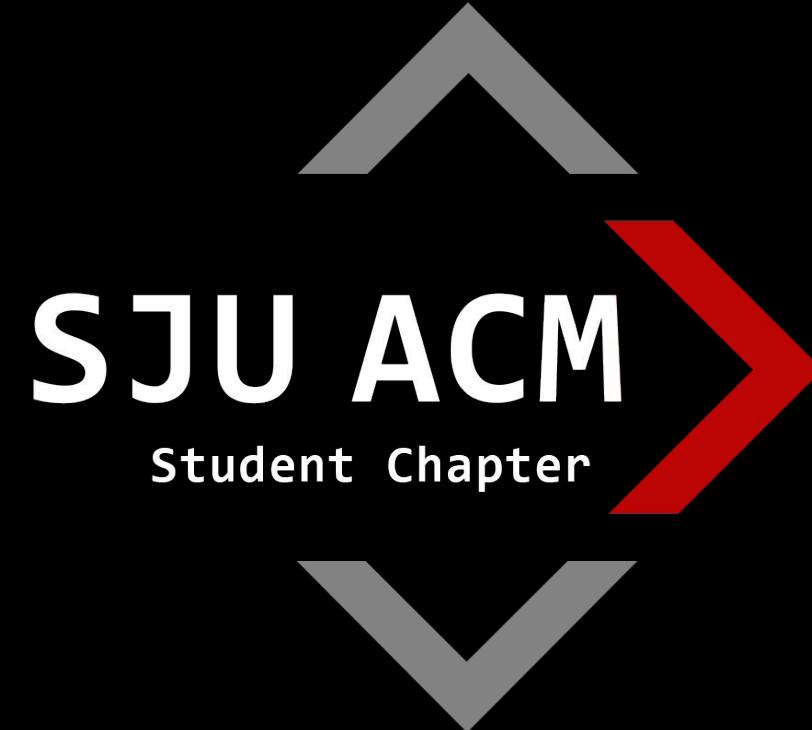




# DIGITAL FORENSICS INVESTIGATIONS + SJU ACM CLUE

SJU ACM STUDENT CHAPTER



SIGN IN FORM:



# INTRO TO DIGITAL FORENSICS



# WHAT IS DIGITAL FORENSICS?

- A BRANCH OF FORENSICS SCIENCE THAT FOCUSES ON ELECTRONIC DATA
- ELECTRONIC DATA IS A HUGE COMPONENT OF CRIMINAL INVESTIGATIONS
- CAN ALSO BE USED DURING INCIDENT RESPONSE AS A PART OF CYBER ATTACK INVESTIGATIONS
- BOTH PUBLIC AND PRIVATE SECTOR
- REQUIRES A DEEP UNDERSTANDING OF HOW COMPUTERS AND FILE SYSTEMS WORK





# **5 STAGES OF A DIGITAL FORENSICS INVESTIGATION**

# 1. IDENTIFICATION

- THERE ARE LEGAL CONSTRAINTS TO WHAT DATA CAN BE COLLECTED AND EXAMINED IN PUBLIC SECTOR INVESTIGATIONS
  - DETERMINE WHAT DATA IS RELEVANT TO THE CASE
  - DETERMINE THE SCOPE OF THE INVESTIGATION
  - NEED TO ACQUIRE A SEARCH WARRANT
  - FOURTH AMENDMENT RIGHTS ARE IN PLAY
- EVEN IN THE PRIVATE SECTOR, IT IS IMPORTANT TO IDENTIFY DATA PRIOR TO INVESTIGATING TO ENSURE A SMOOTH PROCESS

## The 4th Amendment

The right of the people to be secure in their persons, houses, papers, and effects, against unreasonable searches and seizures, shall not be violated, and no Warrants shall issue, but upon probable cause, supported by Oath or affirmation, and particularly describing the place to be searched, and the persons or things to be seized.



## 2. ACQUISITION

- PRESERVING EVIDENCE IS PARAMOUNT DURING ANY FORENSICS INVESTIGATION
  - ALWAYS USE A WRITE BLOCKER
- AS SUCH, ACQUISITION IS A DELICATE STAGE
- MOST COMMON ACQUISITION FORMAT: IMAGE FILE
  - A BIT-BY-BIT DIRECT COPY OF A STORAGE DRIVE
  - COMPATIBLE WITH FORENSICS TOOLKITS FOR FURTHER ANALYSIS OF THE CONTENTS OF THE DRIVE





### 3. ANALYSIS

- THE FUN PART
- EXAMINE DATA FOR ANY EVIDENCE THAT CONTRIBUTES TO THE GOAL OF YOUR INVESTIGATION
- CORRELATE ANY FACTS PREVIOUSLY KNOWN OR OPEN SOURCE INTELLIGENCE TO THE DATA AT HAND
- MANY TECHNIQUES TO PERFORM DEEPER ANALYSIS (MORE ON THIS LATER)





## 4. DOCUMENTATION

- THE NOT SO FUN PART
- VERY IMPORTANT TO KEEP TRACK OF ANY FINDINGS DURING THE INVESTIGATION
  - INCLUDE EXPLANATIONS ON HOW THE EVIDENCE WAS FOUND (TOOLS/TECHNIQUES USED)
  - FINDINGS SHOULD ALWAYS BE REPRODUCIBLE





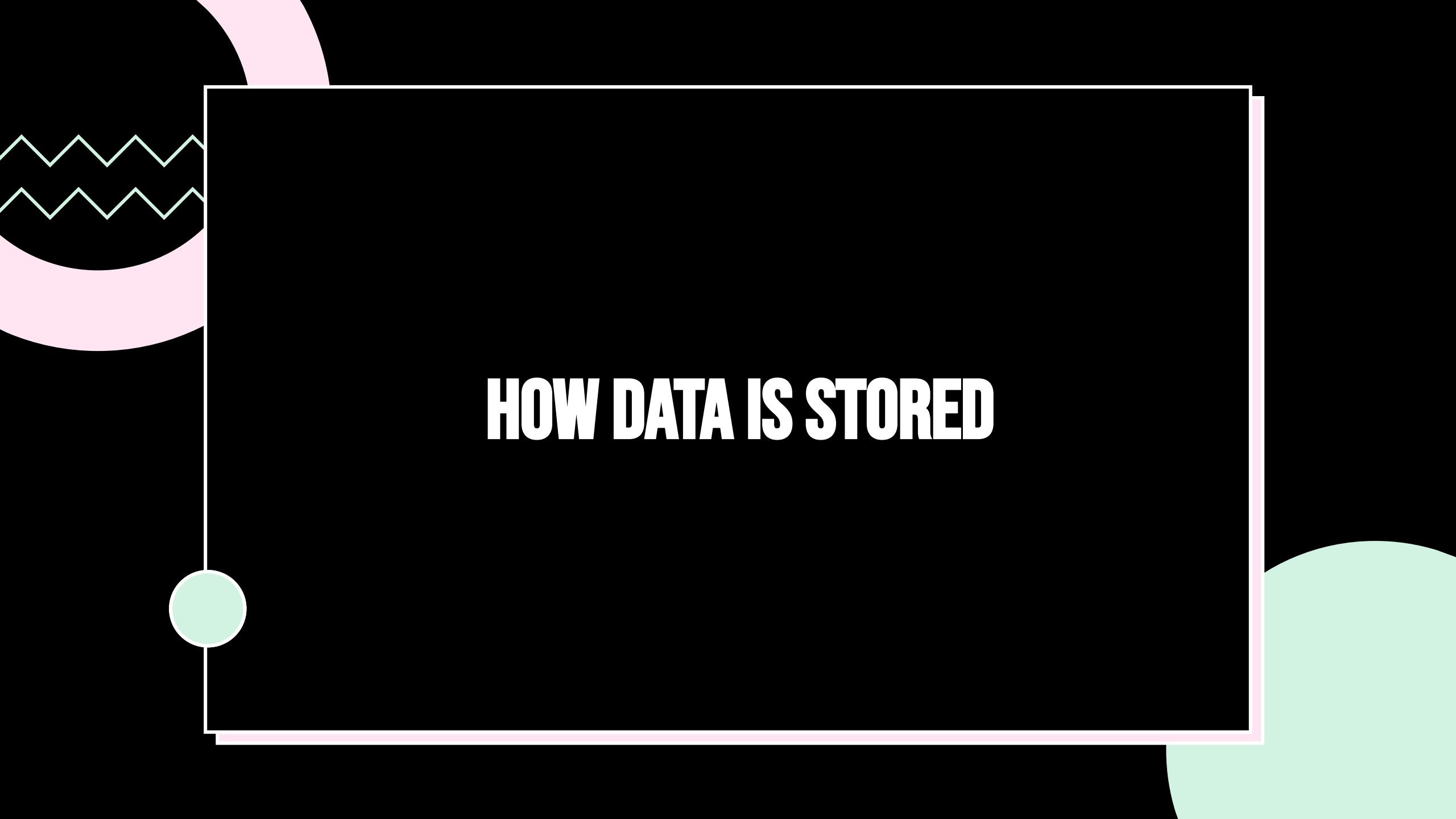
## 5. PRESENTATION

- FINALLY, COMPILE ALL YOUR NOTES AND FINDINGS INTO A REPORT TO BE PRESENTED TO THE PROPER AUTHORITY



- PUBLIC SECTOR:
  - FORENSICS EXPERTS CAN PROVIDE TESTIMONY IN COURT
  - EVIDENCE COLLECTED CAN BE USED IN CRIMINAL AND CIVIL CASES
- PRIVATE SECTOR:
  - FINDINGS ARE TO BE PRESENTED TO WHOEVER HIRED YOU TO CONDUCT THE INVESTIGATION





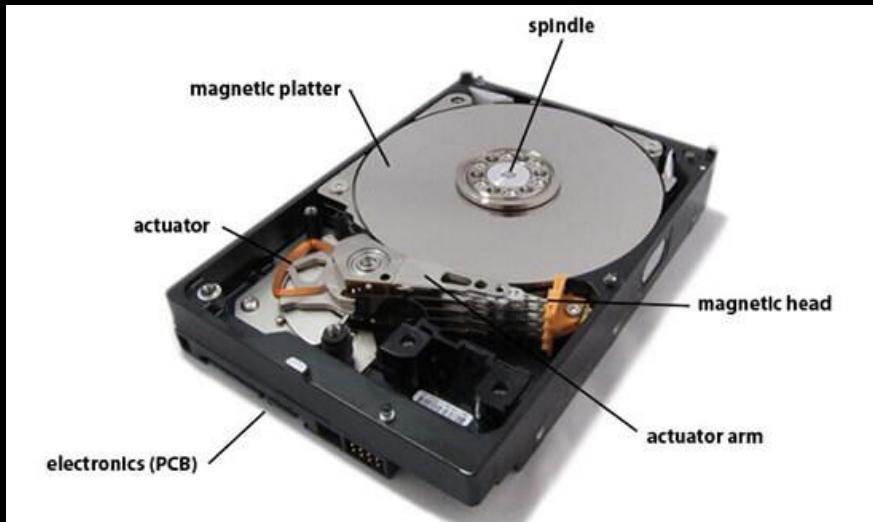
# HOW DATA IS STORED



# PHYSICAL DATA STORAGE TYPES

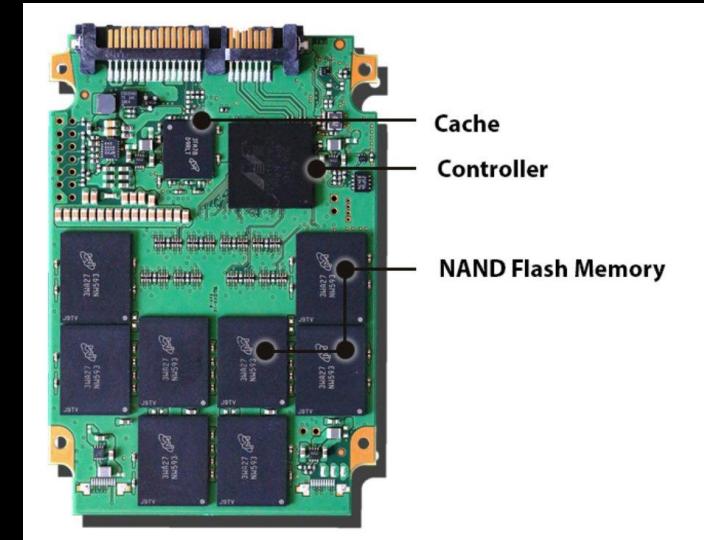
## HARD DRIVE

- DATA IS MAGNETICALLY STORED ON PLATTERS
- DATA IS READ BASED ON MAGNETIC FORCE WHICH EQUATES TO ZEROS AND ONES



## SOLID STATE DRIVE (SSD)

- DATA IS ELECTRICALLY STORED IN CIRCUITS
- DATA IS READ BASED ON ELECTRICAL CHARGES WHICH EQUATE TO ZEROS AND ONES





# FILE SYSTEM BASICS

- MANY DIFFERENT TYPES OF FILE SYSTEMS
- GENERAL STRUCTURE:
  - FILES ARE STORED AS CLUSTERS ON THE DRIVE
  - MASTER FILE TABLE - CONTAINS THE PHYSICAL LOCATION (CLUSTER) WHERE EACH FILE IS STORED. ALSO CONTAINS METADATA ON EACH FILE
  - ANY UNUSED AREA ON THE DRIVE IS CONSIDERED UNALLOCATED SPACE AND DOES NOT HAVE AN ENTRY ON THE MASTER FILE

TABLE

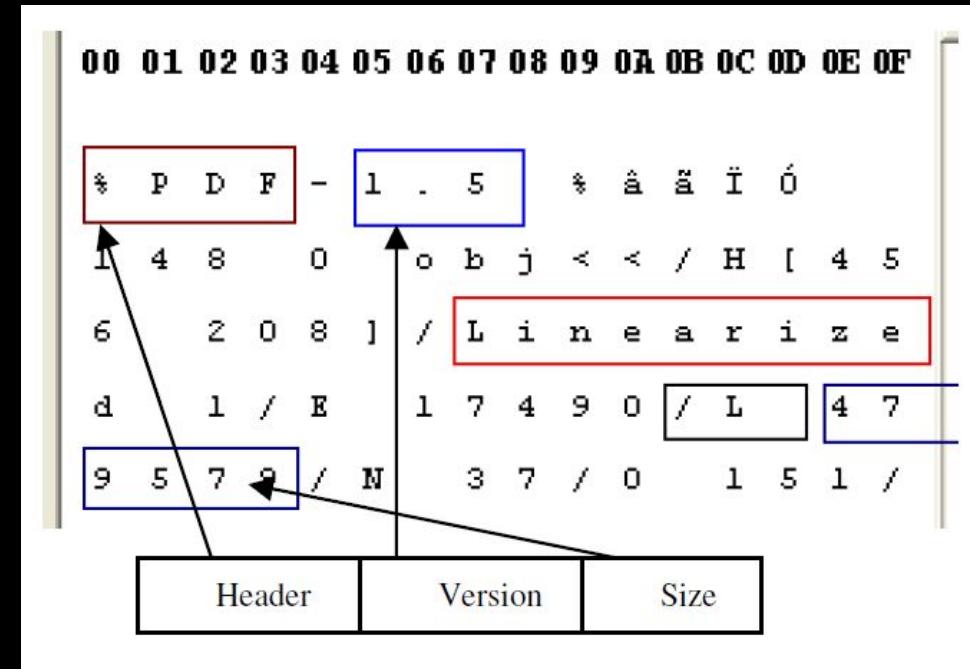
MFT records		File address	
	Seq		
312	[ ... ]	0x0040	0040 0000 0000 0138
313	[ ... ]	0x0001	0001 0000 0000 0139
314	[ ... ]	0x000a	000a 0000 0000 013a
315	[ ... ]	0x0003	0003 0000 0000 013b
316	[ ... ]	0x0003	0003 0000 0000 013c





# DATA CARVING

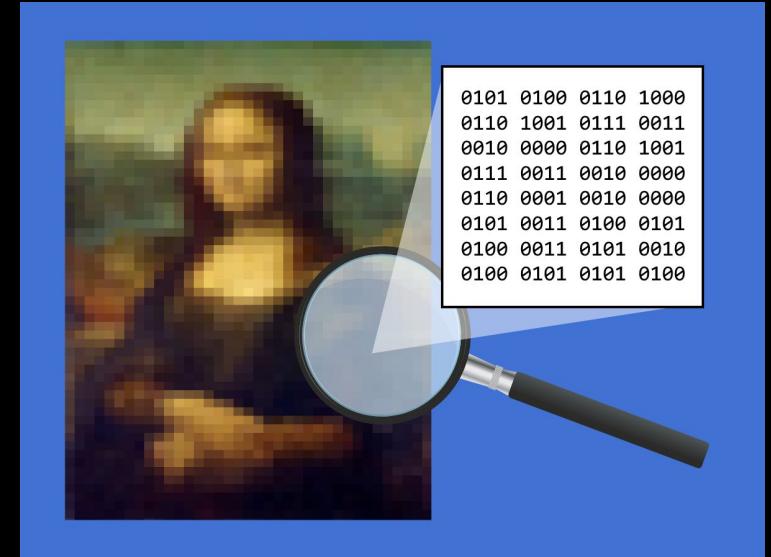
- WHEN FILES ARE DELETED FROM A FILE SYSTEM, THE MASTER FILE TABLE ENTRY FOR THAT FILE IS REMOVED, BUT THE FILE ITSELF IS NOT ACTUALLY DELETED
  - THE BITS REMAIN INTACT UNTIL OVERWRITTEN
  - THE FILE SYSTEM JUST NO LONGER KNOWS THAT THE FILE EXISTS
- THESE FILES CAN BE RECOVERED USING DATA CARVING
  - SEARCHES THROUGH UNALLOCATED SPACE FOR RECOGNIZED FILE HEADERS TO REBUILD A LOST FILE





# STEGANOGRAPHY

- A METHOD OF HIDING DATA WITHIN OTHER FILES
  - MOST COMMONLY HIDDEN IN MEDIA FILE FORMATS
- DATA IS EMBEDDED INTO THE FILE'S BITS SO THAT THE MEDIA LOOKS THE EXACT SAME AT FACE VALUE
- OFTEN TIMES THE DATA IS ENCODED USING A KEY OR PASSPHRASE TO PROVIDE AN ADDED LEVEL OF SECRECY/SECURITY



# LAB PREP

# ● TOOLS YOU WILL BE USING

## FTK IMAGER

- TOOL USED TO IMAGE A DRIVE INTO VARIOUS DIFFERENT FILE FORMATS
- WE WILL BE IMAGING A USB DRIVE AS AN “E01” FILE



## AUTOPSY

- DIGITAL FORENSICS TOOLKIT
- AUTOMATICALLY PERFORMS DATA CARVING
- WE WILL USE THIS FOR THE INVESTIGATION PORTION OF THE LAB





# AUTOPSY DASHBOARD

acm-dfr-lab-test-case - Autopsy 4.20.0

Case View Tools Window Help

Add Data Source Images/Videos Communications Geolocation Timeline Discovery Generate Report Close Case

Data Sources

- File Views
- File Types
- Deleted Files
- MB File Size
- Data Artifacts
  - Metadata (9)
- Analysis Results
  - Keyword Hits (22)
- OS Accounts
- Tags
- Reports

Listing

Data Sources

Name: usb-evidence.E01\_1 Host

Hex Text Application File Metadata OS Account Data

The screenshot displays the Autopsy 4.20.0 interface. At the top, the title bar shows 'acm-dfr-lab-test-case - Autopsy 4.20.0'. Below it is a menu bar with 'Case', 'View', 'Tools', 'Window', and 'Help'. A toolbar follows with icons for 'Add Data Source', 'Images/Videos', 'Communications', 'Geolocation', 'Timeline', 'Discovery', 'Generate Report', and 'Close Case'. The left side features a hierarchical tree view under 'Data Sources' containing categories like 'File Views', 'File Types', 'Deleted Files', 'MB File Size', 'Data Artifacts' (with 'Metadata (9)' listed), 'Analysis Results' (with 'Keyword Hits (22)' listed), 'OS Accounts', 'Tags', and 'Reports'. On the right, a panel titled 'Listing' shows a table for 'Data Sources' with a single entry: 'Name' is 'usb-evidence.E01\_1 Host'. At the bottom, there are tabs for 'Hex', 'Text', 'Application', 'File Metadata', 'OS Account', and 'Data'.





## QUICK NOTE ON USB SAFETY

- NEVER PLUG IN A USB DRIVE FROM AN UNTRUSTED SOURCE
- BAD USB DRIVES CAN AUTOMATICALLY DOWNLOAD MALWARE TO YOUR COMPUTER

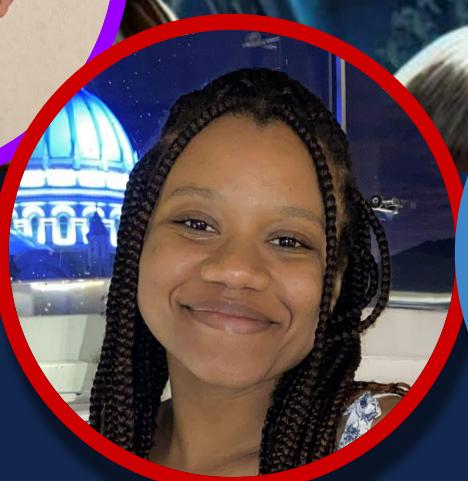


# LAB BRIEFING

# SJU ACM

# CLUE

A Hack at St. John's



# THE HACK

The day is Thursday, October 5. The St. John's ACM Student Chapter club is meeting for its second meeting of the Fall 2023 semester. Upon entering the cyber lab, the club is met with a terrifying discovery: St. John's University has been HACKED! The only piece of evidence left behind by the attacker is a USB drive. St. John's IT was able to estimate that the hack occurred at approximately 12 pm on Thursday, October 5, however, they suspect that a member of the SJU ACM e-board was behind it all. To assist in the investigation, the members of SJU ACM have agreed to examine the contents of the USB drive in hopes of uncovering the true identity of the culprit. It's up to you to figure out who did it, where they did it, and what malware they used.

# THE SUSPECTS



RAYMOND RAMDAT



JAKE ENEA



DAVID ROSOFF



TOMAS SANTOS  
YCIANO



IGNACIO ANTEQUERA  
SANCHEZ



BEN HANIM



FAIROOZ EHSAN



AQUEENA ALEXANDER

# THE BUILDINGS



# THE MALWARE





# THANK YOU!

