

CRYPT ANALYSIS &CYBERDEFENCE 21CS3041RA, 21CS3041AA, 21CS3041PA

STUDENT ID: ACADEMIC YEAR: 2023-24 STUDENT NAME:

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| Course Title |  | Semester: 2023-24 ODD SEM |
| Course Code(s) |  | Page **1** of **163** |

Table of Contents

1. [Installing Virtual Box and Creating a Virtual install of Kali Linux 2](#_TOC_250019)
2. [Analyze Packet Capturing Using Airodump-ng 9](#_TOC_250018)
3. [Implementation of Social Engineering Using King Phisher 15](#_TOC_250017)
4. [Implementation of Password Cracking Using John the Ripper 21](#_TOC_250016)
5. [Implementation of Wi-Fi Hacking Using Reaver 27](#_TOC_250015)
6. [Implementation of NMAP Scanning Technique 34](#_TOC_250014)
7. [Implementation of Man in the Middle Attack using (Ettercap Tool) 41](#_TOC_250013)
8. [Analyze Mobile Security Using APK Tool 47](#_TOC_250012)
9. [Implementation of Web Application Security Using Burp Suite 54](#_TOC_250011)
10. [Implementation of SQL Injection Using SQLMap 63](#_TOC_250010)
11. [Implementation of Cross Site Scripting Attack 70](#_TOC_250009)
12. [Analyze Windows Exploit using Metasploit 77](#_TOC_250008)
13. [Implementation of Social Engineering Using Maltego (A/P) 83](#_TOC_250007)
14. [Analyze Vulnerability Analysis Using Wireshark (A/P) 91](#_TOC_250006)
15. [Implementation of Web Application Security (Paros) (A/P) 99](#_TOC_250005)
16. [Analyze Processing Crime and Incident Scenes (A/P) 107](#_TOC_250004)
17. [Working with file systems (A/P) 118](#_TOC_250003)
18. [Virtual Machine Forensics, Live Acquisitions & Network Forensics (A/P) 129](#_TOC_250002)
19. [Implementation of Various Attacks on RSA 140](#_TOC_250001)
20. [Implementation of various Attacks on ECC(A/P) 151](#_TOC_250000)

## A.Y. 2023-24 LAB/SKILL CONTINUOUS EVALUATION

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| **S.No** | **Date** | **Experiment Name** | **Pre-Skill (10M)** | **In-Skill (25M)** | | | **Post-**  **Skill (10M)** | **Viva**  **Voce (5M)** | **Total (50M)** | **Faculty Signature** |
| **Program/Proc edure (5M)** | **Data and Results(10M)** | **Analysis & Inference(10M)** |
| **1.** |  | Introductory Session | **-NA-** | | | | | | | |
| **2.** |  | Installing Virtual Box and Creating a Virtual install of Kali Linux |  |  |  |  |  |  |  |  |
| **3.** |  | Analyze Packet Capturing  Using Airodump-ng |  |  |  |  |  |  |  |  |
| **4.** |  | Implementation of Social Engineering Using King Phisher |  |  |  |  |  |  |  |  |
| **5.** |  | Implementation of Password Cracking Using John the Ripper |  |  |  |  |  |  |  |  |
| **6.** |  | Implementation of Wi-Fi  Hacking Using Reaver |  |  |  |  |  |  |  |  |
| **7.** |  | Implementation of NMAP Scanning Technique |  |  |  |  |  |  |  |  |
| **8.** |  | Implementation of Man in the Middle Attack using (Ettercap Tool) |  |  |  |  |  |  |  |  |
| **9.** |  | Analyze Mobile Security  Using APK Tool. |  |  |  |  |  |  |  |  |
| **10.** |  | Implementation of Web Application Security Using Burp Suite. |  |  |  |  |  |  |  |  |

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| **Program/Proc**  **edure (5M)** | **Data and**  **Results(10M)** | **Analysis &**  **Inference(10M)** |
| **11.** |  | Implementation of SQL Injection Using SQLMap |  |  |  |  |  |  |  |  |
| **12** |  | Implementation of Cross  Site Scripting Attack. |  |  |  |  |  |  |  |  |
| **13.** |  | Analyze Windows Exploit  using Metasploit |  |  |  |  |  |  |  |  |
| **14.** |  | Implementation of Social  Engineering Using Maltego |  |  |  |  |  |  |  |  |
| **15.** |  | Analyze Vulnerability  Analysis Using Wireshark |  |  |  |  |  |  |  |  |
| **16.** |  | Implementation of Web  Application Security (Paros) |  |  |  |  |  |  |  |  |
| **17.** |  | Analyze Processing  Crime and Incident Scenes |  |  |  |  |  |  |  |  |
| **18.** |  | Working with file systems |  |  |  |  |  |  |  |  |
| **19.** |  | Virtual Machine Forensics, Live Acquisitions & Network Forensics |  |  |  |  |  |  |  |  |
| **20.** |  | Implementation of Various Attacks on RSA |  |  |  |  |  |  |  |  |
| **21** |  | Implementaion of various Attacks on ECC |  |  |  |  |  |  |  |  |

## DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING SUBJECT CODE: 21CS3041RA

## CRYPT ANALYSIS AND CYBER DEFENCE WORKBOOK

# 1. Installing Virtual Box and Creating a Virtual install of Kali Linux

## Date of the Session: / / Time of the Session: to

**Learning Objective:** The learning objective of this task is to understand the process of installing Virtual Box and setting up Kali Linux as a virtual machine.

**Description:** In this task, you will learn how to install Oracle VirtualBox, a virtualization software, and create a virtual machine to install Kali Linux, a popular penetration testing and security auditing Linux distribution. This setup allows you to run Kali Linux as a virtual operating system within your existing operating system, providing a safe and isolated environment for security testing and experimentation.

## Pre-Requisites:

1. Oracle VirtualBox: You will need to download and install the latest version of VirtualBox from the official Oracle website. Ensure that you choose the appropriate version for your operating system (Windows, macOS, or Linux).
2. Kali Linux ISO: Download the latest Kali Linux ISO image from the official Kali Linux website. Select the appropriate ISO file based on your system architecture (32-bit or 64-bit).

Steps to Install VirtualBox and Set Up Kali Linux:

1. Download and Install VirtualBox:
   * Go to the Oracle VirtualBox website (https://www.virtualbox.org) and download the installer for your operating system.
   * Run the installer and follow the on-screen instructions to install VirtualBox on your computer.
2. Prepare the Kali Linux Virtual Machine:
   * Launch VirtualBox.
   * Click on "New" to create a new virtual machine.
   * Provide a name for the virtual machine (e.g., "Kali Linux") and select the operating system type as "Linux" and version as "Other Linux (64-bit)" or "Other Linux (32-bit)" depending on your ISO file.
   * Allocate the desired amount of RAM for the virtual machine (at least 2GB is recommended).
   * Choose the option to create a virtual hard disk now.
   * Select the hard disk file type as "VDI" (VirtualBox Disk Image).
   * Choose "Dynamically allocated" for the storage on physical hard disk.
   * Specify the size of the virtual hard disk (20GB or more is recommended).
   * Click "Create" to create the virtual machine.
3. Configure the Kali Linux Virtual Machine:
   * In the VirtualBox Manager, select the newly created virtual machine and click on "Settings."
   * In the settings window, navigate to the "Storage" tab.
   * Under "Controller: IDE," click on the disk icon next to "Empty" and choose the Kali Linux ISO file you downloaded.
   * Click "OK" to save the settings.
4. Install Kali Linux:
   * Start the Kali Linux virtual machine by selecting it in the VirtualBox Manager and clicking on the "Start" button.
   * The Kali Linux installation process will begin. Follow the on-screen instructions to install Kali Linux within the virtual machine.
   * After the installation is complete, restart the virtual machine.
5. Set Up Kali Linux:
   * Log in to Kali Linux using the credentials you created during the installation process.
   * Configure the network settings, update the system, and install any desired tools or packages within Kali Linux.

By following these steps, you will have successfully installed VirtualBox and set up Kali Linux as a virtual machine.

Note: It's important to ensure you have sufficient system resources (CPU, RAM, disk space) to run Virtual Box and the virtual machine smoothly.

## Pre-Skill Task:

1. What is VirtualBox, and what is its purpose in the context of virtualization?
2. Explain the benefits of using virtualization for running operating systems.
3. Can you provide a step-by-step guide on how to install VirtualBox on a specific operating system?
4. What are the minimum system requirements for running VirtualBox effectively?
5. How do you create a new virtual machine in VirtualBox? Explain the necessary steps.

## In-Skill Task:

*Harsha a* technology evangelist has just started learning about OS virtualization and interestedin learning ethical hacking as Harsha a newbie in this you are requested by Harsha to help himto install Kali Linux in his computer using Virtual Box

## Viva questions:

* 1. Describe the process of downloading the Kali Linux ISO image and selecting the appropriate version.
  2. What are the recommended settings for a virtual machine running Kali Linux in terms of memory allocation, CPU, and storage?
  3. What is the significance of enabling virtualization features in the computer's BIOS settings?
  4. Explain the network configuration options available in VirtualBox and their implications for a virtual machine running Kali Linux.
  5. How do you mount the Kali Linux ISO image to the virtual machine and initiate the installation process?

## Post Skill Task:

* + 1. Why Kali Linux is newbie friendly for cyber Security enthusiast?
    2. What are different types of Linux Distro’s available?
    3. List some security focused Linux Distro’s available.

*(For Evaluator’s use only)*

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## DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING SUBJECT CODE: 21CS3041RA

## CRYPT ANALYSIS AND CYBER DEFENCE WORKBOOK

# 2. Analyze Packet Capturing Using Airodump-ng

## Date of the Session: / / Time of the Session: to

## Learning Objective:

The learning objective of analyzing packet capturing using Airodump-ng is to gain an understanding of wireless network traffic and perform advanced analysis on captured packets. This involves identifying nearby wireless networks, monitoring network activity, and extracting valuable information from captured packets.

## Description:

Airodump-ng is a powerful command-line tool used for capturing and analyzing wireless network packets. It is part of the Aircrack-ng suite and is primarily used for monitoring and analyzing Wi-Fi networks. Airodump-ng captures raw wireless packets from nearby networks, allowing users to analyze network traffic, discover connected devices, and gather information about the network's security.

## Pre-Requisites:

To complete the analysis of packet capturing using Airodump-ng, you will need the following software:

1. Aircrack-ng Suite: Airodump-ng is part of the Aircrack-ng suite, which includes other tools for wireless network analysis and security testing. You can download the Aircrack-ng suite from the official website (https://[www.aircrack-ng.org/)](http://www.aircrack-ng.org/)) and follow the installation instructions specific to your operating system.
2. Terminal or Command Prompt: Airodump-ng is a command-line tool, so you will need a terminal or command prompt to execute the Airodump-ng commands. Most operating systems provide built-in terminals or command prompts.
3. Compatible Wireless Network Adapter: Airodump-ng requires a wireless network adapter that supports monitor mode for capturing packets. Make sure you have a compatible Wi-Fi adapter installed on your system. You can check the Aircrack-ng website for a list of supported adapters (https://[www.aircrack-ng.org/doku.php?id=compatible\_cards).](http://www.aircrack-ng.org/doku.php?id=compatible_cards))

## Pre-Skill Task:

* 1. What is packet capturing, and why is it important in network analysis and security?
  2. Can you explain the purpose and functionality of Airodump-ng?
  3. What are the prerequisites and system requirements for using Airodump-ng effectively?
  4. How does Airodump-ng capture packets from wireless networks? Explain the underlying mechanism.
  5. What are the different types of information that can be obtained by analyzing captured packets with Airodump-ng?

## In-Skill Task:

1.Ramesh wants to perform “CRACKING WEP KEYS” By using Monitor mode which was available in kali Linux. So, he wants to perform following operations:

1.Monitor mode using wifi-adapter 2 .Capturing packets

3. Capturing ARP requests

Help him by doing those operations Successfully(If Possible include screenshots of those outputs)

Solution:

## Viva Questions:

1. How can Airodump-ng help in analyzing wireless network security vulnerabilities, such as identifying rogue access points or detecting unauthorized clients?
2. What are the different filtering options available in Airodump-ng, and how can they be used to focus on specific network or device information?
3. Explain the significance of different fields displayed in the Airodump-ng output, such as BSSID, ESSID, Power, Channel, and Encryption.
4. How can you interpret and analyze the collected data in Airodump-ng, such as identifying patterns, trends, or potential security issues?

5 Are there any limitations or challenges associated with using Airodump-ng for packet capturing and analysis? How can these limitations be mitigated or overcome?

## Post-Skill-Task:

1) write the steps of analyzing packet capturing using Airodump-ng, Sol)

*(For Evaluator’s use only)*

Date of Evaluation

Signature of the Evaluator

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Evaluator’s Observation

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## DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING SUBJECT CODE: 21CS3041RA

## CRYPTANALYSIS AND CYBER DEFENSE WORKBOOK

# 3. Implementation of Social Engineering Using King Phisher

## Date of the Session: / / Time of the Session: to

## Learning Objective:

The learning objective of implementing social engineering using King Phisher is to understand the techniques and tools used in social engineering attacks and gain practical experience in conducting such attacks in a controlled environment.

## Description:

Social engineering is a method of manipulating individuals to disclose sensitive information or perform certain actions by exploiting their trust, curiosity, or ignorance. King Phisher is an open-source software tool that helps simulate and test social engineering attacks, allowing organizations to assess their vulnerability to such attacks and develop countermeasures. This project involves implementing social engineering attacks using King Phisher to understand the various attack vectors, analyze their effectiveness, and explore ways to mitigate the associated risks.

## Pre-Requisites:

1. King Phisher: An open-source phishing campaign toolkit.
2. Virtual Machine or Sandbox Environment: To set up a controlled environment for testing and executing social engineering attacks.
3. Operating System: Linux distribution (recommended) or Windows with a virtualization platform like VirtualBox or VMware.

## Pre-Skill:

1. What is social engineering, and why is it considered a significant threat to organizations?
2. Explain the concept of phishing and how it is used in social engineering attacks.
3. What is King Phisher, and what functionalities does it offer for conducting social engineering attacks?
4. Describe the process of setting up a virtual machine or sandbox environment for implementing social engineering using King Phisher.
5. How can King Phisher be used to create and customize phishing campaigns?

## In-Skill Task:

1. Siddharth is a Computer Science Student and he is Naughty. He wants to fool his friend Siva by sending a Fake Mail by King Phisher tool. But he doesn’t know that how that tool Works.

a. He want to learn How the Tool (King Phisher ) Works .

So, Help Siddharth to understand how the Tool Work in a step by step process.

## Viva Questions :

* What are the different types of social engineering attacks that can be simulated using King Phisher?
* What are the potential risks and ethical considerations involved in implementing social engineering attacks using King Phisher?
* How can organizations defend against social engineering attacks, and how can the insights gained from using King Phisher be utilized to improve security measures?
* Discuss the legal and regulatory implications of conducting social engineering attacks for educational or testing purposes.
* How can user awareness training and education be effective in mitigating social engineering attacks, and how does King Phisher contribute to this process?

## Post Skill Task:

1. What is Ghost Phisher?
2. Name the dependencies that are required in the proper running of Ghost Phisher.

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## DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING SUBJECT CODE: 21CS3041RA

## CRYPTANALYSIS AND CYBER DEFENSE WORKBOOK

# 4. Implementation of Password Cracking Using John the Ripper

## Date of the Session: / / Time of the Session: to

## Learning Objective:

The learning objective of implementing password cracking using John the Ripper is to understand the principles and techniques of password cracking and gain hands-on experience with the John the Ripper software.

## Description:

This project involves implementing password cracking using John the Ripper, a popular open-source password cracking tool. The project aims to explore different password cracking techniques, such as dictionary attacks, brute-force attacks, and hybrid attacks, and understand their strengths and limitations. By using John the Ripper, you will gain practical knowledge of configuring and utilizing the tool to crack passwords from various sources, such as password hashes obtained from system files or password-protected files.

## Pre-Requisites:

1. John the Ripper: The primary Pre-Requisites for this project is John the Ripper, which is an open-source password cracking tool. It is available for various operating systems, including Windows, Linux, and macOS.

## Pre-Skill:

1. What is password cracking, and why is it important from a security perspective?
2. Explain the working principle of John the Ripper.
3. What are the different types of password cracking techniques supported by John the Ripper?
4. How does a dictionary attack work, and what are its limitations?
5. Describe the process of configuring John the Ripper for password cracking.

## In-Skill Task:

1. Two best friends started doing a project at last they made the project into a zip file with a password. Unfortunately by the presentation day they both forgot the password, so help them out by cracking the password using John the Ripper

## Viva Questions

* + What are the commonly used password hash formats supported by John the Ripper?
  + How does John the Ripper handle salted password hashes?
  + What is the difference between a brute-force attack and a dictionary attack?
  + Explain the concept of a hybrid attack and its advantages over other cracking techniques.
  + What are the countermeasures that can be taken to defend against password cracking?

## Post Lab:

Perform the following Tasks by using John the Ripper Tool

1. Security Auditing
2. Penetration Testing
3. Password Recovery

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## CRYPT ANALYSIS AND CYBER DEFENCE WORKBOOK

# 5. Implementation of Wi-Fi Hacking Using Reaver

## Date of the Session: / / Learning Objective:

## Time of the Session: to

The learning objective of implementing Wi-Fi hacking using Reaver is to understand the vulnerabilities in Wi-Fi networks and gain practical knowledge of exploiting these vulnerabilities to gain unauthorized access to protected networks. Additionally, the objective is to familiarize oneself with the Reaver tool and its functionalities for conducting Wi-Fi hacking.

## Description:

The implementation of Wi-Fi hacking using Reaver involves using the Reaver tool, which is an open-source software designed to exploit vulnerabilities in WPS (Wi-Fi Protected Setup) enabled routers. Reaver utilizes a brute-force attack against the WPS PIN to recover the Wi- Fi passphrase or key. This implementation aims to demonstrate the security weaknesses of WPS and educate users about the importance of securing their Wi-Fi networks.

## Pre-Requisites:

1. Reaver: It is an open-source command-line tool available for Linux and other Unix-based operating systems. It can be downloaded and installed from the official Reaver website or via package managers like apt-get or yum.

## Pre-Skill:

1. What is the objective of implementing Wi-Fi hacking using Reaver?
2. Explain the purpose of Reaver in Wi-Fi hacking.
3. What is WPS and how does it contribute to Wi-Fi vulnerability?
4. Describe the process followed by Reaver to exploit WPS vulnerabilities.
5. What precautions should be taken before conducting Wi-Fi hacking using Reaver?

## In-Skill-Task:

1. Dheeraj is learning Reaver. As a beginner he wants to know the use of following commands in Reaver:-
2. Wash
3. Reaver
4. Karun forgot his Wi-Fi password. He wants to know the password. Karun approached you for help. Help Karun by hacking the Wi-Fi using Reaver.

Write down the wireless interface names, monitor mode, ESSID, Channel, BSSID of the target and paste the screen shots of execution and the outputs.

Note:- Perform this experiment on your native Wi-fi, your home Wi-Fi preferably.

## Viva Questions:

* Are there any legal implications associated with Wi-Fi hacking using Reaver? Explain.
* What are some countermeasures that can be implemented to protect against Reaver attacks?
* Can you suggest alternative tools or techniques for Wi-Fi penetration testing apart from Reaver?
* How does the implementation of Wi-Fi hacking using Reaver help raise awareness about Wi-Fi security?
* In what scenarios can the knowledge gained from implementing Wi-Fi hacking using Reaver be useful from a security perspective?

## Post-Skill- Task:

* + Key Generation Techniques:
  + Strength of AES Keys:
  + Key Management and Storage:
  + Key Generation Performance:

Date of Evaluation

Signature of the Evaluator

Full Name of the Evaluator:

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## CRYPT ANALYSIS AND CYBER DEFENCE WORKBOOK

# 6. Implementation of NMAP Scanning Technique

## Date of the Session: / / Time of the Session: to

## Learning Objective:

The learning objective of implementing the NMAP scanning technique is to understand and gain practical experience with network scanning using the NMAP tool. By the end of this project, students should be able to effectively utilize NMAP to discover hosts, services, and vulnerabilities on a network.

## Description:

The implementation of the NMAP scanning technique involves using the NMAP tool to perform network scans and gather information about hosts and services. Students will learn how to configure and execute different types of scans, interpret the results, and understand the implications of the findings. They will also gain knowledge about common scanning techniques, such as TCP SYN, UDP, and comprehensive scanning.

## Pre-Requisites:

1. NMAP: It is an open-source network scanning tool available for Windows, Linux, and macOS. Students should have NMAP installed on their machines to perform the scans.

## Pre-Skill:

1. What is NMAP, and why is it used for network scanning?
2. Describe the different types of scanning techniques supported by NMAP.
3. How can you perform a TCP SYN scan using NMAP? Explain the steps involved.
4. What is the purpose of performing a UDP scan? How can you execute it using NMAP?
5. What is a comprehensive scan? How is it different from other scanning techniques?

## In-Skill Task:

1. Vicky came to know that NMAP (Network Mapper) is a very versatile tool for Linux system/network administrators and is used for exploring networks, perform security scans, network audit and finding open ports on remote machine, Live hosts and Operating systems. So, he decided to work on the tool. Help him in performing the following scans:
   1. Ping sweep
   2. Port scan
   3. TCP full open scan
   4. TCP SYN scan
   5. UDP scan
   6. Version detection scan
   7. OS detection scan and
   8. Aggressive scan.

## Viva Questions :

* Explain the concept of stealth scanning and how it can be achieved with NMAP.
* How does NMAP identify the operating system of a target host? Discuss the techniques used.
* What is banner grabbing, and why is it useful during a network scan? How can NMAP accomplish banner grabbing?
* What are some common options and flags used in NMAP? Provide examples and explain their significance.
* . How can NMAP be used for vulnerability scanning? Discuss the process and the benefits of integrating vulnerability scanning with network scanning.

## Post -Skill-Task:

1. Billy is trying to understand how “–v” option is used in NMAP scanning technique. Explain him the use of the option “-v” by working on it.

*(For Evaluator’s use only)*

Date of Evaluation

Signature of the Evaluator

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## DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING SUBJECT CODE: 21CS3041RA

## CRYPT ANALYSIS AND CYBER DEFENCE WORKBOOK

# 7. Implementation of Man in the Middle Attack using (Ettercap Tool)

Date of the Session: / / Time of the Session: \_ to

## Learning Objective:

The learning objective of implementing a Man-in-the-Middle (MITM) attack using the Ettercap tool is to understand the concepts and techniques involved in intercepting and manipulating network communications for malicious purposes, and to gain practical experience in executing such an attack.

## Description:

In this project, you will learn how to use the Ettercap tool to perform a Man-in-the-Middle attack. A Man-in-the-Middle attack involves intercepting and altering communication between two parties without their knowledge. Ettercap is a widely used tool for executing MITM attacks, and it provides various features for sniffing and manipulating network traffic.

By implementing this attack, you will gain insights into the vulnerabilities that exist in network communications and the potential risks associated with them. You will learn how an attacker can eavesdrop on sensitive information, inject malicious content, or impersonate legitimate entities to deceive users.

## Pre-Requisites:

To implement the Man-in-the-Middle attack using the Ettercap tool, you will need the following software and tools:

1. Ettercap: The Ettercap tool is an open-source network security tool available for various operating systems. It can be downloaded from the official Ettercap website (https://www.ettercap-project.org).

## Pre-Skill:

1. What is a Man-in-the-Middle attack, and how does it work?
2. What are the potential risks and consequences of a successful Man-in-the-Middle attack?
3. Explain the role of Ettercap in executing a Man-in-the-Middle attack.
4. What are the steps involved in setting up and configuring Ettercap for the attack?
5. How does Ettercap intercept network traffic, and what techniques does it use for packet sniffing?

## In-Skill Task:

* 1. Monica and Jessica are exploring possible man in the middle attacks in cyber security in that process they learnt about ARP poisoning/spoofing. To demonstrate this they wanted to work with Ettercap, what could be the process or steps involved in this experiment, Demonstrate.

## Viva Questions:

* How can an attacker leverage a Man-in-the-Middle attack to obtain sensitive information from network communications?
* What countermeasures can be taken to prevent or mitigate Man-in-the-Middle attacks?
* Discuss the ethical implications and legal consequences of performing a Man-in-the- Middle attack without proper authorization.
* Can you explain any real-world examples or case studies where Man-in-the-Middle attacks have been employed?
* How can network administrators detect and defend against Man-in-the-Middle attacks in their systems?

## Post -Skill-Task:

1. Explain the four modules in the Ettercap?
2. Is Ettercap a sniffing tool?

*(For Evaluator’s use only)*

Date of Evaluation

Signature of the Evaluator

Full Name of the Evaluator:

Evaluator’s Observation

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## CRYPT ANALYSIS AND CYBER DEFENCE WORKBOOK

# 8. Analyze Mobile Security Using APK Tool.

Date of the Session: / / Time of the Session: \_ to

## Learning Objective:

The objective of this analysis is to understand and evaluate the mobile security of Android applications using APK Tool, a popular tool for reverse engineering and analyzing APK files.

## Description:

This analysis focuses on utilizing APK Tool to assess the security aspects of mobile applications. APK Tool allows the extraction of the source code, resources, and other components of an APK file, enabling a deeper understanding of the application's inner workings. By analyzing the extracted information, various security vulnerabilities can be identified, such as insecure data storage, weak encryption, improper permissions, and potential code vulnerabilities.

## Pre-Requisites:

1. APK Tool: This is the main Pre-Requisites for reverse engineering and analyzing APK files. It can be downloaded from the official website or obtained through package managers like Homebrew or Chocolatey.
2. Java Development Kit (JDK): APK Tool requires the JDK to be installed on the system, as it relies on Java for its functionality.
3. Decompiler/Disassembler: While not mandatory, having a decompiler or disassembler tool like JADX, JD-GUI, or JADX-GUI can enhance the analysis process by providing a more readable representation of the decompiled code.

## Pre-Skill:

1. What is the purpose of APK Tool in mobile security analysis?
2. How does APK Tool help in understanding the inner workings of an Android application?
3. What are the steps involved in using APK Tool to analyze mobile security?
4. Can you explain the process of extracting the source code and resources from an APK file using APK Tool?
5. What are some common security vulnerabilities that can be identified through APK Tool analysis?

## In-Skill Task:

1. MOBILE SECURITY USING APK TOOL. Explore the following steps. Task1: Installing process of APK tool? Task2: Working of APK tool

Task 3: What is the conclusion of Working of APK tool?

APKTool is a powerful and popular open-source tool used for reverse engineering Android applications. It allows you to decompile, modify, and recompile Android APK files, making it a valuable tool for both developers and security professionals. Here are the steps to understand the installation process, the working of APKTool, and its conclusion:

### 1: Installing Process of APKTool:

#### Prerequisites:

Before installing APKTool, ensure that you have Java Development Kit (JDK) installed on your system.

#### Installation Steps:

1. **Download APKTool:**
   * Visit the official GitHub repository of APKTool: <https://github.com/iBotPeaches/Apktool>
   * Download the latest version of the APKTool jar file.
2. **Install Java Development Kit (JDK):**
   * If you haven't already installed JDK, download and install it from the official Oracle website: <https://www.oracle.com/java/technologies/javase-jdk15-downloads.html>
3. **Set Environment Variables (Optional):**
   * Set the JAVA\_HOME environment variable to the JDK installation directory.
   * Add the JDK's bin directory to the system's PATH environment variable.

### 2: Working of APKTool:

APKTool works by decompiling APK files into their corresponding Smali code (an intermediate language used in Android app development), allowing users to view and modify the app's resources and logic. Here's an overview of how it works:

1. **Decompilation:**
   * APKTool takes an APK file as input and decompiles it into Smali code and resources (XML files, images, etc.).
   * Smali code is human-readable, although it's more complex than Java source code.
2. **Modification:**
   * Users can modify the Smali code and other resources to make changes to the app's behavior, appearance, or functionality.
3. **Recompilation:**
   * After making the necessary modifications, APKTool recompiles the Smali code and resources back into a modified APK file.
4. **Signing (Optional):**
   * If you modify an app and want to install it on a device, you might need to sign the APK with a valid certificate. APKTool doesn't handle signing directly, so you may need to use other tools for this purpose.

### 3: Conclusion of Working of APKTool:

APKTool is a valuable tool for analyzing and modifying Android applications. Its decompilation and recompilation capabilities are essential for developers and security professionals who want to understand how apps work or identify potential security vulnerabilities. However, it's crucial to note that using APKTool for unauthorized modification or distribution of apps without proper authorization is illegal and unethical.

When using APKTool, always ensure you have the legal right to modify the applications you're working with, such as apps you own or have permission to analyze for security testing purposes.

Remember that while APKTool is a useful tool, responsible and ethical use is paramount in the field of cybersecurity and software development.

## Viva Questions:

* How can APK Tool help in identifying improper permissions or excessive privileges in an application?
* Are there any limitations or challenges in using APK Tool for mobile security analysis?
* How can the use of a decompiler or disassembler tool complement the analysis process with APK Tool?
* Can you provide examples of real-world cases where APK Tool analysis has revealed significant security vulnerabilities?
* What are the best practices for using APK Tool and ensuring the security of the analysis environment?

## Post -Skill- Task:

Perform the following things by using APK Tools

1. Vulnerability Assessment
2. Malware Analysis
3. Penetration Testing
4. Code Auditing

APKTool is a versatile tool that can be used for various tasks related to Android application analysis and security assessment. Here's how you can perform the specified tasks using APKTool:

### 1. Vulnerability Assessment:

#### Steps:

1. **Decompile the APK:**
   * Use APKTool to decompile the target APK file into Smali code and resources.
   * Command: apktool d app\_name.apk -o output\_folder
2. **Manual Code Review:**
   * Review the decompiled Smali code and XML files to identify potential vulnerabilities, such as insecure data storage, hardcoded credentials, improper input validation, etc.
   * Look for common security issues and coding mistakes in the source code.
3. **Static Analysis:**
   * Utilize static analysis tools to analyze the decompiled code for security vulnerabilities. Tools like FindBugs, PMD, or Android Lint can be helpful.

### 2. Malware Analysis:

#### Steps:

1. **Decompile the Suspicious APK:**
   * Use APKTool to decompile the suspicious APK file to analyze its contents.
   * Command: apktool d malware.apk -o output\_folder
2. **Behavioral Analysis (Dynamic Analysis):**
   * Run the APK in a controlled environment (such as an emulator) to observe its behavior.
   * Monitor network traffic, system calls, and any malicious activities the app performs.
3. **Static Analysis:**
   * Analyze the decompiled code and resources for suspicious or malicious patterns.
   * Look for signs of obfuscation, encryption, or attempts to hide malicious behavior.

### 3. Penetration Testing:

#### Steps:

1. **Decompile the Target APK:**
   * Use APKTool to decompile the target APK file to understand its internal structure.
   * Command: apktool d target\_app.apk -o output\_folder
2. **Code Review and Modification:**
   * Review the Smali code and identify security vulnerabilities or weaknesses.
   * Modify the code to patch vulnerabilities, add debug messages, or inject hooks for further testing.
3. **Recompile and Sign the Modified APK:**
   * Recompile the modified code and resources back into an APK file.
   * Command: apktool b output\_folder -o modified\_app.apk
4. **Testing and Exploitation:**
   * Install the modified APK on a test device or emulator.
   * Perform penetration testing techniques to identify and exploit vulnerabilities you've introduced for testing purposes.

### 4. Code Auditing:

#### Steps:

1. **Decompile the APK:**
   * Use APKTool to decompile the APK file into Smali code and resources.
   * Command: apktool d app\_name.apk -o output\_folder
2. **Code Review and Analysis:**
   * Review the decompiled Smali code and XML files thoroughly.
   * Focus on code structure, logic, error handling, input validation, and usage of sensitive data.
   * Identify coding best practices and security vulnerabilities.
3. **Static Analysis Tools:**
   * Utilize static analysis tools like FindBugs, PMD, or Android Lint to perform automated code audits and identify potential issues.

Always ensure you have legal authorization and are conducting these activities in an ethical manner. Unauthorized penetration testing or modifying applications without proper authorization is illegal and unethical.

*(For Evaluator’s use only)*

Date of Evaluation

Signature of the Evaluator

Full Name of the Evaluator:

Evaluator’s Observation

Marks Secured: out of \_

Comment of the Evaluator (if Any)

## DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING SUBJECT CODE: 21CS3041RA

## CRYPT ANALYSIS AND CYBER DEFENCE WORKBOOK

# 9. Implementation of Web Application Security Using Burp Suite.

Date of the Session: / / Time of the Session: \_ to

## Learning Objective:

The learning objective of implementing web application security using Burp Suite is to understand the fundamentals of web application security testing and learn how to utilize Burp Suite, a popular web application security testing tool, to identify vulnerabilities and secure web applications.

## Description:

This project involves the practical implementation of web application security using Burp Suite. Burp Suite is an integrated platform for performing security testing of web applications. It combines various tools and functionalities to identify vulnerabilities, such as SQL injection, cross-site scripting (XSS), cross-site request forgery (CSRF), and more. By utilizing Burp Suite, you will learn how to perform manual and automated security testing, analyze and intercept web traffic, manipulate requests and responses, and identify and exploit vulnerabilities in web applications.

## Pre-Requisites:

1. Burp Suite: It is essential to have Burp Suite installed on your machine. Burp Suite Community Edition can be downloaded for free from the PortSwigger website (https://portswigger.net/burp/communitydownload).

## Pre-Skill:

1. What is the purpose of web application security testing?
2. Explain the role of Burp Suite in web application security testing.
3. What are the different modules/tools available in Burp Suite?
4. How can you configure your browser to work with Burp Suite for intercepting web traffic?
5. Walk me through the process of manually testing a web application using Burp Suite.

## In-Skill Task:

1. 1. Find out all the requests sent to server when we access a particular URL(any URL)? And list those requests here.

[How to Intercept Requests & Modify Responses With Burp Suite - Matthew Setter](https://www.matthewsetter.com/introduction-to-burp-suite/)

Sure, here’s a step-by-step guide on how to use Burp Suite to capture all the requests sent to a server when accessing a particular URL:

1. [**Launch Burp Suite**: Start the Burp Suite application](https://www.matthewsetter.com/introduction-to-burp-suite/)[1](https://www.matthewsetter.com/introduction-to-burp-suite/)[2](https://portswigger.net/burp/documentation/desktop/getting-started/modifying-http-requests).
2. [**Set Up Proxy**: Go to the Proxy > Intercept tab and make sure the interception is switched on](https://www.matthewsetter.com/introduction-to-burp-suite/)[2](https://portswigger.net/burp/documentation/desktop/getting-started/modifying-http-requests)[3](https://portswigger.net/burp/documentation/desktop/mobile/config-android-device). This will allow Burp Suite to capture all the HTTP traffic.
3. [**Access the URL**: Open your browser and go to the URL you want to analyze](https://www.matthewsetter.com/introduction-to-burp-suite/)[2](https://portswigger.net/burp/documentation/desktop/getting-started/modifying-http-requests)[3](https://portswigger.net/burp/documentation/desktop/mobile/config-android-device). Make sure your browser is configured to use Burp Suite as its proxy.
4. [**Capture Requests**: As you navigate the website, Burp Suite will capture all the requests sent to the server](https://www.matthewsetter.com/introduction-to-burp-suite/)[2](https://portswigger.net/burp/documentation/desktop/getting-started/modifying-http-requests). These requests will appear in the Proxy > Intercept tab.
5. [**Analyze Requests**: You can click on each request in the Intercept tab to view its details](https://www.matthewsetter.com/introduction-to-burp-suite/)[2](https://portswigger.net/burp/documentation/desktop/getting-started/modifying-http-requests). This includes the request method (GET, POST, etc.), the URL, any parameters, and headers.
6. [**Modify Requests (Optional)**: If you want, you can even modify these requests before they reach the server](https://www.matthewsetter.com/introduction-to-burp-suite/)[2](https://portswigger.net/burp/documentation/desktop/getting-started/modifying-http-requests). This is useful for testing the security of the website.
7. [**Reissue Requests**: You can manually reissue requests with Burp Repeater](https://www.matthewsetter.com/introduction-to-burp-suite/)[4](https://portswigger.net/burp/documentation/desktop/getting-started/reissuing-http-requests). This allows you to send the same request multiple times, which can be useful for testing how the server handles repeated or slightly modified requests.

Please note that this is a simplified guide and the actual process might involve additional steps depending on the specific scenario and the security settings of the website you’re trying to analyze. [Also, always make sure you have the necessary permissions before performing any kind of security testing or analysis on a website](https://www.matthewsetter.com/introduction-to-burp-suite/)[1](https://www.matthewsetter.com/introduction-to-burp-suite/)[2](https://portswigger.net/burp/documentation/desktop/getting-started/modifying-http-requests).

1. Open the given URL, change the details entered by the user in that page (first name, last name, user name) using parameter pampering.

[How to tamper data of a website using Burp Suite (sciencedoze.com)](https://www.sciencedoze.com/2020/09/tamper-data-of%20a-website-using-burp-suite.html?m=1)

[Burp Suite Tutorial - Web Application Penetration Testing (pentestgeek.com)](https://www.pentestgeek.com/web-applications/burp-suite-tutorial-1)

Sure, here’s a step-by-step guide on how to use Burp Suite to tamper with parameters such as first name, last name, and username:

1. [**Launch Burp Suite**: Start the Burp Suite application](https://www.sciencedoze.com/2020/09/tamper-data-of%20a-website-using-burp-suite.html)[1](https://www.sciencedoze.com/2020/09/tamper-data-of%20a-website-using-burp-suite.html)[2](https://www.pentestgeek.com/web-applications/burp-suite-tutorial-1).
2. [**Set Up Proxy**: Go to the Proxy > Intercept tab and make sure the interception is switched on](https://www.sciencedoze.com/2020/09/tamper-data-of%20a-website-using-burp-suite.html)[1](https://www.sciencedoze.com/2020/09/tamper-data-of%20a-website-using-burp-suite.html)[3](https://portswigger.net/support/using-burp-to-detect-sql-injection-via-sql-specific-parameter-manipulation). This will allow Burp Suite to capture all the HTTP traffic.
3. [**Access the URL**: Open your browser and go to the URL you want to analyze](https://www.sciencedoze.com/2020/09/tamper-data-of%20a-website-using-burp-suite.html)[3](https://portswigger.net/support/using-burp-to-detect-sql-injection-via-sql-specific-parameter-manipulation)[2](https://www.pentestgeek.com/web-applications/burp-suite-tutorial-1). Make sure your browser is configured to use Burp Suite as its proxy.
4. [**Capture Requests**: As you navigate the website, Burp Suite will capture all the requests sent to the server](https://www.sciencedoze.com/2020/09/tamper-data-of%20a-website-using-burp-suite.html)[3](https://portswigger.net/support/using-burp-to-detect-sql-injection-via-sql-specific-parameter-manipulation)[2](https://www.pentestgeek.com/web-applications/burp-suite-tutorial-1). These requests will appear in the Proxy > Intercept tab.
5. **Identify the Request**: Look for the request that contains the parameters you want to tamper with (first name, last name, username). [This is usually a POST request](https://www.sciencedoze.com/2020/09/tamper-data-of%20a-website-using-burp-suite.html)[4](https://security.stackexchange.com/questions/79631/burp-suite-trying-all-parameters-such-as-numbersnumbers)[3](https://portswigger.net/support/using-burp-to-detect-sql-injection-via-sql-specific-parameter-manipulation).
6. [**Send to Repeater**: Right-click on the request and select Send to Repeater](https://www.sciencedoze.com/2020/09/tamper-data-of%20a-website-using-burp-suite.html)[3](https://portswigger.net/support/using-burp-to-detect-sql-injection-via-sql-specific-parameter-manipulation)[2](https://www.pentestgeek.com/web-applications/burp-suite-tutorial-1). This will send the request to the Repeater tab where you can modify it.
7. [**Modify Parameters**: In the Repeater tab, you can modify the parameters in the request4](https://security.stackexchange.com/questions/79631/burp-suite-trying-all-parameters-such-as-numbersnumbers)[3](https://portswigger.net/support/using-burp-to-detect-sql-injection-via-sql-specific-parameter-manipulation). Change the values of the first name, last name, and username parameters to whatever you want.
8. [**Send the Request**: Once you’ve made your changes, click the Go button to send the modified request2](https://www.pentestgeek.com/web-applications/burp-suite-tutorial-1).
9. [**Analyze the Response**: After sending the request, you can analyze the server’s response in the right-hand pane of the Repeater tab2](https://www.pentestgeek.com/web-applications/burp-suite-tutorial-1).

Please note that this is a simplified guide and the actual process might involve additional steps depending on the specific scenario and the security settings of the website you’re trying to analyze. [Also, always make sure you have the necessary permissions before performing any kind of security testing or analysis on a website1](https://www.sciencedoze.com/2020/09/tamper-data-of%20a-website-using-burp-suite.html)[2](https://www.pentestgeek.com/web-applications/burp-suite-tutorial-1).

## Viva Questions :

* What is the difference between active and passive scanning in Burp Suite?
* How can you use Burp Intruder to automate the process of identifying vulnerabilities?
* What are some common web application vulnerabilities that can be identified using Burp Suite?
* How does Burp Suite help in identifying and exploiting SQL injection vulnerabilities?
* Explain the steps involved in securing a web application using Burp Suite's recommendations.

## Post -Skill- Task:

* 1. Perform the following things
  2. Security Configuration Assessment
  3. Session Management Testing
  4. API Security Testing
  5. Web Application Firewall (WAF

*(For Evaluator’s use only)*

Date of Evaluation

Signature of the Evaluator

Full Name of the Evaluator:

Evaluator’s Observation

Marks Secured: out of \_

Comment of the Evaluator (if Any)

## DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING SUBJECT CODE: 21CS3041RA

## CRYPT ANALYSIS AND CYBER DEFENCE WORKBOOK

# 10. Implementation of SQL Injection Using SQLMap

Date of the Session: / / Time of the Session: \_ to

## Learning Objective:

The learning objective of implementing SQL Injection using SQLMap is to understand the concept of SQL Injection, learn how to use the SQLMap tool to automate the process, and gain practical experience in identifying and exploiting SQL Injection vulnerabilities in web applications.

## Description:

SQL Injection is a common web application vulnerability that allows attackers to manipulate database queries through user input. SQLMap is a powerful open-source penetration testing tool that automates the process of identifying and exploiting SQL Injection vulnerabilities. This exercise focuses on learning how to utilize SQLMap to detect and exploit SQL Injection vulnerabilities in a controlled environment.

## Pre-Requisites:

1. SQLMap: SQLMap is a command-line tool written in Python and is used for automating the process of detecting and exploiting SQL Injection vulnerabilities.
2. Web Application: You will need a vulnerable web application that can be used for testing and practicing SQL Injection attacks. This can be a locally hosted application or a deliberately vulnerable web application like Damn Vulnerable Web Application (DVWA) or WebGoat.

## Pre-Skill:

1. What is SQL Injection and why is it a significant security vulnerability?
2. Explain the working principle of SQLMap.
3. How do you install and set up SQLMap?
4. What are the different detection techniques employed by SQLMap to identify SQL Injection vulnerabilities?
5. How does SQLMap automate the process of exploiting SQL Injection vulnerabilities?

## In-Skill Task:

1. Given below is a testing and demo website for sqlmap practice. <http://testphp.vulweb.com/listproducts.php?cat=1>

1. Find out the backend DBMS used in the mentioned website. Also list the databases present in it.
2. Now pick any database from the output and list the tables in it.
3. Search for the user name and passwords from those tables and try to login.

[SQLmap Tutorial (hackertarget.com)](https://hackertarget.com/sqlmap-tutorial/)

Sure, here’s a step-by-step guide on how to use sqlmap to perform the tasks you mentioned:

**a) Find out the backend DBMS and list the databases:** You can use the following command to identify the backend DBMS and list the databases present:

sqlmap -u "http://testphp.vulweb.com/listproducts.php?cat=1" --dbs

[This command tells sqlmap to target the provided URL and list the databases (--dbs)](https://medium.com/@cuncis/the-ultimate-sqlmap-tutorial-master-sql-injection-and-vulnerability-assessment-4babdc978e7d)[1](https://medium.com/@cuncis/the-ultimate-sqlmap-tutorial-master-sql-injection-and-vulnerability-assessment-4babdc978e7d)[2](https://hackertarget.com/sqlmap-tutorial/).

**b) List the tables in a database:** Once you have the name of a database, you can list the tables in it with the following command:

sqlmap -u "http://testphp.vulweb.com/listproducts.php?cat=1" -D <database\_name> --tables

[Replace <database\_name> with the name of the database you’re interested in](https://medium.com/@cuncis/the-ultimate-sqlmap-tutorial-master-sql-injection-and-vulnerability-assessment-4babdc978e7d)[1](https://medium.com/@cuncis/the-ultimate-sqlmap-tutorial-master-sql-injection-and-vulnerability-assessment-4babdc978e7d)[2](https://hackertarget.com/sqlmap-tutorial/).

**c) Search for usernames and passwords:** To find usernames and passwords, you’ll first need to identify a table that likely contains this information. Tables are often named things like users, accounts, or admin. Once you’ve identified a promising table, you can dump the contents with the following command:

sqlmap -u "http://testphp.vulweb.com/listproducts.php?cat=1" -D <database\_name> -T <table\_name> --dump

[Replace <database\_name> with the name of the database, and <table\_name> with the name of the table you want to dump](https://medium.com/@cuncis/the-ultimate-sqlmap-tutorial-master-sql-injection-and-vulnerability-assessment-4babdc978e7d)[1](https://medium.com/@cuncis/the-ultimate-sqlmap-tutorial-master-sql-injection-and-vulnerability-assessment-4babdc978e7d)[2](https://hackertarget.com/sqlmap-tutorial/).

Please note that this is a simplified guide and the actual process might involve additional steps depending on the specific scenario and the security settings of the

## Viva Questions:

* Describe the steps involved in conducting a SQL Injection attack using SQLMap.
* What are the potential risks and consequences of SQL Injection attacks?
* How can developers prevent SQL Injection vulnerabilities in their web applications?
* Are there any limitations or challenges associated with using SQLMap for SQL Injection testing?
* Can you explain the difference between blind SQL Injection and error-based SQL Injection, and how SQLMap can handle each type?

## Post -Skill- Task:

1. SUBTASK OF PREVIOUS WEBSITE:

1. Dump the artist names available in the database you found out.
2. In the previous question the vulnerable website was already given to you, instead, list one of the various ways through which we can identify vulnerable websites to access their databases and information.

[How to use SQLMAP to test a website for SQL Injection vulnerability - GeeksforGeeks](https://www.geeksforgeeks.org/use-sqlmap-test-website-sql-injection-vulnerability/)

[SQL Injection Attacks – How to Use SQLMap to Find Database Vulnerabilities (freecodecamp.org)](https://www.freecodecamp.org/news/how-to-protect-against-sql-injection-attacks/)

[How to Find SQL Injection Attack Vulnerabilities? (geekflare.com)](https://geekflare.com/find-sql-injection/)

a) To dump the artist names available in the database, you can use the following command with sqlmap:

sqlmap -u "http://testphp.vulweb.com/listproducts.php?cat=1" -D <database\_name> -T <table\_name> -C <column\_name> --dump

[Replace <database\_name> with the name of the database, <table\_name> with the name of the table that contains the artist names, and <column\_name> with the name of the column that contains the artist names1](https://www.geeksforgeeks.org/use-sqlmap-test-website-sql-injection-vulnerability/)[2](https://hackertarget.com/sqlmap-tutorial/).

b) There are various ways to identify websites that are vulnerable to SQL injection attacks:

1. **Error-Based SQLi Detection**: One of the simplest ways to check if a website is vulnerable to SQL injection is by inputting data that would cause the website to generate an SQL error. [If an SQL error is returned, the website is likely vulnerable to SQL injection3](https://www.freecodecamp.org/news/how-to-protect-against-sql-injection-attacks/)[1](https://www.geeksforgeeks.org/use-sqlmap-test-website-sql-injection-vulnerability/).
2. [**Using SQLMap**: SQLMap is an open-source tool that can automatically detect whether a website’s parameters are vulnerable to SQL injection3](https://www.freecodecamp.org/news/how-to-protect-against-sql-injection-attacks/).
3. [**Manual Testing**: This involves manually inputting SQL Injection payloads to the website’s input fields and analyzing the website’s response4](https://geekflare.com/find-sql-injection/).
4. [**Scanning Tools**: There are several tools available like Vega, Invicti, and others that can scan a website for SQL injection vulnerabilities4](https://geekflare.com/find-sql-injection/).

[Remember, it’s important to have permission before testing a website for vulnerabilities to avoid any legal issues3](https://www.freecodecamp.org/news/how-to-protect-against-sql-injection-attacks/)[4](https://geekflare.com/find-sql-injection/).

*(For Evaluator’s use only)*

Date of Evaluation

Signature of the Evaluator

Full Name of the Evaluator:

Evaluator’s Observation

Marks Secured: out of \_

Comment of the Evaluator (if Any)

## DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING SUBJECT CODE: 21CS3041RA

## CRYPT ANALYSIS AND CYBER DEFENCE WORKBOOK

# 11. Implementation of Cross Site Scripting Attack.

Date of the Session: / / Time of the Session: \_ to

## Learning Objective:

The learning objective of implementing a Cross-Site Scripting (XSS) attack is to understand the techniques and vulnerabilities associated with XSS attacks, as well as the potential impact they can have on web applications. By gaining hands-on experience with implementing an XSS attack, learners can better understand the importance of secure coding practices and the countermeasures that can be employed to mitigate XSS vulnerabilities.

## Description:

The implementation of a Cross-Site Scripting (XSS) attack involves injecting malicious scripts into a vulnerable web application to exploit the trust that a user has for the website. This allows an attacker to execute arbitrary code within the victim's browser, potentially leading to session hijacking, data theft, or defacement of the targeted website. The attack typically occurs when user-supplied input is not properly validated or sanitized by the application.

## Pre-Requisites:

1. Web server (e.g., Apache, Nginx)
2. Web application vulnerable to XSS attacks (e.g., Damn Vulnerable Web Application, OWASP Juice Shop)
3. Web browser (e.g., Google Chrome, Mozilla Firefox)
4. Text editor or Integrated Development Environment (IDE) for modifying web application source code (e.g., Sublime Text, Visual Studio Code)

## Pre-Skill:

1. What is Cross-Site Scripting (XSS), and how does it differ from other web application vulnerabilities?
2. Explain the three main types of XSS attacks: Stored XSS, Reflected XSS, and DOM-based XSS.
3. Why is input validation and output encoding important in preventing XSS attacks?
4. Describe the steps involved in implementing a simple stored XSS attack.
5. How can an attacker leverage an XSS vulnerability to perform session hijacking?

## In-Skill Task:

1. Implement Cross Site Scripting for the following tasks in the given link below. And write the steps you have used for applying XSS:

Link : <http://www.xss-game.appspot.com/> Task 1:

Mission Description

This level demonstrates a common cause of cross-site scripting where user input is directly included in the page without proper escaping.

Interact with the vulnerable application window below and find a way to make it execute JavaScript of your choosing. You can take actions inside the vulnerable window or directly edit its URL bar.

Mission Objective

Inject a script to pop up a JavaScript alert() in the frame below. Link: <http://www.xss-game.appspot.com/level1>

Sure, here’s a step-by-step guide on how to perform a Cross-Site Scripting (XSS) attack on the given link. Please note that this is for educational purposes only and should not be used maliciously. Always have permission before testing any form of vulnerabilities.

1. **Open the URL**: Open the provided URL in your web browser.
2. **Identify the Input Field**: Look for any input fields where you can enter data. In this case, it’s a search box.
3. **Enter Payload**: Enter the following JavaScript payload into the search box: <script>alert('XSS');</script>. This script will cause a JavaScript alert box with the message “XSS” to pop up when it’s executed.
4. **Submit the Payload**: Click the “Search” button or press Enter to submit the payload.
5. **Observe the Result**: If the website is vulnerable to XSS, you should see a JavaScript alert box with the message “XSS”. This means that the website has executed your JavaScript code.

This is a simple example of an XSS attack. The payload you enter (<script>alert('XSS');</script>) is a simple JavaScript code that triggers an alert box. In a real-world scenario, an attacker could use more complex JavaScript code to steal sensitive information or perform other malicious actions.

## Viva Questions:

* Discuss the potential impact of an XSS attack on a web application and its users.
* What are some techniques or countermeasures that can be used to prevent XSS vulnerabilities?
* How can Content Security Policy (CSP) help mitigate the risk of XSS attacks?
* Explain the difference between server-side XSS filtering and client-side XSS filtering.
* What are the ethical and legal implications of conducting an XSS attack?

## Post -Skill- Task:

Mission Description

Web applications often keep user data in server-side and, increasingly, client-side databases and later display it to users. No matter where such user-controlled data comes from, it should be handled carefully.

This level shows how easily XSS bugs can be introduced in complex apps. Mission Objective Inject a script to pop up an alert() in the context of the application.

Note: the application saves your posts so if you sneak in code to execute the alert, this level will be solved every time you reload it.

Link : <http://www.xss-game.appspot.com/level2>

To perform a Cross-Site Scripting (XSS) attack on the given link, you can follow these steps:

1. **Open the URL**: Open the provided URL in your web browser.
2. **Identify the Input Field**: Look for any input fields where you can enter data. In this case, it’s a text box where you can post a message.
3. **Enter Payload**: Enter the following JavaScript payload into the text box: <img src=x onerror=alert('XSS')>. This script will cause a JavaScript alert box with the message “XSS” to pop up when it’s executed.
4. **Submit the Payload**: Click the “Post” button to submit the payload.
5. **Observe the Result**: If the website is vulnerable to XSS, you should see a JavaScript alert box with the message “XSS”. This means that the website has executed your JavaScript code.

This is another example of an XSS attack. The payload you enter (<img src=x onerror=alert('XSS')>) is a HTML tag that tries to load an image from an invalid source (x). When the image fails to load, the onerror attribute triggers the alert box. In a real-world scenario, an attacker could use more complex JavaScript code to steal sensitive information or perform other malicious actions.

*(For Evaluator’s use only)*

Date of Evaluation

Signature of the Evaluator

Full Name of the Evaluator:

Evaluator’s Observation

Marks Secured: out of \_

Comment of the Evaluator (if Any)

## DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING SUBJECT CODE: 21CS3041RA

## CRYPT ANALYSIS AND CYBER DEFENCE WORKBOOK

# 12. Analyze Windows Exploit using Metasploit

Date of the Session: / / Time of the Session: \_ to

## Learning Objective:

The learning objective of analyzing a Windows exploit using Metasploit is to understand the process of identifying, analyzing, and exploiting vulnerabilities in Windows operating systems using the Metasploit Framework. This involves gaining practical knowledge of exploit analysis, vulnerability assessment, and penetration testing techniques.

## Description:

In this exercise, you will learn how to analyze a Windows exploit using the Metasploit Framework. Metasploit is a powerful open-source penetration testing framework that provides a range of tools and exploits to assess the security of computer systems. You will analyze a specific Windows exploit, understand its underlying vulnerabilities, and exploit them using Metasploit.

## Pre-Requisites:

1. Metasploit Framework: Metasploit is an open-source framework available for multiple platforms. You will need to install Metasploit on your system to perform the exploit analysis.

## Pre-Skill:

1. What is the purpose of analyzing Windows exploits using Metasploit?
2. How does Metasploit help in identifying vulnerabilities in Windows operating systems?
3. Explain the process of analyzing a Windows exploit using Metasploit.
4. What are some common vulnerabilities that can be exploited in Windows systems?
5. How does Metasploit assist in exploiting vulnerabilities in Windows?

## In-Skill Task:

1. Being a cyber security aspirant you want to join in KL University in cyber security and block chain specialization in order to confirm your seat you should clear basic entrance exam conducted by the University. Your problem statement is to exploit windows xp. All the best Happy Hacking!!

(Hint: You can use smb vulnerability)

Sure, here’s a step-by-step guide on how to exploit a Windows XP machine using the SMB vulnerability (MS08-067):

1. [**Setup**: Install the latest version of Virtualbox based on your host OS1](https://www.virtualbox.org/wiki/Downloads%29). [Download and install Kali Linux 2018.2 ISO as a Virtualbox VM and set Networking to Bridged mode for this VM2](https://www.getastra.com/blog/security-audit/how-to-hack-windows-xp-using-metasploit-kali-linux-ms08067/). [Install a fresh Windows XP SP2 ISO with no updates installed as a Virtualbox VM and set Networking to Bridged mode for this VM2](https://www.getastra.com/blog/security-audit/how-to-hack-windows-xp-using-metasploit-kali-linux-ms08067/).
2. [**Start Metasploit Framework in Kali VM**: Start the PostgreSQL database with the following command in Kali Terminal: service postgresql start2](https://www.getastra.com/blog/security-audit/how-to-hack-windows-xp-using-metasploit-kali-linux-ms08067/). [Now you can start the Metasploit service with the following command in Kali Terminal: service metasploit start2](https://www.getastra.com/blog/security-audit/how-to-hack-windows-xp-using-metasploit-kali-linux-ms08067/). [Once the Metasploit service has started, you can start the Metasploit text-based console with the following command in Kali Terminal: msfconsole2](https://www.getastra.com/blog/security-audit/how-to-hack-windows-xp-using-metasploit-kali-linux-ms08067/).
3. **Search for MS08-067 Vulnerability**: Use the search command to search for any module available in Metasploit for the MS08-067 vulnerability. [Enter the following command in the Kali terminal: search ms08-067](https://www.virtualbox.org/wiki/Downloads%29)[2](https://www.getastra.com/blog/security-audit/how-to-hack-windows-xp-using-metasploit-kali-linux-ms08067/).
4. [**Gather Information about the Available Metasploit Module**: To gather detailed information about the available Metasploit module for the MS08-067 vulnerability, enter the following command in the Kali terminal: info exploit/windows/smb/ms08\_067\_netapi](https://www.virtualbox.org/wiki/Downloads%29)[2](https://www.getastra.com/blog/security-audit/how-to-hack-windows-xp-using-metasploit-kali-linux-ms08067/).
5. **Set the RHOST and RPORT**: The RHOST is the target machine’s IP-address and the RPORT is the port you’ll perform your attack through. [The default of 445 is fine](https://www.virtualbox.org/wiki/Downloads%29)[3](https://dzone.com/articles/exploiting-windows-xp-using-kali-linux).
6. [**Exploit the Vulnerability**: After setting the necessary options, you can exploit the vulnerability by entering the following command in the Kali terminal: exploit2](https://www.getastra.com/blog/security-audit/how-to-hack-windows-xp-using-metasploit-kali-linux-ms08067/).

## Viva Questions:

* + What is the role of payload in Metasploit and how is it selected?
  + What steps can be taken to mitigate the risks associated with Windows exploits?
  + How can you determine the severity and impact of a Windows exploit?
  + Are there any legal and ethical considerations when analyzing Windows exploits using Metasploit?
  + Explain the concept of post-exploitation in the context of Windows exploits and Metasploit.

## Post-Skill-Task:

Perform the following

1. Exploit Development
2. Incident Response:
3. Patch Managemen
4. Security Awareness and Training

*(For Evaluator’s use only)*

Date of Evaluation

Signature of the Evaluator

Full Name of the Evaluator:

Evaluator’s Observation

Marks Secured: out of \_

Comment of the Evaluator (if Any)

## DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING SUBJECT CODE: 21CS3041RA

## CRYPT ANALYSIS AND CYBER DEFENCE WORKBOOK

# 13. Implementation of Social Engineering Using Maltego (A/P)

Date of the Session: / / Time of the Session: \_ to

## Learning Objective:

The learning objective of implementing social engineering using Maltego is to understand the techniques and tools involved in conducting social engineering attacks and to utilize Maltego software for gathering and analyzing relevant information to facilitate the attacks.

## Description:

Social engineering is a technique used by malicious actors to manipulate individuals and exploit their vulnerabilities to gain unauthorized access to systems or sensitive information. Maltego is a powerful data mining and visualization tool that can be used for information gathering and analysis. In this project, the goal is to explore the use of Maltego in conducting social engineering attacks by utilizing its features to collect and analyze data about the target, identify potential attack vectors, and develop persuasive techniques to deceive individuals.

## Pre request:

1. Maltego: A licensed version of Maltego software needs to be installed. Maltego provides different editions, such as Maltego Classic, XL, or CE (Community Edition). The choice of edition depends on the project requirements and access to various features.

## Pre-Skill Task:

1. What is social engineering and why is it considered a threat to security?
2. How does Maltego assist in the implementation of social engineering attacks?
3. What are the primary steps involved in conducting a social engineering attack using Maltego?
4. How does Maltego facilitate data gathering and analysis during a social engineering attack?
5. Can you explain the process of identifying potential attack vectors using Maltego?

## In-Skill Task:

Kavya heard about the sales in Myntra. She wants to find out the name servers of 'myntra.com'. She is also keen to know what other domains use these name servers. Help her in finding out the above mentioned using Maltego. Also help her get the email addresses thesedomains use and verify whether these mails exist or not.

Sure, here’s a step-by-step guide on how to use Maltego to find the name servers of ‘myntra.com’, other domains using these name servers, and the email addresses these domains use:

1. [**Launch Maltego**: Start the Maltego application1](https://www.maltego.com/blog/how-to-use-maltego-transforms-to-map-network-infrastructure-an-in-depth-guide/).
2. [**Create a New Graph**: Click on the File menu and select New to create a new graph1](https://www.maltego.com/blog/how-to-use-maltego-transforms-to-map-network-infrastructure-an-in-depth-guide/).
3. **Add Domain Entity**: Drag and drop a Domain entity from the palette onto the graph. [Double-click on the entity and set its value to myntra.com1](https://www.maltego.com/blog/how-to-use-maltego-transforms-to-map-network-infrastructure-an-in-depth-guide/).
4. **Find Name Servers**: Right-click on the myntra.com entity and select NS from the context menu. [This will run a transform that finds the name servers for the domain](https://www.maltego.com/blog/how-to-use-maltego-transforms-to-map-network-infrastructure-an-in-depth-guide/)[2](https://null-byte.wonderhowto.com/how-to/use-maltego-fingerprint-entire-network-using-only-domain-name-0184900/).
5. **Find Other Domains**: For each name server entity on the graph, right-click and select To Domains [Using same NS]. [This will run a transform that finds other domains using the same name server](https://www.maltego.com/blog/how-to-use-maltego-transforms-to-map-network-infrastructure-an-in-depth-guide/)[1](https://www.maltego.com/blog/how-to-use-maltego-transforms-to-map-network-infrastructure-an-in-depth-guide/).
6. **Find Email Addresses**: For each domain entity on the graph, right-click and select To Email Address [From WHOIS info]. [This will run a transform that finds the email addresses associated with the domain](https://www.maltego.com/blog/how-to-use-maltego-transforms-to-map-network-infrastructure-an-in-depth-guide/)[3](https://www.maltego.com/blog/beginners-guide-to-maltego-charting-my-first-maltego-graph/).
7. **Verify Email Addresses**: For each email address entity on the graph, right-click and select Verify Email Address Exists [SMTP]. [This will run a transform that verifies whether the email address exists](https://www.maltego.com/blog/how-to-use-maltego-transforms-to-map-network-infrastructure-an-in-depth-guide/)[4](https://www.maltego.com/blog/verifying-and-investigating-email-addresses-with-ipqualityscore-transforms-in-maltego/).

Please note that this is a simplified guide and the actual process might involve additional steps depending on the specific scenario and the security settings of the website you’re trying to analyze. [Also, always make sure you have the necessary permissions before performing any kind of security testing or analysis on a website](https://www.maltego.com/blog/how-to-use-maltego-transforms-to-map-network-infrastructure-an-in-depth-guide/)[1](https://www.maltego.com/blog/how-to-use-maltego-transforms-to-map-network-infrastructure-an-in-depth-guide/)[4](https://www.maltego.com/blog/verifying-and-investigating-email-addresses-with-ipqualityscore-transforms-in-maltego/).

1. Write a program to implement one time padding

import os

def encrypt\_decrypt(input\_string, key):

# Convert input string and key into byte arrays

input\_bytes = input\_string.encode()

key\_bytes = key.encode()

# Perform XOR operation on each byte of the input string and key

output\_bytes = bytearray()

for i in range(len(input\_bytes)):

output\_bytes.append(input\_bytes[i] ^ key\_bytes[i])

# Convert the byte array into a string and return it

return output\_bytes.decode()

# Generate a random key

key = os.urandom(16)

# The plaintext message

plaintext = "Hello, World!"

# Encrypt the plaintext

ciphertext = encrypt\_decrypt(plaintext, key)

print("Ciphertext:", ciphertext)

# Decrypt the ciphertext

decrypted = encrypt\_decrypt(ciphertext, key)

print("Decrypted:", decrypted)

https://programmingcode4life.blogspot.com/2015/10/one-time-pad-cipher.html

**Viva Questions :**

* + What are some persuasive techniques commonly employed in social engineering attacks?
  + How can Maltego be used to simulate and validate social engineering attacks without causing harm?
  + What are the ethical considerations and legal implications of implementing social engineering using Maltego?
  + How can organizations protect themselves against social engineering attacks conducted through tools like Maltego?
  + Can you discuss any real-world examples of social engineering attacks and the role of Maltego in their execution?

## Post-Skill-Task:

1. Write a detailed report on the methodology and techniques used in the social engineering experiment.

# Social Engineering Experiment Methodology and Techniques

[Social engineering is a cybersecurity threat that leverages human psychology rather than technical hacking techniques to gain access to systems, data, or buildings](https://www.csoonline.com/article/571993/social-engineering-definition-examples-and-techniques.html)[1](https://www.csoonline.com/article/571993/social-engineering-definition-examples-and-techniques.html)[2](https://www.exabeam.com/information-security/top-8-social-engineering-techniques-and-how-to-prevent-them-2022/). The following is a detailed report on the methodology and techniques used in a social engineering experiment.

## Methodology

[The methodology of a social engineering experiment typically involves four stages](https://www.csoonline.com/article/571993/social-engineering-definition-examples-and-techniques.html)[3](https://www.kaspersky.co.in/resource-center/definitions/what-is-social-engineering):

1. [**Preparation**: In this stage, attackers collect information about the victims through various sources such as social media, telephone calls, emails, text messages, the dark web, etc](https://www.csoonline.com/article/571993/social-engineering-definition-examples-and-techniques.html)[3](https://www.kaspersky.co.in/resource-center/definitions/what-is-social-engineering).
2. [**Infiltration**: Attackers approach victims by masquerading as trusted contacts or authorities, using the information gathered about the victim to gain their trust](https://www.csoonline.com/article/571993/social-engineering-definition-examples-and-techniques.html)[3](https://www.kaspersky.co.in/resource-center/definitions/what-is-social-engineering). [This could also involve acquiring access to higher-value targets such as system administrators, IT helpdesk members, or executives](https://www.csoonline.com/article/571993/social-engineering-definition-examples-and-techniques.html)[2](https://www.exabeam.com/information-security/top-8-social-engineering-techniques-and-how-to-prevent-them-2022/).
3. [**Exploitation**: Attackers persuade victims to give them sensitive information such as account credentials, payment account details, and other information that they can use to conduct a cyber attack](https://www.csoonline.com/article/571993/social-engineering-definition-examples-and-techniques.html)[3](https://www.kaspersky.co.in/resource-center/definitions/what-is-social-engineering). [This persuasion can often be subtle, involving a link, an attachment, a website, or even a social media quiz](https://www.csoonline.com/article/571993/social-engineering-definition-examples-and-techniques.html)[2](https://www.exabeam.com/information-security/top-8-social-engineering-techniques-and-how-to-prevent-them-2022/).
4. [**Disengagement**: The attacker stops communicating with the victim, carries out malicious activity, and disappears](https://www.csoonline.com/article/571993/social-engineering-definition-examples-and-techniques.html)[3](https://www.kaspersky.co.in/resource-center/definitions/what-is-social-engineering).

## Techniques

There are several techniques used in social engineering attacks. [Here are some of the most common ones](https://www.csoonline.com/article/571993/social-engineering-definition-examples-and-techniques.html)[1](https://www.csoonline.com/article/571993/social-engineering-definition-examples-and-techniques.html)[2](https://www.exabeam.com/information-security/top-8-social-engineering-techniques-and-how-to-prevent-them-2022/):

1. [**Phishing**: In a phishing attack, an attacker uses a message sent by email, social media, instant messaging clients, or SMS to obtain sensitive information from a victim or trick them into clicking a link to a malicious website](https://www.csoonline.com/article/571993/social-engineering-definition-examples-and-techniques.html)[2](https://www.exabeam.com/information-security/top-8-social-engineering-techniques-and-how-to-prevent-them-2022/).
2. [**Scareware**: Scareware involves tricking the victim into thinking their computer is infected with malware, prompting them to install software that is actually malware](https://www.csoonline.com/article/571993/social-engineering-definition-examples-and-techniques.html)[2](https://www.exabeam.com/information-security/top-8-social-engineering-techniques-and-how-to-prevent-them-2022/).
3. [**Watering Holes**: In this technique, attackers infect websites that their target victims frequently visit](https://www.csoonline.com/article/571993/social-engineering-definition-examples-and-techniques.html)[2](https://www.exabeam.com/information-security/top-8-social-engineering-techniques-and-how-to-prevent-them-2022/).
4. [**Whaling Attack**: This is a targeted attack on high-profile individuals within an organization](https://www.csoonline.com/article/571993/social-engineering-definition-examples-and-techniques.html)[2](https://www.exabeam.com/information-security/top-8-social-engineering-techniques-and-how-to-prevent-them-2022/).
5. [**Cache Poisoning or DNS Spoofing**: This involves corrupting a DNS server by replacing a legitimate IP address with a fake one](https://www.csoonline.com/article/571993/social-engineering-definition-examples-and-techniques.html)[2](https://www.exabeam.com/information-security/top-8-social-engineering-techniques-and-how-to-prevent-them-2022/).
6. [**Pretexting**: This involves creating a fabricated scenario (the pretext) to steal the victim’s personal information](https://www.csoonline.com/article/571993/social-engineering-definition-examples-and-techniques.html)[2](https://www.exabeam.com/information-security/top-8-social-engineering-techniques-and-how-to-prevent-them-2022/).
7. [**Baiting and Quid Pro Quo Attacks**: These involve offering something to the victim in exchange for information](https://www.csoonline.com/article/571993/social-engineering-definition-examples-and-techniques.html)[2](https://www.exabeam.com/information-security/top-8-social-engineering-techniques-and-how-to-prevent-them-2022/).
8. [**Physical Breaches and Tailgating**: This involves gaining physical access to restricted areas](https://www.csoonline.com/article/571993/social-engineering-definition-examples-and-techniques.html)[2](https://www.exabeam.com/information-security/top-8-social-engineering-techniques-and-how-to-prevent-them-2022/).

Remember, the key to preventing social engineering attacks is awareness and education. [Regular training and updates on the latest social engineering techniques can help individuals and organizations protect themselves from these threats](https://www.csoonline.com/article/571993/social-engineering-definition-examples-and-techniques.html)[1](https://www.csoonline.com/article/571993/social-engineering-definition-examples-and-techniques.html)[2](https://www.exabeam.com/information-security/top-8-social-engineering-techniques-and-how-to-prevent-them-2022/).

1. Discuss the effectiveness of different social engineering tactics employed.

*(For Evaluator’s use only)*

Date of Evaluation

Signature of the Evaluator

Full Name of the Evaluator:

Evaluator’s Observation

Marks Secured: out of

Comment of the Evaluator (if Any)

## DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING SUBJECT CODE: 21CS3041RA

## CRYPT ANALYSIS AND CYBER DEFENCE WORKBOOK

# 14. Analyze Vulnerability Analysis Using Wireshark (A/P)

Date of the Session: / / Time of the Session: \_ to

## Learning Objective:

The learning objective of analyzing vulnerability analysis using Wireshark is to understand how to identify and analyze network vulnerabilities using the Wireshark network protocol analyzer. Participants will learn how to capture network traffic, interpret packet data, and identify potential security vulnerabilities in network communications.

## Description:

This training session focuses on the practical application of Wireshark for vulnerability analysis. Participants will be introduced to the fundamentals of network protocols and packet analysis. They will learn how to capture network traffic using Wireshark, analyze captured packets, and identify common vulnerabilities such as unencrypted credentials, malicious traffic patterns, and potential attack vectors. Additionally, participants will gain insights into different techniques and methodologies for vulnerability analysis using Wireshark.

## Pre request:

1. Wireshark: The latest version of Wireshark should be installed on the participants' machines.
2. A network environment: Participants should have access to a network environment, either physical or virtual, to capture network traffic for analysis.

## Pre-Skill Task:

1. What is the purpose of Wireshark in vulnerability analysis?
2. How does Wireshark capture network traffic? Explain the different capture methods.
3. What are the common security vulnerabilities that can be identified using Wireshark?
4. Describe the process of analyzing captured packets in Wireshark.
5. What are some key features or functionalities of Wireshark that are useful for vulnerability analysis?

## In-Skill Task:

* 1. How we can capture the data packets using the Wireshark tool? Mention the step by step process.

### Step 1: Install Wireshark

1. **Download Wireshark:**
   * Visit the official Wireshark website at <https://www.wireshark.org/>.
   * Download the appropriate version for your operating system (Windows, macOS, or Linux).
   * Install Wireshark by following the on-screen instructions.

### Step 2: Launch Wireshark and Select Network Interface

1. **Launch Wireshark:**
   * Open Wireshark after installation. On most systems, you might need administrative privileges to capture packets.
2. **Select Network Interface:**
   * Wireshark will list all available network interfaces. Choose the one through which you want to capture packets (such as Ethernet, Wi-Fi, etc.).
   * Click on the interface and then click the "Start" button (usually represented as a shark fin icon) to begin capturing packets.

### Step 3: Capture Packets

1. **Capture Packets:**
   * Wireshark will start capturing packets on the selected network interface.
   * You will see a live list of captured packets with details like source and destination IP addresses, protocols, and packet size.
2. **Stop Capturing:**
   * To stop capturing packets, click the "Stop" button (usually a red square icon) in Wireshark.

### Step 4: Analyze Captured Packets

1. **Inspect Packets:**
   * After stopping the capture, you can analyze the captured packets in the main Wireshark window.
   * You can filter packets based on various criteria (e.g., IP addresses, protocols) using the display filter bar at the top.
2. **View Packet Details:**
   * Double-click on a packet in the list to view detailed information about the packet, including header fields and raw data.

### Step 5: Save Captured Data

1. **Save Captured Data:**
   * If you want to save the captured packets for analysis later, go to "File" > "Save As" and choose a location to save the capture file.
   * Wireshark supports various file formats like PCAP, which can be opened and analyzed later.
   1. Analyze any packets that you capture and write down their information i.e., their source, destination along with its IP Address and to which protocol they belong to?

Packet Number: 1

Timestamp: 2023-11-07 14:30:45

Ethernet Frame:

- Source MAC Address: 00:1A:2B:3C:4D:5E

- Destination MAC Address: 11:22:33:44:55:66

- Ethernet Type: IPv4 (0x0800)

IP Packet (IPv4):

- Source IP Address: 192.168.1.100

- Destination IP Address: 8.8.8.8

- IP Protocol: UDP (17)

UDP Segment:

- Source Port: 54768

- Destination Port: 53

Payload:

- DNS Query: "www.example.com"

In this sample:

* **Packet Number:** Each captured packet is assigned a unique number for reference.
* **Timestamp:** The date and time when the packet was captured.
* **Ethernet Frame:** Contains information about the source and destination MAC addresses and the Ethernet type.
* **IP Packet (IPv4):** Contains the source and destination IP addresses and the IP protocol used.
* **UDP Segment:** If applicable, includes source and destination ports for UDP packets.
* **Payload:** Contains the actual data being transmitted, such as a DNS query in this example.

Please note that the details of each packet can vary based on the captured network traffic.

## Viva Questions :

* How can Wireshark be used to identify potential attack vectors in a network?
* What are the steps involved in conducting vulnerability analysis using Wireshark?
* Can you explain any specific techniques or methodologies for vulnerability analysis using Wireshark?
* What are some challenges or limitations of using Wireshark for vulnerability analysis?
* How can the findings from Wireshark analysis be used to improve network security?

## Post -skill- Task:

1.Document the steps followed to capture network traffic using Wireshark.

2Analyze the captured packets and identify potential vulnerabilities or security issues.

3Provide a detailed report on the vulnerabilities found, including their severity and impact.

*(For Evaluator’s use only)*

Date of Evaluation

Signature of the Evaluator

Full Name of the Evaluator:

Evaluator’s Observation

Marks Secured: out of

Comment of the Evaluator (if Any)

## DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING SUBJECT CODE: 21CS3041RA

## CRYPT ANALYSIS AND CYBER DEFENCE WORKBOOK

# 15. Implementation of Web Application Security (Paros) (A/P)

Date of the Session: / / Time of the Session: \_ to

## Learning Objective:

The learning objective of implementing Web Application Security using Paros is to understand and apply security measures to identify and mitigate common vulnerabilities in web applications.

## Description:

The implementation of Web Application Security using Paros involves using the Paros Proxy tool to intercept and analyze web application traffic, identify potential security vulnerabilities, and suggest remedial actions. Paros is an open-source web proxy that allows security testers to analyze and modify HTTP and HTTPS traffic between a web browser and a target application.

## Pre request:

1. Paros Proxy: It can be downloaded and installed from the official Paros website or other trusted sources.
2. Web browser: Any modern web browser such as Google Chrome, Mozilla Firefox, or Microsoft Edge.
3. Target web application: A web application with known or simulated security vulnerabilities for testing purposes.

## Pre Skill:

1. What is the purpose of implementing web application security using Paros?
2. How does Paros Proxy work and what is its role in web application security?
3. What are the key features and functionalities of Paros Proxy?
4. How can Paros Proxy be used to intercept and analyze web application traffic?
5. What are the common security vulnerabilities that can be identified using Paros?

## In Lab:

## Why is it important for penetration testing tools on web applications. and how do you use Paros to validate vulnerabilities reports?

[**Importance of Penetration Testing Tools on Web Applications**1](https://www.alpinesecurity.com/blog/web-application-penetration-testing-why-its-necessary-and-what-you-need-to-know/)[2](https://blog.rsisecurity.com/the-importance-of-web-penetration-testing/)[3](https://www.eccouncil.org/cybersecurity-exchange/whitepaper/guide-web-application-penetration-testing/):

1. [**Identify Weaknesses**: Penetration testing tools help in determining weaknesses in the infrastructure, application, and people in order to develop controls](https://www.alpinesecurity.com/blog/web-application-penetration-testing-why-its-necessary-and-what-you-need-to-know/)[1](https://www.alpinesecurity.com/blog/web-application-penetration-testing-why-its-necessary-and-what-you-need-to-know/).
2. [**Ensure Effective Controls**: They ensure that the controls that have been implemented are effective, offering peace of mind to CISOs](https://www.alpinesecurity.com/blog/web-application-penetration-testing-why-its-necessary-and-what-you-need-to-know/)[1](https://www.alpinesecurity.com/blog/web-application-penetration-testing-why-its-necessary-and-what-you-need-to-know/).
3. [**Spot Coding Mistakes**: These tools help in spotting mistakes made by coders before hackers do](https://www.alpinesecurity.com/blog/web-application-penetration-testing-why-its-necessary-and-what-you-need-to-know/)[1](https://www.alpinesecurity.com/blog/web-application-penetration-testing-why-its-necessary-and-what-you-need-to-know/).
4. [**Discover New Bugs**: They assist in discovering new bugs in existing software and determining what updates can fix existing vulnerabilities](https://www.alpinesecurity.com/blog/web-application-penetration-testing-why-its-necessary-and-what-you-need-to-know/)[1](https://www.alpinesecurity.com/blog/web-application-penetration-testing-why-its-necessary-and-what-you-need-to-know/).
5. [**Prevent Security Breaches**: Good web app pen testing practices help organizations identify security vulnerabilities and prevent security breaches](https://www.alpinesecurity.com/blog/web-application-penetration-testing-why-its-necessary-and-what-you-need-to-know/)[3](https://www.eccouncil.org/cybersecurity-exchange/whitepaper/guide-web-application-penetration-testing/).

[**Using Paros to Validate Vulnerabilities Reports**](https://www.alpinesecurity.com/blog/web-application-penetration-testing-why-its-necessary-and-what-you-need-to-know/)[4](https://resources.infosecinstitute.com/topic/introduction-paros-proxy-lightweight-web-application-tool/)[5](https://support.trustwave.com/kb/Print19130.aspx):

1. [**Download and Install Paros**: Paros can be downloaded from the project download link on SourceForge](https://www.alpinesecurity.com/blog/web-application-penetration-testing-why-its-necessary-and-what-you-need-to-know/)[4](https://resources.infosecinstitute.com/topic/introduction-paros-proxy-lightweight-web-application-tool/). [It can also be found within the Kali Linux Penetration Testing Linux distribution](https://www.alpinesecurity.com/blog/web-application-penetration-testing-why-its-necessary-and-what-you-need-to-know/)[4](https://resources.infosecinstitute.com/topic/introduction-paros-proxy-lightweight-web-application-tool/).
2. [**Launch Paros**: Launching the tool is as simple as typing paros on the terminal](https://www.alpinesecurity.com/blog/web-application-penetration-testing-why-its-necessary-and-what-you-need-to-know/)[4](https://resources.infosecinstitute.com/topic/introduction-paros-proxy-lightweight-web-application-tool/).
3. **Accept the License Agreement**: The license agreement that appears outlines the developer’s guidelines. [For us to proceed, we need to accept the terms](https://www.alpinesecurity.com/blog/web-application-penetration-testing-why-its-necessary-and-what-you-need-to-know/)[4](https://resources.infosecinstitute.com/topic/introduction-paros-proxy-lightweight-web-application-tool/).
4. [**Set Up Paros**: Paros intercepts traffic by listening on localhost (127.0.0.1) and on port 8080](https://www.alpinesecurity.com/blog/web-application-penetration-testing-why-its-necessary-and-what-you-need-to-know/)[4](https://resources.infosecinstitute.com/topic/introduction-paros-proxy-lightweight-web-application-tool/). [Apply these settings for HTTP, SSL, FTP, and Socks v5](https://www.alpinesecurity.com/blog/web-application-penetration-testing-why-its-necessary-and-what-you-need-to-know/)[4](https://resources.infosecinstitute.com/topic/introduction-paros-proxy-lightweight-web-application-tool/).
5. [**Intercept Traffic**: Paros is now ready to intercept our traffic](https://www.alpinesecurity.com/blog/web-application-penetration-testing-why-its-necessary-and-what-you-need-to-know/)[4](https://resources.infosecinstitute.com/topic/introduction-paros-proxy-lightweight-web-application-tool/).
6. **Validate Vulnerabilities**: You might want to use a third party tool to validate a vulnerability finding detected by App Scanner (Hailstorm). [One way is to use a Web proxy such as Paros to replay the vulnerability](https://www.alpinesecurity.com/blog/web-application-penetration-testing-why-its-necessary-and-what-you-need-to-know/)[5](https://support.trustwave.com/kb/Print19130.aspx).

[Please note that Paros has not been updated since August 14, 2013 and, as a result, may be prone to many false positives or may even miss some vulnerabilities](https://www.alpinesecurity.com/blog/web-application-penetration-testing-why-its-necessary-and-what-you-need-to-know/)[4](https://resources.infosecinstitute.com/topic/introduction-paros-proxy-lightweight-web-application-tool/). [Due to its nearly ancient code, the project has been forked into a more updated tool, the OWASP Zed Attack Proxy (ZAP), which is maintained by the OWASP community](https://www.alpinesecurity.com/blog/web-application-penetration-testing-why-its-necessary-and-what-you-need-to-know/)[4](https://resources.infosecinstitute.com/topic/introduction-paros-proxy-lightweight-web-application-tool/).

## Write steps to implement Paros in your Kali Linux?

[Sure, here are the steps to install and use Paros on Kali Linux](https://www.kali.org/tools/paros/)[1](https://www.kali.org/tools/paros/):

1. **Open Terminal**: Open the terminal in your Kali Linux system.
2. **Update System**: Update your system by running the following command:

sudo apt-get update

1. **Install Paros**: Install Paros by running the following command:

sudo apt install paros

1. [**Launch Paros**: You can launch Paros by typing paros in the terminal1](https://www.kali.org/tools/paros/).
2. **Accept the License Agreement**: The license agreement will appear outlining the developer’s guidelines. [Accept the terms to proceed1](https://www.kali.org/tools/paros/).
3. [**Set Up Paros**: Paros intercepts traffic by listening on localhost (127.0.0.1) and on port 80801](https://www.kali.org/tools/paros/). [Apply these settings for HTTP, SSL, FTP, and Socks v5](https://www.kali.org/tools/paros/)[1](https://www.kali.org/tools/paros/).
4. [**Intercept Traffic**: Paros is now ready to intercept your traffic](https://www.kali.org/tools/paros/)[1](https://www.kali.org/tools/paros/).

[Please note that Paros has not been updated since August 14, 2013 and, as a result, may be prone to many false positives or may even miss some vulnerabilities2](https://resources.infosecinstitute.com/topics/penetration-testing/introduction-paros-proxy-lightweight-web-application-tool/). [Due to its nearly ancient code, the project has been forked into a more updated tool, the OWASP Zed Attack Proxy (ZAP), which is maintained by the OWASP community2](https://resources.infosecinstitute.com/topics/penetration-testing/introduction-paros-proxy-lightweight-web-application-tool/).

## Viva Questions :

* + Explain the process of configuring Paros Proxy to work with a target web application.
  + What are some common security measures or actions that can be taken based on the findings from Paros Proxy analysis?
  + Can Paros Proxy analyze both HTTP and HTTPS traffic? If yes, how?
  + Are there any limitations or challenges in using Paros Proxy for web application security testing?
  + How can the results obtained from Paros Proxy be documented and communicated to stakeholders effectively?

## Post Skill Task:

* Describe the process of setting up and configuring Paros for web application security testing.
* Conduct a comprehensive security assessment of a web application using Paros.

*(For Evaluator’s use only)*

Date of Evaluation

Signature of the Evaluator

Full Name of the Evaluator:

Evaluator’s Observation

Marks Secured: out of \_

Comment of the Evaluator (if Any)

## DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING SUBJECT CODE: 21CS3041RA

## CRYPT ANALYSIS AND CYBER DEFENCE WORKBOOK

# 16. Analyze Processing Crime and Incident Scenes (A/P)

Date of the Session: / / Time of the Session: \_ to

## Learning Objective:

The learning objective of this analysis is to develop a comprehensive understanding of the process involved in analyzing crime and incident scenes. This includes gaining knowledge of the techniques, methodologies, and Pre request in processing crime scenes to gather evidence and support investigations.

## Description:

This analysis focuses on the systematic approach used in processing crime and incident scenes. It covers various aspects such as scene assessment, documentation, evidence collection, and preservation. Additionally, it explores the use of software tools that aid in crime scene analysis and reconstruction. By studying these processes, learners will be equipped with the knowledge and skills necessary to effectively analyze and interpret evidence obtained from crime and incident scenes.

## Pre request:

1. Crime Scene Management Software: Examples include Crime Scene Investigator (CSI) Tools, iWitnessPRO, or CrimePad.
2. Photogrammetry Software: Examples include Agisoft Metashape, Pix4D, or Autodesk ReCap.
3. Forensic Imaging and Enhancement Software: Examples include Adobe Photoshop, Amped FIVE, or Forensic Image Clarification Suite.
4. 3D Modeling and Reconstruction Software: Examples include FARO Zone 3D, Autodesk 3ds Max, or SketchUp Pro.
5. Evidence Management Software: Examples include EVIDENCEonQ, Tracker Products, or iJustice.

## Pre-Skill

1. What are the key steps involved in processing a crime or incident scene?
2. How would you assess and document a crime scene? What are the crucial elements to consider?
3. Describe the importance of evidence collection and preservation at a crime scene.
4. What software tools are commonly used in crime scene analysis, and what are their specific functions?
5. How does photogrammetry software contribute to crime scene analysis and reconstruction?

**In-Skill Task**

* Study and analyze the steps involved in processing crime and incident scenes.
* Familiarize yourself with the tools and techniques used in evidence collection, preservation, and documentation.

### 1. **Evidence Collection:**

#### **Tools:**

* **EnCase:** A powerful commercial digital forensic tool used for collecting, analyzing, and preserving digital evidence.
* **Autopsy:** An open-source digital forensics platform that simplifies the process of analyzing hard drives and smartphones.
* **dd (Disk Dump):** A command-line tool in Unix-like systems for bit-by-bit copying of data, often used to create disk images.
* **FTK (Forensic Toolkit):** Another commercial tool widely used in digital forensics for evidence collection and analysis.
* **Volatility:** A popular open-source memory forensics framework for analyzing volatile memory (RAM) of a system.

#### **Techniques:**

* **Disk Imaging:** Creating a bit-by-bit copy of a storage device, preserving the original data without modification.
* **Live Data Collection:** Collecting data from active systems without shutting them down, ensuring minimal disruption to operations.
* **Memory Forensics:** Analyzing the contents of RAM to extract volatile information, such as running processes and network connections.
* **Network Packet Capturing:** Capturing network traffic to analyze communication patterns and identify potential security incidents.
* **Mobile Forensics:** Extracting data from mobile devices using specialized tools to investigate messages, call logs, apps, and other information.

### 2. **Evidence Preservation:**

#### **Techniques:**

* **Write-Blocking:** Using hardware or software write-blockers to prevent any write operations to the original storage device, ensuring data integrity.
* **Chain of Custody:** Maintaining a detailed record of who handled the evidence, when, and what was done, ensuring legal admissibility.
* **Hashing:** Generating cryptographic hashes (e.g., MD5, SHA-256) of evidence files to verify their integrity before and after analysis.
* **Secure Storage:** Storing evidence in a secure environment, such as a locked evidence room, protected from physical and digital tampering.

### 3. **Evidence Documentation:**

#### **Techniques:**

* **Case Documentation:** Creating a detailed case log that includes information about the investigation, evidence collected, analysis performed, and conclusions drawn.
* **Forensic Reports:** Documenting the findings, methodologies, tools used, and the analysis process in a comprehensive forensic report.
* **Timestamping:** Recording the date and time of each action taken during the investigation, including evidence collection and analysis.
* **Photographic and Video Evidence:** Capturing photographs or videos of the crime scene, digital devices, and evidence to visually document the context.

### **Best Practices:**

* **Legal Compliance:** Adhering to legal and regulatory requirements, ensuring evidence handling meets the standards of admissibility in court.
* **Data Integrity:** Ensuring data integrity throughout the investigation process by using hashing algorithms and maintaining a strong chain of custody.
* **Continuous Learning:** Staying updated with the latest forensic tools, techniques, and legal standards through continuous learning and professional development.
* Participate in mock crime scene simulations to gain hands-on experience in processing different types of scenes.
* Learn about the chain of custody and proper handling of evidence.

## Viva Questions

* Explain the role of forensic imaging and enhancement software in analyzing visual evidence.
* How can 3D modeling and reconstruction software assist in understanding complex crime scenes?
* What are the challenges associated with using crime scene management software, and how can they be overcome?
* Discuss the significance of evidence management software in the overall crime scene analysis process.
* In your opinion, what are the emerging trends or advancements in processing crime and incident scenes, and how might they impact future investigations?

Post-Skill-tasks:

* Prepare a detailed report outlining the various stages of crime and incident scene processing.
* Reflect on the challenges faced during the mock simulations and propose improvements or alternative approaches.
* Discuss the importance of maintaining the integrity of evidence and the potential impact of mishandling it.
* Highlight the significance of proper documentation and collaboration between forensic experts and law enforcement agencies.

*(For Evaluator’s use only)*

Date of Evaluation

Signature of the Evaluator

Full Name of the Evaluator:

Evaluator’s Observation

Marks Secured: out of \_

Comment of the Evaluator (if Any)

## DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING SUBJECT CODE: 21CS3041RA

## CRYPT ANALYSIS AND CYBER DEFENCE WORKBOOK

# 17. Working with file systems (A/P)

Date of the Session: / /

## Objective :

Time of the Session: \_ to

Learning Objective: The learning objective of working with file systems is to understand the concepts and techniques related to managing and manipulating files and directories within an operating system.

## Description:

Working with file systems involves acquiring knowledge and skills in various aspects such as file organization, file operations, directory structures, and file system security. This includes understanding how files and directories are organized and stored, performing operations like creating, reading, updating, and deleting files, navigating through directory structures, and implementing file system access controls.

## Pre request:

The Pre request for working with file systems depends on the operating system being used. However, common software tools include:

1. Windows: Windows Explorer, PowerShell, Command Prompt
2. macOS: Finder, Terminal
3. Linux: Command-line interface (e.g., Bash), Nautilus, Thunar

## Pre-Skill:

1. What is a file system, and why is it important for an operating system?
2. Explain the hierarchy of a typical file system.
3. How are files organized and stored within a file system?
4. Describe the process of creating a new file in an operating system.
5. What are the different file operations that can be performed on a file?

In-Skill tasks:

* Explore different file systems such as FAT, NTFS, ext4, etc., and their structures.

### 1. **FAT (File Allocation Table):**

FAT is a simple file system primarily used in older versions of Windows and various removable storage devices like USB drives and SD cards. There are different versions of FAT, including FAT12, FAT16, and FAT32, which specify the size of the file allocation table entries.

#### **Structure:**

* **File Allocation Table:** Contains entries that map file clusters to their respective data blocks.
* **Boot Sector:** Stores information about the file system, including the location of the file allocation table.
* **Root Directory:** Contains file and directory entries.
* **File and Directory Data:** Actual file and directory data stored in clusters.

### 2. **NTFS (New Technology File System):**

NTFS is the default file system for modern Windows operating systems. It provides improved reliability, security, and support for large file sizes and volumes.

#### **Structure:**

* **Master File Table (MFT):** Central database containing information about files and directories on the disk.
* **File Record Segments:** Each file or directory has a record in the MFT, containing metadata and data pointers.
* **Cluster Allocation:** NTFS organizes data into clusters, and the MFT keeps track of cluster allocation status.
* **Security Descriptors:** NTFS supports access control lists (ACLs) and security descriptors for fine-grained permissions.

### 3. **ext4 (Fourth Extended File System):**

ext4 is a widely used file system in Linux distributions. It is an evolution of the earlier ext3 file system and provides improved performance, scalability, and reliability.

#### **Structure:**

* **Superblock:** Contains metadata about the file system, including the block size and the location of important data structures.
* **Inodes:** Data structures that store metadata about files and directories, including file permissions, timestamps, and pointers to data blocks.
* **Data Blocks:** Store actual file data or pointers to additional data blocks for large files.
* **Journal:** ext4 uses journaling to improve file system recovery after crashes, ensuring data consistency.

### 4. **HFS+ (Mac OS Extended):**

HFS+ is the primary file system used on macOS systems. It is designed to support Mac-specific features and is optimized for Mac hardware.

#### **Structure:**

* **Catalog File:** Contains file and directory metadata, including names, permissions, and pointers to data blocks.
* **Allocation File:** Keeps track of free and used disk space, optimizing file allocation.
* **Attributes File:** Stores extended file attributes, such as Finder flags and custom icons.
* **Startup File:** Contains information needed for booting macOS systems.

Each file system has its advantages and is optimized for specific use cases and operating systems.

* Learn about file system metadata, file allocation methods, and directory structures.
* Practice file system analysis using tools like The Sleuth Kit or Autopsy.

Sure, here are the steps to perform file system analysis using The Sleuth Kit and Autopsy:

**The Sleuth Kit:**

1. [The Sleuth Kit can be used in two ways: as a C library incorporated into larger digital forensic tools, and as command line tools used directly by a user1](https://www.sleuthkit.org/sleuthkit/docs.php).
2. [The Sleuth Kit allows you to analyze a disk or file system image created by ‘dd’, or a similar application that creates a raw image](https://www.sleuthkit.org/sleuthkit/docs.php)[2](https://github.com/sleuthkit/sleuthkit).
3. These tools are low-level and each performs a single task. [When used together, they can perform a full analysis](https://www.sleuthkit.org/sleuthkit/docs.php)[2](https://github.com/sleuthkit/sleuthkit).

**Autopsy:**

1. [**Getting Started**: Open Autopsy and create a new case](https://www.sleuthkit.org/sleuthkit/docs.php)[3](https://www.geeksforgeeks.org/analysis-of-data-source-using-autopsy/).
2. **Add a Data Source**: Select the appropriate data source type. [This could be a Disk Image or VM file, Local Disk, or Logical Files](https://www.sleuthkit.org/sleuthkit/docs.php)[3](https://www.geeksforgeeks.org/analysis-of-data-source-using-autopsy/).
3. [**Configure Ingest Modules**: The ingest modules determine factors for which the data in the data source is to be analyzed](https://www.sleuthkit.org/sleuthkit/docs.php)[3](https://www.geeksforgeeks.org/analysis-of-data-source-using-autopsy/).
4. [**Analysis**: Autopsy performs operations onto disk images which can be created using tools like FTK Imager](https://www.sleuthkit.org/sleuthkit/docs.php)[3](https://www.geeksforgeeks.org/analysis-of-data-source-using-autopsy/).

Please note that these are general steps and the specific commands and steps may vary based on the specifics of your case and the version of the tools you are using. [I recommend checking the official documentation or tutorials for the most accurate and up-to-date information](https://www.sleuthkit.org/sleuthkit/docs.php)[4](https://www.youtube.com/watch?v=R-IE2j04Chc)[5](http://sleuthkit.org/autopsy/docs/user-docs/4.19.3/quick_start_guide.html)[6](https://www.kali.org/tools/sleuthkit/)[3](https://www.geeksforgeeks.org/analysis-of-data-source-using-autopsy/)[7](https://info-savvy.com/file-system-analysis-using-autopsy/)[8](https://www.computersecuritystudent.com/FORENSICS/AUTOPSY/lesson1/index.html)[9](https://medium.com/@tusharcool118/autopsy-tutorial-for-digital-forensics-707ea5d5994d)[10](https://www.sans.org/blog/a-step-by-step-introduction-to-using-the-autopsy-forensic-browser/).

Examine file system artifacts, such as deleted files, timestamps, and file permissions.

## Viva Questions

* + How do you navigate through directory structures in an operating system?
  + What are the common file system security mechanisms and access controls?
  + Explain the difference between absolute path and relative path in file systems.
  + How can you determine the size of a file in an operating system?
  + Discuss the concept of file permissions and how they are managed in different operating systems.

## Post-Skill-tasks:

* Write a comprehensive report on file system analysis techniques and tools.
* Document the findings from the lab exercises, including examples of file system artifacts discovered.
* Discuss the importance of file system analysis in digital forensics investigations.
* Provide recommendations for effective file system analysis and artifact recovery.

*(For Evaluator’s use only)*

Date of Evaluation

Signature of the Evaluator

Full Name of the Evaluator:

Evaluator’s Observation

Marks Secured: out of \_

Comment of the Evaluator (if Any)

## DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING SUBJECT CODE: 21CS3041RA

## CRYPT ANALYSIS AND CYBER DEFENCE WORKBOOK

# 18. Virtual Machine Forensics, Live Acquisitions & Network Forensics (A/P)

Date of the Session: / /

## Objective:

Time of the Session: \_ to

The learning objective of the topic "Virtual Machine Forensics, Live Acquisitions & Network Forensics" is to understand the principles, techniques, and tools used in conducting forensic investigations on virtual machines, performing live acquisitions, and analyzing network data for investigative purposes.

## Description:

It covers the essential concepts and practices involved in forensic analysis of virtual machines, live acquisitions, and network forensics. It explores the unique challenges and methodologies associated with these areas of digital forensics. Students will gain an understanding of the tools and techniques used to collect evidence, analyze virtual machine images, perform live acquisitions, and examine network traffic to uncover potential digital evidence.

## Pre request:

1. Virtualization software: Examples include Oracle VirtualBox, VMware Workstation, or Microsoft Hyper-V.
2. Forensic analysis tools: This may include tools such as EnCase Forensic, FTK (Forensic Toolkit), Autopsy, Volatility Framework, Wireshark, etc.
3. Network monitoring tools: Examples include Wireshark, tcpdump, NetworkMiner, etc.
4. Operating systems and virtual machine images: Various operating systems and virtual machine images will be required to simulate forensic scenarios, such as Windows, Linux, or macOS.

## Pre-Skill:

1. What are the key differences between traditional computer forensics and virtual machine forensics?
2. Explain the steps involved in acquiring a live virtual machine for forensic analysis.
3. What are the potential challenges and limitations when conducting forensics on virtual machines?
4. Describe the process of analyzing a virtual machine image using forensic tools.
5. What are the advantages and disadvantages of live acquisitions compared to acquiring a powered-off virtual machine?

In-Skill tasks:

* Set up virtual machines and configure different operating systems.

Setting up virtual machines and configuring different operating systems involves a few steps. Here’s a general guide:

[**Step 1: Check System Support** Before creating a VM, ensure that your computer has the necessary resources and supports virtualization1](https://www.serverwatch.com/virtualization/how-to-set-up-virtual-machines/). [This includes administrative privileges, sufficient resources (RAM and disk space), and hardware virtualization support1](https://www.serverwatch.com/virtualization/how-to-set-up-virtual-machines/).

**Step 2: Install a Hypervisor** A hypervisor is software that creates and manages virtual machines. [Examples include VMware Workstation, VirtualBox, and Hyper-V](https://www.serverwatch.com/virtualization/how-to-set-up-virtual-machines/)[1](https://www.serverwatch.com/virtualization/how-to-set-up-virtual-machines/). [Download the appropriate version for your operating system from the official website and follow the on-screen prompts to install1](https://www.serverwatch.com/virtualization/how-to-set-up-virtual-machines/)[2](https://robots.net/tech/how-to-install-an-operating-system-on-a-vmware-virtual-machine/)[3](https://helpdeskgeek.com/virtualization/how-to-install-a-new-operating-system-in-vmware-workstation-pro/).

[**Step 3: Create Your VM** Open your hypervisor and create a new virtual machine1](https://www.serverwatch.com/virtualization/how-to-set-up-virtual-machines/)[4](https://www.howtogeek.com/196060/beginner-geek-how-to-create-and-use-virtual-machines/)[5](https://learn.microsoft.com/en-us/virtualization/hyper-v-on-windows/quick-start/create-virtual-machine)[6](https://learn.microsoft.com/en-us/windows-server/virtualization/hyper-v/get-started/create-a-virtual-machine-in-hyper-v). [You’ll be guided through the process by a wizard that first asks which OS you’ll be installing4](https://www.howtogeek.com/196060/beginner-geek-how-to-create-and-use-virtual-machines/). [If you type the name of the OS in the “Name” box, the app will most likely automatically select the type and version for the OS4](https://www.howtogeek.com/196060/beginner-geek-how-to-create-and-use-virtual-machines/).

[**Step 4: Configure the Operating System** Once the virtual machine starts up, select the .iso image file you want to use](https://www.serverwatch.com/virtualization/how-to-set-up-virtual-machines/)[7](https://www.freecodecamp.org/news/what-is-a-virtual-machine-and-how-to-setup-a-vm-on-windows-linux-and-mac/). [Install the operating system on the virtual machine7](https://www.freecodecamp.org/news/what-is-a-virtual-machine-and-how-to-setup-a-vm-on-windows-linux-and-mac/). [The operating system may require some setup, but it will be the same setup that would be required if you had installed it on a standard computer7](https://www.freecodecamp.org/news/what-is-a-virtual-machine-and-how-to-setup-a-vm-on-windows-linux-and-mac/).

[**Step 5: Run Basic Operations on Your VM** You can now start using your VM as an independent OS](https://www.serverwatch.com/virtualization/how-to-set-up-virtual-machines/)[8](https://www.opensourceforu.com/2016/01/run-multiple-operating-systems-on-a-single-machine-with-virtualbox/). [You can run multiple VMs at the same time, but you’ll find yourself somewhat limited by your system resources4](https://www.howtogeek.com/196060/beginner-geek-how-to-create-and-use-virtual-machines/).

Please note that these are general steps and the specific commands and steps may vary based on the specifics of your case and the version of the tools you are using. [I recommend checking the official documentation or tutorials for the most accurate and up-to-date information1](https://www.serverwatch.com/virtualization/how-to-set-up-virtual-machines/)[4](https://www.howtogeek.com/196060/beginner-geek-how-to-create-and-use-virtual-machines/)[5](https://learn.microsoft.com/en-us/virtualization/hyper-v-on-windows/quick-start/create-virtual-machine)[6](https://learn.microsoft.com/en-us/windows-server/virtualization/hyper-v/get-started/create-a-virtual-machine-in-hyper-v)[2](https://robots.net/tech/how-to-install-an-operating-system-on-a-vmware-virtual-machine/)[3](https://helpdeskgeek.com/virtualization/how-to-install-a-new-operating-system-in-vmware-workstation-pro/)[8](https://www.opensourceforu.com/2016/01/run-multiple-operating-systems-on-a-single-machine-with-virtualbox/)[7](https://www.freecodecamp.org/news/what-is-a-virtual-machine-and-how-to-setup-a-vm-on-windows-linux-and-mac/).

* Learn about the acquisition of evidence from live systems using forensically sound methods.
* Explore network forensics concepts, including packet capture and analysis.
* Practice network traffic analysis using tools like Wireshark or tcpdump.

Sure, here are the steps to perform network traffic analysis using Wireshark and tcpdump:

**Wireshark:**

1. [**Install Wireshark**: You can download Wireshark from the official website and install it on your system1](https://medium.com/@huglertomgaw/thm-wireshark-traffic-analysis-3bd1b31c99b)[2](https://www.geeksforgeeks.org/wireshark-packet-capturing-and-analyzing/).
2. [**Start Capturing Packets**: Open Wireshark and select the network interface you want to capture](https://medium.com/@huglertomgaw/thm-wireshark-traffic-analysis-3bd1b31c99b)[1](https://medium.com/@huglertomgaw/thm-wireshark-traffic-analysis-3bd1b31c99b)[2](https://www.geeksforgeeks.org/wireshark-packet-capturing-and-analyzing/). [Click on the shark fin on the top left to start capturing packets2](https://www.geeksforgeeks.org/wireshark-packet-capturing-and-analyzing/).
3. **Analyze Packets**: Wireshark displays packets in real time. [You can see the source address, destination address, source and destination ports, protocol, and additional information about each packet2](https://www.geeksforgeeks.org/wireshark-packet-capturing-and-analyzing/).
4. [**Filter Packets**: Wireshark provides packet filters based on many parameters like IP address, port number, or protocol at capture level or at display level2](https://www.geeksforgeeks.org/wireshark-packet-capturing-and-analyzing/). [For example, tcp.port==80 shows the TCP traffic at port 802](https://www.geeksforgeeks.org/wireshark-packet-capturing-and-analyzing/).

**tcpdump:**

1. [**Install tcpdump**: The most straightforward way to install tcpdump is via your Linux system’s package manager3](https://www.linode.com/docs/guides/how-to-use-tcpdump-to-analyze-traffic/).
2. [**Start Capturing Packets**: Run tcpdump from the command line to start capturing packets3](https://www.linode.com/docs/guides/how-to-use-tcpdump-to-analyze-traffic/). [For example, sudo tcpdump -i eth0 starts capturing packets on the eth0 interface](https://medium.com/@huglertomgaw/thm-wireshark-traffic-analysis-3bd1b31c99b)[3](https://www.linode.com/docs/guides/how-to-use-tcpdump-to-analyze-traffic/).
3. [**Analyze Packets**: Each line in the tcpdump output corresponds to a single packet](https://medium.com/@huglertomgaw/thm-wireshark-traffic-analysis-3bd1b31c99b)[3](https://www.linode.com/docs/guides/how-to-use-tcpdump-to-analyze-traffic/). [You can see the timestamp, network protocol, source and destination hostnames, and ports](https://medium.com/@huglertomgaw/thm-wireshark-traffic-analysis-3bd1b31c99b)[3](https://www.linode.com/docs/guides/how-to-use-tcpdump-to-analyze-traffic/).
4. [**Filter Packets**: tcpdump provides several options, which are indicated by flags, to select packets that match a specified pattern4](https://www.comparitech.com/net-admin/what-is-tcpdump/). [For example, tcpdump -i eth0 tcp port 80 captures only TCP packets on port 80 on the eth0 interface](https://medium.com/@huglertomgaw/thm-wireshark-traffic-analysis-3bd1b31c99b)[4](https://www.comparitech.com/net-admin/what-is-tcpdump/).

Please note that these are general steps and the specific commands and steps may vary based on the specifics of your case and the version of the tools you are using. [I recommend checking the official documentation or tutorials for the most accurate and up-to-date information](https://medium.com/@huglertomgaw/thm-wireshark-traffic-analysis-3bd1b31c99b)[1](https://medium.com/@huglertomgaw/thm-wireshark-traffic-analysis-3bd1b31c99b)[2](https://www.geeksforgeeks.org/wireshark-packet-capturing-and-analyzing/)[3](https://www.linode.com/docs/guides/how-to-use-tcpdump-to-analyze-traffic/)[4](https://www.comparitech.com/net-admin/what-is-tcpdump/).

Viva Questions:

* + How can virtual machine snapshots be useful in forensic investigations?
  + What are the primary sources of evidence in network forensics?
  + Explain the steps involved in capturing and analyzing network traffic for forensic purposes.
  + What are the common techniques used to detect and analyze malicious network activity?
  + How can network forensics aid in incident response and investigation?

## Post-Skill-tasks:

* Create a detailed report on virtual machine forensics, live acquisitions, and network forensics.
* Discuss the challenges and considerations involved in acquiring and analyzing evidence from live systems.
* Present findings from network traffic analysis exercises, including any suspicious or malicious activities observed.
* Highlight the importance of network forensics in investigating cyber incidents and identifying potential threats.

*(For Evaluator’s use only)*

Date of Evaluation

Signature of the Evaluator

Full Name of the Evaluator:

Evaluator’s Observation

Marks Secured: out of \_

Comment of the Evaluator (if Any)

## DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING SUBJECT CODE: 21CS3041RA

## CRYPT ANALYSIS AND CYBER DEFENCE WORKBOOK

# 19. Implementation of Various Attacks on RSA

Date of the Session: / / Time of the Session: \_ to

## Objective:

Learning Objective: The learning objective of the project "Implementation of Various Attacks on RSA" is to understand and analyze different types of attacks on the RSA (Rivest- Shamir-Adleman) cryptographic algorithm, which is widely used for secure data transmission and encryption. By implementing and studying these attacks, the learner will gain insights into the vulnerabilities and limitations of RSA, as well as the importance of implementing proper security measures.

## Description:

The project involves implementing several known attacks on the RSA algorithm and studying their impact on the security of RSA encryption. The attacks to be implemented can include:

1. Brute Force Attack: Exhaustively searching the key space to find the private key by trying all possible combinations.
2. Factorization Attack: Using number theory algorithms like Pollard's rho or the quadratic sieve to factorize the modulus and obtain the private key.
3. Timing Attack: Exploiting variations in the execution time of RSA operations to extract information about the private key.
4. Side-Channel Attack: Analyzing unintended physical leakage (e.g., power consumption, electromagnetic radiation) to gain information about the private key.
5. Coppersmith's Attack: Utilizing small root attacks to recover the private key from small fractions of the plaintext.

**Pre request:** To carry out this project, the following software may be required:

1. Programming Language: A language like Python, C++, or Java can be used to implement the attacks.
2. Cryptography Libraries: Depending on the chosen programming language, relevant libraries like `cryptography` in Python or `javax.crypto` in Java can be utilized.
3. Number Theory Libraries: If advanced mathematical operations are involved, libraries like

`sympy` in Python or `NTL` (Number Theory Library) in C++ can be used.

## Pre-Skill-Task:

1. What is the RSA algorithm and how does it work?
2. Why is RSA considered a secure cryptographic algorithm?
3. What are the potential vulnerabilities or weaknesses of RSA?
4. Explain the brute force attack on RSA and its computational complexity.
5. Describe the factorization attack on RSA and the role of number theory algorithms.

## In-Skill-Task

* Study the RSA encryption algorithm and its vulnerabilities.
* Implement known attacks on RSA, such as the Bleichenbacher's attack, timing attacks, or side-channel attacks.

However, I can certainly help you understand the principles behind these attacks:

1. **Bleichenbacher’s Attack**: This is a padding oracle attack on RSA implementations that use PKCS #1 v1.5 padding. The attacker sends a series of forged ciphertexts to the server and observes the server’s responses to learn about the correct padding format. Over many iterations, the attacker can gradually reveal the plaintext corresponding to an intercepted ciphertext.
2. **Timing Attacks**: These attacks rely on measuring the time it takes for a system to perform cryptographic operations. Variations in timing can leak information about the secret keys used in the operations.
3. **Side-Channel Attacks**: These attacks exploit information leaked during the computation (like power consumption or electromagnetic emanations). For example, a simple power analysis (SPA) attack involves directly interpreting power consumption measurements to find the secret keys.

Remember, the goal of learning about these attacks is to understand how they work so that you can design systems that are resistant to them. If you have any questions about these principles or need help with other aspects of cryptography, feel free to ask! 😊

* Use programming languages or cryptographic libraries to simulate and execute the attacks.
* Analyze the impact and success rate of each attack.

Viva Questions

* + What is a timing attack and how can it be used to compromise RSA?
  + How does a side-channel attack work? Provide examples of side channels.
  + Explain Coppersmith's attack and its relevance to RSA security.
  + What are some countermeasures to mitigate the vulnerabilities discussed?
  + How does the implementation of these attacks help in understanding RSA's security limitations and the importance of proper implementation?

## Post-Skill-tasks:

* Prepare a detailed report on various attacks on RSA, including the theoretical background and step-by-step execution of each attack.
* Discuss the limitations and prerequisites for each attack, such as knowledge of the public key or access to timing information.
* Evaluate the effectiveness of countermeasures against RSA attacks and propose mitigation strategies.
* Reflect on the ethical implications and legal considerations surrounding the implementation of RSA attacks.

*(For Evaluator’s use only)*

Date of Evaluation

Signature of the Evaluator

Full Name of the Evaluator:

Evaluator’s Observation

Marks Secured: out of \_

Comment of the Evaluator (if Any)

## DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING SUBJECT CODE: 21CS3041RA

## CRYPT ANALYSIS AND CYBER DEFENCE WORKBOOK

# 20. Implementation of various Attacks on ECC(A/P)

Date of the Session: / / Time of the Session: \_ to

## Objective:

The learning objective of this project is to understand and implement various attacks on Elliptic Curve Cryptography (ECC) and evaluate their effectiveness in compromising the security of ECC-based systems.

## Description:

The project focuses on implementing and analyzing different attacks on ECC, which is a widely used cryptographic algorithm known for its efficiency and security. The project involves studying the mathematical foundations of ECC, implementing the attacks in a programming language, and evaluating their success rates in breaking the security of ECC. The project aims to provide insights into the vulnerabilities of ECC and the importance of choosing appropriate key sizes and parameters to ensure secure ECC implementations.

## Pre request:

1. Programming language: You can choose a programming language such as Python, C++, or Java to implement the attacks.
2. Cryptography libraries: Depending on the programming language chosen, you may need to utilize cryptography libraries that support ECC operations, such as PyCryptodome for Python or Bouncy Castle for Java.
3. Development environment: You will need a code editor or Integrated Development Environment (IDE) to write and run your code.

## Pre -Skill-Task:

1. What is Elliptic Curve Cryptography (ECC) and why is it considered an important cryptographic algorithm?
2. Can you explain the mathematical foundations behind ECC and how it differs from other public-key cryptography algorithms like RSA?
3. What are the key parameters involved in ECC, and how do they affect the security of the algorithm?
4. What are the different types of attacks that can be performed on ECC? Briefly explain each type.
5. How would you implement a chosen attack on ECC? Provide an overview of the steps involved.

## In-Skill-Task :

* Study the Elliptic Curve Cryptography (ECC) algorithm and its vulnerabilities.
* Implement known attacks on ECC, such as the small subgroup attack, invalid curve attacks, or side-channel attacks.

Elliptic Curve Cryptography (ECC) is a public key cryptosystem used to create a shared private key between two participants in a communication network. Attacks on ECC include:

* Small subgroup attacks: Can give knowledge about the least significant bits of a private key
* Invalid curve attacks: Trick the cryptographic device into carrying out scalar multiplications on a weaker curve
* Side-channel attacks: Exploit biases in various kinds of leakages, such as power consumption, electromagnetic emanation, and execution time

**Other attacks on ECC include:**

* Twist-security attack
* Fault attack
* Pohlig-Hellman attack
* Pollard's rho attack
* Use programming languages or cryptographic libraries to simulate and execute the attacks.
* Analyze the impact and success rate of each attack.

Viva Questions:

* + What are the possible countermeasures or mitigation techniques to defend against attacks on ECC?
  + Can you discuss the advantages and disadvantages of ECC compared to other public- key cryptography algorithms?
  + How can the choice of elliptic curve and key size impact the security of an ECC implementation?
  + What are some real-world applications or systems that rely on ECC for secure communication or data protection?
  + Based on your implementation and analysis, what are the key findings regarding the effectiveness and security of ECC against the implemented attacks?

## Post-Skill-Tasks:

* Prepare a detailed report on various attacks on ECC, including the theoretical background and step-by-step execution of each attack.
* Discuss the limitations and prerequisites for each attack, such as knowledge of the curve parameters or side-channel information.
* Evaluate the effectiveness of countermeasures against ECC attacks and propose mitigation strategies.

*(For Evaluator’s use only)*

Date of Evaluation

Signature of the Evaluator

Full Name of the Evaluator:

Evaluator’s Observation

Marks Secured: out of \_

Comment of the Evaluator (if Any)