems Expert

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IMG_0142.JPG	10/30/05 4:57:12 PM	10/30/05 4:57:12 PM	7/26/03 11:06:24 AM	0
IMG_0143.JPG	10/30/05 6:01:08 PM	10/30/05 6:01:08 PM	7/26/03 11:06:24 AM	0
IMG_0144.JPG	10/30/05 6:01:14 PM	10/30/05 6:01:14 PM	7/26/03 11:06:25 AM	0
IMG_0145.JPG	10/30/05 6:01:20 PM	10/30/05 6:01:19 PM	7/26/03 11:06:25 AM	0
IMG_0146.JPG	10/30/05 6:01:28 PM	10/30/05 6:01:28 PM	7/26/03 11:06:26 AM	0
IMG_0147.JPG	10/30/05 6:02:08 PM	10/30/05 6:02:08 PM	7/26/03 11:06:26 AM	0
IMG_0148.JPG	10/30/05 6:02:14 PM	10/30/05 6:02:15 PM	7/26/03 11:06:26 AM	0
IMG_0149.JPG	10/30/05 6:02:22 PM	10/30/05 6:02:22 PM	7/26/03 11:06:27 AM	0
IMG_0164.JPG	11/10/05 8:22:18 PM	11/10/05 8:22:18 PM	7/26/03 11:06:29 AM	0
IMG_0165.JPG	11/10/05 8:22:30 PM	11/10/05 8:22:30 PM	7/26/03 11:06:29 AM	0
IMG_0168.JPG	11/10/05 8:23:12 PM	11/10/05 8:23:12 PM	7/26/03 11:06:29 AM	0
IMG_0169.JPG	11/10/05 8:23:26 PM	11/10/05 8:23:26 PM	7/26/03 11:06:30 AM	0
IMG_0172.JPG	11/10/05 8:24:20 PM	11/10/05 8:24:19 PM	7/26/03 11:06:30 AM	0
IMG_0174.JPG	11/10/05 8:24:48 PM	11/10/05 8:24:47 PM	7/26/03 11:06:31 AM	0
IMG_0175.JPG	11/10/05 8:25:04 PM	11/10/05 8:25:04 PM	7/26/03 11:06:31 AM	0
IMG_0176.JPG	11/10/05 8:25:10 PM	11/10/05 8:25:11 PM	7/26/03 11:06:31 AM	0
IMG_0177.JPG	11/10/05 8:25:36 PM	11/10/05 8:25:35 PM	7/26/03 11:06:32 AM	0
IMG_0178.JPG	11/10/05 8:25:54 PM	11/10/05 8:25:54 PM	7/26/03 11:06:32 AM	0
IMG_0179.JPG	11/10/05 8:26:04 PM	11/10/05 8:26:04 PM	7/26/03 11:06:33 AM	0
IMG_0180.JPG	11/10/05 8:26:22 PM	11/10/05 8:26:22 PM	7/26/03 11:06:33 AM	0
IMG_0181.JPG	11/10/05 8:26:26 PM	11/10/05 8:26:25 PM	7/26/03 11:06:33 AM	0
IMG_0182.JPG	11/10/05 8:26:30 PM	11/10/05 8:26:29 PM	7/26/03 11:06:34 AM	0
IMG_0183.JPG	11/10/05 8:27:34 PM	11/10/05 8:27:33 PM	7/26/03 11:06:34 AM	0
IMG_0203.JPG	12/25/05 2:59:44 AM	12/25/05 2:59:44 AM	7/26/03 11:06:36 AM	0
IMG_0204.JPG	12/25/05 2:59:50 AM	12/25/05 2:59:50 AM	7/26/03 11:06:36 AM	0
IMG_0205.JPG	12/25/05 3:00:42 AM	12/25/05 3:00:42 AM	7/26/03 11:06:37 AM	0
IMG_0206.JPG	12/25/05 3:00:50 AM	12/25/05 3:00:49 AM	7/26/03 11:06:37 AM	0
IMG_0207.JPG	12/25/05 3:01:40 AM	12/25/05 3:01:40 AM	7/26/03 11:06:37 AM	0
IMG_0208.JPG	12/25/05 3:01:46 AM	12/25/05 3:01:46 AM	7/26/03 11:06:38 AM	0

Table 3: Contents "Studies" on the hard drive

FAT Create Date	FAT Access Date	FAT Modified Date	Directory Path	Entry Type
2003-07-26 11:05:03	07/28/03	2003-07-26 11:05:04	Studies	Folder
2003-07-26 11:05:03	07/28/03	2003-07-26 11:05:04	Studies/V110205	Folder
2003-07-26 11:05:03	02/12/10	2006-01-16 09:33:36	Studies/V110205/v.psa	File
2003-07-26 11:05:04	07/28/03	2003-07-26 11:05:06	Studies/V110205/VIF	Folder
2003-07-26 11:05:04	02/12/10	2006-01-16 09:32:42	Studies/V110205/V1.PSA	File
2003-07-26 11:05:04	02/12/10	2008-03-15 02:32:04	Studies/V110205/VIF.PSA	File
2003-07-26 11:05:04	02/12/10	2008-03-10 17:55:14	Studies/V110205/VIF/backupCt.dat	File
2003-07-26 11:05:05	02/12/10	2008-03-10 17:55:14	Studies/V110205/VIF/collstatus.dat	File
2003-07-26 11:05:05	02/12/10	2003-07-29 02:51:48	Studies/V110205/VIF/pz.psa	File
2003-07-26 11:05:05	02/12/10	2008-03-10 17:55:14	Studies/V110205/VIF/tagstatus.dat	File
2003-07-26 11:05:05	02/12/10	2005-11-24 05:26:52	Studies/V110205/VIF/tm.4.cache	File
2003-07-26 11:05:06	07/28/03	2003-07-26 11:05:08	Studies/V110205/VIF/pz	Folder
2003-07-26 11:05:06	02/12/10	2003-07-29 02:52:14	Studies/V110205/VIF/pz/backupCt.dat	File
2003-07-26 11:05:06	02/12/10	2003-07-29 02:52:14	Studies/V110205/VIF/pz/collstatus.dat	File
2003-07-26 11:05:06	02/12/10	2003-07-29 02:52:14	Studies/V110205/VIF/pz/tagstatus.dat	File


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2003-07-26 11:05:06	02/12/10	2005-11-10 04:30:54	Studies/V110205/V1F/pz/tn.4.cache	File
2003-07-26 11:05:06	07/28/03	2003-07-26 11:05:08	Studies/V110205/V1	Folder
2003-07-26 11:05:06	02/12/10	2006-01-16 09:33:30	Studies/V110205/V1/backupCt.dat	File
2003-07-26 11:05:07	02/12/10	2006-01-16 09:33:30	Studies/V110205/V1/collstatus.dat	File
2003-07-26 11:05:07	02/12/10	2006-01-16 09:33:30	Studies/V110205/V1/tagstatus.dat	File
2003-07-26 11:05:07	02/12/10	2005-11-24 05:19:24	Studies/V110205/V1/tn.4.cache	File
2003-07-26 11:05:07	07/28/03	2003-07-26 11:05:08	Studies/V110205/v	Folder
2003-07-26 11:05:07	02/12/10	2006-01-16 09:34:46	Studies/V110205/v/backupCt.dat	File
2003-07-26 11:05:07	02/12/10	2006-01-16 09:34:46	Studies/V110205/v/collstatus.dat	File
2003-07-26 11:05:08	02/12/10	2006-01-16 09:34:46	Studies/V110205/v/tagstatus.dat	File
2003-07-26 11:05:08	02/12/10	2005-11-02 01:22:50	Studies/V110205/v/tn.4.cache	File
2003-07-26 11:05:08	07/28/03	2003-07-26 11:05:10	Studies/V110205/2005-11-24-0814-46	Folder
2003-07-26 11:05:08	02/12/10	2005-11-24 18:07:50	Studies/V110205/2005-11-24-0814-46/IMG_0184.JPG	File
2003-07-26 11:05:09	02/12/10	2005-11-24 18:07:56	Studies/V110205/2005-11-24-0814-46/IMG_0185.JPG	File
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2003-07-26 11:05:10	02/12/10	2005-11-24 18:10:22	Studies/V110205/2005-11-24-0814-46/IMG_0189.JPG	File
2003-07-26 11:05:10	02/12/10	2005-11-24 18:10:28	Studies/V110205/2005-11-24-0814-46/IMG_0190.JPG	File
2003-07-26 11:05:11	02/12/10	2005-11-24 18:10:38	Studies/V110205/2005-11-24-0814-46/IMG_0191.JPG	File
2003-07-26 11:05:11	02/12/10	2005-11-24 05:21:50	Studies/V110205/2005-11-24-0814-46/Thumbs.db	File
2003-07-26 11:05:11	07/28/03	2003-07-26 11:05:12	Studies/V110205/2005-11-24-0814-46/New Folder	Folder
2003-07-26 11:05:11	07/28/03	2003-07-26 11:05:12	Studies/V110205/2005-11-02-0422-20	Folder
2003-07-26 11:05:11	02/12/10	2005-11-02 14:59:16	Studies/V110205/2005-11-02-0422-20/IMG_0150.JPG	File
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2003-07-26 11:05:13	02/12/10	2005-11-02 14:59:48	Studies/V110205/2005-11-02-0422-20/IMG_0154.JPG	File
2003-07-26 11:05:13	02/12/10	2005-11-02 15:00:22	Studies/V110205/2005-11-02-0422-20/IMG_0155.JPG	File
2003-07-26 11:05:14	02/12/10	2005-11-02 15:00:30	Studies/V110205/2005-11-02-0422-20/IMG_0156.JPG	File
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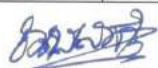
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2003-07-26 11:05:17	02/12/10	2008-08-23 14:39:26	Studies/V110205/2005-11-02-0422-20/Thumbs.db	File
2003-07-26 11:05:17	07/28/03	2003-07-26 11:05:18	Studies/Msk101905	Folder
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2003-07-26 11:05:17	02/12/10	2006-01-16 09:19:12	Studies/Msk101905/Msk.psa	File
2003-07-26 11:05:17	02/12/10	2006-01-16 09:21:30	Studies/Msk101905/Msk/backupCr.dat	File
2003-07-26 11:05:17	02/12/10	2006-01-16 09:21:30	Studies/Msk101905/Msk/collstatus.dat	File
2003-07-26 11:05:18	02/12/10	2005-10-31 17:19:56	Studies/Msk101905/Msk/rmf.2.cache	File
2003-07-26 11:05:18	02/12/10	2006-01-16 09:21:30	Studies/Msk101905/Msk/tagstatus.dat	File
2003-07-26 11:05:18	02/12/10	2005-12-21 17:14:34	Studies/Msk101905/Msk/tn.4.cache	File
2003-07-26 11:05:18	07/28/03	2003-07-26 11:05:20	Studies/Msk101905/2005-12-21-2009-33	Folder
2003-07-26 11:05:18	02/12/10	2005-12-18 21:37:58	Studies/Msk101905/2005-12-21-2009-33/IMG_0194.JPG	File
2003-07-26 11:05:19	02/12/10	2005-12-18 21:38:20	Studies/Msk101905/2005-12-21-2009-33/IMG_0197.JPG	File
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2003-07-26 11:05:20	02/12/10	2005-12-25 16:15:40	Studies/Msk101905/2005-12-21-2009-33/Thumbs.db	File
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2003-07-26 11:05:21	02/12/10	2005-10-19 14:54:56	Studies/Msk101905/2005-10-19-0727-59/IMG_0082.JPG	File
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2003-07-26 11:05:25	07/28/03	2003-07-26 11:05:26	Studies/Mo101805/Mo	Folder
2003-07-26 11:05:25	02/12/10	2005-10-31 17:23:52	Studies/Mo101805/Mo.psa	File
2003-07-26 11:05:25	02/12/10	2005-10-31 17:24:52	Studies/Mo101805/Mo/backupCr.dat	File
2003-07-26 11:05:25	02/12/10	2005-10-31 17:24:52	Studies/Mo101805/Mo/collstatus.dat	File
2003-07-26 11:05:26	02/12/10	2005-10-31 17:24:52	Studies/Mo101805/Mo/tagstatus.dat	File
2003-07-26 11:05:26	02/12/10	2005-10-18 03:44:42	Studies/Mo101805/Mo/tn.4.cache	File
2003-07-26 11:05:26	07/28/03	2003-07-26 11:05:28	Studies/Mo101805/2005-10-18-0744-20	Folder
2003-07-26 11:05:26	02/12/10	2005-10-18 16:32:06	Studies/Mo101805/2005-10-18-0744-20/IMG_0071.JPG	File



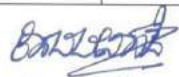
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2003-07-26 11:05:29	02/12/10	2005-10-18 16:33:30	Studies/Mo101805/2005-10-18-0744-20/IMG_0078.JPG	File
2003-07-26 11:05:29	02/12/10	2005-10-28 16:16:58	Studies/Mo101805/2005-10-18-0744-20/Thumbs.db	File
2003-07-26 11:05:30	07/28/03	2003-07-26 11:05:32	Studies/Mnp102005	Folder
2003-07-26 11:05:30	07/28/03	2003-07-26 11:05:32	Studies/Mnp102005/Mnp	Folder
2003-07-26 11:05:30	02/12/10	2005-10-29 19:52:52	Studies/Mnp102005/M.PSA	File
2003-07-26 11:05:30	02/12/10	2006-04-03 01:29:34	Studies/Mnp102005/Mnp.psa	File
2003-07-26 11:05:30	02/12/10	2006-04-03 01:30:30	Studies/Mnp102005/Mnp/backupCt.dat	File
2003-07-26 11:05:31	02/12/10	2006-04-03 01:30:30	Studies/Mnp102005/Mnp/collstatus.dat	File
2003-07-26 11:05:31	02/12/10	2007-09-11 19:33:04	Studies/Mnp102005/Mnp/pz.psa	File
2003-07-26 11:05:31	02/12/10	2006-04-03 01:30:30	Studies/Mnp102005/Mnp/tagstatus.dat	File
2003-07-26 11:05:31	02/12/10	2005-12-30 15:05:54	Studies/Mnp102005/Mnp/tn.4.cache	File
2003-07-26 11:05:32	07/28/03	2003-07-26 11:05:34	Studies/Mnp102005/M	Folder
2003-07-26 11:05:32	07/28/03	2003-07-26 11:05:34	Studies/Mnp102005/Mnp/pz	Folder
2003-07-26 11:05:32	02/12/10	2007-09-11 19:33:22	Studies/Mnp102005/Mnp/pz/backupCt.dat	File
2003-07-26 11:05:32	02/12/10	2007-09-11 19:33:22	Studies/Mnp102005/Mnp/pz/collstatus.dat	File
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2003-07-26 11:05:33	02/12/10	2005-10-29 19:54:02	Studies/Mnp102005/M/backupCt.dat	File
2003-07-26 11:05:33	02/12/10	2005-10-29 19:54:02	Studies/Mnp102005/M/collstatus.dat	File
2003-07-26 11:05:33	02/12/10	2005-10-29 19:54:02	Studies/Mnp102005/M/tagstatus.dat	File
2003-07-26 11:05:33	02/12/10	2005-10-29 19:50:26	Studies/Mnp102005/M/tn.4.cache	File
2003-07-26 11:05:33	07/28/03	2003-07-26 11:05:34	Studies/Mnp102005/2005-12-30-1801-28	Folder
2003-07-26 11:05:34	02/12/10	2005-12-30 14:56:06	Studies/Mnp102005/2005-12-30-1801-28/IMG_0209.JPG	File
2003-07-26 11:05:34	02/12/10	2005-12-30 14:56:12	Studies/Mnp102005/2005-12-30-1801-28/IMG_0210.JPG	File
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2003-07-26 11:05:37	02/12/10	2005-12-30 14:58:50	Studies/Mnp102005/2005-12-30-1801-28/IMG_0217.JPG	File



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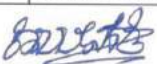

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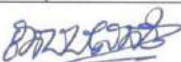

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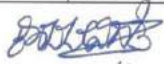

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2003-07-26 11:06:28	02/12/10	2005-12-21 17:16:24	Studies/A111005/A1/backupCr.dat	File
2003-07-26 11:06:28	02/12/10	2005-12-21 17:16:24	Studies/A111005/A1/collstatus.dat	File
2003-07-26 11:06:28	02/12/10	2005-12-21 17:16:24	Studies/A111005/A1/tagstatus.dat	File
2003-07-26 11:06:28	02/12/10	2005-11-10 04:19:10	Studies/A111005/A1/tn.4.cache	File
2003-07-26 11:06:29	07/28/03	2003-07-26 11:06:30	Studies/A111005/2005-11-10-0718-42	Folder
2003-07-26 11:06:29	02/12/10	2005-11-10 17:22:18	Studies/A111005/2005-11-10-0718-42/IMG_0164.JPG	File
2003-07-26 11:06:29	02/12/10	2005-11-10 17:22:30	Studies/A111005/2005-11-10-0718-42/IMG_0165.JPG	File
2003-07-26 11:06:29	02/12/10	2005-11-10 17:23:12	Studies/A111005/2005-11-10-0718-42/IMG_0168.JPG	File
2003-07-26 11:06:30	02/12/10	2005-11-10 17:23:26	Studies/A111005/2005-11-10-0718-42/IMG_0169.JPG	File
2003-07-26 11:06:30	02/12/10	2005-11-10 17:24:20	Studies/A111005/2005-11-10-0718-42/IMG_0172.JPG	File
2003-07-26 11:06:31	02/12/10	2005-11-10 17:24:48	Studies/A111005/2005-11-10-0718-42/IMG_0174.JPG	File
2003-07-26 11:06:31	02/12/10	2005-11-10 17:25:04	Studies/A111005/2005-11-10-0718-42/IMG_0175.JPG	File
2003-07-26 11:06:31	02/12/10	2005-11-10 17:25:10	Studies/A111005/2005-11-10-0718-42/IMG_0176.JPG	File
2003-07-26 11:06:32	02/12/10	2005-11-10 17:25:36	Studies/A111005/2005-11-10-0718-42/IMG_0177.JPG	File
2003-07-26 11:06:32	02/12/10	2005-11-10 17:25:54	Studies/A111005/2005-11-10-0718-42/IMG_0178.JPG	File
2003-07-26 11:06:33	02/12/10	2005-11-10 17:26:04	Studies/A111005/2005-11-10-0718-42/IMG_0179.JPG	File
2003-07-26 11:06:33	02/12/10	2005-11-10 17:26:22	Studies/A111005/2005-11-10-0718-42/IMG_0180.JPG	File
2003-07-26 11:06:33	02/12/10	2005-11-10 17:26:26	Studies/A111005/2005-11-10-0718-42/IMG_0181.JPG	File
2003-07-26 11:06:34	02/12/10	2005-11-10 17:26:30	Studies/A111005/2005-11-10-0718-42/IMG_0182.JPG	File
2003-07-26 11:06:34	02/12/10	2005-11-10 17:27:34	Studies/A111005/2005-11-10-0718-42/IMG_0183.JPG	File
2003-07-26 11:06:35	02/12/10	2006-01-16 10:48:58	Studies/A111005/2005-11-10-0718-42/Thumbs.db	File
2003-07-26 11:06:35	07/28/03	2003-07-26 11:06:36	Studies/4L122505	Folder
2003-07-26 11:06:35	07/28/03	2003-07-26 11:06:36	Studies/4L122505/4L	Folder
2003-07-26 11:06:35	02/12/10	2005-12-25 16:19:30	Studies/4L122505/4L.PSA	File
2003-07-26 11:06:35	02/12/10	2005-12-25 16:20:20	Studies/4L122505/4L/backupCr.dat	File
2003-07-26 11:06:35	02/12/10	2005-12-25 16:20:20	Studies/4L122505/4L/collstatus.dat	File


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Dr. Keshava Munegowda

Author and File Systems Expert

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2003-07-26 11:06:35	02/12/10	2005-12-25 16:20:20	Studies/4L122505/4L/tagstatus.dat	File
2003-07-26 11:06:36	02/12/10	2005-12-25 16:16:34	Studies/4L122505/4L/tn.4.cache	File
2003-07-26 11:06:36	07/28/03	2003-07-26 11:06:38	Studies/4L122505/2005-12-25-1911-54	Folder
2003-07-26 11:06:36	02/12/10	2005-12-25 23:59:44	Studies/4L122505/2005-12-25-1911-54/IMG_0203.JPG	File
2003-07-26 11:06:36	02/12/10	2005-12-25 23:59:50	Studies/4L122505/2005-12-25-1911-54/IMG_0204.JPG	File
2003-07-26 11:06:37	02/12/10	2005-12-26 00:00:42	Studies/4L122505/2005-12-25-1911-54/IMG_0205.JPG	File
2003-07-26 11:06:37	02/12/10	2005-12-26 00:00:50	Studies/4L122505/2005-12-25-1911-54/IMG_0206.JPG	File
2003-07-26 11:06:37	02/12/10	2005-12-26 00:01:40	Studies/4L122505/2005-12-25-1911-54/IMG_0207.JPG	File
2003-07-26 11:06:38	02/12/10	2005-12-26 00:01:46	Studies/4L122505/2005-12-25-1911-54/IMG_0208.JPG	File
2003-07-26 11:06:38	02/12/10	2005-12-25 16:17:54	Studies/4L122505/2005-12-25-1911-54/Thumbs.db	File



[Dr. KESHAVA MUNEGOWDA]

Steven Alexander
Trace Digital Forensics, LLC
10010 Seneca Falls Ave
Bakersfield, CA 93312

October 9, 2020

Re: Canon EOS 20D Camera – Time zone awareness

To Whom It May Concern:

The Canon EOS 20D stores pictures on compact flash cards using the FAT-16 filesystem. The FAT-16 filesystem specifies that timestamps are stored in local time. Other filesystems store timestamps in UTC time so that they can be adjusted to the current time zone. The Canon EOS 20D is not time zone aware and does not store any information on the compact flash card that would allow the time to be adjusted from one time zone to another.

Sincerely,

A handwritten signature in cursive script that reads "Steven Alexander".

Steven Alexander

Steven Alexander
Trace Digital Forensics, LLC
10010 Seneca Falls Ave
Bakersfield, CA 93312

October 11, 2020

Re: Canon EOS 20D Camera – Exif vs FAT creation times.

To Whom It May Concern:

The Canon EOS 20D stores pictures on compact flash cards using the FAT-16 filesystem. When the Canon EOS 20D camera saves a picture, it stores it with Exif metadata inside the JPEG image. The Exif metadata includes dates—CreateDate, DateTimeOriginal, and ModifyDate—which are all the same as each other. These dates do not always match the FAT-16 filesystem timestamps.

In my testing, which included over 1,500 pictures taken with the Canon EOS 20D, the FAT Creation Date (which includes the date and time) can be up to nine seconds later than the Exif time. I did not observe the same range of difference in the opposite direction. The Exif times were up to one second later than the FAT Creation Date timestamp.

I also observed that the FAT Last Modified timestamp can be up to nine seconds later than the Exif times. Again, the reverse was not true. I observed Exif times up to one second later than the FAT Last Modified timestamp, but never more than that.

Sincerely,

A handwritten signature in cursive script that reads "Steven Alexander".

Steven Alexander

Expert Statement #1B: Pattern of the Time-Shifts

This statement references the data in Table 1 from Expert Statement #A, so it is included here for convenience.

1. Daylight Savings Time (DST) ended on 10/30/05 at 2 AM, meaning that at 2 AM on 10/30/05, clocks were turned **back one hour**.¹
2. Based on the EXIF DateTimeOriginal values
 - a. IMG_0043.JPG-IMG_0113.JPG, IMG_0115.JPG-IMG_0126.JPG appear to be taken before 10/30/05 and have their FAT Date Modified one hour behind their EXIF DateTimeOriginal.
 - b. IMG_0127.JPG-IMG_0137.JPG appear to be taken on 10/30/05 after 2 AM and their FAT Date Modified is two hours behind their EXIF DateTimeOriginal, within a few seconds.
 - c. IMG_0138.JPG-IMG_0149.JPG appear to be taken on 10/30/05 after 4:55 PM and their FAT Date Modified is within a few seconds of the EXIF DateTimeOriginal. There is no time-shift observed for this group.
 - d. IMG_0150.JPG onwards appear to be taken after 10/30/05 and, similar to c) above, there is no time-shift observed for this group.
3. 2a, 2c and 2d establish a pattern that is consistent with someone trying to adjust for DST: shifted by an hour before 2AM and no shift after, relative to the EXIF DateTimeOriginal. However,
 - a. For reasons outlined in Expert Statement #1A, without manual intervention there would be no time-shifts for any of the groups.
 - b. 2b does not fit the pattern because it has a two-hour shift and it is after DST, so should not be shifted to begin with.

In conclusion, my opinion is that the intended pattern of the manual alterations was to make it look like the dates were shifted by DST, but in doing so, several errors were made, further indicating manual alteration.



Dr. Keshava Munegowda, PhD

• **Education Qualifications:**

- PhD Computer Science and Engineering, Visvesvaraya Technological University, 2016. Research domain is File systems.
- Master of technology in Computer Science and Engineering, Visvesvaraya Technological University, 2004.
- Bachelor of Engineering in Computer Science and Engineering, Bangalore University, INDIA, 2001.

• **Book on FAT File systems:**

- "ExFAT and FAT File System Internals", November 2016, Amazon publications.

¹ <https://www.timeanddate.com/time/change/usa/new-york?year=2005>

Dr. Keshava Munegowda

Author and File Systems Expert

10/23/2020

- **Granted US patents on FAT File systems:**

1. USPTO application number: 12326915 entitled "Storage Optimizations by Directory compaction in FAT File system", US patent number: 8429331.
2. USPTO application number: 12762829 entitled "FAT file in reserved cluster entry with ready entry state", US patent number: 8452734.
3. USPTO application number: 13870344, entitled "IC updating File system meta data with log record data", US patent number: 9043286
4. USPTO application number: 14075757 entitled "File access method and system there of", US patent number: 9569447
5. USPTO application number: 15413058 entitled "Method and System for File storage and access", US patent number: 9817837

Table 1 : Pictures on hard drive, sorted by EXIF DateTimeOriginal

FILE_NAME	HD FAT Modified Date	HD EXIF DateTimeOriginal	HD FAT Create Date	Time Shift Between FAT Modified and EXIF DateTimeOriginal (up to a few seconds)
IMG_0043.JPG	10/16/05 11:30:04 PM	10/17/05 12:30:04 AM	7/26/03 11:05:58 AM	1
IMG_0044.JPG	10/17/05 3:53:24 PM	10/17/05 4:53:22 PM	7/26/03 11:05:58 AM	1
IMG_0045.JPG	10/17/05 3:53:40 PM	10/17/05 4:53:40 PM	7/26/03 11:05:59 AM	1
IMG_0046.JPG	10/17/05 3:54:08 PM	10/17/05 4:54:09 PM	7/26/03 11:05:59 AM	1
IMG_0047.JPG	10/17/05 3:54:24 PM	10/17/05 4:54:24 PM	7/26/03 11:05:59 AM	1
IMG_0048.JPG	10/17/05 3:54:38 PM	10/17/05 4:54:38 PM	7/26/03 11:06:00 AM	1
IMG_0049.JPG	10/17/05 3:54:54 PM	10/17/05 4:54:54 PM	7/26/03 11:06:00 AM	1
IMG_0050.JPG	10/17/05 3:55:04 PM	10/17/05 4:55:05 PM	7/26/03 11:06:00 AM	1
IMG_0051.JPG	10/17/05 3:55:28 PM	10/17/05 4:55:28 PM	7/26/03 11:06:01 AM	1
IMG_0052.JPG	10/17/05 3:55:42 PM	10/17/05 4:55:41 PM	7/26/03 11:06:02 AM	1
IMG_0053.JPG	10/17/05 3:55:54 PM	10/17/05 4:55:52 PM	7/26/03 11:06:02 AM	1
IMG_0054.JPG	10/17/05 3:55:58 PM	10/17/05 4:55:59 PM	7/26/03 11:06:02 AM	1
IMG_0055.JPG	10/17/05 3:56:24 PM	10/17/05 4:56:25 PM	7/26/03 11:06:03 AM	1
IMG_0056.JPG	10/17/05 3:56:36 PM	10/17/05 4:56:36 PM	7/26/03 11:06:03 AM	1
IMG_0057.JPG	10/17/05 3:56:48 PM	10/17/05 4:56:48 PM	7/26/03 11:06:03 AM	1
IMG_0058.JPG	10/17/05 3:56:58 PM	10/17/05 4:56:58 PM	7/26/03 11:06:04 AM	1
IMG_0059-1.JPG	10/17/05 9:00:58 PM	10/17/05 10:00:57 PM	7/26/03 11:06:14 AM	1
IMG_0060-1.JPG	10/17/05 9:01:06 PM	10/17/05 10:01:07 PM	7/26/03 11:06:15 AM	1
IMG_0061-1.JPG	10/17/05 9:01:12 PM	10/17/05 10:01:13 PM	7/26/03 11:06:15 AM	1
IMG_0062-1.JPG	10/17/05 9:01:24 PM	10/17/05 10:01:24 PM	7/26/03 11:06:16 AM	1
IMG_0063-1.JPG	10/17/05 9:01:32 PM	10/17/05 10:01:32 PM	7/26/03 11:06:16 AM	1
IMG_0064-1.JPG	10/17/05 9:02:00 PM	10/17/05 10:02:00 PM	7/26/03 11:06:17 AM	1
IMG_0065-1.JPG	10/17/05 9:02:08 PM	10/17/05 10:02:07 PM	7/26/03 11:06:17 AM	1
IMG_0066-1.JPG	10/17/05 9:02:14 PM	10/17/05 10:02:13 PM	7/26/03 11:06:17 AM	1
IMG_0067-1.JPG	10/17/05 9:02:34 PM	10/17/05 10:02:34 PM	7/26/03 11:06:18 AM	1
IMG_0068-1.JPG	10/17/05 9:03:02 PM	10/17/05 10:03:01 PM	7/26/03 11:06:19 AM	1
IMG_0069-1.JPG	10/17/05 9:03:10 PM	10/17/05 10:03:10 PM	7/26/03 11:06:19 AM	1
IMG_0070-1.JPG	10/17/05 9:03:24 PM	10/17/05 10:03:24 PM	7/26/03 11:06:20 AM	1
IMG_0071.JPG	10/18/05 7:32:06 PM	10/18/05 8:32:06 PM	7/26/03 11:05:26 AM	1
IMG_0072.JPG	10/18/05 7:32:26 PM	10/18/05 8:32:26 PM	7/26/03 11:05:26 AM	1
IMG_0073.JPG	10/18/05 7:32:36 PM	10/18/05 8:32:36 PM	7/26/03 11:05:27 AM	1
IMG_0074.JPG	10/18/05 7:32:44 PM	10/18/05 8:32:44 PM	7/26/03 11:05:27 AM	1
IMG_0075.JPG	10/18/05 7:33:08 PM	10/18/05 8:33:09 PM	7/26/03 11:05:28 AM	1

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IMG_0076.JPG	10/18/05 7:33:14 PM	10/18/05 8:33:15 PM	7/26/03 11:05:28 AM	1
IMG_0077.JPG	10/18/05 7:33:22 PM	10/18/05 8:33:22 PM	7/26/03 11:05:29 AM	1
IMG_0078.JPG	10/18/05 7:33:30 PM	10/18/05 8:33:30 PM	7/26/03 11:05:29 AM	1
IMG_0079.JPG	10/19/05 5:54:08 PM	10/19/05 6:54:09 PM	7/26/03 11:05:20 AM	1
IMG_0080.JPG	10/19/05 5:54:22 PM	10/19/05 6:54:23 PM	7/26/03 11:05:21 AM	1
IMG_0081.JPG	10/19/05 5:54:32 PM	10/19/05 6:54:33 PM	7/26/03 11:05:21 AM	1
IMG_0082.JPG	10/19/05 5:54:56 PM	10/19/05 6:54:57 PM	7/26/03 11:05:21 AM	1
IMG_0083.JPG	10/19/05 5:55:10 PM	10/19/05 6:55:10 PM	7/26/03 11:05:22 AM	1
IMG_0084.JPG	10/19/05 5:55:36 PM	10/19/05 6:55:37 PM	7/26/03 11:05:22 AM	1
IMG_0085.JPG	10/19/05 5:55:48 PM	10/19/05 6:55:49 PM	7/26/03 11:05:23 AM	1
IMG_0086.JPG	10/19/05 5:55:56 PM	10/19/05 6:55:57 PM	7/26/03 11:05:23 AM	1
IMG_0087.JPG	10/19/05 5:56:08 PM	10/19/05 6:56:09 PM	7/26/03 11:05:24 AM	1
IMG_0088.JPG	10/19/05 5:56:24 PM	10/19/05 6:56:24 PM	7/26/03 11:05:24 AM	1
IMG_0089.JPG	10/19/05 5:56:34 PM	10/19/05 6:56:34 PM	7/26/03 11:05:24 AM	1
IMG_0090.JPG	10/19/05 6:32:52 PM	10/19/05 7:32:51 PM	7/26/03 11:06:08 AM	1
IMG_0091.JPG	10/19/05 6:32:58 PM	10/19/05 7:32:57 PM	7/26/03 11:06:08 AM	1
IMG_0092.JPG	10/19/05 6:33:08 PM	10/19/05 7:33:09 PM	7/26/03 11:06:09 AM	1
IMG_0093.JPG	10/19/05 6:33:18 PM	10/19/05 7:33:18 PM	7/26/03 11:06:09 AM	1
IMG_0094.JPG	10/19/05 6:33:26 PM	10/19/05 7:33:25 PM	7/26/03 11:06:10 AM	1
IMG_0095.JPG	10/19/05 6:33:30 PM	10/19/05 7:33:29 PM	7/26/03 11:06:10 AM	1
IMG_0096.JPG	10/19/05 6:33:52 PM	10/19/05 7:33:51 PM	7/26/03 11:06:10 AM	1
IMG_0097.JPG	10/19/05 6:33:58 PM	10/19/05 7:33:57 PM	7/26/03 11:06:11 AM	1
IMG_0098.JPG	10/19/05 6:34:08 PM	10/19/05 7:34:08 PM	7/26/03 11:06:11 AM	1
IMG_0099.JPG	10/20/05 3:20:12 PM	10/20/05 4:20:13 PM	7/26/03 11:05:45 AM	1
IMG_0100.JPG	10/20/05 3:20:30 PM	10/20/05 4:20:31 PM	7/26/03 11:05:46 AM	1
IMG_0101.JPG	10/20/05 3:20:44 PM	10/20/05 4:20:44 PM	7/26/03 11:05:46 AM	1
IMG_0102.JPG	10/20/05 3:21:02 PM	10/20/05 4:21:02 PM	7/26/03 11:05:46 AM	1
IMG_0103.JPG	10/20/05 3:21:28 PM	10/20/05 4:21:28 PM	7/26/03 11:05:47 AM	1
IMG_0104.JPG	10/20/05 3:25:14 PM	10/20/05 4:25:14 PM	7/26/03 11:05:47 AM	1
IMG_0105.JPG	10/20/05 3:26:56 PM	10/20/05 4:26:56 PM	7/26/03 11:05:47 AM	1
IMG_0106.JPG	10/20/05 3:27:04 PM	10/20/05 4:27:03 PM	7/26/03 11:05:48 AM	1
IMG_0107.JPG	10/20/05 3:49:24 PM	10/20/05 4:49:23 PM	7/26/03 11:05:48 AM	1
IMG_0108.JPG	10/20/05 3:49:26 PM	10/20/05 4:49:26 PM	7/26/03 11:05:49 AM	1
IMG_0109.JPG	10/20/05 3:49:30 PM	10/20/05 4:49:29 PM	7/26/03 11:05:49 AM	1
IMG_0110.JPG	10/29/05 4:11:16 AM	10/29/05 5:11:16 AM	7/26/03 11:05:51 AM	1
IMG_0111.JPG	10/29/05 4:11:42 AM	10/29/05 5:11:43 AM	7/26/03 11:05:51 AM	1
IMG_0112.JPG	10/29/05 4:43:36 AM	10/29/05 5:43:36 AM	7/26/03 11:05:52 AM	1
IMG_0113.JPG	10/29/05 4:43:54 AM	10/29/05 5:43:54 AM	7/26/03 11:05:52 AM	1
IMG_0115.JPG	10/29/05 4:44:52 AM	10/29/05 5:44:52 AM	7/26/03 11:05:52 AM	1
IMG_0116.JPG	10/29/05 4:44:56 AM	10/29/05 5:44:55 AM	7/26/03 11:05:53 AM	1
IMG_0117.JPG	10/29/05 4:45:06 AM	10/29/05 5:45:06 AM	7/26/03 11:05:53 AM	1
IMG_0118.JPG	10/29/05 4:45:20 AM	10/29/05 5:45:20 AM	7/26/03 11:05:54 AM	1
IMG_0119.JPG	10/29/05 4:45:26 AM	10/29/05 5:45:25 AM	7/26/03 11:05:54 AM	1
IMG_0120.JPG	10/29/05 4:45:40 AM	10/29/05 5:45:40 AM	7/26/03 11:05:55 AM	1
IMG_0121.JPG	10/29/05 4:45:50 AM	10/29/05 5:45:50 AM	7/26/03 11:05:55 AM	1
IMG_0122.JPG	10/29/05 4:46:00 AM	10/29/05 5:46:00 AM	7/26/03 11:05:55 AM	1
IMG_0123.JPG	10/29/05 4:47:00 AM	10/29/05 5:46:59 AM	7/26/03 11:05:56 AM	1
IMG_0124.JPG	10/29/05 4:47:06 AM	10/29/05 5:47:05 AM	7/26/03 11:05:56 AM	1
IMG_0125.JPG	10/29/05 4:47:10 AM	10/29/05 5:47:11 AM	7/26/03 11:05:57 AM	1
IMG_0126.JPG	10/29/05 4:47:24 AM	10/29/05 5:47:24 AM	7/26/03 11:05:57 AM	1
IMG_0127.JPG	10/30/05 2:34:20 AM	10/30/05 4:34:20 AM	7/26/03 11:05:40 AM	2
IMG_0128.JPG	10/30/05 2:35:14 AM	10/30/05 4:35:14 AM	7/26/03 11:05:40 AM	2
IMG_0129.JPG	10/30/05 2:36:06 AM	10/30/05 4:36:05 AM	7/26/03 11:05:41 AM	2
IMG_0130.JPG	10/30/05 2:36:42 AM	10/30/05 4:36:42 AM	7/26/03 11:05:41 AM	2
IMG_0131.JPG	10/30/05 2:36:54 AM	10/30/05 4:36:55 AM	7/26/03 11:05:42 AM	2
IMG_0132.JPG	10/30/05 2:37:12 AM	10/30/05 4:37:12 AM	7/26/03 11:05:42 AM	2


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Author and File Systems Expert

10/23/2020

IMG_0133.JPG	10/30/05 2:37:44 AM	10/30/05 4:37:45 AM	7/26/03 11:05:43 AM	2
IMG_0134.JPG	10/30/05 2:37:58 AM	10/30/05 4:37:58 AM	7/26/03 11:05:43 AM	2
IMG_0135.JPG	10/30/05 2:38:00 AM	10/30/05 4:38:00 AM	7/26/03 11:05:44 AM	2
IMG_0136.JPG	10/30/05 3:39:00 AM	10/30/05 5:39:00 AM	7/26/03 11:05:44 AM	2
IMG_0137.JPG	10/30/05 3:39:06 AM	10/30/05 5:39:06 AM	7/26/03 11:05:45 AM	2
IMG_0138.JPG	10/30/05 4:55:42 PM	10/30/05 4:55:41 PM	7/26/03 11:06:22 AM	0
IMG_0139.JPG	10/30/05 4:55:52 PM	10/30/05 4:55:51 PM	7/26/03 11:06:23 AM	0
IMG_0140.JPG	10/30/05 4:56:20 PM	10/30/05 4:56:21 PM	7/26/03 11:06:23 AM	0
IMG_0141.JPG	10/30/05 4:56:46 PM	10/30/05 4:56:46 PM	7/26/03 11:06:24 AM	0
IMG_0142.JPG	10/30/05 4:57:12 PM	10/30/05 4:57:12 PM	7/26/03 11:06:24 AM	0
IMG_0143.JPG	10/30/05 6:01:08 PM	10/30/05 6:01:08 PM	7/26/03 11:06:24 AM	0
IMG_0144.JPG	10/30/05 6:01:14 PM	10/30/05 6:01:14 PM	7/26/03 11:06:25 AM	0
IMG_0145.JPG	10/30/05 6:01:20 PM	10/30/05 6:01:19 PM	7/26/03 11:06:25 AM	0
IMG_0146.JPG	10/30/05 6:01:28 PM	10/30/05 6:01:28 PM	7/26/03 11:06:26 AM	0
IMG_0147.JPG	10/30/05 6:02:08 PM	10/30/05 6:02:08 PM	7/26/03 11:06:26 AM	0
IMG_0148.JPG	10/30/05 6:02:14 PM	10/30/05 6:02:15 PM	7/26/03 11:06:26 AM	0
IMG_0149.JPG	10/30/05 6:02:22 PM	10/30/05 6:02:22 PM	7/26/03 11:06:27 AM	0
IMG_0150.JPG	11/2/05 5:59:16 PM	11/02/05 5:59:16 PM	7/26/03 11:05:11 AM	0
IMG_0151.JPG	11/2/05 5:59:26 PM	11/02/05 5:59:25 PM	7/26/03 11:05:12 AM	0
IMG_0152.JPG	11/2/05 5:59:30 PM	11/02/05 5:59:30 PM	7/26/03 11:05:12 AM	0
IMG_0153.JPG	11/2/05 5:59:34 PM	11/02/05 5:59:34 PM	7/26/03 11:05:12 AM	0
IMG_0154.JPG	11/2/05 5:59:48 PM	11/02/05 5:59:47 PM	7/26/03 11:05:13 AM	0
IMG_0155.JPG	11/2/05 6:00:22 PM	11/02/05 6:00:22 PM	7/26/03 11:05:13 AM	0
IMG_0156.JPG	11/2/05 6:00:30 PM	11/02/05 6:00:29 PM	7/26/03 11:05:14 AM	0
IMG_0157.JPG	11/2/05 6:00:38 PM	11/02/05 6:00:38 PM	7/26/03 11:05:14 AM	0
IMG_0158.JPG	11/2/05 6:00:48 PM	11/02/05 6:00:49 PM	7/26/03 11:05:14 AM	0
IMG_0159.JPG	11/2/05 6:01:10 PM	11/02/05 6:01:10 PM	7/26/03 11:05:15 AM	0
IMG_0160.JPG	11/2/05 6:01:18 PM	11/02/05 6:01:18 PM	7/26/03 11:05:15 AM	0
IMG_0161.JPG	11/2/05 6:09:00 PM	11/02/05 6:08:59 PM	7/26/03 11:05:15 AM	0
IMG_0162.JPG	11/2/05 6:09:02 PM	11/02/05 6:09:02 PM	7/26/03 11:05:16 AM	0
IMG_0163.JPG	11/2/05 6:09:10 PM	11/02/05 6:09:11 PM	7/26/03 11:05:16 AM	0
IMG_0164.JPG	11/10/05 8:22:18 PM	11/10/05 8:22:18 PM	7/26/03 11:06:29 AM	0
IMG_0165.JPG	11/10/05 8:22:30 PM	11/10/05 8:22:30 PM	7/26/03 11:06:29 AM	0
IMG_0168.JPG	11/10/05 8:23:12 PM	11/10/05 8:23:12 PM	7/26/03 11:06:29 AM	0
IMG_0169.JPG	11/10/05 8:23:26 PM	11/10/05 8:23:26 PM	7/26/03 11:06:30 AM	0
IMG_0172.JPG	11/10/05 8:24:20 PM	11/10/05 8:24:19 PM	7/26/03 11:06:30 AM	0
IMG_0174.JPG	11/10/05 8:24:48 PM	11/10/05 8:24:47 PM	7/26/03 11:06:31 AM	0
IMG_0175.JPG	11/10/05 8:25:04 PM	11/10/05 8:25:04 PM	7/26/03 11:06:31 AM	0
IMG_0176.JPG	11/10/05 8:25:10 PM	11/10/05 8:25:11 PM	7/26/03 11:06:31 AM	0
IMG_0177.JPG	11/10/05 8:25:36 PM	11/10/05 8:25:35 PM	7/26/03 11:06:32 AM	0
IMG_0178.JPG	11/10/05 8:25:54 PM	11/10/05 8:25:54 PM	7/26/03 11:06:32 AM	0
IMG_0179.JPG	11/10/05 8:26:04 PM	11/10/05 8:26:04 PM	7/26/03 11:06:33 AM	0
IMG_0180.JPG	11/10/05 8:26:22 PM	11/10/05 8:26:22 PM	7/26/03 11:06:33 AM	0
IMG_0181.JPG	11/10/05 8:26:26 PM	11/10/05 8:26:25 PM	7/26/03 11:06:33 AM	0
IMG_0182.JPG	11/10/05 8:26:30 PM	11/10/05 8:26:29 PM	7/26/03 11:06:34 AM	0
IMG_0183.JPG	11/10/05 8:27:34 PM	11/10/05 8:27:33 PM	7/26/03 11:06:34 AM	0
IMG_0184.JPG	11/24/05 9:07:50 PM	11/24/05 9:07:50 PM	7/26/03 11:05:08 AM	0
IMG_0185.JPG	11/24/05 9:07:56 PM	11/24/05 9:07:55 PM	7/26/03 11:05:09 AM	0
IMG_0186.JPG	11/24/05 9:08:08 PM	11/24/05 9:08:07 PM	7/26/03 11:05:09 AM	0
IMG_0187.JPG	11/24/05 9:09:52 PM	11/24/05 9:09:52 PM	7/26/03 11:05:09 AM	0
IMG_0188.JPG	11/24/05 9:10:08 PM	11/24/05 9:10:08 PM	7/26/03 11:05:10 AM	0
IMG_0189.JPG	11/24/05 9:10:22 PM	11/24/05 9:10:23 PM	7/26/03 11:05:10 AM	0
IMG_0190.JPG	11/24/05 9:10:28 PM	11/24/05 9:10:28 PM	7/26/03 11:05:10 AM	0
IMG_0191.JPG	11/24/05 9:10:38 PM	11/24/05 9:10:37 PM	7/26/03 11:05:11 AM	0
IMG_0194.JPG	12/18/05 12:37:58 AM	12/18/05 12:37:58 AM	7/26/03 11:05:18 AM	0
IMG_0197.JPG	12/18/05 12:38:20 AM	12/18/05 12:38:20 AM	7/26/03 11:05:19 AM	0


[Dr. KESHAVA MUNEGOWDA]

Dr. Keshava Munegowda

Author and File Systems Expert

10/23/2020

IMG_0198.JPG	12/18/05 12:38:28 AM	12/18/05 12:38:28 AM	7/26/03 11:05:19 AM	0
IMG_0199.JPG	12/18/05 12:38:56 AM	12/18/05 12:38:55 AM	7/26/03 11:05:20 AM	0
IMG_0203.JPG	12/25/05 2:59:44 AM	12/25/05 2:59:44 AM	7/26/03 11:06:36 AM	0
IMG_0204.JPG	12/25/05 2:59:50 AM	12/25/05 2:59:50 AM	7/26/03 11:06:36 AM	0
IMG_0205.JPG	12/25/05 3:00:42 AM	12/25/05 3:00:42 AM	7/26/03 11:06:37 AM	0
IMG_0206.JPG	12/25/05 3:00:50 AM	12/25/05 3:00:49 AM	7/26/03 11:06:37 AM	0
IMG_0207.JPG	12/25/05 3:01:40 AM	12/25/05 3:01:40 AM	7/26/03 11:06:37 AM	0
IMG_0208.JPG	12/25/05 3:01:46 AM	12/25/05 3:01:46 AM	7/26/03 11:06:38 AM	0
IMG_0209.JPG	12/30/05 5:56:06 PM	12/30/05 5:56:05 PM	7/26/03 11:05:34 AM	0
IMG_0210.JPG	12/30/05 5:56:12 PM	12/30/05 5:56:11 PM	7/26/03 11:05:34 AM	0
IMG_0211.JPG	12/30/05 5:56:16 PM	12/30/05 5:56:15 PM	7/26/03 11:05:34 AM	0
IMG_0212.JPG	12/30/05 5:56:20 PM	12/30/05 5:56:20 PM	7/26/03 11:05:35 AM	0
IMG_0213.JPG	12/30/05 5:56:46 PM	12/30/05 5:56:46 PM	7/26/03 11:05:35 AM	0
IMG_0214.JPG	12/30/05 5:56:54 PM	12/30/05 5:56:53 PM	7/26/03 11:05:36 AM	0
IMG_0215.JPG	12/30/05 5:56:56 PM	12/30/05 5:56:56 PM	7/26/03 11:05:36 AM	0
IMG_0216.JPG	12/30/05 5:57:00 PM	12/30/05 5:56:59 PM	7/26/03 11:05:37 AM	0
IMG_0217.JPG	12/30/05 5:58:50 PM	12/30/05 5:58:50 PM	7/26/03 11:05:37 AM	0
IMG_0218.JPG	12/30/05 5:59:00 PM	12/30/05 5:58:59 PM	7/26/03 11:05:37 AM	0
IMG_0219.JPG	12/30/05 5:59:08 PM	12/30/05 5:59:07 PM	7/26/03 11:05:38 AM	0
IMG_0220.JPG	12/30/05 5:59:18 PM	12/30/05 5:59:18 PM	7/26/03 11:05:38 AM	0
IMG_0221.JPG	12/30/05 5:59:56 PM	12/30/05 5:59:56 PM	7/26/03 11:05:39 AM	0
IMG_0222.JPG	12/30/05 6:00:08 PM	12/30/05 6:00:08 PM	7/26/03 11:05:39 AM	0
IMG_0223.JPG	12/30/05 6:00:24 PM	12/30/05 6:00:24 PM	7/26/03 11:05:39 AM	0


[Dr. KESHAVA MUNEGOWDA]

Expert Statement #5: Manual Alteration of File Modified Time

Suppose we have a FAT-32 hard drive and FAT-16 compact flash card. Suppose, also, that a particular file, IMG_175, was downloaded from the CF card and backed up to the hard drive (HD), and that the tables below contain the file system data for IMG_175 on each device.

1. The EXIF metadata "CreatorTool: Photoshop Adobe Elements 3.0" would not have been added by the camera at creation time (on the CF card). This must have been added and thus EXIF metadata must have been modified after creation.
2. If EXIF metadata is modified, it means the file contents are modified.
3. If the file contents are modified after creation, the file system modified time (on the HD) should be different from the file creation time on the CF card.
4. Because they are the SAME and not DIFFERENT, the HD file system modified time and/or CF card creation time must have been altered manually to match.

Table 1: IMG_175 on the hard drive

File Modified Date	11/10/2005 20:25:04
EXIF Created Date	11/10/2005 20:25:04
EXIF CreatorTool	Photoshop Adobe Elements 3.0
EXIF Model	Canon EOS 20D

Table 2: IMG_175 on the CF card

File Modified Date	11/10/2005 20:25:04
File Created Date	11/10/2005 20:25:04



Dr. Keshava Munegowda, PhD

• **Education Qualifications:**

- PhD Computer Science and Engineering, Visvesvaraya Technological University, 2016. Research domain is File systems.
- Master of technology in Computer Science and Engineering, Visvesvaraya Technological University, 2004.
- Bachelor of Engineering in Computer Science and Engineering, Bangalore University, INDIA, 2001.

• **Book on FAT File systems:**

- "ExFAT and FAT File system Internals", November 2016, Amazon publications.

• **Granted US patents on FAT File systems:**

1. USPTO application number: 12326915 entitled "Storage Optimizations by Directory compaction in FAT File system", US patent number: 8429331.
2. USPTO application number: 12762829 entitled "FAT file in reserved cluster entry with ready entry state", US patent number: 8452734.
3. USPTO application number: 13870344, entitled "IC updating File system meta data with log record data", US patent number: 9043286
4. USPTO application number: 14075757 entitled "File access method and system there of", US patent number: 9569447
5. USPTO application number: 15413058 entitled "Method and System for File storage and access", US patent number: 9817837

Trial Transcript Summary #1

This appendix contains excerpts from publicly available transcripts that show that the compact flash card was accessed improperly while in FBI custody and filesystem data was changed while in custody (September 19, 2018) and before forensic analysis (June 11, 2019).

On Page 4967 of the transcript, FBI Examiner Booth says that their forensic analysis unit received the Canon camera and storage device (CF media card) on 6/10/19:

1	A	Yes.
2	Q	And do your notes now, Exhibit 961, help you answer the
3		question when the Cannon camera and storage device, 524, were
4		first examined by the CART unit?
5	A	The -- the -- my notes reflect when I examined and had
6		access to the Cannon camera.
7	Q	Okay. And that's what --
8	A	And only -- and only me having access to that.
9	Q	And what do your notes reflect?
10	A	I received it on 6/10 of '19.
11	Q	June 10th, 2019?
12	A	Yes.

On Page 4968, Booth says "when it was in my hands it was write protected, yes," referring to whether the storage device was taken through a write-blocking process before examination, as is standard protocol:

13 Q And was this device also taken through the process of
14 write copied -- write protected?
15 A When it was in my hands it was write protected, yes.
16 Q Can you tell me when that was?
17 A That happened on 6/11.
18 Q And, again, the reason you write protect to be -- the --
19 whether it's a hard drive or a piece of data, like this data
20 disk, forensically you don't access it directly, correct?
21 A No, we don't.
22 Q And that's what you described yesterday to the
23 prosecutor, that's what you described to me this morning,
24 correct?
25 A Correct.

On Page 4969, cross-examination reveals that files on the media card (14 in total) were accessed on September 19, 2018.

6 Q I'd like to take you to -- this is page 84 of
7 Exhibit 521. And I'd like to begin with JPEG on top here,
8 224.
9 (Exhibit published.)
10 BY MR. der OHANNESIAN:
11 Q First of all, I want to make sure you can read that.
12 A I can see it.
13 Q You say that this image was created on March 9th, 2006?
14 A That's the created date that's --
15 Q Yes?
16 A That's the created date that's listed for the file.
17 Q It was modified on March 9, 2006?
18 A That's the modified date that's reflected from the file
19 system.
20 Q And then it was accessed, correct, on a certain date?
21 A Yes, I see it's been accessed.
22 Q It was accessed on September 19, 2018, correct?
23 A Correct.

Then on Page 4973, the examiner affirms that file system data of the media card was changed while it was in FBI custody:

3 IT IS BEING REMOVED FROM THE FILE SYSTEM.

4 Q I'm talking about the data that we just looked at.

5 A That file system data appears to have been changed.

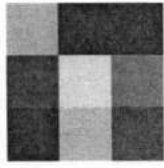
6 Q When we say "changed," it was changed while it was in the
7 possession of the FBI?

8 A If I'm taking the dates on when we received it, it would
9 appear so.

10 Q And the dates that you received just now came from your
11 report, correct?

12 A Yes.

EXHIBIT 2



**Abrams
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October 23, 2020

Summary Expert Opinion

I have reviewed the following:

- Expert Statements #1A, #1B, #5, #7 by Dr. Keshava Munegowda, dated 10/12/20
- Expert corroborations for Expert Statement #1B from Mr. Samuel Plainfield and Mr. Dylan Sperber
- Expert corroboration for Expert Statement #7 from Mr. Steven Burgess
- The letter entitled, "The Importance of Forensic Images" from Mr. Steven Alexander
- The following trial transcript excerpts:
 - 4872-4881, FBI testifies images created in 2005
 - 4973, Media card was accessed by unknown person
 - 4962-4967, Exhibit 524 delivery date
 - 4973, File system changed while in FBI custody on 9/19/2018
 - 4968-4972, Proof that write blocker was not used and file system data was altered while in FBI custody
 - 4967, Media card arrives to forensics lab on 2/22/19
 - 4905, Unsealed evidence part 1
 - 4889, Unsealed evidence part 2
 - 4886, Unsealed evidence part 3
 - 4977, FBI says EXIF data not easy to change
 - 5371, Prosecution says photos taken exactly when folder stated
 - 4940-4941, FBI testifies file creation dates not reliable
 - 5373-5375, Racketeering 4 Prosecution Closing Statement

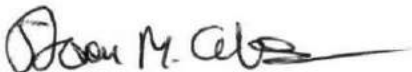
Based on my review and assuming that the data that has been presented to me is true, I conclude the following:

- I consider the improper access of the media card while it was in the custody of the FBI (referenced in the above documents) on 9/19/18, prior to its receipt into evidence and subsequent forensic analysis, as a type of tampering that irretrievably interrupted and invalidated the chain of custody over that digital photo evidence and overwrote crucial evidence on the media thus tampering with and destroying possibly exculpatory evidence.
- Because there is no way of knowing the accuracy of the computer system clock on the computer that copied the digital photos in this case, the dates and times associated with those digital photos cannot be relied upon or assumed to be accurate, especially given the other inconsistencies noted in the metadata from the digital photo evidence.

- Based on the testimony that I read, FBI Examiner Booth misstated basic facts about the inherent reliability of EXIF data on JPEG photos, specifically and incorrectly stating that the dates in the EXIF header were difficult to modify, and should be assumed to be reliable. In fact, EXIF header data is easily modified by several popular JPEG editing tools that are available for free on the Internet. It is my opinion that in making his statement, Examiner Booth either purposely misled the fact finders or simply is not sufficiently knowledgeable about the facts to which he testified. The former would be perjury. If the latter is true, that may be considered perjury by omission, as he projected that knew more about the subject than he did.
- I believe based on what I read that the statements made by the prosecution regarding EXIF data were made to purposefully mislead the jury about the reliability of the digital photo evidence in question.
- I can think of no way other than tampering to create the effect observed in Expert Statement #5. Therefore, I concur with Dr. Munegowda's conclusion.
- After reviewing Expert Statement #1A and #1B, I agree that the most plausible explanation is that the dates of the 94 pictures referenced were manually altered.
- Furthermore, I also agree the pattern of tampering in this effect does seem to generally conform to a Daylight Savings Time pattern (but not consistently), so it is possible the intent of the tamperer may have been to introduce this time zone conversion effect for the appearance of authenticity.

In conclusion, it is my expert opinion that the digital photo evidence, based on the abovementioned materials I reviewed, was tampered with and should have been excluded as unreliable, and should not have been used to support any charges. Further, based on my reviews of the above mentioned materials it appears that the government, in contradicting the testimony of their own expert witness, was intentionally dishonest about the reliability of said digital photo evidence in its closing statement to the jury. This would leave the jury with a misperception about the reliability of crucial evidence they were about to begin deliberating.

My CV can be found in Exhibit A.



Steven M. Abrams

Enc.

APPENDIX A.

**Steven M. Abrams, J.D., M.S.
Curriculum Vitae**

Steven M. Abrams, J.D., M.S.
Attorney, Digital Forensics Examiner and Instructor
1154 Holly Bend Drive
Mount Pleasant, SC 29466
843-216-1100
Steve@AbramsForensics.com

Curriculum Vitae

My key practice areas are Computer Forensics, e-Discovery, and Computer Law.

Education

- 2016 -Techno Security 2016, Computer Forensics Training Seminar, Myrtle Beach, SC,
June 5-8, 2016

- 2014 -Georgia Bureau of Investigations, Internet Evidence Finder Forensics Training,
Decatur, Georgia, February 2014

- 2013 -Techno Security 2013, Computer Forensics Training Seminar, Myrtle Beach, SC,
June 2-5, 2013

- 2012 -Techno Security 2012, Computer Forensics Training Seminar, Myrtle Beach, SC,
June 3-6, 2012

- 2011 -November 9-12: EnCase 7 Training, Salt Lake City, UT
-November 6 – 9: Paraben Forensics Innovations Conference, Park City, UT
- South Carolina Assoc. of Legal Investigators (SCALI) Annual Training Seminar, May
2011
- April 7, 2011: SC Electronic Crime Task Force Quarterly Meeting and Training

- 2010 -Techno Security 2010, Computer Forensics Training Seminar, Myrtle Beach, SC, June
- SCALI Annual Training Seminar, May 2010

- 2009 - Cellebrite Mobile Device Forensics Certification (CCMDE), SEMAR, Mexico City,
Mexico
-SCALI Annual Training Seminar, May 2009

- 2008 - South Carolina Basic Constable Training, Tri-County Technical College / SC Criminal
Justice Academy, October – November 2008
- Commissioned as a South Carolina State Constable (LEO) on November 20, 2008.
- Techno Security 2008, Computer Forensics Training Seminar, Myrtle Beach, SC, June

- 2007 - Charleston School of Law, Charleston, SC, Juris Doctor (J.D. - Magna Cum Laude)

- GMU2007 Computer Forensics Symposium, Regional Computer Forensic Group
of the High Technology Crime Investigation Association, Fairfax VA, Aug. 2007 (40
CEU HTCIA)
- Techno Security 2007, Computer Forensics Training Seminar, Myrtle Beach, SC, June

- 2006 - University of Aberdeen, School of Law, Kings College, Old Aberdeen, Scotland
in collaboration with the University of Baltimore Law School
Summer Law Program in Comparative Criminal Procedure and UK Business Entities &
Taxation
- Techno Security 2006, Computer Forensics Training Seminar, Myrtle Beach, SC, June
- SCALI Annual Training Seminar, May 2006

- 2005 - SCALI Annual Training Seminar, May 2005
- SCALI Fall Training Seminar, October 2005

- 2004 - Access Data Advanced Windows Forensics, June 23-25, 2004, New York City. (24
Credit Hours)
- SCALI Annual Training Seminar, May 2004 (10 CEU)

- 2003 - GMU2003 Computer Forensics Symposium, Regional Computer Forensic Group
of the High Technology Crime Investigation Association, George Mason University,
Fairfax, VA. Aug.2003, (40 CEU HTCIA)
- Techno Security 2003, Computer Forensics and Security Conference (24 CEU)
- SCALI Annual Training Seminar & PI Training Seminar (16 CEU SLED)

- 2002 - SCALI Annual & Fall Training Seminars (16 CEU SLED)
- GMU2002 Computer Forensics Symposium, Regional Computer Forensic Group
of the High Technology Crime Investigation Association, Fairfax VA, Aug. 2002,
(40 CEU HTCIA)
- Access Data Computer Forensic Boot Camp, North Carolina Justice Academy,
Edneyville, NC (24 CEU)

- 1992-1994 Microsoft Internet Developer Workshops NY, NY

- 1992-1993 Novell NetWare CNE Training, IBM Skills Discovery, Jericho NY

- 1984-1985 Microcomputer and Electronics Engineering, Hofstra University, Hempstead NY

- 1982-1983 Ph.D. Studies, Faculty Fellowship, Columbia University, Graduate School of Arts &
Sciences
- 1981-1982 Columbia University, College of Physicians & Surgeons, Master of Science (M.S.)

- 1977-1981 Allegheny College, Meadville PA, Bachelor of Arts (B.A.) (Psychology - Computer
Science)

Professional Licenses

Current

Licensed Attorney in South Carolina
 Licensed Attorney in District of Columbia
 Licensed Attorney and Counselor at Law in New York

Previous

Licensed as a Private Investigator in South Carolina and New York (2002-2008), South Carolina
 State Constable (Sworn, 2008-2019).

Experience (Selected)

2016 – Present, Senior Attorney, Abrams Cyber Law & Forensics, LLC. Mount Pleasant, SC 29466. Concentration on Electronic Privacy and Defamation Cases, Electronic Discovery, and Digital Forensics.

2018 - Continuing Legal Education Instructor, ***Electronic Privacy Violations during Divorce: Legal and Ethical Guidelines for Family Law Practitioners***, SC Bar, Columbia SC (February 21, 2018).

2016 – Continuing Legal Education Instructor, ***Smartphones as evidence for Personal Injury Cases***, NBI, Charleston SC (December 8, 2016).

2011 – 2016 Sole Practitioner Abrams Law Firm, PC. Mount Pleasant, SC 29466

2011 - Digital Forensics Instructor / Investigator, H-11 Digital Forensics / United States Embassy, Tirane, Albania.

2010 – Facilitator, Instructor, Annual In-Service Legals and CDV Training (SLED), Lowcountry Constable Association.

2009 – Speaker, South Carolina Association for Justice, Hilton Head, SC (August 6, 2009) Topic: Civil Discovery of E-mails after *O’Grady*

2009 – Digital Forensics Instructor/Investigator, H-11 Digital Forensics / United States Embassy, Mexico City, Mexico.

2008 – Digital Forensics Instructor/Investigator, H-11 Digital Forensics / United States Embassy, Mexico City, Mexico.

2008 – Faculty, SC Bar Convention – Family Law Section CLE

2008 – 2011 Shareholder, Abrams Millonzi Law Firm, P.C., Mount Pleasant, SC 29464

2007 - Presenter, “E-Discovery: Definition, FRCP Changes and Application CLE”, NBI, Charlotte, NC, December 19, 2007

2007 - Digital Forensics Instructor/Investigator, H-11 Digital Forensics, United States Embassy, Mexico City, Mexico

2007 - Presenter, “Civil to Criminal: Collaborative Computer Forensics Investigations between PIs and Law Enforcement”, GMU2007, August 9th & 10th, 2007

2007 - Presenter – “A South Carolina Lawyer’s Roadmap to Navigating the New Federal E-Discovery Rules,” The South Carolina Bar (CLE Division), April 13, 2007.

2006 - Presenter – “Typical Internet Sexual Activity and its Detection”, Family Law CLE, The South Carolina Bar (CLE Division), November 2006.

2006 - Instructor, "3-day Hands-on Computer Forensics Workshop", Trident Technical College, N. Charleston, SC, CLE accredited by The South Carolina Bar, January 2006.

2005 - Lecturer, "Computer Forensic Introduction", Trident Technical College, CLE accredited by South Carolina Bar and CEU / In-Service hours for PIs / LE by SLED.

2001 - Present Steve Abrams & Company, Ltd. (dba Abrams Computer Forensics)
Licensed Private Investigator, Computer Forensics Examiner

1998 - 2001 Steve Abrams & Company, Ltd. Mt. Pleasant, SC, President

1996 - Democratic National Committee, Instructor - Southeast and Northeast Regional Schools for Congressional Campaign Managers.

1995 – 1999 Direct Marketers of Charleston Mt Pleasant, SC, Partner
Co-owner of Political Database Marketing Company and full service political print shop.

1994 - 1995 The Software Studio Mt Pleasant, SC, Owner
Owner of software development company that developed database applications for the Newspaper publishing industry.

1992-1993 Town of North Hempstead, Manhasset, NY, Deputy Commissioner of Finance

1986 - 1992 Digitron Telecommunications, Inc., Huntington, NY, Director of R&D

1984 - 1986 Computer Associates International., Islandia, NY, Senior Systems Programmer

1983 Contel Information Systems Division. Great Neck NY, Software Engineer
(Developed the first Network Forensics Applications for the DoD)

Recent Publications

Steven M. Abrams, Knowledge of Computer Forensics Is Becoming Essential for Attorneys in the Information Age, 75 N.Y. St. B. Assn. J. 8, 15 (Feb. 2003).

Steven M. Abrams, Knowledge of Computer Forensics, Essential for 21st Century Private Investigators, 16 PI Mag. 46, 59 (October 2003).

Professional Awards & Honors

2008 – Member, SLED Ad Hoc Committee on Computer Forensics

2007 – CALI Excellence for the Future Award, Aviation Law, Charleston School of Law, Fall 2006

- CALI Excellence for the Future Award, Interviewing, Counseling & Negotiation, Charleston School of Law, Fall 2006
- CALI Excellence for the Future Award, Insurance Law, Charleston School of Law, Fall 2006

_ Dean's List, Charleston School of Law, Fall 2006, Spring 2007.

2004 - "2004 SCALI Investigator of the Year"

2003 - Member, SLED Private Investigations Business Advisory Committee

Professional Associations

Member, Institute of Electrical and Electronics Engineers - IEEE

Member, Lowcountry Constables Association - LCA

Bar Association Memberships

Admitted to practice in **South Carolina, District of Columbia, and New York.**

Compensation

I receive \$350 per hour, plus mileage, travel and lodging expenses, for all Computer Forensics services and for depositions and trial testimony.

Previous Expert Testimony

I have completed over 1200 computer forensics investigations, the overwhelming majority of cases were settled and did not require me to testify.

South Carolina cases in which I was qualified in court as an expert are:

Hillburn v. Hillburn, (2001-DR-08-2354);
Smith v. Smith, (2001-DR-22-212);
Natale v. Natale, (2003-DR-10-775)
Berda v. Berda, (2003-DR-10-1899);
Murphy v. Murphy (2004-DR-10-1510) and
Overstolz v. Fountain of Youth Wellness Centers LLC (2003-CP-10-000761).
Gitter v. Gitter (2008-DR-10-2865)
Ricigliano v. Ricigliano, (2009-DR-18-0102)
Edwards v Junevicius, (2010-DR-10-4736)
BTM Machinery Inc. v. Michael J. Finley (2013-CP-10-4366)
Cherry v Cherry (2014-DR-10-95)
Whitfield v. Schimpf and Sweetgrass Plastic Surgery,
LLC (Case No. 2017-CP-10-2758)

I was qualified as a testifying expert on digital forensics in federal court in

UHLIG, LLC, V JOHN ADAM SHIRLEY, (CIVIL ACTION No.. 6:08-1208-HFF)

I have also prepared expert's reports under Federal Rule 26(a)(2)(B) for the following federal civil suits filed in the United States District Court for the District of South Carolina:

Lumpkin v. Bennani, (Civil Action No. 2:03-2904-23), and
Miller v. American LaFrance Corp. (Civil Action No. 2:04-1668-23)
Microsoft v. BWC Products Inc. (Civil Action No. 2:06-CV-2023-CWH)
Quala Systems, Inc, et al., v. Bulkhaul USA, Inc., et al. (Civil Action No. 2:07-CV-00673-PMD)
Mainfreight v. John Marco, et al., (Civil Action No. 9:cv00563 JFA)

I was appointed the Court's Expert in US District Court, District of South Carolina, Rock Hill Division:

The Travelers Home and Marine Ins. Co. v. Pope, C/A No.: 0:10-cv-1688-JFA

I was qualified as a computer forensics expert in North Carolina courts in:
Hollins v. Lightfoot.

In addition, I have been deposed in the following matters over the past ten years:

Thomas & Assoc. v. Christopher Humphreys (Case No. 2018-CP-10-0455)
*Catherine Cope v. Wells Fargo Bank N.A., Century 21 Properties Plus, and
Jim Bailey, individually;* (Case No.: 2018-CP-18-00112)
Rick Gray v. Church Mutual (2017)
Calandra v. Calandra (2004-DR-10-2675)
McLernon v. McLernon (2003-DR-10-3090)
White v. Cassidy (2004-DR-08-256)
Khoury v. Noce (2006-CP-10-001830)
Quala Systems, Inc, et al., v. Bulkhaul USA, Inc., et al. (Civil Action No. 2:07-CV-00673-PMD)
Mainfreight v. John Marco, et al., (Civil Action No. 9:cv00563 JFA)
Beard v. Dunn & Dixon-Hughes et al, (Case No. 2010-CP-08-0776)
UHLIG, LLC, V JOHN ADAM SHIRLEY, (CIVIL ACTION No.6:08-1208-HFF)
ALTMAN, ET AL. V. FIRST CITIZENS BANK AND TRUST COMPANY (2012-CP-34-0124)

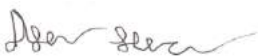
(Revised: Sept 11, 2019)

Declaration of Dylan Sperber

Forensic Evaluation of Statement

1. On 10/21/2020, IT Acceleration was contacted to review the statement *Expert Statement #5: Deliberate Alteration of File Modified Time* (Exhibit 1), made by Dr. Keshava Munegowda.
2. I have read the statement and am assuming that the data in Exhibit 1, Tables 1 and 2 are accurate.
3. I agree with Dr. Keshava Munegowda's findings.
4. I reserve the right to change my findings if new information is presented.

I attest that all the facts above are true.



October 21, 2020
Dylan Sperber – IT Acceleration, Inc

Exhibit 1:

Dr . Keshava Munegowda

Author and File Systems Expert

10/22/2020

Expert Statement #5: Manual Alteration of File Modified Time

Suppose we have a FAT-32 hard drive and FAT-16 compact flash card. Suppose, also, that a particular file, IMG_175, was downloaded from the CF card and backed up to the hard drive (HD), and that the tables below contain the file system data for IMG_175 on each device.

1. The EXIF metadata "CreatorTool: Photoshop Adobe Elements 3.0" would not have been added by the camera at creation time (on the CF card). This must have been added and thus EXIF metadata must have been modified after creation.
2. If EXIF metadata is modified, it means the file contents are modified.
3. If the file contents are modified after creation, the file system modified time (on the HD) should be different from the file creation time on the CF card.
4. Because they are the SAME and not DIFFERENT, the HD file system modified time and/or CF card creation time must have been altered manually to match.

Table 1: IMG_175 on the hard drive

File Modified Date	11/10/2005 20:25:04
EXIF Created Date	11/10/2005 20:25:04
EXIF CreatorTool	Photoshop Adobe Elements 3.0
EXIF Model	Canon EOS 20D

Table 2: IMG_175 on the CF card

File Modified Date	11/10/2005 20:25:04
File Created Date	11/10/2005 20:25:04



Dr. Keshava Munegowda, PhD

- **Education Qualifications:**

- PhD Computer Science and Engineering, Visvesvaraya Technological University, 2016. Research domain is File systems.
- Master of technology in Computer Science and Engineering, Visvesvaraya Technological University, 2004.
- Bachelor of Engineering in Computer Science and Engineering, Bangalore University, INDIA, 2001.

- **Book on FAT File systems:**

- "ExFAT and FAT File system Internals", November 2016, Amazon publications.

- **Granted US patents on FAT File systems:**

1. USPTO application number: 12326915 entitled "Storage Optimizations by Directory compaction in FAT File system", US patent number: 8429331.
2. USPTO application number: 12762829 entitled "FAT file in reserved cluster entry with ready entry state", US patent number: 8452734.
3. USPTO application number: 13870344, entitled "IC updating File system meta data with log record data", US patent number: 9043286
4. USPTO application number: 14075757 entitled "File access method and system thereof", US patent number: 9669447
5. USPTO application number: 15413058 entitled "Method and System for File storage and access", US patent number: 9817837

Exhibit 2:

Dylan J. Sperber

Education:

Bachelor of Science in Digital Forensics
Bloomsburg University of Pennsylvania - Bloomsburg, Pennsylvania

June 2012 – May 2016

Career History:

IT Acceleration Inc. (Digital Forensics Analyst)

February 2019 - Present

- Manage and conduct investigations on various forensic projects including evidence management for civil and criminal defense matters.
- Perform forensic acquisitions.
- Expertise and use of FTK, Axiom, Encase, Oxygen; Cellebrite; XWays, LogicCube Neo Falcon; Voom HardCopy 3p, Sumuri Recon Imager (Mac).
- Web preservasions of email and social networks.
- Data recovery on failed hard drives.
- IT support for Mac, Windows and Network issues.
- Forensics report writing and evidence analysis on various electronic devices and networks.
- Testify in court of law at Luzerne County Courthouse

DLS Discovery (Digital Legal Services)

E-Discovery Analyst

August 2018 – February 2019

- Complete day to day eDiscovery requests from various law firms.
- Handle and process sensitive data using eDiscovery tools such as Nuix and Relativity.
- Using Digital Forensics techniques to image and produce reports on devices such as computers and hard drives.

Innovative Development LLC

E-Discovery Analyst

June 2016 – August 2018

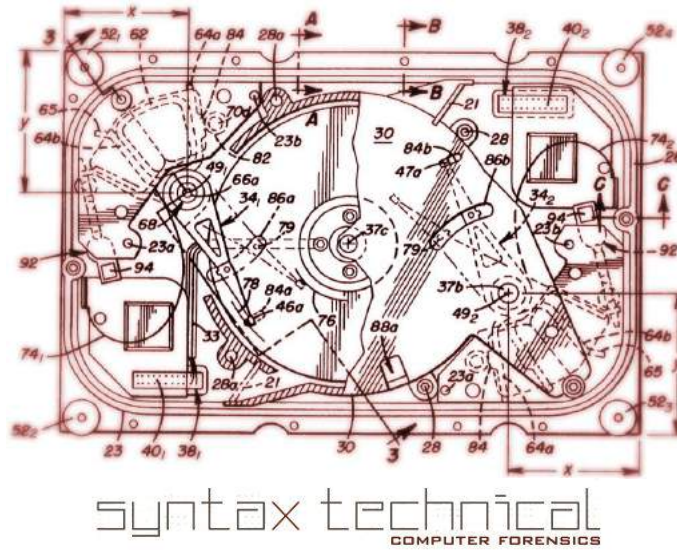
- Contracted to perform eDiscovery projects for AstraZeneca Pharmaceuticals.
- Data collections of PC's, mobile devices, and servers.
- Custodian data collections for paralegals which are used for ongoing court cases.
- Maintaining documentation of data collection for eDiscovery process involving offline/online device tracking chain of custody and billing information.
- Manage legal, compliance and HR data projects for paralegals.
- Business application collection which involves SQL querying of various databases.
- Conduct weekly reports as part of the SOP and client needs.
- Involved with high level data migration from Recommind to Ringtail of over 40TB of data.

Certifications:

- Recommind Accelerate – Open Text
- Comp TIA A+

Technical Proficiencies / Experience:

- Proficient in File Systems including FAT12, FAT16, FAT32, and NTFS
- Proficient in Windows Artifacts and Registry
- Use of Forensic tools including FTK, EnCase, X-Ways, Sleuth Kit, Axiom, Oxygen, Cellebrite, Sumuri Recon Imager; LogicCube NEO Falcon, VOOM Hardcopy 3P, Evidence Tracker
- Linux / UNIX / Mac OS
- Mobile OS's
- Wireshark
- Penetration Testing practices and tools
- Understanding of Malware analysis and tools
- Recommind, Toad, SharePoint, Robocopy, Enterprise Vault, SAP
- Relativity, NUIX, Concordance, IPro



Declaration of Samuel Plainfield

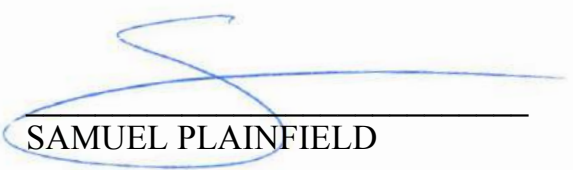
October 22, 2020

I, Samuel Plainfield, hereby declare as follows:

1. I am a forensic investigator, specializing in computer and mobile forensics. Attached as **Exhibit A** is my curriculum vitae which includes a compendium of representative cases. I have experience in the matters relevant to this case.
2. I have been retained to review and opine in connection with a declaration of Dr. Munegowda dated October 22, 2020 (**Exhibit B**). My compensation is not dependent on the outcome of this matter.
3. I have reviewed the declaration and generally agree with the conclusions set forth by the author.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge.

Dated: October 22, 2020



SAMUEL PLAINFIELD



EDUCATION

InfoSec Institute: CCFE: Certified Computer Forensics Examiner (2011)

Las Vegas, NV

CHFI: Certified Hacking Forensic Investigator (2011)

Academy of Art University: BFA Visual Effects & Animation (2009)

San Francisco, CA

WORK HISTORY

- **Flatwater Forensics**
Director of Forensic Analysis

2017 – Present
San Francisco, CA

Litigation consultancy primarily operating under the privileged relationship between counsel and litigation consultant providing actionable analysis of complex ESI, converting raw digital discovery into cogent, admissible evidence that drives investigation and litigation outcomes.

Flatwater is comprised of a unique team that combines experienced, seasoned trial lawyers with technical experts in forensics, information security (InfoSec) and ESI skilled at finding electronic evidence that may otherwise be misinterpreted or unexploited.

Leverage strategic relationships, supported by our corporate technology partners at Vital Enterprises, to lead investigations driven by forensic and electronic data, vertically managing challenging investigations of scale and volume. Oversee ingestion and processing of ESI, attorney document and data review, factual and forensic investigations, and preparation of trial evidence.

- **syntax technical computer forensics**
Forensic Investigator

2010 – Present
San Francisco, CA

- Appointed as a forensic expert by the US District Court for Northern California and numerous state superior courts.
- Qualified as a forensic expert and testified.
- Retained as a cell tower analyst expert by the San Mateo and San Francisco Bar Associations.
- Imaged systems utilizing proven methods ensuring integrity of evidence.
- Examined evidence produced using P3 Commander, EnCase, Autopsy, FTK, and proprietary scripts and methods for targeted searches.
- Exhaustively documented and strictly maintained chain of custody.
- Consistently physically secured and maintained evidence.
- Performed cell record and cell tower data analysis and reconstruction.
- Performed Apple iOS (iPhone/iPad), Android, BlackBerry & Windows Mobile forensics.
- Developed and maintained an advanced, proprietary data recovery platform.

See **Representative Cases** on the following page for detailed case descriptions

- **Sideman & Bancroft LLP**
eDiscovery / Forensic Investigator

2014 – 2017
San Francisco, CA

- Computer & mobile forensics on civil and criminal matters.
- eDiscovery expertise on high-volume matters.
- Supervise proprietary data management (custom software development).

- **Natoma Law Offices** 2002 – 2010
Consultant San Francisco, CA
 - Consulted for a group of attorneys as an investigator and computer expert on criminal, civil federal and state matters.
- **Holden High School** 2013 – 2014
Technology Instructor: Advanced Modeling & Rendering; Operating Systems Orinda, CA
 - Developed two custom curriculums encompassing: the fundamentals for 3d technical modeling and rendering; as well as a course on operating systems and general computer science.

Representative Cases:

<i>People v. Garcia</i> Super Ct. Alameda (2019)	Appointed as a forensic expert to testify and extract data otherwise unrecoverable with “traditional” law enforcement Cellebrite imaging in this murder trial. Court authorization was obtained for physical imaging; deleted text message content as well as Facebook Messenger data was presented to the jury.
<i>USA v. Reyes</i> USDC CAND (2019)	Appointed as a forensic expert to review evidence and testify re Apple iOS devices in connection with Find My iPad use, reliability, WiFi trilateration and myriad nuances with iOS revisions and device iteration history.
<i>Gu v. Qiao et al.</i> Super. Ct. SF (2018)	Retained as a video forensic expert to examine, enhance and testify re security footage in a unique fraud matter.
<i>O’Malley v. Roat</i> Super. Ct. Mendocino (2018)	Retained as a cell phone forensics expert to testify and opine re fraudulent phone calls and AppleID events (FaceTime) as items of evidentiary interest.
<i>Davis v. Spence</i> Super. Ct. SF (2017)	Retained to conduct security audit and investigation in connection with surreptitious electronic tracking and surveillance.
<i>People v. Reyes-Hernandez</i> Super. Ct. SF (2016)	Appointed as a cell phone forensics expert to preserve, extract, analyze and testify re cell tower geolocation data in a DV matter.
<i>People v. Singh</i> Super. Ct. SF (2016)	Appointed as a forensic expert in connection with unique motion for new trial to review and perform exhaustive analysis of new evidence never presented to the jury at trial.
<i>Veronica Foods v. Ecklin, et al.</i> USDC CAND (2016)	Retained as a forensic expert to reconstruct deleted content, timeline analysis and present evidence in connection with theft of IP.
<i>USA v. Babadjov</i> USDC CAND (2016)	Retained as a forensic expert in connection with electronic evidence obtained by the DEA/FBI from sales of heroin and fentanyl on the dark web marketplace AlphaBay (since seized) involving encryption keys and cryptocurrency verification.
<i>People v. Vogt</i> Super. Ct. San Mateo (2015)	Appointed as a forensic expert to review and testify re FBI omitted evidence and technical notes as well as new evidence missed during trial.
<i>People v. Juarez</i> Super. Ct. Contra Costa (2015)	Retained as a forensic expert to determine source of CP in a unique matter; case was dismissed due to strong forensic evidence concluding innocence.

<i>USA v. Wallace</i> USDC CAND (2014-2015)	Appointed as a forensic expert in connection with Facebook (“Spam King”) spamming matter to analyze and opine re ~250GB of seized data by the FBI consisting of code used to compromise over 400,000 Facebook accounts.
<i>USA v. Williams</i> USDC CAND (2014)	Appointed as a forensic expert in connection with over seven terabytes of “pole cam” (FBI hidden video surveillance) data. “Death-eligible,” multi-defendant RICO case.
<i>USA v. Larson</i> USDC CAND (2013)	Retained as a forensic expert to review FBI & local investigator’s forensic procedures and iPhone evidence seized in connection with this CP matter. Protected virtual machines and iPhone WiFi triangulation data were investigated in this case.
<i>Alegrett v. City and County of San Francisco</i> USDC CAND (2014)	Retained as a video forensic expert to assist at trial and enhance cell phone footage and synchronize/clarify audio in this police “excessive force” case against the City and County of San Francisco.
<i>People v. Niles Graham</i> Super. Ct. Contra Costa (2014)	Retained as a forensic expert to assist with meticulous iPhone photograph EXIF/metadata artifacts, iMessage and text message timestamps provided by the prosecution. This case ultimately settled due to strong forensic evidence.
<i>USA v. Vella</i> USDC CAND (2013-2014)	Retained as a forensic expert to review raw P2P data & review FBI/DOJ forensic procedures and discovery in this federal CP matter.
<i>In re Matter of J. Garcia</i> Super Ct. Alameda (2014)	Appointed as a forensic expert to review and testify re EXIF/metadata in photos and videos preserved from defendant’s Android cell phone. Court authorized the release of evidence to preserve and examine in greater detail.
<i>People v. Vasquez</i> Super Ct. SF (2013-2014)	Appointed as a forensic expert to review SFPD and US Dept. of Homeland Security forensic procedures and evidence in connection with this Ares P2P CP matter.
<i>People v. Ames</i> Super. Ct. Colorado (2013-2014)	Retained as a forensic video enhancement expert in a bank robbery case. Stabilized and enhanced security camera footage using a variety of expert-reproducible technical methods common to the visual effects industry to produce clear and sequential reviewing method to isolate evidence.
<i>People v. Rodriguez</i> Super. Ct. SF (2014)	Retained as a computer forensic expert to review and opine re evidence in an Ares/CP matter. Specifically, registry entries detailing keywords and methodology for tracking IP addresses associated with downloaded content.
<i>USA v. Miles</i> USDC CAND (2013-2014)	Appointed as a computer forensic expert in a “PayPal hacking”/distributed denial of service (“DDoS”) case. Determined extent of damages & prepared an exhibit detailing packet count for the court.
<i>USA v. Maness</i> USDC CAND (2013-2014)	Appointed as a computer forensic expert to determine whether evidence was destroyed by the defendant. Prepared chronology of electronic events that transpired on the system and removable media. Performed exhaustive timeline presentation of data events, cloud restoration logs and a myriad of system activity.
<i>USA v. Singer</i> USDC CAND (2013)	Retained as a computer forensic expert to examine and testify re bank/property fraud.

<i>People v. Fagen</i> Super. Ct. Contra Costa (2013)	Retained as a computer forensic expert to examine multiple systems with full-volume encryption and handle sensitive information for large corporations. Assisted counsel in all aspects of forensic investigation, drafted subpoenas to Google, Zynga, AT&T and Comcast; worked directly with the RCFL (Regional Computer Forensic Laboratory) and subpoenaed other agencies to coerce production of pertinent encryption keys. Case was dismissed due to a preponderance of forensic evidence supporting the defendant's narrative.
<i>USA v. Marlon</i> USDC CAND (2013)	Appointed as a cell phone expert to reconstruct tower location, calls, text messages and other electronic stored cell information.
<i>USA v. Napoli</i> USDC CAND (2012-2014)	Retained as a computer forensic expert and consultant in this online pharmacy fraud case with over four terabytes of electronic discovery. Retained for pre-trial, trial and appeal. Performed analysis of DEA and FBI forensic reports; conducted exhaustive investigative examinations of raw data on evidence systems produced by the government.
<i>USA v. Tillman</i> USDC NVD (2009-2013)	Appointed in this federal multi-defendant murder case. Traveled to the FBI and reviewed ballistics evidence with local investigator. Performed exhaustive technical documentation of evidence for counsel's review.
<i>People v. Allen</i> Super. Ct. Modesto (2008-2010)	Appointed in state capital law enforcement officer murder prosecution. Multi-system forensic analysis resulted in critical evidence which ultimately resulted in a rare life sentence, avoiding a costly trial. Moreover, the abundance of media coverage resulted in an extraordinary change of venue.
<i>USA v. Herrera</i> USDC CAND (2009-2014)	Appointed in multi-defendant MS-13 gang murder case. Performed cell tower record analysis of numerous interconnected phones, advanced "tower dump" data and detailed event and orientation (via azimuth) reconstruction.

TECHNICAL BACKGROUND

OPERATING SYSTEMS

- MS-DOS 6.22; Windows 3.1x, 95, 98, 2000/NT, XP/MCE, Windows Server / Vista / 7 / 8 / 10.
- Linux Operating Systems & command line.
- All versions of Apple desktop OS X/"MacOS"
- All iOS versions through 12.X (iPhone & iPad deployment, jailbreak, security, firewalls, SHSH, forensics)
- Legal: SIFT, CaseMap, Concordance, Summation, CaseVantage, FullAuthority.
- VMware Hypervisor/vSphere/ESX(I), Citrix XenServer/XenDesktop, Sun VirtualBox.
- Forensics: EnCase, FTK, Paraben Commander, Helix, WinHex, Wireshark, Autopsy, p2eXplorer, Oxygen Forensic Suite/Detective, Magnet Forensics IEF, Axiom, TestDisk, Ares Decrypter, BEncode, Magnet EDD, OSFClone, Plaso L2T, RegRipper, myriad flexible Linux CLI tools.

LANGUAGES

Bilingual: English & Spanish

Expert Statement #5: Manual Alteration of File Modified Time

Suppose we have a FAT-32 hard drive and FAT-16 compact flash card. Suppose, also, that a particular file, IMG_175, was downloaded from the CF card and backed up to the hard drive (HD), and that the tables below contain the file system data for IMG_175 on each device.

1. The EXIF metadata "CreatorTool: Photoshop Adobe Elements 3.0" would not have been added by the camera at creation time (on the CF card). This must have been added and thus EXIF metadata must have been modified after creation.
2. If EXIF metadata is modified, it means the file contents are modified.
3. If the file contents are modified after creation, the file system modified time (on the HD) should be different from the file creation time on the CF card.
4. Because they are the SAME and not DIFFERENT, the HD file system modified time and/or CF card creation time must have been altered manually to match.

Table 1: IMG_175 on the hard drive

File Modified Date	11/10/2005 20:25:04
EXIF Created Date	11/10/2005 20:25:04
EXIF CreatorTool	Photoshop Adobe Elements 3.0
EXIF Model	Canon EOS 20D

Table 2: IMG_175 on the CF card

File Modified Date	11/10/2005 20:25:04
File Created Date	11/10/2005 20:25:04

**Dr. Keshava Munegowda, PhD****• Education Qualifications:**

- PhD Computer Science and Engineering, Visvesvaraya Technological University, 2016. Research domain is File systems.
- Master of technology in Computer Science and Engineering, Visvesvaraya Technological University, 2004.
- Bachelor of Engineering in Computer Science and Engineering, Bangalore University, INDIA, 2001.

• Book on FAT File systems:

- "ExFAT and FAT File system Internals", November 2016, Amazon publications.

• Granted US patents on FAT File systems:

1. USPTO application number: 12326915 entitled "Storage Optimizations by Directory compaction in FAT File system", US patent number: 8429331.
2. USPTO application number: 12762829 entitled "FAT file in reserved cluster entry with ready entry state", US patent number: 8452734.
3. USPTO application number: 13870344, entitled "IC updating File system meta data with log record data", US patent number: 9043286
4. USPTO application number: 14075757 entitled "File access method and system there of", US patent number: 9569447
5. USPTO application number: 15413058 entitled "Method and System for File storage and access", US patent number: 9817837

EXHIBIT 3

1 A Yes, I did.

2 Q With respect to Government's Exhibit 508, which was the
3 first image we looked at, you testified that that was created
4 based on the EXIF data in December of 2005?

5 A Yes.

6 Q And with respect to 509, you testified that was with
7 respect to November 2005?

8 A Yes.

9 Q And with respect to the images in the remainder of the
10 folders, that's from folder BJ103005 through Msk101905, what
11 was the month and year of the images that we looked at
12 yesterday?

13 A That was October of '05.

14 Q Examiner Booth, you testified that you also created a
15 report with respect to the images in this folder, V110205, is
16 that right?

17 A That's correct.

18 Q Now, I'd like you to direct your attention to Government
19 Exhibit 518-A through U.

20 MS. HAJJAR: May I approach the witness, Your Honor?

21 THE COURT: Yes.

22 BY MS. HAJJAR:

23 Q Examiner Booth, can you just look at those exhibits?

24 A (Witness complies.) I have.

25 Q Are those exhibits images that were also reflected in

1 your report with respect to that folder?

2 A Yes, they were.

3 MS. HAJJAR: Your Honor, the Government offers
4 Government Exhibit 518-A through U.

5 MR. Der OHANNESIAN: No objection.

6 THE COURT: All right, Government Exhibit 518-A
7 through U received in evidence.

8 (Government's Exhibits 518-A through 518-U were
9 received in evidence.)

10 MS. HAJJAR: Your Honor, can I just retrieve
11 the book?

12 THE COURT: Yes, you may.

13 MS. HAJJAR: Your Honor, at this time, I would like
14 to ask that the images be published to the jury alone with
15 Special Agent Rees, if that's all right with Your Honor.

16 THE COURT: All right.

17 (Images shown to the jury alone.)

18 BY MS. HAJJAR:

19 Q Examiner Booth, the images that comprise those exhibits,
20 some of them are located in this folder (indicating), is that
21 right?

22 A Correct.

23 Q And what is the name of that folder?

24 A It's 2005-11-02-0422-20.

25 Q And the remaining images are located in this folder

1 (indicating)?

2 A Yes.

3 Q What's the name of that folder?

4 A 2005-11-24-0814-46.

5 Q And the title of the main folder that contains both those
6 folders?

7 A That is V110205.

8 Q Now, in connection with the report you created, was there
9 EXIF data for each of these photographs within that folder?

10 A Yes, there was.

11 Q I am showing you --

12 MS. HAJJAR: Can I show something just to the
13 witness, Your Honor?

14 THE COURT: Go ahead.

15 (Exhibit published to the witness alone.)

16 BY MS. HAJJAR:

17 Q I am showing you what's marked for identification as
18 Government Exhibit 504-B.

19 A No.

20 THE COURT: Go ahead.

21 MS. HAJJAR: Thank you.

22 Q Can you see that, Examiner Booth?

23 MS. HAJJAR: May I approach the witness with it,
24 Your Honor?

25 THE COURT: Yes, go ahead.

1 BY MS. HAJJAR:

2 Q Do you recognize this exhibit?

3 A Yes, I do.

4 Q And is this the EXIF data for the images that we just
5 discussed?

6 A Yes.

7 MS. HAJJAR: Your Honor, the Government offers
8 Government Exhibit 504-B into evidence.

9 MR. Der OHANNESIAN: No objection.

10 THE COURT: All right, Exhibit 504-B is received in
11 evidence.

12 (Government's Exhibit 504-B was received in
13 evidence.)

14 MS. HAJJAR: May I publish it, Your Honor?

15 THE COURT: Yes, let us see.

16 (Exhibit published.)

17 THE COURT: Okay. All right.

18 MS. HAJJAR: Thank you.

19 Q Examiner Booth, this exhibit is not the entirety of the
20 report you created with respect to that folder, is that right?

21 A No, it isn't.

22 Q It's just the EXIF data?

23 A Yes.

24 Q Okay. And so for the first page of Government
25 Exhibit 504, that's the first image we looked at, Image --

1 sorry, just referring to Government Exhibit 550, that's the
2 first image here (indicating)?

3 (Exhibit published.)

4 A Yes, it is.

5 Q And what is the EXIF image make and model?

6 A The make is a Cannon EOS 20D.

7 Q And the date and time?

8 A The date/time original is 2005:11:02 17:59:16.

9 Q And that's November 2nd, 2005?

10 A Yes, it is.

11 Q Turning to page 11 of the same exhibit, it's the same
12 camera for Image 0151.

13 And what's the date and time?

14 A The original date and time is 2005:11:02 17:59:25.

15 Q And that's, again, November 2nd?

16 A Yes, it is.

17 THE COURT: Do you have the serial number of the
18 camera?

19 BY MS. HAJJAR:

20 Q So turning your attention, Examiner Booth, to page 16 of
21 that exhibit.

22 (Exhibit published.)

23 Q That's, again, the Cannon EOS 20D camera?

24 A Yes.

25 Q And what's the serial number?

1 A The serial number is 1420908348.

2 Q Is that the same serial number as all of the images we've
3 been discussing this far?

4 A Yes, I believe it is.

5 Q Turning your attention to page 31, this is for
6 Image 0153.

7 The same camera associated with this?

8 A Yes.

9 Q What's the date and time?

10 A The date/time original is 2005:11:02 17:59:34.

11 Q And turning to page 41, this is for Image 154. What's
12 the date and time?

13 A Date/time original is 2005:11:02 17:59:47.

14 Q The following image, which is on page 51. The date and
15 time?

16 A The time original is 2005:11:02 18:00:22.

17 Q For the following image, Image 156, is that, again,
18 November 2nd, 2005?

19 A Yes.

20 Q And the following image, again, November 2nd, 2005?

21 A Yes, it is.

22 Q And the same for the following image, 158?

23 A Yes, it is.

24 Q The following image as well, 159?

25 A Yes, it is.

1 Q And 160, the same, November 2nd, 2005?

2 A Yes.

3 Q And the same for 161?

4 A Yes.

5 Q As well as 162?

6 A Yes.

7 Q As well as 163?

8 A Yes.

9 Q Now, I want to direct your attention quickly to
10 Government Exhibit 550 again.

11 (Exhibit published.)

12 BY MS. HAJJAR:

13 Q Each of the images we looked at were dated November 2nd,
14 2005.

15 Are they within the folder titled 2005-11-02?

16 A Yes, they are.

17 Q Okay. The remaining images are within 2005-11-24, is
18 that right?

19 A Correct.

20 Q And so starting with the first image of that segment,
21 which is -- what's the name of the first image in that folder?

22 A That is IMG_0104.

23 Q Sorry. I'll just zoom in a bit on Government
24 Exhibit 550.

25 A Oh, 184.

1 Q Okay.

2 So the remaining images span from Image 184 through
3 Image 191, is that right?

4 A Correct.

5 Q So with respect to the EXIF data for Image 184, what's
6 the date and time?

7 A The date/time original is 2005:11:24.

8 Q So that image was taken November 24th, 2005?

9 A Correct.

10 Q And is it the same camera, Cannon camera?

11 A Yes, it is.

12 Q And turning to the -- page 146 for that image, is it the
13 same serial number?

14 A Yes, it is.

15 Q Then turning to the following image, Image 185, is the
16 date and time the same -- the -- not the time, necessarily,
17 but the date, November 24th, 2005?

18 A Yes, it is.

19 Q And for the following image, 186, is this also the same
20 date, November 24th, 2005?

21 A Yes, it is.

22 Q And the next image as well, the same date?

23 A Yes, it is.

24 Q And Image 188, the following image, same date?

25 A Yes, it is.

1 Q And image --

2 THE COURT: We can't see the number.

3 MS. HAJJAR: I'm sorry. There we go.

4 THE COURT: Go ahead.

5 BY MS. HAJJAR:

6 Q Image 189, the same date?

7 A Yes, it is.

8 Q The last image, which is Image 190, is it the same date?

9 A Yes, it is.

10 Q Did you observe anything about the times of the images in
11 sequence?

12 A The times, in general, weren't -- as far as -- as far as
13 the seconds are concerned, were sporadic. So they're not in
14 one-second order. So it's not like 28 seconds, 29 seconds,
15 30 seconds. They're grouped in -- a little off. So I gather
16 that just would be standard.

17 Q What do you mean by --

18 A They're not just scattered around. They were not in an
19 order, just like where it's one second, every two seconds you
20 get a picture. So it doesn't seem to be a timer, it seems to
21 be just normal usage of a camera.

22 Q Can you explain that? What do you mean?

23 A Well, you might take a picture every one or two seconds.
24 And, you know, depending if you're at a party, you know how
25 many pictures you take at a party. You're not taking one

1 every two seconds and it's timed every two seconds, unless you
2 have it on a timer. So it's going to be sporadic.

3 Q So it's not regular, in other words, the images -- the
4 time and -- the specific time of each image in sequence?

5 A Yeah, it's not a regular pattern where it's every two
6 seconds. So it does not appear to be on a timer.

7 Q And, Examiner Booth, the EXIF data we just examined, they
8 reflect two dates on which the images were taken?

9 A Yes.

10 Q November 2nd, 2005, and November 24th, 2005?

11 A Correct.

12 MS. HAJJAR: No further questions, Your Honor.

13 THE COURT: Cross-examination.

14 CROSS-EXAMINATION

15 BY MR. der OHANNESIAN:

16 Q Good morning. Is it Mr. Booth?

17 A Yes, it is.

18 Q Is that your official title that I should use?

19 A You may.

20 Q Okay, thank you.

21 In terms of the material you reviewed, is it only
22 your material that you reviewed?

23 A Yes.

24 Q Do you understand my -- did you review any material
25 prepared by anyone else, either from the FBI, any other lab or

EXHIBIT 4

1 A Which -- which metadata are you specifically --

2 Q The date accessed.

3 A You're talking from the file system?

4 Q I'm talking about the data that we just looked at.

5 A That file system data appears to have been changed.

6 Q When we say "changed," it was changed while it was in the
7 possession of the FBI?

8 A If I'm taking the dates on when we received it, it would
9 appear so.

10 Q And the dates that you received just now came from your
11 report, correct?

12 A Yes.

13 Q That you generated as evidence in the case against --
14 United States against Keith Raniere, correct?

15 A Yes.

16 Q The goal of forensic examination is to preserve the
17 electronic data, so that the metadata doesn't change, correct?

18 A Correct.

19 Q Do you know the name of the person who accessed the SD or
20 media card, Exhibit 524, on September 19, 2018?

21 A No, I do not.

22 Q Do you have any record in any piece of evidence or notes
23 that reflects the accessing of Government Exhibit 524 by any
24 representative of the FBI on September 19, 2018?

25 A No, I do not.

EXHIBIT 5

1 **BRIAN BOOTH,**

2 previously called as a witness by the Government, having
3 been previously duly sworn/affirmed by the Courtroom
4 Deputy, was examined and testified further under oath as
5 follows:

6 CROSS-EXAMINATION CONTINUED

7 BY MR. der OHANNESIAN:

8 Q Mr. Booth, I'm going to show you some items first.

9 MR. der OHANNESIAN: Judge, this will just be for
10 the witness.

11 THE COURT: All right, let me see.

12 Go ahead.

13 Q This is Exhibit 945, which we looked at from this
14 morning. And could you reiterate what 945 is?

15 A 945 is the package sheet from the digital camera piece of
16 evidence.

17 Q And does this include the data card, Exhibit 524, or not?

18 A From what I -- my understanding was that was what was
19 obtained outside the -- or inside the actual camera.

20 Q So do you know if there is a separate document for the
21 data device?

22 A No, there isn't.

23 Q Then I want to show you document 960.

24 What is that?

25 A It's a evidence bar code. It's 1B16. It's the -- one

1 red rope containing the Western Digital storage device.

2 Q And what do you call this document?

3 A This is the evidence sheet.

4 Q And this would be for the Western Digital drive?

5 A Yes.

6 MR. der OHANNESIAN: I'll offer 945 and 960 at this
7 time.

8 MS. HAJJAR: No objection.

9 THE COURT: All right, Defense Exhibits 945 and 960
10 are received in evidence.

11 (Defendant's Exhibits 945 and 960 were received in
12 evidence.)

13 BY MR. der OHANNESIAN:

14 Q Mr. Booth, Exhibits 945 and 960 are in evidence. If you
15 need them to answer my questions, please ask me for them.

16 A Okay.

17 MR. der OHANNESIAN: This will be just for the
18 witness, Your Honor.

19 Q This is several sheets of paper. So what I am going to
20 do is show it to you directly, so you can look through all of
21 them, rather than my doing it from the ELMO.

22 MR. der OHANNESIAN: Is that okay, Your Honor, if I
23 give it to the witness?

24 THE COURT: Sure.

25 THE WITNESS: (Witness complies.)

1 BY MR. der OHANNESIAN:

2 Q First, the number on that exhibit on the front page, just
3 so I -- for the record, is DX what?

4 A DX 961.

5 Q And what is DX 961?

6 A DX 961 is a rough draft of the examination notes.

7 Q Are those the notes that you were referring to this
8 morning?

9 A Yes, I am.

10 Q That you said you didn't have?

11 A Yes.

12 Q That might help you answer some questions?

13 A Yes.

14 Q Does it contain the photos that were taken in this case
15 also?

16 A Yes, they do.

17 Q Okay. And, again, if you need that to answer my
18 questions, to refresh your recollection, just let me know.

19 The first question is: Are there any photos that
20 were taken of the box in which the Cannon camera and storage
21 device were located?

22 A No, there wasn't.

23 Q Now, you can answer that with certainty, correct?

24 A Yes, because the -- because of the speed of having to do
25 the camera at this point, and that the camera was also

1 produced in court already, that I just needed to
2 actually process the item, and get it -- get the item
3 processed.

4 Q When you say the camera was produced in court, when was
5 that?

6 A I think it was that morning, if I'm -- if I'm not
7 mistaken. I wasn't in court, so I don't know.

8 Q Will those notes in Exhibit 961 help you answer that
9 question, if you believe the camera was produced in some court
10 proceeding?

11 A No.

12 Q Okay. That's just your guess?

13 A Yeah, that was what I heard from someone on the squad.
14 So I don't know for sure.

15 Q That's not reflected in the notes, correct?

16 A No, it's not reflected in the notes.

17 Q Does Exhibit 961 help you answer the question when the
18 Cannon camera and storage device were delivered to the FBI
19 CART office?

20 A No, the evidence sheet would have that information.

21 Q Is that one of the two exhibits that we just put in
22 evidence?

23 A Yes, I would believe it would be.

24 Q Looking at Exhibit 945.

25 (Exhibit published.)

1 A That's the Cannon camera?

2 Q Yes.

3 A Yes.

4 Q And this morning, I think -- looking at the first page,
5 does that tell you when it came to the CART office?

6 A You'll have to scroll down a little -- scroll up a little
7 bit, and it's up to the right. It says when we received it.

8 (Exhibit published.)

9 A You're going down. You need to go up.

10 Q What's the date?

11 A You need to go up.

12 THE COURT: To the top of the page?

13 THE WITNESS: Yes, top of the page.

14 THE COURT: Hold on.

15 MR. der OHANNESIAN: This can be for the jury.

16 THE COURT: Yes, I know. I just want it to be up.
17 Yeah, okay.

18 (Exhibit published.)

19 THE WITNESS: And you need to move it to the left a
20 little bit, so I can see it.

21 MR. der OHANNESIAN: Here you go.

22 THE WITNESS: 3/27 of '18.

23 BY MR. der OHANNESIAN:

24 Q So March 27th, 2018, is when the Cannon camera and
25 Exhibit 524 were delivered to the lab?

1 A Yes.

2 Q And do your notes now, Exhibit 961, help you answer the
3 question when the Cannon camera and storage device, 524, were
4 first examined by the CART unit?

5 A The -- the -- my notes reflect when I examined and had
6 access to the Cannon camera.

7 Q Okay. And that's what --

8 A And only -- and only me having access to that.

9 Q And what do your notes reflect?

10 A I received it on 6/10 of '19.

11 Q June 10th, 2019?

12 A Yes.

13 Q And then you generated a report, correct?

14 A Correct.

15 Q And February 22nd is when the CART office first put an
16 evidence sticker on the device, correct?

17 A Correct.

18 Q And then June 11th is your initials when you did your
19 work with this device, correct?

20 A Correct.

21 Q You prepared a report concerning the metadata obtained
22 from the storage device, which is Exhibit 524, correct?

23 A Correct.

24 Q Exhibit 521, which is in evidence, contains information
25 about metadata associated with images from this electronic

EXHIBIT 6

1 A Which -- which metadata are you specifically --

2 Q The date accessed.

3 A You're talking from the file system?

4 Q I'm talking about the data that we just looked at.

5 A That file system data appears to have been changed.

6 Q When we say "changed," it was changed while it was in the
7 possession of the FBI?

8 A If I'm taking the dates on when we received it, it would
9 appear so.

10 Q And the dates that you received just now came from your
11 report, correct?

12 A Yes.

13 Q That you generated as evidence in the case against --
14 United States against Keith Raniere, correct?

15 A Yes.

16 Q The goal of forensic examination is to preserve the
17 electronic data, so that the metadata doesn't change, correct?

18 A Correct.

19 Q Do you know the name of the person who accessed the SD or
20 media card, Exhibit 524, on September 19, 2018?

21 A No, I do not.

22 Q Do you have any record in any piece of evidence or notes
23 that reflects the accessing of Government Exhibit 524 by any
24 representative of the FBI on September 19, 2018?

25 A No, I do not.

EXHIBIT 7

1 device, correct?

2 A Correct.

3 Q It's okay to call it an electronic device?

4 A Yes, you can.

5 Q And when we talk about the metadata in this case for this
6 card, it would include when it was created, correct?

7 A The metadata will have a date/time that would say a
8 created date.

9 Q When it was accessed?

10 A It will have an access time/date.

11 Q And when it was modified?

12 A And modified dates, yes.

13 Q And was this device also taken through the process of
14 write copied -- write protected?

15 A When it was in my hands it was write protected, yes.

16 Q Can you tell me when that was?

17 A That happened on 6/11.

18 Q And, again, the reason you write protect to be -- the --
19 whether it's a hard drive or a piece of data, like this data
20 disk, forensically you don't access it directly, correct?

21 A No, we don't.

22 Q And that's what you described yesterday to the
23 prosecutor, that's what you described to me this morning,
24 correct?

25 A Correct.

1 Q And that's very, very important, correct?

2 A Yes, it is.

3 Q Because you want to maintain the integrity of the
4 electronic evidence?

5 A Yes, I do.

6 Q I'd like to take you to -- this is page 84 of
7 Exhibit 521. And I'd like to begin with JPEG on top here,
8 224.

9 (Exhibit published.)

10 BY MR. der OHANNESIAN:

11 Q First of all, I want to make sure you can read that.

12 A I can see it.

13 Q You say that this image was created on March 9th, 2006?

14 A That's the created date that's --

15 Q Yes?

16 A That's the created date that's listed for the file.

17 Q It was modified on March 9, 2006?

18 A That's the modified date that's reflected from the file
19 system.

20 Q And then it was accessed, correct, on a certain date?

21 A Yes, I see it's been accessed.

22 Q It was accessed on September 19, 2018, correct?

23 A Correct.

24 Q Look at exhibit -- the same exhibit, Image 225.

25 The next item reflects what might be called "carved

1 data"?

2 A Yes.

3 Q Okay. It doesn't mean the image doesn't exist on the
4 computer, though, correct?

5 A Well, if you're talking about the EXIF HTML, is that what
6 you're referencing?

7 Q No. Well, for example, right below it you see Image 225?

8 A Yes.

9 Q Let's continue. Image 225 created in March 9, 2006,
10 correct?

11 A Correct.

12 Q Modified in 2006 and it was accessed on September 19,
13 2018, correct?

14 A Correct.

15 Q And that's according to what you're reading off this
16 Exhibit 524, correct?

17 A Correct.

18 Q And Image 227, that was also accessed on September 19,
19 2018, correct?

20 A Correct.

21 Q Exhibit [sic] 228 was accessed on September 19, 2018?

22 A Which number again, excuse me?

23 Q 228.

24 A Yes.

25 Q Image 229, that was also accessed on September 19, 2018,

1 correct?

2 A Correct.

3 Q Image 230 was accessed on September 19, 2018, correct?

4 A Correct.

5 Q Image 231, JPEG, accessed on September 19, 2018? Is that
6 what the access date is?

7 A Is that a question or --

8 Q Yes. My question is: Does your report, in Exhibit 521-A
9 of the Government, reflect that JPEG Image 231 was accessed on
10 September 19, 2008 [sic]?

11 A Correct.

12 Q Does your report reflect that Image 233 was accessed on
13 September 19, 2018?

14 A Correct.

15 THE COURT: Could you repeat that?

16 MR. der OHANNESIAN: Yes.

17 BY MR. der OHANNESIAN:

18 Q Does your report reflect that JPEG Image 233 was accessed
19 by September 19 -- on September 19, 2018?

20 A Correct.

21 Q Image 234, JPEG, accessed on September 19, 2018?

22 A Correct.

23 Q Image 235 accessed on September 19, 2018?

24 A Correct.

25 Q Image 236 accessed on September 9, 2018?

1 A Correct.

2 Q Image 237, on page 89 continuing into page 90, accessed
3 on September 9, 2018?

4 A Correct.

5 Q Image 238 accessed on September 19, 2018?

6 A Correct.

7 Q JPEG 241 accessed on September 19, 2018?

8 A Correct.

9 Q There is no entry for JPEG 242 in the report.

10 On JPEG 243, that was accessed on September 19,
11 2018?

12 THE COURT: He can't see it.

13 MR. der OHANNESIAN: I'm sorry.

14 THE WITNESS: Yes.

15 (Exhibit published.)

16 BY MR. der OHANNESIAN:

17 Q Is that correct?

18 A Correct.

19 Q The metadata for JPEGs 224, 225, 227 to 241, and 243 from
20 Government Exhibit 524, the media card, changed after it was
21 collected on March 27, 2018, correct?

22 A The access dates appear to be.

23 Q The metadata for Exhibit 524, the media card, reflects
24 that the digital evidence on Exhibit 524 changed while it was
25 in the possession of the FBI, correct?

EXHIBIT 8

1 A Yes.

2 Q And do your notes now, Exhibit 961, help you answer the
3 question when the Cannon camera and storage device, 524, were
4 first examined by the CART unit?

5 A The -- the -- my notes reflect when I examined and had
6 access to the Cannon camera.

7 Q Okay. And that's what --

8 A And only -- and only me having access to that.

9 Q And what do your notes reflect?

10 A I received it on 6/10 of '19.

11 Q June 10th, 2019?

12 A Yes.

13 Q And then you generated a report, correct?

14 A Correct.

15 Q And February 22nd is when the CART office first put an
16 evidence sticker on the device, correct?

17 A Correct.

18 Q And then June 11th is your initials when you did your
19 work with this device, correct?

20 A Correct.

21 Q You prepared a report concerning the metadata obtained
22 from the storage device, which is Exhibit 524, correct?

23 A Correct.

24 Q Exhibit 521, which is in evidence, contains information
25 about metadata associated with images from this electronic

EXHIBIT 9

1 (Exhibit published to the jury.)

2 A Yes it does.

3 Q This tells you the date that the agent may have collected
4 it, March 27?

5 A Yes.

6 Q You said there was no sealed bag for the camera, correct?

7 A No. It was a box that I received it in.

8 Q And there was no sealed bag for the LEXAR card, correct?

9 A I don't recall it being sealed.

10 (Exhibit published to the jury.)

11 Q This hard drive, this cannot be accessed without being
12 connected to another device, correct?

13 A Correct.

14 Q It's like a thumb drive; by itself, you can't just look
15 at what's on it without connecting it with something, correct?

16 A Correct.

17 Q Now, you mentioned a LaCie hard drive, correct, LaCie?

18 A I don't recall mentioning a LaCie hard drive. Unless
19 you're talking about in other pieces of evidence --

20 MR. DER OHANNESIAN: Ms. Hajjar?

21 (Exhibit published to the jury.)

22 Q Very quickly, can you read Exhibit 560 on it?

23 A Government Exhibit 560.

24 Q And see on the back there's a CART signature?

25 A Yes, I do.

1 BY MR. DER OHANNESIAN (Continuing):

2 Q Would it be fair to say you have no information on what
3 happened to the camera prior to the time that you examined it?

4 A Well, with the evidence sheet, we know a path of who has
5 gotten the evidence at any point in between me and it actually
6 being obtained out in the field.

7 Q And who was it that had access to the camera or the box
8 prior to the time of your examination of it?

9 A I don't have that evidence sheet in front of me to be
10 able to refer.

11 Q If you had that evidence sheet, could you answer that
12 question?

13 A Yes, I could.

14 Q And with respect to Government Exhibit 524, the LEXAR
15 card, was that submitted to you in a bag of some sort?

16 A Yeah, it was a cellophane bag.

17 Q Was it a sealed cellophane bag?

18 A No, it was not.

19 Q Was Government Exhibit 524, LEXAR datacard, in the box?

20 A Yes, it was.

21 Q The box you previously described with the camera?

22 A Yes.

23 Q Was there a separate piece of paper which would identify
24 who, if anyone, had access to that datacard prior to your
25 examination of it?

1 recreate them or if another examiner needs to recreate them,
2 we can do that.

3 Q And would those typewritten notes reflect the condition
4 or how you received Government Exhibit 503?

5 A Yes, it would.

6 Q Whether it was a paper or plastic bag?

7 A Yes, it would.

8 Q And whether it was sealed or not?

9 A Correct.

10 Q Do you know, without referring to those notes, whether
11 you received Government Exhibit 503 in a sealed or unsealed
12 bag?

13 A From what I recall, it was sealed. We -- we had to open
14 up the seals on all the evidence that we got.

15 Q And with respect to Government Exhibit 520, the Cannon
16 camera, do you recall if that was in a sealed bag when you
17 received it?

18 A No, that -- that was in a box, a cardboard box. And, no,
19 the box, itself, was not sealed at the time.

20 Q So the Cannon camera, which is Government Exhibit 520,
21 was not in a bag, correct?

22 A The Cannon camera was in a Cannon camera bag in a brown
23 paper box.

24 Q Okay. And was there any seal with respect to the box
25 that the camera was in?

EXHIBIT 10

Expert Statement #1A: The Time Shifts

Suppose we have a set of pictures on a FAT-32 hard drive that were taken on a FAT-16 compact flash card, downloaded onto a Windows computer and then backed up to a FAT-32 hard drive. Also suppose these pictures are taken by a camera, a Canon EOS 20D, which does not record time-zone information.¹

Assumption:

When a picture is taken with the Canon EOS 20D and the FAT-16 CF card, the EXIF DateTimeOriginal is within a few seconds of the FAT Date Modified.²

Observation:

Table 1 contains the timestamp data for these pictures on the hard drive. In that table, we observe the following:

- From IMG_0138.JPG onwards ("Group 1"): the EXIF DateTimeOriginal is within a few seconds of the FAT Modified Date, as expected.
- For IMG_0043.JPG – IMG_0126.JPG ("Group 2"), excluding IMG_0114.JPG which is not present on the hard drive: the EXIF DateTimeOriginal is ahead of the FAT Modified date by one hour, within a few seconds.
- For IMG_0127.JPG – IMG_0137.JPG ("Group 3"): the EXIF DateTimeOriginal is ahead of the FAT Modified date by two hours, within a few seconds.

Possible Explanations:

Here are possible explanations for the time differences observed in Groups 2 and 3:

1. **Automatic:** The computer automatically applied a time-zone shift to the FAT Date Modified, which could have occurred
 - a. During the copy operation from the CF card to the computer
 - b. By using normal computer programs to modify the file groups
 - c. During the copy operation from the computer to the hard drive
2. **Manual:** The FAT Date Modified or the EXIF DateTimeOriginal were manually altered after the pictures had been copied from the CF card.

Let us disprove Explanations 1a-c below.

Disproving Explanation 1a:

In order for the computer to adjust for time-zone when copying from the CF card, there would need to be time-zone information in the source data. However, FAT-16 does not store time-zone information in the file system and, as previously stated, the Canon EOS 20D camera does not store time-zone information either. Therefore, Explanation 1a is not valid.

Disproving Explanation 1b:

For the FAT Modified Dates to be almost exactly one hour or two hours behind the EXIF DateTimeOriginals (within a few seconds), the computer clock would need to be set back for each of the 94 pictures and modified exactly one hour (if Group 2) or two hours (if Group 3) before the corresponding EXIF DateTimeOriginal. That would involve up to 94 clock changes. This would not occur automatically, especially not as the result of an automatic time-zone shift.

¹ See enclosed letter from Mr. Steven Alexander dated October 9, 2020.

² See enclosed letter from Mr. Steven Alexander dated October 11, 2020.


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Author and File Systems Expert

10/23/2020

Additionally, this being done manually is exceedingly implausible, if not unprecedented, especially considering these pictures appear to be taken over multiple months.

Disproving Explanation 1c:

Because the hard-drive (FAT-32) does not store time-zone information, the only way that the copy operation to the hard drive would introduce different time-zone shifts is if the computer time-zone was different between Groups 1, 2 and 3.

Table 2 shows the order in which the pictures were copied to the hard drive. As the table shows, the time-zone would need to have been changed 5 times during the copy operation.

Table 3 shows the FAT Create Dates for all of the contents of "Studies", the folder in which all the pictures reside. The pictures are organized into subfolders under "Studies." From the FAT Create Date we see that the entire directory was copied in a bulk operation that took less than two minutes, with no time gaps, from 7/26/03 11:05:03 AM to 11:06:38 AM. Those datetimes are from the computer clock.

The computer could not have been moved across multiple time-zones in less than two minutes. Therefore, someone would have needed to change the time-zone five times within two minutes, sometimes taking 11 seconds or so to change the time-zone twice (see IMG_0223.JPG – IMG_0099.JPG in Table 2) This would be exceedingly difficult to do manually, and it would be highly implausible that someone could do this or would attempt this.

Conclusion

Having ruled Explanations 1a-c as invalid or highly implausible, the only remaining explanation is Explanation 2: Someone manually altered either the FAT Date Modified and/or EXIF DateTimeOriginal for at least 94 pictures (Groups 2 and 3) present on the hard drive, after they had been copied from the CF card.



Dr. Keshava Munegowda, PhD

- **Education Qualifications:**

- PhD Computer Science and Engineering, Visvesvaraya Technological University, 2016. Research domain is File systems.
- Master of technology in Computer Science and Engineering, Visvesvaraya Technological University, 2004.
- Bachelor of Engineering in Computer Science and Engineering, Bangalore University, INDIA, 2001.

- **Book on FAT File systems:**

- "ExFAT and FAT File System Internals", November 2016, Amazon publications.

- **Granted US patents on FAT File systems:**

1. USPTO application number: 12326915 entitled "Storage Optimizations by Directory compaction in FAT File system", US patent number: 8429331.

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2. USPTO application number: 12762829 entitled "FAT file in reserved cluster entry with ready entry state", US patent number: 8452734.
3. USPTO application number: 13870344, entitled "IC updating File system meta data with log record data", US patent number: 9043286
4. USPTO application number: 14075757 entitled "File access method and system there of", US patent number: 9569447
5. USPTO application number: 15413058 entitled "Method and System for File storage and access", US patent number: 9817837

Table 1 : Pictures on hard drive, sorted by EXIF DateTimeOriginal

FILE_NAME	HD FAT Modified Date	HD EXIF DateTimeOriginal	HD FAT Create Date	Time Shift Between FAT Modified and EXIF DateTimeOriginal (up to a few seconds)
IMG_0043.JPG	10/16/05 11:30:04 PM	10/17/05 12:30:04 AM	7/26/03 11:05:58 AM	1
IMG_0044.JPG	10/17/05 3:53:24 PM	10/17/05 4:53:22 PM	7/26/03 11:05:58 AM	1
IMG_0045.JPG	10/17/05 3:53:40 PM	10/17/05 4:53:40 PM	7/26/03 11:05:59 AM	1
IMG_0046.JPG	10/17/05 3:54:08 PM	10/17/05 4:54:09 PM	7/26/03 11:05:59 AM	1
IMG_0047.JPG	10/17/05 3:54:24 PM	10/17/05 4:54:24 PM	7/26/03 11:05:59 AM	1
IMG_0048.JPG	10/17/05 3:54:38 PM	10/17/05 4:54:38 PM	7/26/03 11:06:00 AM	1
IMG_0049.JPG	10/17/05 3:54:54 PM	10/17/05 4:54:54 PM	7/26/03 11:06:00 AM	1
IMG_0050.JPG	10/17/05 3:55:04 PM	10/17/05 4:55:05 PM	7/26/03 11:06:00 AM	1
IMG_0051.JPG	10/17/05 3:55:28 PM	10/17/05 4:55:28 PM	7/26/03 11:06:01 AM	1
IMG_0052.JPG	10/17/05 3:55:42 PM	10/17/05 4:55:41 PM	7/26/03 11:06:02 AM	1
IMG_0053.JPG	10/17/05 3:55:54 PM	10/17/05 4:55:52 PM	7/26/03 11:06:02 AM	1
IMG_0054.JPG	10/17/05 3:55:58 PM	10/17/05 4:55:59 PM	7/26/03 11:06:02 AM	1
IMG_0055.JPG	10/17/05 3:56:24 PM	10/17/05 4:56:25 PM	7/26/03 11:06:03 AM	1
IMG_0056.JPG	10/17/05 3:56:36 PM	10/17/05 4:56:36 PM	7/26/03 11:06:03 AM	1
IMG_0057.JPG	10/17/05 3:56:48 PM	10/17/05 4:56:48 PM	7/26/03 11:06:03 AM	1
IMG_0058.JPG	10/17/05 3:56:58 PM	10/17/05 4:56:58 PM	7/26/03 11:06:04 AM	1
IMG_0059-1.JPG	10/17/05 9:00:58 PM	10/17/05 10:00:57 PM	7/26/03 11:06:14 AM	1
IMG_0060-1.JPG	10/17/05 9:01:06 PM	10/17/05 10:01:07 PM	7/26/03 11:06:15 AM	1
IMG_0061-1.JPG	10/17/05 9:01:12 PM	10/17/05 10:01:13 PM	7/26/03 11:06:15 AM	1
IMG_0062-1.JPG	10/17/05 9:01:24 PM	10/17/05 10:01:24 PM	7/26/03 11:06:16 AM	1
IMG_0063-1.JPG	10/17/05 9:01:32 PM	10/17/05 10:01:32 PM	7/26/03 11:06:16 AM	1
IMG_0064-1.JPG	10/17/05 9:02:00 PM	10/17/05 10:02:00 PM	7/26/03 11:06:17 AM	1
IMG_0065-1.JPG	10/17/05 9:02:08 PM	10/17/05 10:02:07 PM	7/26/03 11:06:17 AM	1
IMG_0066-1.JPG	10/17/05 9:02:14 PM	10/17/05 10:02:13 PM	7/26/03 11:06:17 AM	1
IMG_0067-1.JPG	10/17/05 9:02:34 PM	10/17/05 10:02:34 PM	7/26/03 11:06:18 AM	1
IMG_0068-1.JPG	10/17/05 9:03:02 PM	10/17/05 10:03:01 PM	7/26/03 11:06:19 AM	1
IMG_0069-1.JPG	10/17/05 9:03:10 PM	10/17/05 10:03:10 PM	7/26/03 11:06:19 AM	1
IMG_0070-1.JPG	10/17/05 9:03:24 PM	10/17/05 10:03:24 PM	7/26/03 11:06:20 AM	1
IMG_0071.JPG	10/18/05 7:32:06 PM	10/18/05 8:32:06 PM	7/26/03 11:05:26 AM	1
IMG_0072.JPG	10/18/05 7:32:26 PM	10/18/05 8:32:26 PM	7/26/03 11:05:26 AM	1
IMG_0073.JPG	10/18/05 7:32:36 PM	10/18/05 8:32:36 PM	7/26/03 11:05:27 AM	1
IMG_0074.JPG	10/18/05 7:32:44 PM	10/18/05 8:32:44 PM	7/26/03 11:05:27 AM	1
IMG_0075.JPG	10/18/05 7:33:08 PM	10/18/05 8:33:09 PM	7/26/03 11:05:28 AM	1
IMG_0076.JPG	10/18/05 7:33:14 PM	10/18/05 8:33:15 PM	7/26/03 11:05:28 AM	1
IMG_0077.JPG	10/18/05 7:33:22 PM	10/18/05 8:33:22 PM	7/26/03 11:05:29 AM	1
IMG_0078.JPG	10/18/05 7:33:30 PM	10/18/05 8:33:30 PM	7/26/03 11:05:29 AM	1
IMG_0079.JPG	10/19/05 5:54:08 PM	10/19/05 6:54:09 PM	7/26/03 11:05:20 AM	1
IMG_0080.JPG	10/19/05 5:54:22 PM	10/19/05 6:54:23 PM	7/26/03 11:05:21 AM	1
IMG_0081.JPG	10/19/05 5:54:32 PM	10/19/05 6:54:33 PM	7/26/03 11:05:21 AM	1


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IMG_0082.JPG	10/19/05 5:54:56 PM	10/19/05 6:54:57 PM	7/26/03 11:05:21 AM	1
IMG_0083.JPG	10/19/05 5:55:10 PM	10/19/05 6:55:10 PM	7/26/03 11:05:22 AM	1
IMG_0084.JPG	10/19/05 5:55:36 PM	10/19/05 6:55:37 PM	7/26/03 11:05:22 AM	1
IMG_0085.JPG	10/19/05 5:55:48 PM	10/19/05 6:55:49 PM	7/26/03 11:05:23 AM	1
IMG_0086.JPG	10/19/05 5:55:56 PM	10/19/05 6:55:57 PM	7/26/03 11:05:23 AM	1
IMG_0087.JPG	10/19/05 5:56:08 PM	10/19/05 6:56:09 PM	7/26/03 11:05:24 AM	1
IMG_0088.JPG	10/19/05 5:56:24 PM	10/19/05 6:56:24 PM	7/26/03 11:05:24 AM	1
IMG_0089.JPG	10/19/05 5:56:34 PM	10/19/05 6:56:34 PM	7/26/03 11:05:24 AM	1
IMG_0090.JPG	10/19/05 6:32:52 PM	10/19/05 7:32:51 PM	7/26/03 11:06:08 AM	1
IMG_0091.JPG	10/19/05 6:32:58 PM	10/19/05 7:32:57 PM	7/26/03 11:06:08 AM	1
IMG_0092.JPG	10/19/05 6:33:08 PM	10/19/05 7:33:09 PM	7/26/03 11:06:09 AM	1
IMG_0093.JPG	10/19/05 6:33:18 PM	10/19/05 7:33:18 PM	7/26/03 11:06:09 AM	1
IMG_0094.JPG	10/19/05 6:33:26 PM	10/19/05 7:33:25 PM	7/26/03 11:06:10 AM	1
IMG_0095.JPG	10/19/05 6:33:30 PM	10/19/05 7:33:29 PM	7/26/03 11:06:10 AM	1
IMG_0096.JPG	10/19/05 6:33:52 PM	10/19/05 7:33:51 PM	7/26/03 11:06:10 AM	1
IMG_0097.JPG	10/19/05 6:33:58 PM	10/19/05 7:33:57 PM	7/26/03 11:06:11 AM	1
IMG_0098.JPG	10/19/05 6:34:08 PM	10/19/05 7:34:08 PM	7/26/03 11:06:11 AM	1
IMG_0099.JPG	10/20/05 3:20:12 PM	10/20/05 4:20:13 PM	7/26/03 11:05:45 AM	1
IMG_0100.JPG	10/20/05 3:20:30 PM	10/20/05 4:20:31 PM	7/26/03 11:05:46 AM	1
IMG_0101.JPG	10/20/05 3:20:44 PM	10/20/05 4:20:44 PM	7/26/03 11:05:46 AM	1
IMG_0102.JPG	10/20/05 3:21:02 PM	10/20/05 4:21:02 PM	7/26/03 11:05:46 AM	1
IMG_0103.JPG	10/20/05 3:21:28 PM	10/20/05 4:21:28 PM	7/26/03 11:05:47 AM	1
IMG_0104.JPG	10/20/05 3:25:14 PM	10/20/05 4:25:14 PM	7/26/03 11:05:47 AM	1
IMG_0105.JPG	10/20/05 3:26:56 PM	10/20/05 4:26:56 PM	7/26/03 11:05:47 AM	1
IMG_0106.JPG	10/20/05 3:27:04 PM	10/20/05 4:27:03 PM	7/26/03 11:05:48 AM	1
IMG_0107.JPG	10/20/05 3:49:24 PM	10/20/05 4:49:23 PM	7/26/03 11:05:48 AM	1
IMG_0108.JPG	10/20/05 3:49:26 PM	10/20/05 4:49:26 PM	7/26/03 11:05:49 AM	1
IMG_0109.JPG	10/20/05 3:49:30 PM	10/20/05 4:49:29 PM	7/26/03 11:05:49 AM	1
IMG_0110.JPG	10/29/05 4:11:16 AM	10/29/05 5:11:16 AM	7/26/03 11:05:51 AM	1
IMG_0111.JPG	10/29/05 4:11:42 AM	10/29/05 5:11:43 AM	7/26/03 11:05:51 AM	1
IMG_0112.JPG	10/29/05 4:43:36 AM	10/29/05 5:43:36 AM	7/26/03 11:05:52 AM	1
IMG_0113.JPG	10/29/05 4:43:54 AM	10/29/05 5:43:54 AM	7/26/03 11:05:52 AM	1
IMG_0115.JPG	10/29/05 4:44:52 AM	10/29/05 5:44:52 AM	7/26/03 11:05:52 AM	1
IMG_0116.JPG	10/29/05 4:44:56 AM	10/29/05 5:44:55 AM	7/26/03 11:05:53 AM	1
IMG_0117.JPG	10/29/05 4:45:06 AM	10/29/05 5:45:06 AM	7/26/03 11:05:53 AM	1
IMG_0118.JPG	10/29/05 4:45:20 AM	10/29/05 5:45:20 AM	7/26/03 11:05:54 AM	1
IMG_0119.JPG	10/29/05 4:45:26 AM	10/29/05 5:45:25 AM	7/26/03 11:05:54 AM	1
IMG_0120.JPG	10/29/05 4:45:40 AM	10/29/05 5:45:40 AM	7/26/03 11:05:55 AM	1
IMG_0121.JPG	10/29/05 4:45:50 AM	10/29/05 5:45:50 AM	7/26/03 11:05:55 AM	1
IMG_0122.JPG	10/29/05 4:46:00 AM	10/29/05 5:46:00 AM	7/26/03 11:05:55 AM	1
IMG_0123.JPG	10/29/05 4:47:00 AM	10/29/05 5:46:59 AM	7/26/03 11:05:56 AM	1
IMG_0124.JPG	10/29/05 4:47:06 AM	10/29/05 5:47:05 AM	7/26/03 11:05:56 AM	1
IMG_0125.JPG	10/29/05 4:47:10 AM	10/29/05 5:47:11 AM	7/26/03 11:05:57 AM	1
IMG_0126.JPG	10/29/05 4:47:24 AM	10/29/05 5:47:24 AM	7/26/03 11:05:57 AM	1
IMG_0127.JPG	10/30/05 2:34:20 AM	10/30/05 4:34:20 AM	7/26/03 11:05:40 AM	2
IMG_0128.JPG	10/30/05 2:35:14 AM	10/30/05 4:35:14 AM	7/26/03 11:05:40 AM	2
IMG_0129.JPG	10/30/05 2:36:06 AM	10/30/05 4:36:05 AM	7/26/03 11:05:41 AM	2
IMG_0130.JPG	10/30/05 2:36:42 AM	10/30/05 4:36:42 AM	7/26/03 11:05:41 AM	2
IMG_0131.JPG	10/30/05 2:36:54 AM	10/30/05 4:36:55 AM	7/26/03 11:05:42 AM	2
IMG_0132.JPG	10/30/05 2:37:12 AM	10/30/05 4:37:12 AM	7/26/03 11:05:42 AM	2
IMG_0133.JPG	10/30/05 2:37:44 AM	10/30/05 4:37:45 AM	7/26/03 11:05:43 AM	2
IMG_0134.JPG	10/30/05 2:37:58 AM	10/30/05 4:37:58 AM	7/26/03 11:05:43 AM	2
IMG_0135.JPG	10/30/05 2:38:00 AM	10/30/05 4:38:00 AM	7/26/03 11:05:44 AM	2
IMG_0136.JPG	10/30/05 3:39:00 AM	10/30/05 5:39:00 AM	7/26/03 11:05:44 AM	2
IMG_0137.JPG	10/30/05 3:39:06 AM	10/30/05 5:39:06 AM	7/26/03 11:05:45 AM	2
IMG_0138.JPG	10/30/05 4:55:42 PM	10/30/05 4:55:41 PM	7/26/03 11:06:22 AM	0


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IMG_0139.JPG	10/30/05 4:55:52 PM	10/30/05 4:55:51 PM	7/26/03 11:06:23 AM	0
IMG_0140.JPG	10/30/05 4:56:20 PM	10/30/05 4:56:21 PM	7/26/03 11:06:23 AM	0
IMG_0141.JPG	10/30/05 4:56:46 PM	10/30/05 4:56:46 PM	7/26/03 11:06:24 AM	0
IMG_0142.JPG	10/30/05 4:57:12 PM	10/30/05 4:57:12 PM	7/26/03 11:06:24 AM	0
IMG_0143.JPG	10/30/05 6:01:08 PM	10/30/05 6:01:08 PM	7/26/03 11:06:24 AM	0
IMG_0144.JPG	10/30/05 6:01:14 PM	10/30/05 6:01:14 PM	7/26/03 11:06:25 AM	0
IMG_0145.JPG	10/30/05 6:01:20 PM	10/30/05 6:01:19 PM	7/26/03 11:06:25 AM	0
IMG_0146.JPG	10/30/05 6:01:28 PM	10/30/05 6:01:28 PM	7/26/03 11:06:26 AM	0
IMG_0147.JPG	10/30/05 6:02:08 PM	10/30/05 6:02:08 PM	7/26/03 11:06:26 AM	0
IMG_0148.JPG	10/30/05 6:02:14 PM	10/30/05 6:02:15 PM	7/26/03 11:06:26 AM	0
IMG_0149.JPG	10/30/05 6:02:22 PM	10/30/05 6:02:22 PM	7/26/03 11:06:27 AM	0
IMG_0150.JPG	11/2/05 5:59:16 PM	11/02/05 5:59:16 PM	7/26/03 11:05:11 AM	0
IMG_0151.JPG	11/2/05 5:59:26 PM	11/02/05 5:59:25 PM	7/26/03 11:05:12 AM	0
IMG_0152.JPG	11/2/05 5:59:30 PM	11/02/05 5:59:30 PM	7/26/03 11:05:12 AM	0
IMG_0153.JPG	11/2/05 5:59:34 PM	11/02/05 5:59:34 PM	7/26/03 11:05:12 AM	0
IMG_0154.JPG	11/2/05 5:59:48 PM	11/02/05 5:59:47 PM	7/26/03 11:05:13 AM	0
IMG_0155.JPG	11/2/05 6:00:22 PM	11/02/05 6:00:22 PM	7/26/03 11:05:13 AM	0
IMG_0156.JPG	11/2/05 6:00:30 PM	11/02/05 6:00:29 PM	7/26/03 11:05:14 AM	0
IMG_0157.JPG	11/2/05 6:00:38 PM	11/02/05 6:00:38 PM	7/26/03 11:05:14 AM	0
IMG_0158.JPG	11/2/05 6:00:48 PM	11/02/05 6:00:49 PM	7/26/03 11:05:14 AM	0
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IMG_0163.JPG	11/2/05 6:09:10 PM	11/02/05 6:09:11 PM	7/26/03 11:05:16 AM	0
IMG_0164.JPG	11/10/05 8:22:18 PM	11/10/05 8:22:18 PM	7/26/03 11:06:29 AM	0
IMG_0165.JPG	11/10/05 8:22:30 PM	11/10/05 8:22:30 PM	7/26/03 11:06:29 AM	0
IMG_0168.JPG	11/10/05 8:23:12 PM	11/10/05 8:23:12 PM	7/26/03 11:06:29 AM	0
IMG_0169.JPG	11/10/05 8:23:26 PM	11/10/05 8:23:26 PM	7/26/03 11:06:30 AM	0
IMG_0172.JPG	11/10/05 8:24:20 PM	11/10/05 8:24:19 PM	7/26/03 11:06:30 AM	0
IMG_0174.JPG	11/10/05 8:24:48 PM	11/10/05 8:24:47 PM	7/26/03 11:06:31 AM	0
IMG_0175.JPG	11/10/05 8:25:04 PM	11/10/05 8:25:04 PM	7/26/03 11:06:31 AM	0
IMG_0176.JPG	11/10/05 8:25:10 PM	11/10/05 8:25:11 PM	7/26/03 11:06:31 AM	0
IMG_0177.JPG	11/10/05 8:25:36 PM	11/10/05 8:25:35 PM	7/26/03 11:06:32 AM	0
IMG_0178.JPG	11/10/05 8:25:54 PM	11/10/05 8:25:54 PM	7/26/03 11:06:32 AM	0
IMG_0179.JPG	11/10/05 8:26:04 PM	11/10/05 8:26:04 PM	7/26/03 11:06:33 AM	0
IMG_0180.JPG	11/10/05 8:26:22 PM	11/10/05 8:26:22 PM	7/26/03 11:06:33 AM	0
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IMG_0183.JPG	11/10/05 8:27:34 PM	11/10/05 8:27:33 PM	7/26/03 11:06:34 AM	0
IMG_0184.JPG	11/24/05 9:07:50 PM	11/24/05 9:07:50 PM	7/26/03 11:05:08 AM	0
IMG_0185.JPG	11/24/05 9:07:56 PM	11/24/05 9:07:55 PM	7/26/03 11:05:09 AM	0
IMG_0186.JPG	11/24/05 9:08:08 PM	11/24/05 9:08:07 PM	7/26/03 11:05:09 AM	0
IMG_0187.JPG	11/24/05 9:09:52 PM	11/24/05 9:09:52 PM	7/26/03 11:05:09 AM	0
IMG_0188.JPG	11/24/05 9:10:08 PM	11/24/05 9:10:08 PM	7/26/03 11:05:10 AM	0
IMG_0189.JPG	11/24/05 9:10:22 PM	11/24/05 9:10:23 PM	7/26/03 11:05:10 AM	0
IMG_0190.JPG	11/24/05 9:10:28 PM	11/24/05 9:10:28 PM	7/26/03 11:05:10 AM	0
IMG_0191.JPG	11/24/05 9:10:38 PM	11/24/05 9:10:37 PM	7/26/03 11:05:11 AM	0
IMG_0194.JPG	12/18/05 12:37:58 AM	12/18/05 12:37:58 AM	7/26/03 11:05:18 AM	0
IMG_0197.JPG	12/18/05 12:38:20 AM	12/18/05 12:38:20 AM	7/26/03 11:05:19 AM	0
IMG_0198.JPG	12/18/05 12:38:28 AM	12/18/05 12:38:28 AM	7/26/03 11:05:19 AM	0
IMG_0199.JPG	12/18/05 12:38:56 AM	12/18/05 12:38:55 AM	7/26/03 11:05:20 AM	0
IMG_0203.JPG	12/25/05 2:59:44 AM	12/25/05 2:59:44 AM	7/26/03 11:06:36 AM	0
IMG_0204.JPG	12/25/05 2:59:50 AM	12/25/05 2:59:50 AM	7/26/03 11:06:36 AM	0
IMG_0205.JPG	12/25/05 3:00:42 AM	12/25/05 3:00:42 AM	7/26/03 11:06:37 AM	0
IMG_0206.JPG	12/25/05 3:00:50 AM	12/25/05 3:00:49 AM	7/26/03 11:06:37 AM	0

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IMG_0207.JPG	12/25/05 3:01:40 AM	12/25/05 3:01:40 AM	7/26/03 11:06:37 AM	0
IMG_0208.JPG	12/25/05 3:01:46 AM	12/25/05 3:01:46 AM	7/26/03 11:06:38 AM	0
IMG_0209.JPG	12/30/05 5:56:06 PM	12/30/05 5:56:05 PM	7/26/03 11:05:34 AM	0
IMG_0210.JPG	12/30/05 5:56:12 PM	12/30/05 5:56:11 PM	7/26/03 11:05:34 AM	0
IMG_0211.JPG	12/30/05 5:56:16 PM	12/30/05 5:56:15 PM	7/26/03 11:05:34 AM	0
IMG_0212.JPG	12/30/05 5:56:20 PM	12/30/05 5:56:20 PM	7/26/03 11:05:35 AM	0
IMG_0213.JPG	12/30/05 5:56:46 PM	12/30/05 5:56:46 PM	7/26/03 11:05:35 AM	0
IMG_0214.JPG	12/30/05 5:56:54 PM	12/30/05 5:56:53 PM	7/26/03 11:05:36 AM	0
IMG_0215.JPG	12/30/05 5:56:56 PM	12/30/05 5:56:56 PM	7/26/03 11:05:36 AM	0
IMG_0216.JPG	12/30/05 5:57:00 PM	12/30/05 5:56:59 PM	7/26/03 11:05:37 AM	0
IMG_0217.JPG	12/30/05 5:58:50 PM	12/30/05 5:58:50 PM	7/26/03 11:05:37 AM	0
IMG_0218.JPG	12/30/05 5:59:00 PM	12/30/05 5:58:59 PM	7/26/03 11:05:37 AM	0
IMG_0219.JPG	12/30/05 5:59:08 PM	12/30/05 5:59:07 PM	7/26/03 11:05:38 AM	0
IMG_0220.JPG	12/30/05 5:59:18 PM	12/30/05 5:59:18 PM	7/26/03 11:05:38 AM	0
IMG_0221.JPG	12/30/05 5:59:56 PM	12/30/05 5:59:56 PM	7/26/03 11:05:39 AM	0
IMG_0222.JPG	12/30/05 6:00:08 PM	12/30/05 6:00:08 PM	7/26/03 11:05:39 AM	0
IMG_0223.JPG	12/30/05 6:00:24 PM	12/30/05 6:00:24 PM	7/26/03 11:05:39 AM	0

Table 2: Pictures on hard drive, sorted by FAT Date Created

FILE_NAME	HD FAT Modified Date	HD EXIF DateTimeOriginal	HD FAT Create Date	Time Shift Between FAT Modified and EXIF DateTimeOriginal (up to a few seconds)
IMG_0184.JPG	11/24/05 9:07:50 PM	11/24/05 9:07:50 PM	7/26/03 11:05:08 AM	0
IMG_0185.JPG	11/24/05 9:07:56 PM	11/24/05 9:07:55 PM	7/26/03 11:05:09 AM	0
IMG_0186.JPG	11/24/05 9:08:08 PM	11/24/05 9:08:07 PM	7/26/03 11:05:09 AM	0
IMG_0187.JPG	11/24/05 9:09:52 PM	11/24/05 9:09:52 PM	7/26/03 11:05:09 AM	0
IMG_0188.JPG	11/24/05 9:10:08 PM	11/24/05 9:10:08 PM	7/26/03 11:05:10 AM	0
IMG_0189.JPG	11/24/05 9:10:22 PM	11/24/05 9:10:23 PM	7/26/03 11:05:10 AM	0
IMG_0190.JPG	11/24/05 9:10:28 PM	11/24/05 9:10:28 PM	7/26/03 11:05:10 AM	0
IMG_0191.JPG	11/24/05 9:10:38 PM	11/24/05 9:10:37 PM	7/26/03 11:05:11 AM	0
IMG_0150.JPG	11/2/05 5:59:16 PM	11/02/05 5:59:16 PM	7/26/03 11:05:11 AM	0
IMG_0151.JPG	11/2/05 5:59:26 PM	11/02/05 5:59:25 PM	7/26/03 11:05:12 AM	0
IMG_0152.JPG	11/2/05 5:59:30 PM	11/02/05 5:59:30 PM	7/26/03 11:05:12 AM	0
IMG_0153.JPG	11/2/05 5:59:34 PM	11/02/05 5:59:34 PM	7/26/03 11:05:12 AM	0
IMG_0154.JPG	11/2/05 5:59:48 PM	11/02/05 5:59:47 PM	7/26/03 11:05:13 AM	0
IMG_0155.JPG	11/2/05 6:00:22 PM	11/02/05 6:00:22 PM	7/26/03 11:05:13 AM	0
IMG_0156.JPG	11/2/05 6:00:30 PM	11/02/05 6:00:29 PM	7/26/03 11:05:14 AM	0
IMG_0157.JPG	11/2/05 6:00:38 PM	11/02/05 6:00:38 PM	7/26/03 11:05:14 AM	0
IMG_0158.JPG	11/2/05 6:00:48 PM	11/02/05 6:00:49 PM	7/26/03 11:05:14 AM	0
IMG_0159.JPG	11/2/05 6:01:10 PM	11/02/05 6:01:10 PM	7/26/03 11:05:15 AM	0
IMG_0160.JPG	11/2/05 6:01:18 PM	11/02/05 6:01:18 PM	7/26/03 11:05:15 AM	0
IMG_0161.JPG	11/2/05 6:09:00 PM	11/02/05 6:08:59 PM	7/26/03 11:05:15 AM	0
IMG_0162.JPG	11/2/05 6:09:02 PM	11/02/05 6:09:02 PM	7/26/03 11:05:16 AM	0
IMG_0163.JPG	11/2/05 6:09:10 PM	11/02/05 6:09:11 PM	7/26/03 11:05:16 AM	0
IMG_0194.JPG	12/18/05 12:37:58 AM	12/18/05 12:37:58 AM	7/26/03 11:05:18 AM	0
IMG_0197.JPG	12/18/05 12:38:20 AM	12/18/05 12:38:20 AM	7/26/03 11:05:19 AM	0
IMG_0198.JPG	12/18/05 12:38:28 AM	12/18/05 12:38:28 AM	7/26/03 11:05:19 AM	0
IMG_0199.JPG	12/18/05 12:38:56 AM	12/18/05 12:38:55 AM	7/26/03 11:05:20 AM	0
IMG_0079.JPG	10/19/05 5:54:08 PM	10/19/05 6:54:09 PM	7/26/03 11:05:20 AM	1
IMG_0080.JPG	10/19/05 5:54:22 PM	10/19/05 6:54:23 PM	7/26/03 11:05:21 AM	1
IMG_0081.JPG	10/19/05 5:54:32 PM	10/19/05 6:54:33 PM	7/26/03 11:05:21 AM	1


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IMG_0082.JPG	10/19/05 5:54:56 PM	10/19/05 6:54:57 PM	7/26/03 11:05:21 AM	1
IMG_0083.JPG	10/19/05 5:55:10 PM	10/19/05 6:55:10 PM	7/26/03 11:05:22 AM	1
IMG_0084.JPG	10/19/05 5:55:36 PM	10/19/05 6:55:37 PM	7/26/03 11:05:22 AM	1
IMG_0085.JPG	10/19/05 5:55:48 PM	10/19/05 6:55:49 PM	7/26/03 11:05:23 AM	1
IMG_0086.JPG	10/19/05 5:55:56 PM	10/19/05 6:55:57 PM	7/26/03 11:05:23 AM	1
IMG_0087.JPG	10/19/05 5:56:08 PM	10/19/05 6:56:09 PM	7/26/03 11:05:24 AM	1
IMG_0088.JPG	10/19/05 5:56:24 PM	10/19/05 6:56:24 PM	7/26/03 11:05:24 AM	1
IMG_0089.JPG	10/19/05 5:56:34 PM	10/19/05 6:56:34 PM	7/26/03 11:05:24 AM	1
IMG_0071.JPG	10/18/05 7:32:06 PM	10/18/05 8:32:06 PM	7/26/03 11:05:26 AM	1
IMG_0072.JPG	10/18/05 7:32:26 PM	10/18/05 8:32:26 PM	7/26/03 11:05:26 AM	1
IMG_0073.JPG	10/18/05 7:32:36 PM	10/18/05 8:32:36 PM	7/26/03 11:05:27 AM	1
IMG_0074.JPG	10/18/05 7:32:44 PM	10/18/05 8:32:44 PM	7/26/03 11:05:27 AM	1
IMG_0075.JPG	10/18/05 7:33:08 PM	10/18/05 8:33:09 PM	7/26/03 11:05:28 AM	1
IMG_0076.JPG	10/18/05 7:33:14 PM	10/18/05 8:33:15 PM	7/26/03 11:05:28 AM	1
IMG_0077.JPG	10/18/05 7:33:22 PM	10/18/05 8:33:22 PM	7/26/03 11:05:29 AM	1
IMG_0078.JPG	10/18/05 7:33:30 PM	10/18/05 8:33:30 PM	7/26/03 11:05:29 AM	1
IMG_0209.JPG	12/30/05 5:56:06 PM	12/30/05 5:56:05 PM	7/26/03 11:05:34 AM	0
IMG_0210.JPG	12/30/05 5:56:12 PM	12/30/05 5:56:11 PM	7/26/03 11:05:34 AM	0
IMG_0211.JPG	12/30/05 5:56:16 PM	12/30/05 5:56:15 PM	7/26/03 11:05:34 AM	0
IMG_0212.JPG	12/30/05 5:56:20 PM	12/30/05 5:56:20 PM	7/26/03 11:05:35 AM	0
IMG_0213.JPG	12/30/05 5:56:46 PM	12/30/05 5:56:46 PM	7/26/03 11:05:35 AM	0
IMG_0214.JPG	12/30/05 5:56:54 PM	12/30/05 5:56:53 PM	7/26/03 11:05:36 AM	0
IMG_0215.JPG	12/30/05 5:56:56 PM	12/30/05 5:56:56 PM	7/26/03 11:05:36 AM	0
IMG_0216.JPG	12/30/05 5:57:00 PM	12/30/05 5:56:59 PM	7/26/03 11:05:37 AM	0
IMG_0217.JPG	12/30/05 5:58:50 PM	12/30/05 5:58:50 PM	7/26/03 11:05:37 AM	0
IMG_0218.JPG	12/30/05 5:59:00 PM	12/30/05 5:58:59 PM	7/26/03 11:05:37 AM	0
IMG_0219.JPG	12/30/05 5:59:08 PM	12/30/05 5:59:07 PM	7/26/03 11:05:38 AM	0
IMG_0220.JPG	12/30/05 5:59:18 PM	12/30/05 5:59:18 PM	7/26/03 11:05:38 AM	0
IMG_0221.JPG	12/30/05 5:59:56 PM	12/30/05 5:59:56 PM	7/26/03 11:05:39 AM	0
IMG_0222.JPG	12/30/05 6:00:08 PM	12/30/05 6:00:08 PM	7/26/03 11:05:39 AM	0
IMG_0223.JPG	12/30/05 6:00:24 PM	12/30/05 6:00:24 PM	7/26/03 11:05:39 AM	0
IMG_0127.JPG	10/30/05 2:34:20 AM	10/30/05 4:34:20 AM	7/26/03 11:05:40 AM	2
IMG_0128.JPG	10/30/05 2:35:14 AM	10/30/05 4:35:14 AM	7/26/03 11:05:40 AM	2
IMG_0129.JPG	10/30/05 2:36:06 AM	10/30/05 4:36:05 AM	7/26/03 11:05:41 AM	2
IMG_0130.JPG	10/30/05 2:36:42 AM	10/30/05 4:36:42 AM	7/26/03 11:05:41 AM	2
IMG_0131.JPG	10/30/05 2:36:54 AM	10/30/05 4:36:55 AM	7/26/03 11:05:42 AM	2
IMG_0132.JPG	10/30/05 2:37:12 AM	10/30/05 4:37:12 AM	7/26/03 11:05:42 AM	2
IMG_0133.JPG	10/30/05 2:37:44 AM	10/30/05 4:37:45 AM	7/26/03 11:05:43 AM	2
IMG_0134.JPG	10/30/05 2:37:58 AM	10/30/05 4:37:58 AM	7/26/03 11:05:43 AM	2
IMG_0135.JPG	10/30/05 2:38:00 AM	10/30/05 4:38:00 AM	7/26/03 11:05:44 AM	2
IMG_0136.JPG	10/30/05 3:39:00 AM	10/30/05 5:39:00 AM	7/26/03 11:05:44 AM	2
IMG_0137.JPG	10/30/05 3:39:06 AM	10/30/05 5:39:06 AM	7/26/03 11:05:45 AM	2
IMG_0099.JPG	10/20/05 3:20:12 PM	10/20/05 4:20:13 PM	7/26/03 11:05:45 AM	1
IMG_0100.JPG	10/20/05 3:20:30 PM	10/20/05 4:20:31 PM	7/26/03 11:05:46 AM	1
IMG_0101.JPG	10/20/05 3:20:44 PM	10/20/05 4:20:44 PM	7/26/03 11:05:46 AM	1
IMG_0102.JPG	10/20/05 3:21:02 PM	10/20/05 4:21:02 PM	7/26/03 11:05:46 AM	1
IMG_0103.JPG	10/20/05 3:21:28 PM	10/20/05 4:21:28 PM	7/26/03 11:05:47 AM	1
IMG_0104.JPG	10/20/05 3:25:14 PM	10/20/05 4:25:14 PM	7/26/03 11:05:47 AM	1
IMG_0105.JPG	10/20/05 3:26:56 PM	10/20/05 4:26:56 PM	7/26/03 11:05:47 AM	1
IMG_0106.JPG	10/20/05 3:27:04 PM	10/20/05 4:27:03 PM	7/26/03 11:05:48 AM	1
IMG_0107.JPG	10/20/05 3:49:24 PM	10/20/05 4:49:23 PM	7/26/03 11:05:48 AM	1
IMG_0108.JPG	10/20/05 3:49:26 PM	10/20/05 4:49:26 PM	7/26/03 11:05:49 AM	1
IMG_0109.JPG	10/20/05 3:49:30 PM	10/20/05 4:49:29 PM	7/26/03 11:05:49 AM	1
IMG_0110.JPG	10/29/05 4:11:16 AM	10/29/05 5:11:16 AM	7/26/03 11:05:51 AM	1
IMG_0111.JPG	10/29/05 4:11:42 AM	10/29/05 5:11:43 AM	7/26/03 11:05:51 AM	1

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10/23/2020

IMG_0112.JPG	10/29/05 4:43:36 AM	10/29/05 5:43:36 AM	7/26/03 11:05:52 AM	1
IMG_0113.JPG	10/29/05 4:43:54 AM	10/29/05 5:43:54 AM	7/26/03 11:05:52 AM	1
IMG_0115.JPG	10/29/05 4:44:52 AM	10/29/05 5:44:52 AM	7/26/03 11:05:52 AM	1
IMG_0116.JPG	10/29/05 4:44:56 AM	10/29/05 5:44:55 AM	7/26/03 11:05:53 AM	1
IMG_0117.JPG	10/29/05 4:45:06 AM	10/29/05 5:45:06 AM	7/26/03 11:05:53 AM	1
IMG_0118.JPG	10/29/05 4:45:20 AM	10/29/05 5:45:20 AM	7/26/03 11:05:54 AM	1
IMG_0119.JPG	10/29/05 4:45:26 AM	10/29/05 5:45:25 AM	7/26/03 11:05:54 AM	1
IMG_0120.JPG	10/29/05 4:45:40 AM	10/29/05 5:45:40 AM	7/26/03 11:05:55 AM	1
IMG_0121.JPG	10/29/05 4:45:50 AM	10/29/05 5:45:50 AM	7/26/03 11:05:55 AM	1
IMG_0122.JPG	10/29/05 4:46:00 AM	10/29/05 5:46:00 AM	7/26/03 11:05:55 AM	1
IMG_0123.JPG	10/29/05 4:47:00 AM	10/29/05 5:46:59 AM	7/26/03 11:05:56 AM	1
IMG_0124.JPG	10/29/05 4:47:06 AM	10/29/05 5:47:05 AM	7/26/03 11:05:56 AM	1
IMG_0125.JPG	10/29/05 4:47:10 AM	10/29/05 5:47:11 AM	7/26/03 11:05:57 AM	1
IMG_0126.JPG	10/29/05 4:47:24 AM	10/29/05 5:47:24 AM	7/26/03 11:05:57 AM	1
IMG_0043.JPG	10/16/05 11:30:04 PM	10/17/05 12:30:04 AM	7/26/03 11:05:58 AM	1
IMG_0044.JPG	10/17/05 3:53:24 PM	10/17/05 4:53:22 PM	7/26/03 11:05:58 AM	1
IMG_0045.JPG	10/17/05 3:53:40 PM	10/17/05 4:53:40 PM	7/26/03 11:05:59 AM	1
IMG_0046.JPG	10/17/05 3:54:08 PM	10/17/05 4:54:09 PM	7/26/03 11:05:59 AM	1
IMG_0047.JPG	10/17/05 3:54:24 PM	10/17/05 4:54:24 PM	7/26/03 11:05:59 AM	1
IMG_0048.JPG	10/17/05 3:54:38 PM	10/17/05 4:54:38 PM	7/26/03 11:06:00 AM	1
IMG_0049.JPG	10/17/05 3:54:54 PM	10/17/05 4:54:54 PM	7/26/03 11:06:00 AM	1
IMG_0050.JPG	10/17/05 3:55:04 PM	10/17/05 4:55:05 PM	7/26/03 11:06:00 AM	1
IMG_0051.JPG	10/17/05 3:55:28 PM	10/17/05 4:55:28 PM	7/26/03 11:06:01 AM	1
IMG_0052.JPG	10/17/05 3:55:42 PM	10/17/05 4:55:41 PM	7/26/03 11:06:02 AM	1
IMG_0053.JPG	10/17/05 3:55:54 PM	10/17/05 4:55:52 PM	7/26/03 11:06:02 AM	1
IMG_0054.JPG	10/17/05 3:55:58 PM	10/17/05 4:55:59 PM	7/26/03 11:06:02 AM	1
IMG_0055.JPG	10/17/05 3:56:24 PM	10/17/05 4:56:25 PM	7/26/03 11:06:03 AM	1
IMG_0056.JPG	10/17/05 3:56:36 PM	10/17/05 4:56:36 PM	7/26/03 11:06:03 AM	1
IMG_0057.JPG	10/17/05 3:56:48 PM	10/17/05 4:56:48 PM	7/26/03 11:06:03 AM	1
IMG_0058.JPG	10/17/05 3:56:58 PM	10/17/05 4:56:58 PM	7/26/03 11:06:04 AM	1
IMG_0090.JPG	10/19/05 6:32:52 PM	10/19/05 7:32:51 PM	7/26/03 11:06:08 AM	1
IMG_0091.JPG	10/19/05 6:32:58 PM	10/19/05 7:32:57 PM	7/26/03 11:06:08 AM	1
IMG_0092.JPG	10/19/05 6:33:08 PM	10/19/05 7:33:09 PM	7/26/03 11:06:09 AM	1
IMG_0093.JPG	10/19/05 6:33:18 PM	10/19/05 7:33:18 PM	7/26/03 11:06:09 AM	1
IMG_0094.JPG	10/19/05 6:33:26 PM	10/19/05 7:33:25 PM	7/26/03 11:06:10 AM	1
IMG_0095.JPG	10/19/05 6:33:30 PM	10/19/05 7:33:29 PM	7/26/03 11:06:10 AM	1
IMG_0096.JPG	10/19/05 6:33:52 PM	10/19/05 7:33:51 PM	7/26/03 11:06:10 AM	1
IMG_0097.JPG	10/19/05 6:33:58 PM	10/19/05 7:33:57 PM	7/26/03 11:06:11 AM	1
IMG_0098.JPG	10/19/05 6:34:08 PM	10/19/05 7:34:08 PM	7/26/03 11:06:11 AM	1
IMG_0059-1.JPG	10/17/05 9:00:58 PM	10/17/05 10:00:57 PM	7/26/03 11:06:14 AM	1
IMG_0060-1.JPG	10/17/05 9:01:06 PM	10/17/05 10:01:07 PM	7/26/03 11:06:15 AM	1
IMG_0061-1.JPG	10/17/05 9:01:12 PM	10/17/05 10:01:13 PM	7/26/03 11:06:15 AM	1
IMG_0062-1.JPG	10/17/05 9:01:24 PM	10/17/05 10:01:24 PM	7/26/03 11:06:16 AM	1
IMG_0063-1.JPG	10/17/05 9:01:32 PM	10/17/05 10:01:32 PM	7/26/03 11:06:16 AM	1
IMG_0064-1.JPG	10/17/05 9:02:00 PM	10/17/05 10:02:00 PM	7/26/03 11:06:17 AM	1
IMG_0065-1.JPG	10/17/05 9:02:08 PM	10/17/05 10:02:07 PM	7/26/03 11:06:17 AM	1
IMG_0066-1.JPG	10/17/05 9:02:14 PM	10/17/05 10:02:13 PM	7/26/03 11:06:17 AM	1
IMG_0067-1.JPG	10/17/05 9:02:34 PM	10/17/05 10:02:34 PM	7/26/03 11:06:18 AM	1
IMG_0068-1.JPG	10/17/05 9:03:02 PM	10/17/05 10:03:01 PM	7/26/03 11:06:19 AM	1
IMG_0069-1.JPG	10/17/05 9:03:10 PM	10/17/05 10:03:10 PM	7/26/03 11:06:19 AM	1
IMG_0070-1.JPG	10/17/05 9:03:24 PM	10/17/05 10:03:24 PM	7/26/03 11:06:20 AM	1
IMG_0138.JPG	10/30/05 4:55:42 PM	10/30/05 4:55:41 PM	7/26/03 11:06:22 AM	0
IMG_0139.JPG	10/30/05 4:55:52 PM	10/30/05 4:55:51 PM	7/26/03 11:06:23 AM	0
IMG_0140.JPG	10/30/05 4:56:20 PM	10/30/05 4:56:21 PM	7/26/03 11:06:23 AM	0
IMG_0141.JPG	10/30/05 4:56:46 PM	10/30/05 4:56:46 PM	7/26/03 11:06:24 AM	0


[Dr. KESHAVA MUNEGOWDA]

Dr. Keshava Munegowda

Author and File Systems Expert

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IMG_0142.JPG	10/30/05 4:57:12 PM	10/30/05 4:57:12 PM	7/26/03 11:06:24 AM	0
IMG_0143.JPG	10/30/05 6:01:08 PM	10/30/05 6:01:08 PM	7/26/03 11:06:24 AM	0
IMG_0144.JPG	10/30/05 6:01:14 PM	10/30/05 6:01:14 PM	7/26/03 11:06:25 AM	0
IMG_0145.JPG	10/30/05 6:01:20 PM	10/30/05 6:01:19 PM	7/26/03 11:06:25 AM	0
IMG_0146.JPG	10/30/05 6:01:28 PM	10/30/05 6:01:28 PM	7/26/03 11:06:26 AM	0
IMG_0147.JPG	10/30/05 6:02:08 PM	10/30/05 6:02:08 PM	7/26/03 11:06:26 AM	0
IMG_0148.JPG	10/30/05 6:02:14 PM	10/30/05 6:02:15 PM	7/26/03 11:06:26 AM	0
IMG_0149.JPG	10/30/05 6:02:22 PM	10/30/05 6:02:22 PM	7/26/03 11:06:27 AM	0
IMG_0164.JPG	11/10/05 8:22:18 PM	11/10/05 8:22:18 PM	7/26/03 11:06:29 AM	0
IMG_0165.JPG	11/10/05 8:22:30 PM	11/10/05 8:22:30 PM	7/26/03 11:06:29 AM	0
IMG_0168.JPG	11/10/05 8:23:12 PM	11/10/05 8:23:12 PM	7/26/03 11:06:29 AM	0
IMG_0169.JPG	11/10/05 8:23:26 PM	11/10/05 8:23:26 PM	7/26/03 11:06:30 AM	0
IMG_0172.JPG	11/10/05 8:24:20 PM	11/10/05 8:24:19 PM	7/26/03 11:06:30 AM	0
IMG_0174.JPG	11/10/05 8:24:48 PM	11/10/05 8:24:47 PM	7/26/03 11:06:31 AM	0
IMG_0175.JPG	11/10/05 8:25:04 PM	11/10/05 8:25:04 PM	7/26/03 11:06:31 AM	0
IMG_0176.JPG	11/10/05 8:25:10 PM	11/10/05 8:25:11 PM	7/26/03 11:06:31 AM	0
IMG_0177.JPG	11/10/05 8:25:36 PM	11/10/05 8:25:35 PM	7/26/03 11:06:32 AM	0
IMG_0178.JPG	11/10/05 8:25:54 PM	11/10/05 8:25:54 PM	7/26/03 11:06:32 AM	0
IMG_0179.JPG	11/10/05 8:26:04 PM	11/10/05 8:26:04 PM	7/26/03 11:06:33 AM	0
IMG_0180.JPG	11/10/05 8:26:22 PM	11/10/05 8:26:22 PM	7/26/03 11:06:33 AM	0
IMG_0181.JPG	11/10/05 8:26:26 PM	11/10/05 8:26:25 PM	7/26/03 11:06:33 AM	0
IMG_0182.JPG	11/10/05 8:26:30 PM	11/10/05 8:26:29 PM	7/26/03 11:06:34 AM	0
IMG_0183.JPG	11/10/05 8:27:34 PM	11/10/05 8:27:33 PM	7/26/03 11:06:34 AM	0
IMG_0203.JPG	12/25/05 2:59:44 AM	12/25/05 2:59:44 AM	7/26/03 11:06:36 AM	0
IMG_0204.JPG	12/25/05 2:59:50 AM	12/25/05 2:59:50 AM	7/26/03 11:06:36 AM	0
IMG_0205.JPG	12/25/05 3:00:42 AM	12/25/05 3:00:42 AM	7/26/03 11:06:37 AM	0
IMG_0206.JPG	12/25/05 3:00:50 AM	12/25/05 3:00:49 AM	7/26/03 11:06:37 AM	0
IMG_0207.JPG	12/25/05 3:01:40 AM	12/25/05 3:01:40 AM	7/26/03 11:06:37 AM	0
IMG_0208.JPG	12/25/05 3:01:46 AM	12/25/05 3:01:46 AM	7/26/03 11:06:38 AM	0

Table 3: Contents "Studies" on the hard drive

FAT Create Date	FAT Access Date	FAT Modified Date	Directory Path	Entry Type
2003-07-26 11:05:03	07/28/03	2003-07-26 11:05:04	Studies	Folder
2003-07-26 11:05:03	07/28/03	2003-07-26 11:05:04	Studies/V110205	Folder
2003-07-26 11:05:03	02/12/10	2006-01-16 09:33:36	Studies/V110205/v.psa	File
2003-07-26 11:05:04	07/28/03	2003-07-26 11:05:06	Studies/V110205/VIF	Folder
2003-07-26 11:05:04	02/12/10	2006-01-16 09:32:42	Studies/V110205/V1.PSA	File
2003-07-26 11:05:04	02/12/10	2008-03-15 02:32:04	Studies/V110205/VIF.PSA	File
2003-07-26 11:05:04	02/12/10	2008-03-10 17:55:14	Studies/V110205/VIF/backupCr.dat	File
2003-07-26 11:05:05	02/12/10	2008-03-10 17:55:14	Studies/V110205/VIF/collstatus.dat	File
2003-07-26 11:05:05	02/12/10	2003-07-29 02:51:48	Studies/V110205/VIF/pz.psa	File
2003-07-26 11:05:05	02/12/10	2008-03-10 17:55:14	Studies/V110205/VIF/tagstatus.dat	File
2003-07-26 11:05:05	02/12/10	2005-11-24 05:26:52	Studies/V110205/VIF/tm.4.cache	File
2003-07-26 11:05:06	07/28/03	2003-07-26 11:05:08	Studies/V110205/VIF/pz	Folder
2003-07-26 11:05:06	02/12/10	2003-07-29 02:52:14	Studies/V110205/VIF/pz/backupCr.dat	File
2003-07-26 11:05:06	02/12/10	2003-07-29 02:52:14	Studies/V110205/VIF/pz/collstatus.dat	File
2003-07-26 11:05:06	02/12/10	2003-07-29 02:52:14	Studies/V110205/VIF/pz/tagstatus.dat	File


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2003-07-26 11:05:06	02/12/10	2005-11-10 04:30:54	Studies/V110205/V1F/pz/tn.4.cache	File
2003-07-26 11:05:06	07/28/03	2003-07-26 11:05:08	Studies/V110205/V1	Folder
2003-07-26 11:05:06	02/12/10	2006-01-16 09:33:30	Studies/V110205/V1/backupCt.dat	File
2003-07-26 11:05:07	02/12/10	2006-01-16 09:33:30	Studies/V110205/V1/collstatus.dat	File
2003-07-26 11:05:07	02/12/10	2006-01-16 09:33:30	Studies/V110205/V1/tagstatus.dat	File
2003-07-26 11:05:07	02/12/10	2005-11-24 05:19:24	Studies/V110205/V1/tn.4.cache	File
2003-07-26 11:05:07	07/28/03	2003-07-26 11:05:08	Studies/V110205/v	Folder
2003-07-26 11:05:07	02/12/10	2006-01-16 09:34:46	Studies/V110205/v/backupCt.dat	File
2003-07-26 11:05:07	02/12/10	2006-01-16 09:34:46	Studies/V110205/v/collstatus.dat	File
2003-07-26 11:05:08	02/12/10	2006-01-16 09:34:46	Studies/V110205/v/tagstatus.dat	File
2003-07-26 11:05:08	02/12/10	2005-11-02 01:22:50	Studies/V110205/v/tn.4.cache	File
2003-07-26 11:05:08	07/28/03	2003-07-26 11:05:10	Studies/V110205/2005-11-24-0814-46	Folder
2003-07-26 11:05:08	02/12/10	2005-11-24 18:07:50	Studies/V110205/2005-11-24-0814-46/IMG_0184.JPG	File
2003-07-26 11:05:09	02/12/10	2005-11-24 18:07:56	Studies/V110205/2005-11-24-0814-46/IMG_0185.JPG	File
2003-07-26 11:05:09	02/12/10	2005-11-24 18:08:08	Studies/V110205/2005-11-24-0814-46/IMG_0186.JPG	File
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2003-07-26 11:05:10	02/12/10	2005-11-24 18:10:08	Studies/V110205/2005-11-24-0814-46/IMG_0188.JPG	File
2003-07-26 11:05:10	02/12/10	2005-11-24 18:10:22	Studies/V110205/2005-11-24-0814-46/IMG_0189.JPG	File
2003-07-26 11:05:10	02/12/10	2005-11-24 18:10:28	Studies/V110205/2005-11-24-0814-46/IMG_0190.JPG	File
2003-07-26 11:05:11	02/12/10	2005-11-24 18:10:38	Studies/V110205/2005-11-24-0814-46/IMG_0191.JPG	File
2003-07-26 11:05:11	02/12/10	2005-11-24 05:21:50	Studies/V110205/2005-11-24-0814-46/Thumbs.db	File
2003-07-26 11:05:11	07/28/03	2003-07-26 11:05:12	Studies/V110205/2005-11-24-0814-46/New Folder	Folder
2003-07-26 11:05:11	07/28/03	2003-07-26 11:05:12	Studies/V110205/2005-11-02-0422-20	Folder
2003-07-26 11:05:11	02/12/10	2005-11-02 14:59:16	Studies/V110205/2005-11-02-0422-20/IMG_0150.JPG	File
2003-07-26 11:05:12	02/12/10	2005-11-02 14:59:26	Studies/V110205/2005-11-02-0422-20/IMG_0151.JPG	File
2003-07-26 11:05:12	02/12/10	2005-11-02 14:59:30	Studies/V110205/2005-11-02-0422-20/IMG_0152.JPG	File
2003-07-26 11:05:12	02/12/10	2005-11-02 14:59:34	Studies/V110205/2005-11-02-0422-20/IMG_0153.JPG	File
2003-07-26 11:05:13	02/12/10	2005-11-02 14:59:48	Studies/V110205/2005-11-02-0422-20/IMG_0154.JPG	File
2003-07-26 11:05:13	02/12/10	2005-11-02 15:00:22	Studies/V110205/2005-11-02-0422-20/IMG_0155.JPG	File
2003-07-26 11:05:14	02/12/10	2005-11-02 15:00:30	Studies/V110205/2005-11-02-0422-20/IMG_0156.JPG	File
2003-07-26 11:05:14	02/12/10	2005-11-02 15:00:38	Studies/V110205/2005-11-02-0422-20/IMG_0157.JPG	File
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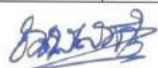
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2003-07-26 11:05:17	07/28/03	2003-07-26 11:05:18	Studies/Msk101905	Folder
2003-07-26 11:05:17	07/28/03	2003-07-26 11:05:18	Studies/Msk101905/Msk	Folder
2003-07-26 11:05:17	02/12/10	2006-01-16 09:19:12	Studies/Msk101905/Msk.psa	File
2003-07-26 11:05:17	02/12/10	2006-01-16 09:21:30	Studies/Msk101905/Msk/backupCr.dat	File
2003-07-26 11:05:17	02/12/10	2006-01-16 09:21:30	Studies/Msk101905/Msk/collstatus.dat	File
2003-07-26 11:05:18	02/12/10	2005-10-31 17:19:56	Studies/Msk101905/Msk/rmf.2.cache	File
2003-07-26 11:05:18	02/12/10	2006-01-16 09:21:30	Studies/Msk101905/Msk/tagstatus.dat	File
2003-07-26 11:05:18	02/12/10	2005-12-21 17:14:34	Studies/Msk101905/Msk/tn.4.cache	File
2003-07-26 11:05:18	07/28/03	2003-07-26 11:05:20	Studies/Msk101905/2005-12-21-2009-33	Folder
2003-07-26 11:05:18	02/12/10	2005-12-18 21:37:58	Studies/Msk101905/2005-12-21-2009-33/IMG_0194.JPG	File
2003-07-26 11:05:19	02/12/10	2005-12-18 21:38:20	Studies/Msk101905/2005-12-21-2009-33/IMG_0197.JPG	File
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2003-07-26 11:05:20	02/12/10	2005-12-25 16:15:40	Studies/Msk101905/2005-12-21-2009-33/Thumbs.db	File
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2003-07-26 11:05:21	02/12/10	2005-10-19 14:54:22	Studies/Msk101905/2005-10-19-0727-59/IMG_0080.JPG	File
2003-07-26 11:05:21	02/12/10	2005-10-19 14:54:32	Studies/Msk101905/2005-10-19-0727-59/IMG_0081.JPG	File
2003-07-26 11:05:21	02/12/10	2005-10-19 14:54:56	Studies/Msk101905/2005-10-19-0727-59/IMG_0082.JPG	File
2003-07-26 11:05:22	02/12/10	2005-10-19 14:55:10	Studies/Msk101905/2005-10-19-0727-59/IMG_0083.JPG	File
2003-07-26 11:05:22	02/12/10	2005-10-19 14:55:36	Studies/Msk101905/2005-10-19-0727-59/IMG_0084.JPG	File
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2003-07-26 11:05:25	07/28/03	2003-07-26 11:05:26	Studies/Mo101805/Mo	Folder
2003-07-26 11:05:25	02/12/10	2005-10-31 17:23:52	Studies/Mo101805/Mo.psa	File
2003-07-26 11:05:25	02/12/10	2005-10-31 17:24:52	Studies/Mo101805/Mo/backupCr.dat	File
2003-07-26 11:05:25	02/12/10	2005-10-31 17:24:52	Studies/Mo101805/Mo/collstatus.dat	File
2003-07-26 11:05:26	02/12/10	2005-10-31 17:24:52	Studies/Mo101805/Mo/tagstatus.dat	File
2003-07-26 11:05:26	02/12/10	2005-10-18 03:44:42	Studies/Mo101805/Mo/tn.4.cache	File
2003-07-26 11:05:26	07/28/03	2003-07-26 11:05:28	Studies/Mo101805/2005-10-18-0744-20	Folder
2003-07-26 11:05:26	02/12/10	2005-10-18 16:32:06	Studies/Mo101805/2005-10-18-0744-20/IMG_0071.JPG	File



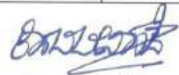
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2003-07-26 11:05:29	02/12/10	2005-10-18 16:33:30	Studies/Mo101805/2005-10-18-0744-20/IMG_0078.JPG	File
2003-07-26 11:05:29	02/12/10	2005-10-28 16:16:58	Studies/Mo101805/2005-10-18-0744-20/Thumbs.db	File
2003-07-26 11:05:30	07/28/03	2003-07-26 11:05:32	Studies/Mnp102005	Folder
2003-07-26 11:05:30	07/28/03	2003-07-26 11:05:32	Studies/Mnp102005/Mnp	Folder
2003-07-26 11:05:30	02/12/10	2005-10-29 19:52:52	Studies/Mnp102005/M.PSA	File
2003-07-26 11:05:30	02/12/10	2006-04-03 01:29:34	Studies/Mnp102005/Mnp.psa	File
2003-07-26 11:05:30	02/12/10	2006-04-03 01:30:30	Studies/Mnp102005/Mnp/backupCt.dat	File
2003-07-26 11:05:31	02/12/10	2006-04-03 01:30:30	Studies/Mnp102005/Mnp/collstatus.dat	File
2003-07-26 11:05:31	02/12/10	2007-09-11 19:33:04	Studies/Mnp102005/Mnp/pz.psa	File
2003-07-26 11:05:31	02/12/10	2006-04-03 01:30:30	Studies/Mnp102005/Mnp/tagstatus.dat	File
2003-07-26 11:05:31	02/12/10	2005-12-30 15:05:54	Studies/Mnp102005/Mnp/tn.4.cache	File
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2003-07-26 11:05:32	02/12/10	2007-09-11 19:33:22	Studies/Mnp102005/Mnp/pz/backupCt.dat	File
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2003-07-26 11:05:32	02/12/10	2005-12-30 15:14:40	Studies/Mnp102005/Mnp/pz/tn.4.cache	File
2003-07-26 11:05:33	02/12/10	2005-10-29 19:54:02	Studies/Mnp102005/M/backupCt.dat	File
2003-07-26 11:05:33	02/12/10	2005-10-29 19:54:02	Studies/Mnp102005/M/collstatus.dat	File
2003-07-26 11:05:33	02/12/10	2005-10-29 19:54:02	Studies/Mnp102005/M/tagstatus.dat	File
2003-07-26 11:05:33	02/12/10	2005-10-29 19:50:26	Studies/Mnp102005/M/tn.4.cache	File
2003-07-26 11:05:33	07/28/03	2003-07-26 11:05:34	Studies/Mnp102005/2005-12-30-1801-28	Folder
2003-07-26 11:05:34	02/12/10	2005-12-30 14:56:06	Studies/Mnp102005/2005-12-30-1801-28/IMG_0209.JPG	File
2003-07-26 11:05:34	02/12/10	2005-12-30 14:56:12	Studies/Mnp102005/2005-12-30-1801-28/IMG_0210.JPG	File
2003-07-26 11:05:34	02/12/10	2005-12-30 14:56:16	Studies/Mnp102005/2005-12-30-1801-28/IMG_0211.JPG	File
2003-07-26 11:05:35	02/12/10	2005-12-30 14:56:20	Studies/Mnp102005/2005-12-30-1801-28/IMG_0212.JPG	File
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2003-07-26 11:05:37	02/12/10	2005-12-30 14:57:00	Studies/Mnp102005/2005-12-30-1801-28/IMG_0216.JPG	File
2003-07-26 11:05:37	02/12/10	2005-12-30 14:58:50	Studies/Mnp102005/2005-12-30-1801-28/IMG_0217.JPG	File



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2003-07-26 11:05:41	02/12/10	2005-10-30 00:36:42	Studies/Mnp102005/2005-10-29-2350-08/IMG_0130.JPG	File
2003-07-26 11:05:42	02/12/10	2005-10-30 00:36:54	Studies/Mnp102005/2005-10-29-2350-08/IMG_0131.JPG	File
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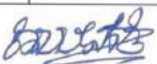

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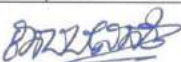

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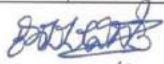

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2003-07-26 11:06:29	07/28/03	2003-07-26 11:06:30	Studies/A111005/2005-11-10-0718-42	Folder
2003-07-26 11:06:29	02/12/10	2005-11-10 17:22:18	Studies/A111005/2005-11-10-0718-42/IMG_0164.JPG	File
2003-07-26 11:06:29	02/12/10	2005-11-10 17:22:30	Studies/A111005/2005-11-10-0718-42/IMG_0165.JPG	File
2003-07-26 11:06:29	02/12/10	2005-11-10 17:23:12	Studies/A111005/2005-11-10-0718-42/IMG_0168.JPG	File
2003-07-26 11:06:30	02/12/10	2005-11-10 17:23:26	Studies/A111005/2005-11-10-0718-42/IMG_0169.JPG	File
2003-07-26 11:06:30	02/12/10	2005-11-10 17:24:20	Studies/A111005/2005-11-10-0718-42/IMG_0172.JPG	File
2003-07-26 11:06:31	02/12/10	2005-11-10 17:24:48	Studies/A111005/2005-11-10-0718-42/IMG_0174.JPG	File
2003-07-26 11:06:31	02/12/10	2005-11-10 17:25:04	Studies/A111005/2005-11-10-0718-42/IMG_0175.JPG	File
2003-07-26 11:06:31	02/12/10	2005-11-10 17:25:10	Studies/A111005/2005-11-10-0718-42/IMG_0176.JPG	File
2003-07-26 11:06:32	02/12/10	2005-11-10 17:25:36	Studies/A111005/2005-11-10-0718-42/IMG_0177.JPG	File
2003-07-26 11:06:32	02/12/10	2005-11-10 17:25:54	Studies/A111005/2005-11-10-0718-42/IMG_0178.JPG	File
2003-07-26 11:06:33	02/12/10	2005-11-10 17:26:04	Studies/A111005/2005-11-10-0718-42/IMG_0179.JPG	File
2003-07-26 11:06:33	02/12/10	2005-11-10 17:26:22	Studies/A111005/2005-11-10-0718-42/IMG_0180.JPG	File
2003-07-26 11:06:33	02/12/10	2005-11-10 17:26:26	Studies/A111005/2005-11-10-0718-42/IMG_0181.JPG	File
2003-07-26 11:06:34	02/12/10	2005-11-10 17:26:30	Studies/A111005/2005-11-10-0718-42/IMG_0182.JPG	File
2003-07-26 11:06:34	02/12/10	2005-11-10 17:27:34	Studies/A111005/2005-11-10-0718-42/IMG_0183.JPG	File
2003-07-26 11:06:35	02/12/10	2006-01-16 10:48:58	Studies/A111005/2005-11-10-0718-42/Thumbs.db	File
2003-07-26 11:06:35	07/28/03	2003-07-26 11:06:36	Studies/4L122505	Folder
2003-07-26 11:06:35	07/28/03	2003-07-26 11:06:36	Studies/4L122505/4L	Folder
2003-07-26 11:06:35	02/12/10	2005-12-25 16:19:30	Studies/4L122505/4L.PSA	File
2003-07-26 11:06:35	02/12/10	2005-12-25 16:20:20	Studies/4L122505/4L/backupCr.dat	File
2003-07-26 11:06:35	02/12/10	2005-12-25 16:20:20	Studies/4L122505/4L/collstatus.dat	File


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Dr. Keshava Munegowda

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2003-07-26 11:06:35	02/12/10	2005-12-25 16:20:20	Studies/4L122505/4L/tagstatus.dat	File
2003-07-26 11:06:36	02/12/10	2005-12-25 16:16:34	Studies/4L122505/4L/tn.4.cache	File
2003-07-26 11:06:36	07/28/03	2003-07-26 11:06:38	Studies/4L122505/2005-12-25-1911-54	Folder
2003-07-26 11:06:36	02/12/10	2005-12-25 23:59:44	Studies/4L122505/2005-12-25-1911-54/IMG_0203.JPG	File
2003-07-26 11:06:36	02/12/10	2005-12-25 23:59:50	Studies/4L122505/2005-12-25-1911-54/IMG_0204.JPG	File
2003-07-26 11:06:37	02/12/10	2005-12-26 00:00:42	Studies/4L122505/2005-12-25-1911-54/IMG_0205.JPG	File
2003-07-26 11:06:37	02/12/10	2005-12-26 00:00:50	Studies/4L122505/2005-12-25-1911-54/IMG_0206.JPG	File
2003-07-26 11:06:37	02/12/10	2005-12-26 00:01:40	Studies/4L122505/2005-12-25-1911-54/IMG_0207.JPG	File
2003-07-26 11:06:38	02/12/10	2005-12-26 00:01:46	Studies/4L122505/2005-12-25-1911-54/IMG_0208.JPG	File
2003-07-26 11:06:38	02/12/10	2005-12-25 16:17:54	Studies/4L122505/2005-12-25-1911-54/Thumbs.db	File



[Dr. KESHAVA MUNEGOWDA]

Steven Alexander
Trace Digital Forensics, LLC
10010 Seneca Falls Ave
Bakersfield, CA 93312

October 9, 2020

Re: Canon EOS 20D Camera – Time zone awareness

To Whom It May Concern:

The Canon EOS 20D stores pictures on compact flash cards using the FAT-16 filesystem. The FAT-16 filesystem specifies that timestamps are stored in local time. Other filesystems store timestamps in UTC time so that they can be adjusted to the current time zone. The Canon EOS 20D is not time zone aware and does not store any information on the compact flash card that would allow the time to be adjusted from one time zone to another.

Sincerely,

A handwritten signature in cursive script that reads "Steven Alexander".

Steven Alexander

Steven Alexander
Trace Digital Forensics, LLC
10010 Seneca Falls Ave
Bakersfield, CA 93312

October 11, 2020

Re: Canon EOS 20D Camera – Exif vs FAT creation times.

To Whom It May Concern:

The Canon EOS 20D stores pictures on compact flash cards using the FAT-16 filesystem. When the Canon EOS 20D camera saves a picture, it stores it with Exif metadata inside the JPEG image. The Exif metadata includes dates—CreateDate, DateTimeOriginal, and ModifyDate—which are all the same as each other. These dates do not always match the FAT-16 filesystem timestamps.

In my testing, which included over 1,500 pictures taken with the Canon EOS 20D, the FAT Creation Date (which includes the date and time) can be up to nine seconds later than the Exif time. I did not observe the same range of difference in the opposite direction. The Exif times were up to one second later than the FAT Creation Date timestamp.

I also observed that the FAT Last Modified timestamp can be up to nine seconds later than the Exif times. Again, the reverse was not true. I observed Exif times up to one second later than the FAT Last Modified timestamp, but never more than that.

Sincerely,

A handwritten signature in cursive script that reads "Steven Alexander".

Steven Alexander

EXHIBIT 11

Steven Alexander
Trace Digital Forensics, LLC



October 9, 2020

Re: Canon EOS 20D Camera – Time zone awareness

To Whom It May Concern:

The Canon EOS 20D stores pictures on compact flash cards using the FAT-16 filesystem. The FAT-16 filesystem specifies that timestamps are stored in local time. Other filesystems store timestamps in UTC time so that they can be adjusted to the current time zone. The Canon EOS 20D is not time zone aware and does not store any information on the compact flash card that would allow the time to be adjusted from one time zone to another.

Sincerely,

A handwritten signature in cursive script that reads "Steven Alexander".

Steven Alexander

EXHIBIT 12

Expert Statement #1B: Pattern of the Time-Shifts

This statement references the data in Table 1 from Expert Statement #A, so it is included here for convenience.

1. Daylight Savings Time (DST) ended on 10/30/05 at 2 AM, meaning that at 2 AM on 10/30/05, clocks were turned **back one hour**.¹
2. Based on the EXIF DateTimeOriginal values
 - a. IMG_0043.JPG-IMG_0113.JPG, IMG_0115.JPG-IMG_0126.JPG appear to be taken before 10/30/05 and have their FAT Date Modified one hour behind their EXIF DateTimeOriginal.
 - b. IMG_0127.JPG-IMG_0137.JPG appear to be taken on 10/30/05 after 2 AM and their FAT Date Modified is two hours behind their EXIF DateTimeOriginal, within a few seconds.
 - c. IMG_0138.JPG-IMG_0149.JPG appear to be taken on 10/30/05 after 4:55 PM and their FAT Date Modified is within a few seconds of the EXIF DateTimeOriginal. There is no time-shift observed for this group.
 - d. IMG_0150.JPG onwards appear to be taken after 10/30/05 and, similar to c) above, there is no time-shift observed for this group.
3. 2a, 2c and 2d establish a pattern that is consistent with someone trying to adjust for DST: shifted by an hour before 2AM and no shift after, relative to the EXIF DateTimeOriginal. However,
 - a. For reasons outlined in Expert Statement #1A, without manual intervention there would be no time-shifts for any of the groups.
 - b. 2b does not fit the pattern because it has a two-hour shift and it is after DST, so should not be shifted to begin with.

In conclusion, my opinion is that the intended pattern of the manual alterations was to make it look like the dates were shifted by DST, but in doing so, several errors were made, further indicating manual alteration.



Dr. Keshava Munegowda, PhD

• **Education Qualifications:**

- PhD Computer Science and Engineering, Visvesvaraya Technological University, 2016. Research domain is File systems.
- Master of technology in Computer Science and Engineering, Visvesvaraya Technological University, 2004.
- Bachelor of Engineering in Computer Science and Engineering, Bangalore University, INDIA, 2001.

• **Book on FAT File systems:**

- "ExFAT and FAT File System Internals", November 2016, Amazon publications.

¹ <https://www.timeanddate.com/time/change/usa/new-york?year=2005>

Dr. Keshava Munegowda

Author and File Systems Expert

10/23/2020

- **Granted US patents on FAT File systems:**

1. USPTO application number: 12326915 entitled "Storage Optimizations by Directory compaction in FAT File system", US patent number: 8429331.
2. USPTO application number: 12762829 entitled "FAT file in reserved cluster entry with ready entry state", US patent number: 8452734.
3. USPTO application number: 13870344, entitled "IC updating File system meta data with log record data", US patent number: 9043286
4. USPTO application number: 14075757 entitled "File access method and system there of", US patent number: 9569447
5. USPTO application number: 15413058 entitled "Method and System for File storage and access", US patent number: 9817837

Table 1 : Pictures on hard drive, sorted by EXIF DateTimeOriginal

FILE_NAME	HD FAT Modified Date	HD EXIF DateTimeOriginal	HD FAT Create Date	Time Shift Between FAT Modified and EXIF DateTimeOriginal (up to a few seconds)
IMG_0043.JPG	10/16/05 11:30:04 PM	10/17/05 12:30:04 AM	7/26/03 11:05:58 AM	1
IMG_0044.JPG	10/17/05 3:53:24 PM	10/17/05 4:53:22 PM	7/26/03 11:05:58 AM	1
IMG_0045.JPG	10/17/05 3:53:40 PM	10/17/05 4:53:40 PM	7/26/03 11:05:59 AM	1
IMG_0046.JPG	10/17/05 3:54:08 PM	10/17/05 4:54:09 PM	7/26/03 11:05:59 AM	1
IMG_0047.JPG	10/17/05 3:54:24 PM	10/17/05 4:54:24 PM	7/26/03 11:05:59 AM	1
IMG_0048.JPG	10/17/05 3:54:38 PM	10/17/05 4:54:38 PM	7/26/03 11:06:00 AM	1
IMG_0049.JPG	10/17/05 3:54:54 PM	10/17/05 4:54:54 PM	7/26/03 11:06:00 AM	1
IMG_0050.JPG	10/17/05 3:55:04 PM	10/17/05 4:55:05 PM	7/26/03 11:06:00 AM	1
IMG_0051.JPG	10/17/05 3:55:28 PM	10/17/05 4:55:28 PM	7/26/03 11:06:01 AM	1
IMG_0052.JPG	10/17/05 3:55:42 PM	10/17/05 4:55:41 PM	7/26/03 11:06:02 AM	1
IMG_0053.JPG	10/17/05 3:55:54 PM	10/17/05 4:55:52 PM	7/26/03 11:06:02 AM	1
IMG_0054.JPG	10/17/05 3:55:58 PM	10/17/05 4:55:59 PM	7/26/03 11:06:02 AM	1
IMG_0055.JPG	10/17/05 3:56:24 PM	10/17/05 4:56:25 PM	7/26/03 11:06:03 AM	1
IMG_0056.JPG	10/17/05 3:56:36 PM	10/17/05 4:56:36 PM	7/26/03 11:06:03 AM	1
IMG_0057.JPG	10/17/05 3:56:48 PM	10/17/05 4:56:48 PM	7/26/03 11:06:03 AM	1
IMG_0058.JPG	10/17/05 3:56:58 PM	10/17/05 4:56:58 PM	7/26/03 11:06:04 AM	1
IMG_0059-1.JPG	10/17/05 9:00:58 PM	10/17/05 10:00:57 PM	7/26/03 11:06:14 AM	1
IMG_0060-1.JPG	10/17/05 9:01:06 PM	10/17/05 10:01:07 PM	7/26/03 11:06:15 AM	1
IMG_0061-1.JPG	10/17/05 9:01:12 PM	10/17/05 10:01:13 PM	7/26/03 11:06:15 AM	1
IMG_0062-1.JPG	10/17/05 9:01:24 PM	10/17/05 10:01:24 PM	7/26/03 11:06:16 AM	1
IMG_0063-1.JPG	10/17/05 9:01:32 PM	10/17/05 10:01:32 PM	7/26/03 11:06:16 AM	1
IMG_0064-1.JPG	10/17/05 9:02:00 PM	10/17/05 10:02:00 PM	7/26/03 11:06:17 AM	1
IMG_0065-1.JPG	10/17/05 9:02:08 PM	10/17/05 10:02:07 PM	7/26/03 11:06:17 AM	1
IMG_0066-1.JPG	10/17/05 9:02:14 PM	10/17/05 10:02:13 PM	7/26/03 11:06:17 AM	1
IMG_0067-1.JPG	10/17/05 9:02:34 PM	10/17/05 10:02:34 PM	7/26/03 11:06:18 AM	1
IMG_0068-1.JPG	10/17/05 9:03:02 PM	10/17/05 10:03:01 PM	7/26/03 11:06:19 AM	1
IMG_0069-1.JPG	10/17/05 9:03:10 PM	10/17/05 10:03:10 PM	7/26/03 11:06:19 AM	1
IMG_0070-1.JPG	10/17/05 9:03:24 PM	10/17/05 10:03:24 PM	7/26/03 11:06:20 AM	1
IMG_0071.JPG	10/18/05 7:32:06 PM	10/18/05 8:32:06 PM	7/26/03 11:05:26 AM	1
IMG_0072.JPG	10/18/05 7:32:26 PM	10/18/05 8:32:26 PM	7/26/03 11:05:26 AM	1
IMG_0073.JPG	10/18/05 7:32:36 PM	10/18/05 8:32:36 PM	7/26/03 11:05:27 AM	1
IMG_0074.JPG	10/18/05 7:32:44 PM	10/18/05 8:32:44 PM	7/26/03 11:05:27 AM	1
IMG_0075.JPG	10/18/05 7:33:08 PM	10/18/05 8:33:09 PM	7/26/03 11:05:28 AM	1



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Dr. Keshava Munegowda

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IMG_0076.JPG	10/18/05 7:33:14 PM	10/18/05 8:33:15 PM	7/26/03 11:05:28 AM	1
IMG_0077.JPG	10/18/05 7:33:22 PM	10/18/05 8:33:22 PM	7/26/03 11:05:29 AM	1
IMG_0078.JPG	10/18/05 7:33:30 PM	10/18/05 8:33:30 PM	7/26/03 11:05:29 AM	1
IMG_0079.JPG	10/19/05 5:54:08 PM	10/19/05 6:54:09 PM	7/26/03 11:05:20 AM	1
IMG_0080.JPG	10/19/05 5:54:22 PM	10/19/05 6:54:23 PM	7/26/03 11:05:21 AM	1
IMG_0081.JPG	10/19/05 5:54:32 PM	10/19/05 6:54:33 PM	7/26/03 11:05:21 AM	1
IMG_0082.JPG	10/19/05 5:54:56 PM	10/19/05 6:54:57 PM	7/26/03 11:05:21 AM	1
IMG_0083.JPG	10/19/05 5:55:10 PM	10/19/05 6:55:10 PM	7/26/03 11:05:22 AM	1
IMG_0084.JPG	10/19/05 5:55:36 PM	10/19/05 6:55:37 PM	7/26/03 11:05:22 AM	1
IMG_0085.JPG	10/19/05 5:55:48 PM	10/19/05 6:55:49 PM	7/26/03 11:05:23 AM	1
IMG_0086.JPG	10/19/05 5:55:56 PM	10/19/05 6:55:57 PM	7/26/03 11:05:23 AM	1
IMG_0087.JPG	10/19/05 5:56:08 PM	10/19/05 6:56:09 PM	7/26/03 11:05:24 AM	1
IMG_0088.JPG	10/19/05 5:56:24 PM	10/19/05 6:56:24 PM	7/26/03 11:05:24 AM	1
IMG_0089.JPG	10/19/05 5:56:34 PM	10/19/05 6:56:34 PM	7/26/03 11:05:24 AM	1
IMG_0090.JPG	10/19/05 6:32:52 PM	10/19/05 7:32:51 PM	7/26/03 11:06:08 AM	1
IMG_0091.JPG	10/19/05 6:32:58 PM	10/19/05 7:32:57 PM	7/26/03 11:06:08 AM	1
IMG_0092.JPG	10/19/05 6:33:08 PM	10/19/05 7:33:09 PM	7/26/03 11:06:09 AM	1
IMG_0093.JPG	10/19/05 6:33:18 PM	10/19/05 7:33:18 PM	7/26/03 11:06:09 AM	1
IMG_0094.JPG	10/19/05 6:33:26 PM	10/19/05 7:33:25 PM	7/26/03 11:06:10 AM	1
IMG_0095.JPG	10/19/05 6:33:30 PM	10/19/05 7:33:29 PM	7/26/03 11:06:10 AM	1
IMG_0096.JPG	10/19/05 6:33:52 PM	10/19/05 7:33:51 PM	7/26/03 11:06:10 AM	1
IMG_0097.JPG	10/19/05 6:33:58 PM	10/19/05 7:33:57 PM	7/26/03 11:06:11 AM	1
IMG_0098.JPG	10/19/05 6:34:08 PM	10/19/05 7:34:08 PM	7/26/03 11:06:11 AM	1
IMG_0099.JPG	10/20/05 3:20:12 PM	10/20/05 4:20:13 PM	7/26/03 11:05:45 AM	1
IMG_0100.JPG	10/20/05 3:20:30 PM	10/20/05 4:20:31 PM	7/26/03 11:05:46 AM	1
IMG_0101.JPG	10/20/05 3:20:44 PM	10/20/05 4:20:44 PM	7/26/03 11:05:46 AM	1
IMG_0102.JPG	10/20/05 3:21:02 PM	10/20/05 4:21:02 PM	7/26/03 11:05:46 AM	1
IMG_0103.JPG	10/20/05 3:21:28 PM	10/20/05 4:21:28 PM	7/26/03 11:05:47 AM	1
IMG_0104.JPG	10/20/05 3:25:14 PM	10/20/05 4:25:14 PM	7/26/03 11:05:47 AM	1
IMG_0105.JPG	10/20/05 3:26:56 PM	10/20/05 4:26:56 PM	7/26/03 11:05:47 AM	1
IMG_0106.JPG	10/20/05 3:27:04 PM	10/20/05 4:27:03 PM	7/26/03 11:05:48 AM	1
IMG_0107.JPG	10/20/05 3:49:24 PM	10/20/05 4:49:23 PM	7/26/03 11:05:48 AM	1
IMG_0108.JPG	10/20/05 3:49:26 PM	10/20/05 4:49:26 PM	7/26/03 11:05:49 AM	1
IMG_0109.JPG	10/20/05 3:49:30 PM	10/20/05 4:49:29 PM	7/26/03 11:05:49 AM	1
IMG_0110.JPG	10/29/05 4:11:16 AM	10/29/05 5:11:16 AM	7/26/03 11:05:51 AM	1
IMG_0111.JPG	10/29/05 4:11:42 AM	10/29/05 5:11:43 AM	7/26/03 11:05:51 AM	1
IMG_0112.JPG	10/29/05 4:43:36 AM	10/29/05 5:43:36 AM	7/26/03 11:05:52 AM	1
IMG_0113.JPG	10/29/05 4:43:54 AM	10/29/05 5:43:54 AM	7/26/03 11:05:52 AM	1
IMG_0115.JPG	10/29/05 4:44:52 AM	10/29/05 5:44:52 AM	7/26/03 11:05:52 AM	1
IMG_0116.JPG	10/29/05 4:44:56 AM	10/29/05 5:44:55 AM	7/26/03 11:05:53 AM	1
IMG_0117.JPG	10/29/05 4:45:06 AM	10/29/05 5:45:06 AM	7/26/03 11:05:53 AM	1
IMG_0118.JPG	10/29/05 4:45:20 AM	10/29/05 5:45:20 AM	7/26/03 11:05:54 AM	1
IMG_0119.JPG	10/29/05 4:45:26 AM	10/29/05 5:45:25 AM	7/26/03 11:05:54 AM	1
IMG_0120.JPG	10/29/05 4:45:40 AM	10/29/05 5:45:40 AM	7/26/03 11:05:55 AM	1
IMG_0121.JPG	10/29/05 4:45:50 AM	10/29/05 5:45:50 AM	7/26/03 11:05:55 AM	1
IMG_0122.JPG	10/29/05 4:46:00 AM	10/29/05 5:46:00 AM	7/26/03 11:05:55 AM	1
IMG_0123.JPG	10/29/05 4:47:00 AM	10/29/05 5:46:59 AM	7/26/03 11:05:56 AM	1
IMG_0124.JPG	10/29/05 4:47:06 AM	10/29/05 5:47:05 AM	7/26/03 11:05:56 AM	1
IMG_0125.JPG	10/29/05 4:47:10 AM	10/29/05 5:47:11 AM	7/26/03 11:05:57 AM	1
IMG_0126.JPG	10/29/05 4:47:24 AM	10/29/05 5:47:24 AM	7/26/03 11:05:57 AM	1
IMG_0127.JPG	10/30/05 2:34:20 AM	10/30/05 4:34:20 AM	7/26/03 11:05:40 AM	2
IMG_0128.JPG	10/30/05 2:35:14 AM	10/30/05 4:35:14 AM	7/26/03 11:05:40 AM	2
IMG_0129.JPG	10/30/05 2:36:06 AM	10/30/05 4:36:05 AM	7/26/03 11:05:41 AM	2
IMG_0130.JPG	10/30/05 2:36:42 AM	10/30/05 4:36:42 AM	7/26/03 11:05:41 AM	2
IMG_0131.JPG	10/30/05 2:36:54 AM	10/30/05 4:36:55 AM	7/26/03 11:05:42 AM	2
IMG_0132.JPG	10/30/05 2:37:12 AM	10/30/05 4:37:12 AM	7/26/03 11:05:42 AM	2


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10/23/2020

IMG_0133.JPG	10/30/05 2:37:44 AM	10/30/05 4:37:45 AM	7/26/03 11:05:43 AM	2
IMG_0134.JPG	10/30/05 2:37:58 AM	10/30/05 4:37:58 AM	7/26/03 11:05:43 AM	2
IMG_0135.JPG	10/30/05 2:38:00 AM	10/30/05 4:38:00 AM	7/26/03 11:05:44 AM	2
IMG_0136.JPG	10/30/05 3:39:00 AM	10/30/05 5:39:00 AM	7/26/03 11:05:44 AM	2
IMG_0137.JPG	10/30/05 3:39:06 AM	10/30/05 5:39:06 AM	7/26/03 11:05:45 AM	2
IMG_0138.JPG	10/30/05 4:55:42 PM	10/30/05 4:55:41 PM	7/26/03 11:06:22 AM	0
IMG_0139.JPG	10/30/05 4:55:52 PM	10/30/05 4:55:51 PM	7/26/03 11:06:23 AM	0
IMG_0140.JPG	10/30/05 4:56:20 PM	10/30/05 4:56:21 PM	7/26/03 11:06:23 AM	0
IMG_0141.JPG	10/30/05 4:56:46 PM	10/30/05 4:56:46 PM	7/26/03 11:06:24 AM	0
IMG_0142.JPG	10/30/05 4:57:12 PM	10/30/05 4:57:12 PM	7/26/03 11:06:24 AM	0
IMG_0143.JPG	10/30/05 6:01:08 PM	10/30/05 6:01:08 PM	7/26/03 11:06:24 AM	0
IMG_0144.JPG	10/30/05 6:01:14 PM	10/30/05 6:01:14 PM	7/26/03 11:06:25 AM	0
IMG_0145.JPG	10/30/05 6:01:20 PM	10/30/05 6:01:19 PM	7/26/03 11:06:25 AM	0
IMG_0146.JPG	10/30/05 6:01:28 PM	10/30/05 6:01:28 PM	7/26/03 11:06:26 AM	0
IMG_0147.JPG	10/30/05 6:02:08 PM	10/30/05 6:02:08 PM	7/26/03 11:06:26 AM	0
IMG_0148.JPG	10/30/05 6:02:14 PM	10/30/05 6:02:15 PM	7/26/03 11:06:26 AM	0
IMG_0149.JPG	10/30/05 6:02:22 PM	10/30/05 6:02:22 PM	7/26/03 11:06:27 AM	0
IMG_0150.JPG	11/2/05 5:59:16 PM	11/02/05 5:59:16 PM	7/26/03 11:05:11 AM	0
IMG_0151.JPG	11/2/05 5:59:26 PM	11/02/05 5:59:25 PM	7/26/03 11:05:12 AM	0
IMG_0152.JPG	11/2/05 5:59:30 PM	11/02/05 5:59:30 PM	7/26/03 11:05:12 AM	0
IMG_0153.JPG	11/2/05 5:59:34 PM	11/02/05 5:59:34 PM	7/26/03 11:05:12 AM	0
IMG_0154.JPG	11/2/05 5:59:48 PM	11/02/05 5:59:47 PM	7/26/03 11:05:13 AM	0
IMG_0155.JPG	11/2/05 6:00:22 PM	11/02/05 6:00:22 PM	7/26/03 11:05:13 AM	0
IMG_0156.JPG	11/2/05 6:00:30 PM	11/02/05 6:00:29 PM	7/26/03 11:05:14 AM	0
IMG_0157.JPG	11/2/05 6:00:38 PM	11/02/05 6:00:38 PM	7/26/03 11:05:14 AM	0
IMG_0158.JPG	11/2/05 6:00:48 PM	11/02/05 6:00:49 PM	7/26/03 11:05:14 AM	0
IMG_0159.JPG	11/2/05 6:01:10 PM	11/02/05 6:01:10 PM	7/26/03 11:05:15 AM	0
IMG_0160.JPG	11/2/05 6:01:18 PM	11/02/05 6:01:18 PM	7/26/03 11:05:15 AM	0
IMG_0161.JPG	11/2/05 6:09:00 PM	11/02/05 6:08:59 PM	7/26/03 11:05:15 AM	0
IMG_0162.JPG	11/2/05 6:09:02 PM	11/02/05 6:09:02 PM	7/26/03 11:05:16 AM	0
IMG_0163.JPG	11/2/05 6:09:10 PM	11/02/05 6:09:11 PM	7/26/03 11:05:16 AM	0
IMG_0164.JPG	11/10/05 8:22:18 PM	11/10/05 8:22:18 PM	7/26/03 11:06:29 AM	0
IMG_0165.JPG	11/10/05 8:22:30 PM	11/10/05 8:22:30 PM	7/26/03 11:06:29 AM	0
IMG_0168.JPG	11/10/05 8:23:12 PM	11/10/05 8:23:12 PM	7/26/03 11:06:29 AM	0
IMG_0169.JPG	11/10/05 8:23:26 PM	11/10/05 8:23:26 PM	7/26/03 11:06:30 AM	0
IMG_0172.JPG	11/10/05 8:24:20 PM	11/10/05 8:24:19 PM	7/26/03 11:06:30 AM	0
IMG_0174.JPG	11/10/05 8:24:48 PM	11/10/05 8:24:47 PM	7/26/03 11:06:31 AM	0
IMG_0175.JPG	11/10/05 8:25:04 PM	11/10/05 8:25:04 PM	7/26/03 11:06:31 AM	0
IMG_0176.JPG	11/10/05 8:25:10 PM	11/10/05 8:25:11 PM	7/26/03 11:06:31 AM	0
IMG_0177.JPG	11/10/05 8:25:36 PM	11/10/05 8:25:35 PM	7/26/03 11:06:32 AM	0
IMG_0178.JPG	11/10/05 8:25:54 PM	11/10/05 8:25:54 PM	7/26/03 11:06:32 AM	0
IMG_0179.JPG	11/10/05 8:26:04 PM	11/10/05 8:26:04 PM	7/26/03 11:06:33 AM	0
IMG_0180.JPG	11/10/05 8:26:22 PM	11/10/05 8:26:22 PM	7/26/03 11:06:33 AM	0
IMG_0181.JPG	11/10/05 8:26:26 PM	11/10/05 8:26:25 PM	7/26/03 11:06:33 AM	0
IMG_0182.JPG	11/10/05 8:26:30 PM	11/10/05 8:26:29 PM	7/26/03 11:06:34 AM	0
IMG_0183.JPG	11/10/05 8:27:34 PM	11/10/05 8:27:33 PM	7/26/03 11:06:34 AM	0
IMG_0184.JPG	11/24/05 9:07:50 PM	11/24/05 9:07:50 PM	7/26/03 11:05:08 AM	0
IMG_0185.JPG	11/24/05 9:07:56 PM	11/24/05 9:07:55 PM	7/26/03 11:05:09 AM	0
IMG_0186.JPG	11/24/05 9:08:08 PM	11/24/05 9:08:07 PM	7/26/03 11:05:09 AM	0
IMG_0187.JPG	11/24/05 9:09:52 PM	11/24/05 9:09:52 PM	7/26/03 11:05:09 AM	0
IMG_0188.JPG	11/24/05 9:10:08 PM	11/24/05 9:10:08 PM	7/26/03 11:05:10 AM	0
IMG_0189.JPG	11/24/05 9:10:22 PM	11/24/05 9:10:23 PM	7/26/03 11:05:10 AM	0
IMG_0190.JPG	11/24/05 9:10:28 PM	11/24/05 9:10:28 PM	7/26/03 11:05:10 AM	0
IMG_0191.JPG	11/24/05 9:10:38 PM	11/24/05 9:10:37 PM	7/26/03 11:05:11 AM	0
IMG_0194.JPG	12/18/05 12:37:58 AM	12/18/05 12:37:58 AM	7/26/03 11:05:18 AM	0
IMG_0197.JPG	12/18/05 12:38:20 AM	12/18/05 12:38:20 AM	7/26/03 11:05:19 AM	0


[Dr. KESHAVA MUNEGOWDA]

Dr. Keshava Munegowda

Author and File Systems Expert

10/23/2020

IMG_0198.JPG	12/18/05 12:38:28 AM	12/18/05 12:38:28 AM	7/26/03 11:05:19 AM	0
IMG_0199.JPG	12/18/05 12:38:56 AM	12/18/05 12:38:55 AM	7/26/03 11:05:20 AM	0
IMG_0203.JPG	12/25/05 2:59:44 AM	12/25/05 2:59:44 AM	7/26/03 11:06:36 AM	0
IMG_0204.JPG	12/25/05 2:59:50 AM	12/25/05 2:59:50 AM	7/26/03 11:06:36 AM	0
IMG_0205.JPG	12/25/05 3:00:42 AM	12/25/05 3:00:42 AM	7/26/03 11:06:37 AM	0
IMG_0206.JPG	12/25/05 3:00:50 AM	12/25/05 3:00:49 AM	7/26/03 11:06:37 AM	0
IMG_0207.JPG	12/25/05 3:01:40 AM	12/25/05 3:01:40 AM	7/26/03 11:06:37 AM	0
IMG_0208.JPG	12/25/05 3:01:46 AM	12/25/05 3:01:46 AM	7/26/03 11:06:38 AM	0
IMG_0209.JPG	12/30/05 5:56:06 PM	12/30/05 5:56:05 PM	7/26/03 11:05:34 AM	0
IMG_0210.JPG	12/30/05 5:56:12 PM	12/30/05 5:56:11 PM	7/26/03 11:05:34 AM	0
IMG_0211.JPG	12/30/05 5:56:16 PM	12/30/05 5:56:15 PM	7/26/03 11:05:34 AM	0
IMG_0212.JPG	12/30/05 5:56:20 PM	12/30/05 5:56:20 PM	7/26/03 11:05:35 AM	0
IMG_0213.JPG	12/30/05 5:56:46 PM	12/30/05 5:56:46 PM	7/26/03 11:05:35 AM	0
IMG_0214.JPG	12/30/05 5:56:54 PM	12/30/05 5:56:53 PM	7/26/03 11:05:36 AM	0
IMG_0215.JPG	12/30/05 5:56:56 PM	12/30/05 5:56:56 PM	7/26/03 11:05:36 AM	0
IMG_0216.JPG	12/30/05 5:57:00 PM	12/30/05 5:56:59 PM	7/26/03 11:05:37 AM	0
IMG_0217.JPG	12/30/05 5:58:50 PM	12/30/05 5:58:50 PM	7/26/03 11:05:37 AM	0
IMG_0218.JPG	12/30/05 5:59:00 PM	12/30/05 5:58:59 PM	7/26/03 11:05:37 AM	0
IMG_0219.JPG	12/30/05 5:59:08 PM	12/30/05 5:59:07 PM	7/26/03 11:05:38 AM	0
IMG_0220.JPG	12/30/05 5:59:18 PM	12/30/05 5:59:18 PM	7/26/03 11:05:38 AM	0
IMG_0221.JPG	12/30/05 5:59:56 PM	12/30/05 5:59:56 PM	7/26/03 11:05:39 AM	0
IMG_0222.JPG	12/30/05 6:00:08 PM	12/30/05 6:00:08 PM	7/26/03 11:05:39 AM	0
IMG_0223.JPG	12/30/05 6:00:24 PM	12/30/05 6:00:24 PM	7/26/03 11:05:39 AM	0


[Dr. KESHAVA MUNEGOWDA]

EXHIBIT 13

Expert Statement #5: Manual Alteration of File Modified Time

Suppose we have a FAT-32 hard drive and FAT-16 compact flash card. Suppose, also, that a particular file, IMG_175, was downloaded from the CF card and backed up to the hard drive (HD), and that the tables below contain the file system data for IMG_175 on each device.

1. The EXIF metadata "CreatorTool: Photoshop Adobe Elements 3.0" would not have been added by the camera at creation time (on the CF card). This must have been added and thus EXIF metadata must have been modified after creation.
2. If EXIF metadata is modified, it means the file contents are modified.
3. If the file contents are modified after creation, the file system modified time (on the HD) should be different from the file creation time on the CF card.
4. Because they are the SAME and not DIFFERENT, the HD file system modified time and/or CF card creation time must have been altered manually to match.

Table 1: IMG_175 on the hard drive

File Modified Date	11/10/2005 20:25:04
EXIF Created Date	11/10/2005 20:25:04
EXIF CreatorTool	Photoshop Adobe Elements 3.0
EXIF Model	Canon EOS 20D

Table 2: IMG_175 on the CF card

File Modified Date	11/10/2005 20:25:04
File Created Date	11/10/2005 20:25:04

**Dr. Keshava Munegowda, PhD****• Education Qualifications:**

- PhD Computer Science and Engineering, Visvesvaraya Technological University, 2016. Research domain is File systems.
- Master of technology in Computer Science and Engineering, Visvesvaraya Technological University, 2004.
- Bachelor of Engineering in Computer Science and Engineering, Bangalore University, INDIA, 2001.

• Book on FAT File systems:

- "ExFAT and FAT File system Internals", November 2016, Amazon publications.

• Granted US patents on FAT File systems:

1. USPTO application number: 12326915 entitled "Storage Optimizations by Directory compaction in FAT File system", US patent number: 8429331.
2. USPTO application number: 12762829 entitled "FAT file in reserved cluster entry with ready entry state", US patent number: 8452734.
3. USPTO application number: 13870344, entitled "IC updating File system meta data with log record data", US patent number: 9043286
4. USPTO application number: 14075757 entitled "File access method and system there of", US patent number: 9569447
5. USPTO application number: 15413058 entitled "Method and System for File storage and access", US patent number: 9817837

EXHIBIT 14

Dr. Keshava Munegowda

Author and File Systems Expert

10/23/2020

Expert Statement #10: Summary

In Expert Statements #1A, #1B and #5, it was shown that at least 95 of the 168 pictures under the "Studies" folder were manually altered.

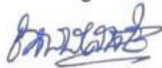
It is my opinion that these alterations were done to make it seem that the dates of the pictures on the hard drive were authentic and the pictures came from the media card. That is tampering.

Tampering is typically not done unless necessary. Because the only charge involving these devices is the charge regarding the alleged 22 contraband pictures, the only purpose that such an extensive and calculated fabrication would serve is to support that the alleged 22 contraband pictures were found on the hard drive as presented. That such fabrication was done suggests that the contraband pictures were not found on the hard drive as presented.

I have reviewed the transcript excerpts in Transcript Summary #1 and the ones appended to Expert Statement #7. Based on the transcripts, which I am assuming are accurate as presented, the following are true:

1. The media card was accessed without a write-blocker and file system data altered in the process, while it was in government custody but before it arrived at the lab for forensic analysis.
2. The government's forensic examiner knowingly lied on the stand multiple times about a well-known technical fact, stating that EXIF data was difficult to change.
3. The government had access to the devices.

Considering the above points and that the only beneficiary of the tampering is the party that brings the charge – the government – it is my opinion that the government, or someone in concert with the government, likely tampered with the hard drive and media card.



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EXHIBIT 15

10/7/2020

EXPERT STATEMENT #7

FBI Examiner Brian Booth made the following statements (the public trial transcripts are included in this report):

- "...with EXIF data, once it's embedded in a picture, it doesn't matter how many times you move it around. It stays in that photo and **it's very hard to remove.**" (Pg 4819)
- In response to the question, "Is there a particular reason why EXIF data is more difficult to alter?", Booth responds "**They purposely designed it that way.**" (Pg 4820)
- "Well, the best reference [for when a photograph is taken] is the EXIF data because that gets put into the JPEG file and **it's not easily modifiable.**" (Pg 4830)
- "... when it comes to EXIF data, it used to be it would only be hard-coded in. You couldn't modify it... when it comes to photos, they still keep you from changing dates and times. **It's not easy to change those.**" (Pg 4977)

I affirm that all of the above statements are false. EXIF data is not difficult to change. A simple Google or YouTube search reveals that there exist many online tools that a lay person can use to easily change EXIF data. EXIF data being easily modifiable is a well-known fact that anyone familiar with technology, especially forensic examiner, would know.

Therefore, I strongly believe that Mr. Booth knowingly lied to the court.



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 4. USPTO application number: 14075757 entitled "File access method and system there of", US patent number: 9569447
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BURGESS FORENSICS
COMPUTER & DIGITAL FORENSICS / EXPERT WITNESS SERVICES

EXPERT STATEMENT ON EXIF DATA

EXIF metadata is not difficult to change. On the contrary, EXIF data is easy to change.

Some EXIF metadata can be changed right from Windows with no special tools by right-clicking on the file and selecting "Properties, and then clicking on the "Details" tab. One can then simply replace data by typing into one of the following fields: Authors, Date taken, Program name, Date acquired, Copyright.

There are many tools for both the Windows and Macintosh platforms that allow one to change EXIF data.

One such is a freely downloadable piece of software that is a fairly technical tool called "ExifTool by Phil Harvey."

However, there is a Graphical User Interface version of this tool called, "ExifToolGUI for Windows," that is easier to use.

In addition, there are many online and consumer tools that allow even a non-technical person to add, remove and change EXIF data.

For instance, there is "EXIF Date Changer,) which has the purpose of changing the dates within a file's EXIF metadata and is very simple to use. It has the capability of performing batch changes, that is, to change the dates of many files at once.

Another such is "AnalogExif," which can change many EXIF metadata fields and also as a batch process.

One more is called, "Photo Date Changer," that allows user to easily change EXIF date and times and also to do so as a batch process. The program allows the user to change the date and time to a specific value, or to batch add/subtract a certain amount of time to a set of files.


Steve Burgess, Burgess Forensics

10/07/2020

Steven Alexander
Trace Digital Forensics, LLC



October 12, 2020

Re: The Importance of Forensic Images

To Whom It May Concern:

When working with data from hard drives, memory cards, and other storage devices, computer and digital forensics professionals typically make a “forensic image” of the device that they can work with during their examination or analysis. A forensic image is used to preserve the contents of the device exactly as they were. The gold standard is to make a physical image of the device: an exact, bit-by-bit copy of all the contents of the device; this includes all files, metadata, unused or unallocated space, the partition table, and any unpartitioned space.

In some cases, forensic professionals may make a “logical image” instead of a physical image. A logical image may not include all of the data from the device but is still forensically reliable. It may contain some or all files and may or may not contain unallocated (unused) space from the hard drive depending on what the forensic examiner sought to preserve. It does, however, preserve the metadata (e.g. date and time stamps) for all files extracted. A logical image can be used when, for example, the examiner wants to preserve some, but not all, of the files on the drive. This can be used to provide a forensically valid copy of a particular set of files or folders, or to provide a copy of the drive minus certain files.

Creating a forensic image, logical or physical, is not the same as copying files from one device to another. Copying files, as any of us might do when using a computer, can cause numerous changes to be made, including: changing date and/or time stamps, not copying certain files, not copying unused/unallocated space, not copying deleted files, and/or changing permissions on files. A copy is useful when sharing documents or files where no forensic analysis is needed. A copy is not considered a forensically reliable way to preserve the contents of a hard drive or storage device and is of little value when there is a dispute about the reliability of the data or questions about metadata such as date and time stamps.

Once a copy of the files on a drive has been created, making a forensic image of the copy does not render the data more reliable. Any files that were left out will still be missing. Any time stamps that were changed will not be restored.

Sincerely,

A handwritten signature in blue ink that reads "Steven Alexander".

Steven Alexander

EXHIBIT 16

1 outside of the file by the operating system. The file system
2 moves that along from place to place with it. So, at any
3 point of giving that movement from place to place, there are
4 times that things can get modified.

5 But when it comes to EXIF data, it used to be it
6 would only be hard-coded in. You couldn't modify it. And
7 only during changes during the years did they open up that you
8 could change the author's name of a photo or even a Word
9 document that you might have. You can always go in and change
10 the author and put comments in and things like that and that's
11 metadata for a Word file. But when it comes to photos, they
12 still keep you from changing dates and times. It's not easy
13 to change those. You have to go through special processes to
14 change those things.

15 Adobe will allow you to copy a photo and modify it
16 and it will take some of that metadata over, but it will
17 actually put in that. Adobe has modified their system.
18 They're taking steps to show that, listen, if you manipulate
19 this we're going to show it in some sense. It's very rare
20 that I've found someone has been changing metadata within a
21 photo and that time and date does not change from place to
22 place. It stays embedded in the photo. So, there's no
23 outside constraint that's changing it, from an OS, from an
24 Apple computer to a Dell computer.

25 So these things stay consistent. Those are prime

EXHIBIT 17



BURGESS FORENSICS
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Steve Burgess, Burgess Forensics

10/07/2020

EXHIBIT 18

Steven Alexander
Trace Digital Forensics, LLC



October 12, 2020

Re: The Importance of Forensic Images

To Whom It May Concern:

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Sincerely,

A handwritten signature in blue ink that reads "Steven Alexander".

Steven Alexander

EXHIBIT 19

Steven Alexander
Trace Digital Forensics, LLC



October 12, 2020

Re: The Importance of Forensic Images

To Whom It May Concern:

When working with data from hard drives, memory cards, and other storage devices, computer and digital forensics professionals typically make a “forensic image” of the device that they can work with during their examination or analysis. A forensic image is used to preserve the contents of the device exactly as they were. The gold standard is to make a physical image of the device: an exact, bit-by-bit copy of all the contents of the device; this includes all files, metadata, unused or unallocated space, the partition table, and any unpartitioned space.

In some cases, forensic professionals may make a “logical image” instead of a physical image. A logical image may not include all of the data from the device but is still forensically reliable. It may contain some or all files and may or may not contain unallocated (unused) space from the hard drive depending on what the forensic examiner sought to preserve. It does, however, preserve the metadata (e.g. date and time stamps) for all files extracted. A logical image can be used when, for example, the examiner wants to preserve some, but not all, of the files on the drive. This can be used to provide a forensically valid copy of a particular set of files or folders, or to provide a copy of the drive minus certain files.

Creating a forensic image, logical or physical, is not the same as copying files from one device to another. Copying files, as any of us might do when using a computer, can cause numerous changes to be made, including: changing date and/or time stamps, not copying certain files, not copying unused/unallocated space, not copying deleted files, and/or changing permissions on files. A copy is useful when sharing documents or files where no forensic analysis is needed. A copy is not considered a forensically reliable way to preserve the contents of a hard drive or storage device and is of little value when there is a dispute about the reliability of the data or questions about metadata such as date and time stamps.

Once a copy of the files on a drive has been created, making a forensic image of the copy does not render the data more reliable. Any files that were left out will still be missing. Any time stamps that were changed will not be restored.

Sincerely,

A handwritten signature in cursive script that reads "Steven Alexander".

Steven Alexander

EXHIBIT 20

UNITED STATES DISTRICT COURT
EASTERN DISTRICT OF NEW YORK

UNITED STATES OF AMERICA

- v. -

KEITH RANIERE,

Defendant.

Case No. 18 Cr. 00204 (NGG) (VMS)

**DECLARATION OF MARC A.
AGNIFILO**

Submitted on April 22, 2019

MARC A. AGNIFILO, an attorney duly admitted in the state of New York and the United States District Court for the Eastern District of New York, hereby affirms under penalty of perjury the following:

1. I am Of Counsel to the law firm Brafman & Associates, P.C., attorneys for Defendant Keith Raniere, and as such am fully familiar with the facts and circumstances herein. I make this declaration in support of Defendant Raniere's Second Motion to Suppress, dated April 22, 2019.

2. Attached hereto as Exhibit 1 is a true and correct copy of the Affidavit of FBI Special Agent Michael Lever dated March 26, 2018 in support of an application for search warrant for 8 Hale Drive, Halfmoon, NY 12065

3. Attached hereto as Exhibit 2 is a true and correct copy of the Search and Seizure Warrant issued on March 26, 2019 by Magistrate Judge Daniel J. Stewart permitting agents to search the premises known and described as 8 Hale Drive, Halfmoon New York 12065.

4. In terms of the timing of this motion, we have repeatedly asked the government to provide reports concerning the search of the backup hard drive from which the child pornography was allegedly recovered. As of the date of this motion, the government has not provided us with any such reports. In fact, when asked recently when we were going to get these reports, the

prosecution stated that the reports were not completed but that the government would make the reports available when the FBI completed them.

5. While the defense should not be in a position of having to claim an expectation of privacy over premises from which alleged child pornography was recovered without first being given basic reports outlining the search and how the items were located and retrieved, given the fact that we are progressing to opening statements fifteen days from today, we simply could not wait any longer to make this motion.

6. Therefore, while the government may raise objection concerning the timing of this motion, this is a problem of the government's making. Not only did it indict Raniere with the child pornography charges and counts at the eleventh hour, it then made the situation far worse by failing to provide the defense with the FBI reports concerning the search. Again, as of the writing of this motion, the government still has not provided these reports to us, despite the fact that we asked for them in open Court and in subsequent communications between the parties.

7. As a result, while the defense should not have to claim standing prior to being provided with the search report, we have had to do so here given the time constraints the government has imposed on the defense and on the Court.

I declare under penalty of perjury that the foregoing is true and correct.

Dated: April 22, 2019
New York, NY

Respectfully submitted,

BRAFMAN & ASSOCIATES, P.C.
767 Third Avenue, 26th Floor
New York, NY 10017
(212) 750 – 7800

/s/

Marc A. Agnifilo, Esq.
Of Counsel

EXHIBIT 21

1 all of which consistently show her birthday of March 1st,
2 1990.

3 Next you know when the photographs were taken
4 because of when they were dated. I don't think we have the,
5 we don't have the -- so there is -- the first one is B110205,
6 and then -- we'll come back to it before we finish.

7 Now the defendant clearly came up with the folder
8 title, because it's his own private nicknames for the women
9 who's pictures are inside them. Each of these folders contain
10 photographs that match the date on which they were taken. You
11 know it because Lauren Salzman and Daniela both testified that
12 the defendant took naked photographs of them in 2005. And the
13 naked photographs they described having been taken are exactly
14 like the ones that you saw in the studies on the Western
15 digital hard drive.

16 Now you also know that the photographs were taken in
17 2005 because that's what the data shows. The forensic
18 examiner, Brian Booth testified that the most reliable
19 metadata that the FBI could obtain from the images on the
20 Western digital hard drive, said that they were taken exactly
21 when the folders stated they were taken. So Government's
22 Exhibit 518 A through N, now we can see it, were taken on
23 November 2, 2005. And Government's Exhibit 518 O through U
24 were taken November 24, 2005.

25 You also know that the photographs were taken when

EXHIBIT 22

1 .jpg 186, creation date, July 26th, 2003, 2:05 p.m.

2 .jpg 187, file creation, July 26th, 2003, 2:05 p.m.

3 .jpg 188, file creation, July 26th, 2003, 2:05 p.m.

4 .jpg 189, July 26th, 2003, 2:05 p.m.

5 .jpg 190, July 26th, 2003, 2:05 p.m.

6 And the last in this series from 184 to 191, file
7 creation date of July 26th, 2003, at 2:05 p.m.?

8 A Correct.

9 Q So looking at that, it's fair to say that for images 184
10 to 191, they have the same file creation date as .jpg images
11 150 to 163.

12 A Yes.

13 Q And in your opinion, is the metadata that was generated
14 with respect to file creation reliable?

15 A No.

16 Q Is it possible these images were created in 2004?

17 A Yes.

18 Q Is it possible they were created in 2005?

19 A Yes.

20 Q Is it possible they were created in 2006?

21 A You can keep going on what dates. I don't know.

22 Q Right. It could be 2008?

23 A Yes.

24 Q It could be 2010?

25 A Correct.

1 Q Because the file creation metadata is not reliable in
2 this case, according to you; correct?

3 A The file -- the file system metadata for those dates and
4 times are not accurate.

5 Q That issue has nothing to do with how you may have
6 conducted your examination; is that correct?

7 A Correct.

8 Q And these images which form the basis of the photographs
9 which were displayed today, also had modified dates on them?

10 A Yes, they did.

11 Q And do you remember what the modified date was for .jpg
12 images 150 to 163?

13 A If I recall, it came back to a 2005 date.

14 Q Okay. And with respect to .jpg images 184 and 195, do
15 you recall what the file modified date was?

16 A I think they call came back to 2005.

17 Q And then did you determine in your analysis file access
18 dates?

19 A No, I did not.

20

21 (Continued on following page.)

22

23

24

25

EXHIBIT 23

1 with. You can inspect it yourself in the jury room.

2 As Special Agent Mills testified, the camera says it
3 was made in Japan. You can see it for yourselves, which
4 proves the third element of the Racketeering Act 2 and 3
5 beyond a reasonable doubt.

6 Now, as for Racketeering Act 4, the defendant was
7 charged with possession of child pornography. The child
8 pornography with which he possessed is the same as the images
9 he took of Camila when she was under 18 years old.

10 The elements of Racketeering Act 4 are that the
11 defendant knowingly possessed the visual depiction. That the
12 visual depiction was produced using material that had been
13 transported in interstate or foreign commerce. That the
14 production of the depiction involved the use of a minor
15 engaged in sexually explicit conduct. And that the defendant
16 knew that the production of the visual depiction involved the
17 use of a minor engaging in sexually explicit conduct.

18 So Racketeering Act 4 is similar to Racketeering Act
19 2 and 3 because elements two and three are the same. The
20 difference for Racketeering Act 4 is that Racketeering Act 4
21 charges the possession, not the creation, of the images of
22 Camila. All possession means is that the defendant had
23 control over the images at some point between when the images
24 were created in November 2005 and when they were seen by
25 Special Agent Mills in March 2018.

1 You know the defendant did, because again, the
2 defendant took those photos. He labels the photos with the
3 first initial of his nickname for Camila, Virgin Camila, and
4 he tells her that he has the photos from way back when.

5 (Continued on next page.)
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1 MS. PENZA: Now, it's not just -- let's check off
2 our three racketeering acts.

3 So I submit that what we just went through proved
4 Racketeering Acts 2, 3, and 4.

5
6 Now, the fact that in addition to the fact that he
7 began his relationship with request Camila when she was still
8 a child, 15. It was coercive and abusive in so many other
9 ways. You saw the nature of that relationship. The WhatsApp
10 chats Special Agent Reiss read were a special window into the
11 defendant's relationship with Camila. You saw how controlling
12 he was. How Camila asked permission to eat, to sleep, to cut
13 her hair, to see a friend, to text her family.

14 At the beginning of this case, Mr. Agnifilo, told
15 you that that a lot of the time the defendant was being
16 controlling, he said what's behind the control? This is
17 something these people signed up for. They are here to make
18 their lives better and they have signed up for this. But you
19 saw the messages, you heard the testimony. This was not about
20 making anyone's life better, and either Camila nor her sister
21 signed up for anything like this: The control, the abuse, the
22 threats to send her back to Mexico. And you likely remember
23 the defendant's obsession with Robbie.

24 The defendant also told Camila that by ruining her
25 period she had ruined herself as the defendant's successor.

EXHIBIT 24

APPENDIX A.

**Steven M. Abrams, J.D., M.S.
Curriculum Vitae**

Steven M. Abrams, J.D., M.S.
Attorney, Digital Forensics Examiner and Instructor
1154 Holly Bend Drive
Mount Pleasant, SC 29466
843-216-1100
Steve@AbramsForensics.com

Curriculum Vitae

My key practice areas are Computer Forensics, e-Discovery, and Computer Law.

Education

- 2016 -Techno Security 2016, Computer Forensics Training Seminar, Myrtle Beach, SC, June 5-8, 2016
- 2014 -Georgia Bureau of Investigations, Internet Evidence Finder Forensics Training, Decatur, Georgia, February 2014
- 2013 -Techno Security 2013, Computer Forensics Training Seminar, Myrtle Beach, SC, June 2-5, 2013
- 2012 -Techno Security 2012, Computer Forensics Training Seminar, Myrtle Beach, SC, June 3-6, 2012
- 2011 -November 9-12: EnCase 7 Training, Salt Lake City, UT
-November 6 – 9: Paraben Forensics Innovations Conference, Park City, UT
- South Carolina Assoc. of Legal Investigators (SCALI) Annual Training Seminar, May 2011
- April 7, 2011: SC Electronic Crime Task Force Quarterly Meeting and Training
- 2010 -Techno Security 2010, Computer Forensics Training Seminar, Myrtle Beach, SC, June
- SCALI Annual Training Seminar, May 2010
- 2009 - Cellebrite Mobile Device Forensics Certification (CCMDE), SEMAR, Mexico City, Mexico
-SCALI Annual Training Seminar, May 2009
- 2008 - South Carolina Basic Constable Training, Tri-County Technical College / SC Criminal Justice Academy, October – November 2008
- Commissioned as a South Carolina State Constable (LEO) on November 20, 2008.
- Techno Security 2008, Computer Forensics Training Seminar, Myrtle Beach, SC, June
- 2007 - Charleston School of Law, Charleston, SC, Juris Doctor (J.D. - Magna Cum Laude)

- GMU2007 Computer Forensics Symposium, Regional Computer Forensic Group of the High Technology Crime Investigation Association, Fairfax VA, Aug. 2007 (40 CEU HTCIA)
- Techno Security 2007, Computer Forensics Training Seminar, Myrtle Beach, SC, June

- 2006 - University of Aberdeen, School of Law, Kings College, Old Aberdeen, Scotland
in collaboration with the University of Baltimore Law School
Summer Law Program in Comparative Criminal Procedure and UK Business Entities &
Taxation
- Techno Security 2006, Computer Forensics Training Seminar, Myrtle Beach, SC, June
- SCALI Annual Training Seminar, May 2006

- 2005 - SCALI Annual Training Seminar, May 2005
- SCALI Fall Training Seminar, October 2005

- 2004 - Access Data Advanced Windows Forensics, June 23-25, 2004, New York City. (24
Credit Hours)
- SCALI Annual Training Seminar, May 2004 (10 CEU)

- 2003 - GMU2003 Computer Forensics Symposium, Regional Computer Forensic Group
of the High Technology Crime Investigation Association, George Mason University,
Fairfax, VA. Aug.2003, (40 CEU HTCIA)
- Techno Security 2003, Computer Forensics and Security Conference (24 CEU)
- SCALI Annual Training Seminar & PI Training Seminar (16 CEU SLED)

- 2002 - SCALI Annual & Fall Training Seminars (16 CEU SLED)
- GMU2002 Computer Forensics Symposium, Regional Computer Forensic Group
of the High Technology Crime Investigation Association, Fairfax VA, Aug. 2002,
(40 CEU HTCIA)
- Access Data Computer Forensic Boot Camp, North Carolina Justice Academy,
Edneyville, NC (24 CEU)

- 1992-1994 Microsoft Internet Developer Workshops NY, NY

- 1992-1993 Novell NetWare CNE Training, IBM Skills Discovery, Jericho NY

- 1984-1985 Microcomputer and Electronics Engineering, Hofstra University, Hempstead NY

- 1982-1983 Ph.D. Studies, Faculty Fellowship, Columbia University, Graduate School of Arts &
Sciences
- 1981-1982 Columbia University, College of Physicians & Surgeons, Master of Science (M.S.)

- 1977-1981 Allegheny College, Meadville PA, Bachelor of Arts (B.A.) (Psychology - Computer
Science)

Professional Licenses

Current

Licensed Attorney in South Carolina
 Licensed Attorney in District of Columbia
 Licensed Attorney and Counselor at Law in New York

Previous

Licensed as a Private Investigator in South Carolina and New York (2002-2008), South Carolina
 State Constable (Sworn, 2008-2019).

Experience (Selected)

2016 – Present, Senior Attorney, Abrams Cyber Law & Forensics, LLC. Mount Pleasant, SC 29466. Concentration on Electronic Privacy and Defamation Cases, Electronic Discovery, and Digital Forensics.

2018 - Continuing Legal Education Instructor, ***Electronic Privacy Violations during Divorce: Legal and Ethical Guidelines for Family Law Practitioners***, SC Bar, Columbia SC (February 21, 2018).

2016 – Continuing Legal Education Instructor, ***Smartphones as evidence for Personal Injury Cases***, NBI, Charleston SC (December 8, 2016).

2011 – 2016 Sole Practitioner Abrams Law Firm, PC. Mount Pleasant, SC 29466

2011 - Digital Forensics Instructor / Investigator, H-11 Digital Forensics / United States Embassy, Tirane, Albania.

2010 – Facilitator, Instructor, Annual In-Service Legals and CDV Training (SLED), Lowcountry Constable Association.

2009 – Speaker, South Carolina Association for Justice, Hilton Head, SC (August 6, 2009) Topic: Civil Discovery of E-mails after *O’Grady*

2009 – Digital Forensics Instructor/Investigator, H-11 Digital Forensics / United States Embassy, Mexico City, Mexico.

2008 – Digital Forensics Instructor/Investigator, H-11 Digital Forensics / United States Embassy, Mexico City, Mexico.

2008 – Faculty, SC Bar Convention – Family Law Section CLE

2008 – 2011 Shareholder, Abrams Millonzi Law Firm, P.C., Mount Pleasant, SC 29464

2007 - Presenter, “E-Discovery: Definition, FRCP Changes and Application CLE”, NBI, Charlotte, NC, December 19, 2007

2007 - Digital Forensics Instructor/Investigator, H-11 Digital Forensics, United States Embassy, Mexico City, Mexico

2007 - Presenter, “Civil to Criminal: Collaborative Computer Forensics Investigations between PIs and Law Enforcement”, GMU2007, August 9th & 10th, 2007

2007 - Presenter – “A South Carolina Lawyer’s Roadmap to Navigating the New Federal E-Discovery Rules,” The South Carolina Bar (CLE Division), April 13, 2007.

2006 - Presenter – “Typical Internet Sexual Activity and its Detection”, Family Law CLE, The South Carolina Bar (CLE Division), November 2006.

2006 - Instructor, "3-day Hands-on Computer Forensics Workshop", Trident Technical College, N. Charleston, SC, CLE accredited by The South Carolina Bar, January 2006.

2005 - Lecturer, "Computer Forensic Introduction", Trident Technical College, CLE accredited by South Carolina Bar and CEU / In-Service hours for PIs / LE by SLED.

2001 - Present Steve Abrams & Company, Ltd. (dba Abrams Computer Forensics)
Licensed Private Investigator, Computer Forensics Examiner

1998 - 2001 Steve Abrams & Company, Ltd. Mt. Pleasant, SC, President

1996 - Democratic National Committee, Instructor - Southeast and Northeast Regional Schools for Congressional Campaign Managers.

1995 – 1999 Direct Marketers of Charleston Mt Pleasant, SC, Partner
Co-owner of Political Database Marketing Company and full service political print shop.

1994 - 1995 The Software Studio Mt Pleasant, SC, Owner
Owner of software development company that developed database applications for the Newspaper publishing industry.

1992-1993 Town of North Hempstead, Manhasset, NY, Deputy Commissioner of Finance

1986 - 1992 Digitron Telecommunications, Inc., Huntington, NY, Director of R&D

1984 - 1986 Computer Associates International., Islandia, NY, Senior Systems Programmer

1983 Contel Information Systems Division. Great Neck NY, Software Engineer
(Developed the first Network Forensics Applications for the DoD)

Recent Publications

Steven M. Abrams, Knowledge of Computer Forensics Is Becoming Essential for Attorneys in the Information Age, 75 N.Y. St. B. Assn. J. 8, 15 (Feb. 2003).

Steven M. Abrams, Knowledge of Computer Forensics, Essential for 21st Century Private Investigators, 16 PI Mag. 46, 59 (October 2003).

Professional Awards & Honors

2008 – Member, SLED Ad Hoc Committee on Computer Forensics

2007 – CALI Excellence for the Future Award, Aviation Law, Charleston School of Law, Fall 2006

- CALI Excellence for the Future Award, Interviewing, Counseling & Negotiation, Charleston School of Law, Fall 2006
- CALI Excellence for the Future Award, Insurance Law, Charleston School of Law, Fall 2006

_ Dean's List, Charleston School of Law, Fall 2006, Spring 2007.

2004 - "2004 SCALI Investigator of the Year"

2003 - Member, SLED Private Investigations Business Advisory Committee

Professional Associations

Member, Institute of Electrical and Electronics Engineers - IEEE

Member, Lowcountry Constables Association - LCA

Bar Association Memberships

Admitted to practice in **South Carolina, District of Columbia, and New York.**

Compensation

I receive \$350 per hour, plus mileage, travel and lodging expenses, for all Computer Forensics services and for depositions and trial testimony.

Previous Expert Testimony

I have completed over 1200 computer forensics investigations, the overwhelming majority of cases were settled and did not require me to testify.

South Carolina cases in which I was qualified in court as an expert are:

Hillburn v. Hillburn, (2001-DR-08-2354);
Smith v. Smith, (2001-DR-22-212);
Natale v. Natale, (2003-DR-10-775)
Berda v. Berda, (2003-DR-10-1899);
Murphy v. Murphy (2004-DR-10-1510) and
Overstolz v. Fountain of Youth Wellness Centers LLC (2003-CP-10-000761).
Gitter v. Gitter (2008-DR-10-2865)
Ricigliano v. Ricigliano, (2009-DR-18-0102)
Edwards v Junevicius, (2010-DR-10-4736)
BTM Machinery Inc. v. Michael J. Finley (2013-CP-10-4366)
Cherry v Cherry (2014-DR-10-95)
Whitfield v. Schimpf and Sweetgrass Plastic Surgery,
LLC (Case No. 2017-CP-10-2758)

I was qualified as a testifying expert on digital forensics in federal court in

UHLIG, LLC, V JOHN ADAM SHIRLEY, (CIVIL ACTION No.. 6:08-1208-HFF)

I have also prepared expert's reports under Federal Rule 26(a)(2)(B) for the following federal civil suits filed in the United States District Court for the District of South Carolina:

Lumpkin v. Bennani, (Civil Action No. 2:03-2904-23), and
Miller v. American LaFrance Corp. (Civil Action No. 2:04-1668-23)
Microsoft v. BWC Products Inc. (Civil Action No. 2:06-CV-2023-CWH)
Quala Systems, Inc, et al., v. Bulkhaul USA, Inc., et al. (Civil Action No. 2:07-CV-00673-PMD)
Mainfreight v. John Marco, et al., (Civil Action No. 9:cv00563 JFA)

I was appointed the Court's Expert in US District Court, District of South Carolina, Rock Hill Division:

The Travelers Home and Marine Ins. Co. v. Pope, C/A No.: 0:10-cv-1688-JFA

I was qualified as a computer forensics expert in North Carolina courts in:
Hollins v. Lightfoot.

In addition, I have been deposed in the following matters over the past ten years:

Thomas & Assoc. v. Christopher Humphreys (Case No. 2018-CP-10-0455)
Catherine Cope v. Wells Fargo Bank N.A., Century 21 Properties Plus, and Jim Bailey, individually; (Case No.: 2018-CP-18-00112)
Rick Gray v. Church Mutual (2017)
Calandra v. Calandra (2004-DR-10-2675)
McLernon v. McLernon (2003-DR-10-3090)
White v. Cassidy (2004-DR-08-256)
Khoury v. Noce (2006-CP-10-001830)
Quala Systems, Inc, et al., v. Bulkhaul USA, Inc., et al. (Civil Action No. 2:07-CV-00673-PMD)
Mainfreight v. John Marco, et al., (Civil Action No. 9:cv00563 JFA)
Beard v. Dunn & Dixon-Hughes et al, (Case No. 2010-CP-08-0776)
UHLIG, LLC, V JOHN ADAM SHIRLEY, (CIVIL ACTION No.6:08-1208-HFF)
ALTMAN, ET AL. V. FIRST CITIZENS BANK AND TRUST COMPANY (2012-CP-34-0124)

(Revised: Sept 11, 2019)

EXHIBIT 25

Dr. KESHAVA MUNEGOWDA

B E, M-Tech, PhD

SUMMARY

System Architect/Technical Manager and an Individual Contributor too

16+ years of experience in Design, Development of File systems, Storage Systems, Cluster Infrastructure development, Software Defined Storage / Streaming Storage, Big data systems and Network Authentication and Security Protocols.

KEY STRENGTHS

Product Development, System Design and Implementation, Data structures and Algorithms, Research and Development, Technical mentorship, Performance benchmarking, Debugging, Patent harvesting and Filing, Research paper publications, University Collaboration for PhDs and Research Programs.

SKILLS

Programming Languages	C, C++, Java 8+, Python 2.x
Operating Systems	Linux / Kernel Internals
Programming paradigms	Object oriented (OOP) Programming Functional Programming Reactive Programming Java Streams and Concurrency (parallel programming).
Distributed Systems	Kafka, Pravega, Pulsar, Bookkeeper, HDFS, RabbitMQ, RocketMQ
File Systems	Linux VFS, FAT 12/16/32, ExFAT, F2FS, TFAT, TexFAT, Ext3
Storage Systems	Linux Block device drivers, SATA, NAND / NOR Flash memories, SSDs.
Network Protocols	TCP/IP, SSL, EAP, EAP-TLS, EAP-TTLS
Network packages	Netty IO
Metrics	Micrometer, Prometheus, Grafana, Influx DB, StatsD
Build Systems	Gradle, make
Source Control	Git
Development IDEs	IntelliJ, PyCharm, Source Insight
Cloud Deployments	AWS, Google Cloud

Experiences

Senior Principal Engineer

02/2013 - Present

DellEMC - Bengaluru, INDIA

- Responsible for Pravega (Software defined storage) Performance Benchmarking and Improvements
- Founder Developer of SBK - Storage Benchmark Kit.
- Pravega client Bug fixing
- Competitive Analysis of Pravega with another products Kafka, Pulsar, NATS, RabbitMQ, etc.
- Architect of DCA (Data Computing Appliance) Software
- RHEL7 Deployment design architect for DCA
- Bug fixing of Power Path multipath software

Lead Engineer, Nucleus and Linux Kernel

01/2006 - 02/2013

Texas Instruments - Bengaluru, INDIA

- Ownership, design and implementation of FAT12/16/32 File systems
- Ownership, design and implementation of ExFAT file system
- Design and implementation of USB host controller driver
- Ownership of Linux kernel open sourcing of USB host controller driver
- Design and implementation of device drivers for MMC/SD, SATA SSDs

Software Engineer, Nucleus and Linux kernel

08/2004 - 12/2005

SASKEN - Bengaluru, INDIA

- Design and implementation device drivers for NAND, NOR Flash memories

Project Trainee Engineer

07/2003 - 08/2004

Global Edge - Bengaluru, INDIA

- Design and Implementation of protocols EAP, EAP-TLS, EAP-TTLS protocols for WLAN authentication and security protocols

Milestones

Granted Patents	Research Papers	Technical Books
5	15	2

Contact Details

Phone	+91 - 9448573494
Email	keshava.gowda@gmail.com
Place	Bengaluru, INDIA
LinkedIn	https://www.linkedin.com/in/dr-keshava-munegowda-phd-604bbb5b/
Git Hub	https://github.com/kmgowda
Research gate	https://www.researchgate.net/profile/Keshava_Munegowda
Open source projects	SBK (Storage Benchmark Kit): https://kmgowda.github.io/SBK Pravega: http://pravega.io

Education

Philosophy of Doctorate (PhD) - Computer and Information Systems

2016

V T U – Belagavi, INDIA

Master of Technology (MTech) - Computer Science and Engineering

2002 - 2004

V T U – Belagavi, INDIA

Bachelor of Engineering (BE) – Computer Science and Engineering

1997 – 2001

Bangalore University – Bengaluru, INDIA

Patents

1. USPTO application number: 12326915 entitled “Storage Optimizations by Directory compaction in FAT File system” , US patent number: 8429331.
2. USPTO application number: 12762829 entitled “FAT file in reserved cluster entry with ready entry state”, US patent number: 8452734.
3. USPTO application number: 13870344, entitled “IC updating File system meta data with log record data”, US patent number: 9043286
4. USPTO application number: 14075757 entitled “File access method and system there of”, US patent number: 9569447
5. USPTO application number: 15413058 entitled “Method and System for File storage and access”, US patent number: 9817837

Books

1. “Design and Implementation of WLAN Authentication and Security: Building Secure Wireless LAN by EAP- MD5, EAP-TLS and EAP-TTLS protocols” by Keshava Munegowda, J u n 2010. LAMBERT Publications, Berlin, Germany
2. “ExFAT and FAT File systems Internals: Exploring FAT, ExFAT, TFAT and TexFAT File systems” by Dr. Keshava Munegowda, Jun 2016, Amazon Digital services, ASIN: BOIHQ8PRA6.

Research Papers

1. “Distributed Streaming storage performance benchmarking: Kafka and Pravega”, Sanjay Kumar, Dr. Keshava Munegowda, International Journal of Innovative Technology and Exploring Engineering, Page 1-8, Volume 9, Issue 2, December 2019.
2. “Avoidance Techniques for snowball effect of wandering tree in flash memory-based File systems” , Keshava Munegowda, Dr. G T Raju, International Journal of Applied Engineering Research, Page 120-124, Volume 10, Number 86, December 2015.
3. “Adapting Endurance and Performance Optimization Strategies of ExFAT File System to FAT File System for embedded storage devices”, Keshava Munegowda, Dr. G T Raju, Veera Manikandan Raju, International Journal of Engineering and Technology (IJET), ISSN : 0975-4024, Pages 204-211, Volume 6, Issue 1, February – March 2014
4. “Directory Compaction Techniques for Space Optimizations in ExFAT and FAT File Systems for Embedded Storage Devices”, Keshava Munegowda, Dr. G T Raju, Veera Manikandan Raju, International Journal of Computer Science Issues (IJCSI), ISSN: 1694-0784, Pages 144-150, Volume 11, Issue 1, Number 2, January 2014.
5. “Design and Implementation of Log Structured FAT and ExFAT File Systems”, Keshava Munegowda, Dr. G T Raju, Veera Manikandan Raju, International Journal of Engineering and Technology (IJET), ISSN: 0975-4024, Pages 1708-1727, Volume 6, Issue 4, August-September 2014.
6. “Methodologies for Geotagging in FAT and ExFAT File Systems for Smart Phones”, Keshava Munegowda, Dr. G T Raju, Veera Manikandan Raju, International Journal of Computer Applications (IJCA), ISSN: 0975 – 8887, Pages 7-14, Volume 92,

Number 2, April 2014.

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EXHIBIT 26



October 23, 2020

To Whom It May Concern

RE: Computer Forensics – Generally Accepted Practices

My name is David R. Wilson. I am a Texas attorney and a computer forensic expert with over 20 years of experience. My curriculum vitae, ("CV"), is attached. The sole purpose of this correspondence is to address two specific questions posed to me regarding: (1) maintaining evidentiary integrity of electronic media; and (2) providing access of electronic media to defense counsel for inspection and review.

Electronic media, by its nature, is easy to edit, delete, destroy, or otherwise alter. Further, electronic media is susceptible to damage from environmental exposure and great care must be taken when collecting, preserving, and handling it. As such, it is crucial that the media be secured, and a complete chain of custody is maintained.

As an example, a media card that delivered to a forensic lab in an unsealed box and an unsealed bag would be a breach of proper handling of electronic data which severely compromises the integrity and reliability of the data. And should the defendant allege that media was altered, it would create substantial doubt as to the veracity and ultimately the reliability of the electronic media.

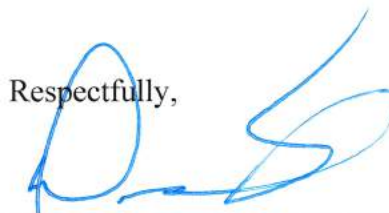
Since *Brady*¹, the U.S. Supreme Court has held that prosecutors provide the defendant an opportunity to view and inspect evidence held by the prosecution. And by failing or refusing to provide the defendant access to the evidence is a violation of the defendant's right to due process.

¹ *Brady v. Maryland*, 373 U.S. 83 (1963).

In matters where electronic media is alleged to contain illicit data² and providing a forensic copy of the media to defendant is prohibited by law, the generally accepted practice is to provide supervised access of the forensic image(s) to the defendant or defendant's counsel and experts. As a forensic computer examiner, I have personally been involved in similar situations.

The generally accepted practice for supervised access involves the prosecution to provide access to defendant's expert of the full and unredacted forensic image(s) at the prosecutor's office. Doing so allows the defendant's expert to conduct his own forensic examination. The practice of extracting data from the forensic image alters and destroys the evidentiary value of such. Further, it does not allow the defendant the opportunity to defend against any claims arising from or related to the electronic media. As such, it is my opinion that by not providing the defendant access to the electronic media would constitute a violation of the defendant's right to due process.

Respectfully,



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² Data that by its nature is illegal to possess.



WILSON LAW PRACTICE, PLLC

David R. Wilson is a Texas attorney and recognized expert in the fields of Computer Forensics and Electronic Discovery. He has over 20 years of significant experience in electronic discovery consulting and computer forensic examinations and has provided expert testimony on numerous occasions.

David was the founder and CEO of D6 Consulting, LLC., a Computer Forensic and Electronic Discovery consulting firm. He was the Southwest Area Practice Leader at Ernst & Young LLP in their Legal Technology Services group. He was a co-founder of Deloitte & Touche's Analytical & Forensic Technology Practice and is a former law enforcement officer where he founded and led the computer crimes section of a large metropolitan police department. He has received thousands of hours of training in computer forensic science and electronic discovery and achieved the designation as a Certified Forensic Computer Examiner (CFCE) by the International Association of Computer Investigative Specialist (IACIS). In addition to his experience and expertise in electronic discovery and forensic analysis, David is a licensed attorney in the State of Texas.

David has significant experience in the following electronic discovery and forensic areas:

- Consulting / Testifying Expert in Discovery and Forensic Technology
- Court-appointed neutral expert
- Special Master in Discovery Disputes
- Electronic discovery consulting and expert testimony
- Acquisition and preservation of electronic data
- E-mail recovery and examination from both user and server based systems
- Recovery of data from all forms of electronic and optical media
- Recovery of electronic data from hidden areas of computer media
- Retrieval and production of electronic data in litigation
- Expert testimony in Computer Forensic investigations

David has led and actively participated in numerous high-profile matters at some of the Nation's largest companies, as well as provided expert courtroom testimony.

Following is a list of representative engagements.

SELECTED EXPERIENCE

- Led a multi-national team in the identification of electronic data sources and development of an electronic 'litigation hold' methodology in response to a multi-defendant litigation

matter and formal SEC investigation. This process involved the identification and review of over 4,000 different business systems in 12 different countries.

- Directed the preservation, collection, review and production of electronic data for a Fortune 500 company in a class action lawsuit and SEC investigation. The process included identifying and processing over 27 million electronic documents and emails, and the forensic imaging of over 250 computer hard drives.
- Managed a team of examiners in the acquisition, preservation and review of electronic data collected from computers belonging to the executives of a large Fortune 500 company. This company was the subject to an SEC investigation and a shareholders' class action suit centered on the restatement of earnings over a three-year period. The investigation resulted in the indictment of several of the top executives by a Federal Grand Jury.
- Led a team of professionals in the seizure of computer equipment from an adverse party as outlined by a Federal Seizure Order and provided expert courtroom testimony related to the examination of the seized computer systems. The lawsuit involved the theft of intellectual property and copyright violations from a previous employee. The seizure and examination of this computer equipment proved to be invaluable in the recovery of data and the prevention of future lost revenues.
- Managed a team of examiners in the acquisition and examination of electronic data obtained from company executives from a newly acquired company. Evidence recovered from the examination assisted the fraud investigation that resulted in a reduction of the acquisition price.
- Worked in the capacity as the court appointed Special Master in the production of electronic data for discovery purposes for both plaintiff and defendants involved in a civil litigation. This function required the acquisition, analysis and production of data from 13 computers.
- Managed an investigation into misallocated funds from a local school district. It was suspected that the cashier at one of the district's high schools had failed to make deposits in excess of \$50,000. This investigation required the examination and reconciliation of numerous accounts. As a result of our work this incident was referred by the school district to the local law enforcement officials for criminal prosecution.

EDUCATION / CERTIFICATIONS

- Licensed Attorney, Texas
- Certified Forensic Computer Examiner, IACIS
- Federal Law Enforcement Training Center
- Computer Forensic Analysis, Guidance Software Inc.,
- International Association of Computer Investigative Specialists-Computer Forensics

ADMISSIONS

- State of Texas
- United States District Court, Eastern District of Texas