Android Hacking and Beyond

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Abstract:

Amid the burgeoning use of mobile devices, particularly those on Android platform, the significance of fortifying their security is more crucial than ever. Kali Nethunter emergers as a pivotal tool for penetration testers, designed to scrutinize Android system's vulnerabilities and strengths. This research offers an intricate exploration of Nethunter, a mobile adaptation of the esteemed Kali Linux, and its proficiency in hacking and safeguarding Android devices. The paper delves into Nethunter's architecture, its comprehensive suite of penetration testing tools, and its practical application in detecting vulnerabilities in Android System.

Significantly, the study expands to cover a spectrum of attack vectors and defensive strategies embodied in Nethunter. It includes an in-depth analysis of HID (Human Interface Device) attacks, where Nethunter can mimic keystroke injections, and Rubber ducky attacks, which exploit USB devices for unauthorized access. The paper also explores phishing attacks, detailing how Nethunter can be employed to create and manage phishing campaigns to test system vulnerabilities.

Moreover, this research examines Nethunter's capabilities in encryption and decryption processes, crucial for understanding and mitigating security breaches. The versatility of Nethunter is further highlighted in its ability to hack camera systems, offering insights into potential privacy and security implications. Additionally, the paper explores how Nethunter can be utilized for Windows system hacks, demonstrating its effectiveness beyond just Android platforms.

By integrating these aspects, the study underscores the multifaceted nature of Nethunter as an ethical hacking tool, pertinent in the ever-evolving landscape of mobile security threads. This comprehensive examination provides readers with an enriched understanding of Nethunter's capabilities, ethical considerations, and pivotal role in Android security in the modern digital era.

Keywords:

Nethunter, Android hacking, Mobile penetration testing, Kali Linux, Cybersecurity, Offensive Security, Architecture, Wi-Fi penetration tools, HID attacks, Installation, Configuration, Supported devices, Practical applications, Ethical implications, Security considerations, Future developments, Penetration tools, Network assessment, BadUSB, Ethical hacking, Vulnerabilities, IoT, Man-in-the-Middle attack, Encryption, Session hijacking, Digital forensics, Open source, SSL stripping.

Introduction:

The digital era, driven by the extensive proliferation of mobile devices, has inevitably brought to the forefront the quintessential challenge of cybersecurity.[5] As we traverse this interconnected landscape, Android, as the world's most popular mobile operating system, plays a pivotal role in our day-to-day digital interactions.[7] Given its ubiquity, it has become a focal point for both security professionals seeking to fortify its defenses and malicious entities aiming to exploit its vulnerabilities.[11]

While the Android platform has been bolstered with layers of security enhancements over the years, the inherent nature of its open-source model, coupled with the diverse ecosystem of device manufacturers and app developers, has left room for potential security gaps. [8] These gaps, if left unaddressed, can compromise user privacy, data integrity, and overall system functionality. Addressing these vulnerabilities requires specialized tools and methodologies tailored for the Android environment. Enter Kali Nethunter.[1]

Developed as an extension of Kali Linux - the renowned cybersecurity and penetration testing platform - Kali Nethunter emerges as a powerhouse, designed meticulously for mobile devices. Its objective is twofold: to equip security professionals.

with a suite of tools that can probe, assess, and strengthen mobile systems, and to serve as an educational platform for the cybersecurity community at large, underlining the intricacies of mobile security.

The significance of Kali Nethunter extends beyond its technical prowess. In a world that's increasingly reliant on mobile transactions from banking to communication to shopping - ensuring the sanctity of these interactions becomes paramount.[3] Nethunter, in this context, is not merely a tool but a symbol of the ongoing tussle between security and vulnerability, highlighting the ceaseless efforts of the cybersecurity community to stay one step ahead of potential threats. [9]

This research paper seeks to delve deep into the world of Nethunter, elucidating its capabilities, applications, and the overarching importance in the broader narrative of Android security. Through a comprehensive examination, readers will be equipped with a profound understanding of Android's vulnerabilities, the tools available to exploit and rectify them, and the ever-evolving dynamics of mobile cybersecurity. [5] [6]

Background:

To truly appreciate the inception and significance of Kali Nethunter, one must first turn the pages of history to its progenitor, Kali Linux. Born out of the desire for a dedicated, robust, and user-centric platform for cybersecurity professionals, Kali Linux emerged as the successor to the acclaimed Backtrack Linux. Designed and maintained by Offensive Security, a company renowned for its commitment to ethical hacking and cybersecurity training, Kali Linux quickly carved a niche for itself as the go-to operating system for penetration testing and digital forensics.

However, as the digital landscape evolved, so did the tools and methodologies of hackers - both ethical and malicious. With the exponential growth in the adoption of mobile devices, especially those powered by the Android OS, the battleground for cybersecurity shifted significantly from traditional computer systems to the palms of users worldwide. Recognizing this shift, and the pressing need for specialized tools to address mobile-centric challenges, the minds behind Kali Linux embarked on a new venture: Kali Nethunter.

Launched in 2014, Kali Nethunter was conceptualized as a merger between the robustness of Kali Linux and the flexibility of mobile platforms. It was designed to provide an open environment where users could run a gamut of penetration testing tools natively on their Android devices. In essence, Nethunter brought the full power of Kali Linux, tailored and optimized, to mobile devices, bridging the gap between traditional cybersecurity approaches and the emerging mobile threats cape.

The very ethos of Nethunter rests on its open-source nature, allowing for continual evolution driven by contributions from the global cybersecurity community. This community-driven approach ensures that Nethunter remains not only relevant in addressing contemporary security challenges but also anticipatory of future threats in the ever-changing mobile ecosystem.

The hacks happening with Nethunter over the last decade have been diverse, ranging from sophisticated attacks on high-profile targets to widespread malware campaigns targeting everyday users. Here are a few charts that show the mobile breaching that has happened over the last decade.

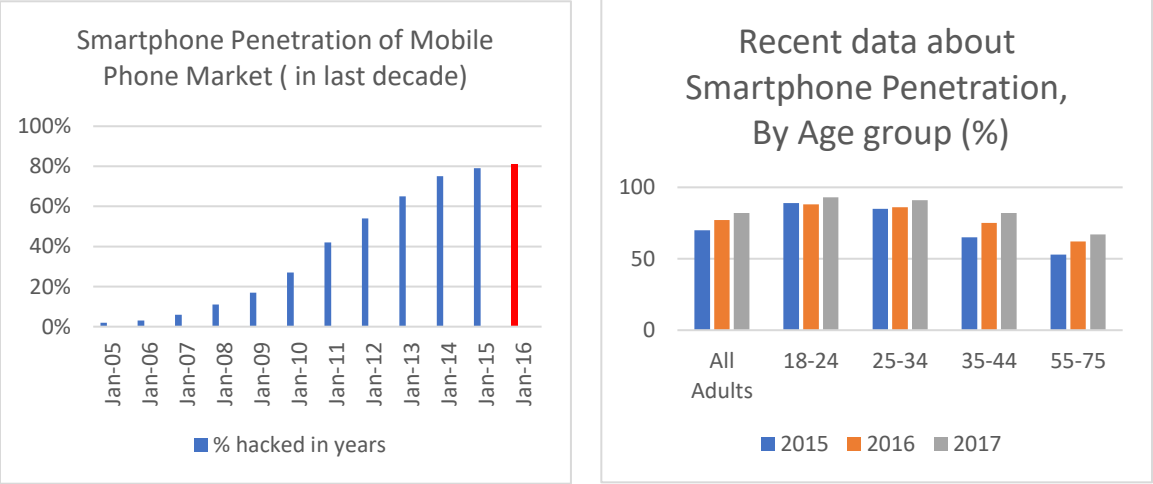


Fig: A Graph analysis for Smartphone penetration over last decade and by percent and age group.

Nethunter's Architecture:

Kali Nethunter, in its essence, is not a standalone operating system but an overlay atop an existing Android installation. This design choice offers both flexibility and power, ensuring that users can harness the capabilities of Kali Linux without entirely relinquishing the native Android experience.

Nethunter Kernel:

At the heart of Nethunter's operations lies its custom kernel. This kernel facilitates essential features that aren't typically available on standard Android installations, such as 802.11 wireless injection and USB device emulation. By optimizing the kernel for penetration testing tasks, Nethunter can push Android devices to their cybersecurity potential.

Nethunter Application: Serving as the user's primary interface with the Nethunter environment, this application offers a suite of penetration testing tools, wrapped in an intuitive UI. From this application, users can launch various tools, manage configurations, and even initiate complex tasks with a touch.

Chroot Environment:

Perhaps the most transformative aspect of Nethunter's architecture is its inclusion of a full-fledged Kali Linux chroot environment.[1] This allows users to run a complete Kali Linux distribution alongside their regular Android OS, accessing a plethora of tools traditionally reserved for desktop environments.[2]

When these components come together, Nethunter transforms an everyday Android device into a potent cybersecurity apparatus. It bridges the world of mobile and desktop penetration test in ensuring that professionals can conduct comprehensive assessments regardless of the platform. [2]

Beyond these core components, Nethunter's architecture is also defined by its integration capabilities. With support for HID (Human Interface Device) attacks, Nethunter devices can emulate keyboards or mice, executing pre-defined sequences of commands on a connected computer.[6] This HID capability opens avenues for a range of attacks, from simple prank payloads to complex system intrusions.[9]

Furthermore, the architecture's design ensures seamless compatibility with external hardware.[6] Whether it's wireless adapters for advanced network analysis or USB devices for specific tasks, Nethunter is engineered to play well with a variety of peripherals, enhancing its versatility in real-world scenarios.

Key Features

Kali Nethunter stands as a beacon in the realm of mobile penetration testing, thanks largely to its vast repertoire of tools and features tailored for the contemporary cybersecurity professional.[1] Its genesis from Kali Linux, a stalwart in cybersecurity circles, ensures that it inherits a legacy of robustness and versatility.[2] Let's delve deep into the hallmark features that define Nethunter:

Custom Kernel: At its core, Nethunter rides on a custom kernel, enhancing the Android operating system to support 802.11 wireless injection and preconfigured connective modes.[3] This kernel isn't merely an enhancement; it's a redefinition of what mobile devices can achieve in penetration testing. With it, tasks previously limited to dedicated hardware or powerful PCs, such as packet injection and network sniffing, become feasible on a portable device.[4]

Full Kali Linux Toolset: Nethunter doesn't trim down its arsenal. Instead, it offers the complete array of Kali Linux tools right at the user's fingertips. This encompasses tools for every stage of a penetration test, from initial reconnaissance to vulnerability assessment and exploitation.[2]

Metasploit Framework Integration: Perhaps one of the most recognized tools in ethical hacking, Metasploit offers capabilities to discover, exploit, and validate vulnerabilities. Nethunter seamlessly integrates this framework, allowing testers to execute complex attack vectors with ease.[5]

Wireshark: For those keen on packet analysis, Nethunter boasts the integration of Wireshark, enabling users to dissect network traffic in real-time, identifying anomalies, and probing for vulnerabilities.[6]

Wireless Network Capabilities: Beyond standard connectivity, Nethunter elevates the game with enhanced wireless capabilities. With its custom kernel, users can harness the power of external Wi-Fi adapters, transforming their device into a wireless penetration powerhouse. From Wi-Fi network scanning and capturing handshakes to setting up rogue APs (Access Points), the possibilities are vast.[3]

HID Interface Emulation: One of Nethunter's standout features is its ability to emulate Human Interface Devices (HID). This means a Nethunter device can masquerade as a keyboard or mouse when connected to systems, executing predefined or custom keystroke payloads. This opens the door to a multitude of attack vectors, from simple mischief like opening the calculator app on a target machine to more advanced tasks like bypassing lock screens.[7]

BadUSB Attack Modes: Expanding on the HID capabilities, Nethunter supports the infamous "BadUSB" attacks. When plugged into a target system, the device can mimic common peripherals, leading to various exploitation avenues.[8]

Software-Defined Radio (SDR): With the appropriate hardware, Nethunter can tap into the intriguing world of SDR. This allows users to analyze a wide range of radio frequencies, from common FM/AM bands to more complex signals, enhancing the scope of penetration testing to encompass radio-based vulnerabilities.[9]

Graphical User Interface for Tool Execution: Despite its complex backend, Nethunter ensures that user experience isn't compromised. It offers a clean, intuitive GUI that provides easy access to its suite of tools, ensuring that both veterans and novices can harness its capabilities efficiently.[10]

Seamless Updates via the Nethunter Store: Keeping tools updated is crucial in the ever-evolving domain of cybersecurity. Recognizing this, Nethunter features its dedicated store, allowing users to fetch the latest tools and updates seamlessly.[11]

VNC Integration: For tasks that demand a more desktop-like interface, Nethunter integrates VNC, enabling users to operate in a more traditional Linux environment while on the go.[12]

Diverse Device Support: While initially tailored for the Nexus series, Nethunter's adaptability has seen its compatibility expand to include a wide range of devices, ensuring that its prowess isn't restricted to a select few. [13]

Installation and Configuration

Deploying Kali Nethunter on an Android device requires a systematic approach, ensuring that the platform is both stable and secure.[14] Here's a detailed overview:

- Rootless Installation (Nethunter rootless)
- Root Installation on Android (Nethunter lite)
- Full Nethunter Installation (Nethunter full on Pinephone and Pinephone pro)

Fig: Kali Nethunter rootless installation (Kali Mini) on Pixel 7

Fig: Kali Nethunter rootless installation (Kali Mini) on Pixel 7

Prerequisites:

The Nethunter rootless installation does not violets the warranty of your device. It is a safe rootless installation meaning that you don't have to unlock your device bootloader. There is no specific Android device requirement mentioned on the Kali Nethunter official website regarding the rootless installation. However, it is important to note that you may have Android version 6.0 and higher also have minimum free storage capacity 2GB for installation.

Installation:

For installation one must follow the steps mentioned on kali Nethunter rootless installation guide. []. It is crucial to note that the packages and requirements can evolve depending on the time of installation.

Rooted Installation (Nethunter lite):

Prerequisites:

Before diving into the installation process, one must ensure the device meets certain criteria.

Supported Device: Nethunter, although versatile, has specific builds tailored for certain devices. It's imperative to ensure your device is on the supported list.

Unlocked Bootloader: The bootloader, responsible for initializing the Android OS, needs to be unlocked to allow custom modifications.

Root Access: Nethunter requires root access to utilize its full suite of tools.

Fig: Nethunter app Screenshot from One plus 7T (Nethunter rootless).

Installation Process:

1. Downloading the Right Build: Visit the official Nethunter website to download the build specific to your device. Ensure you're fetching the latest version to benefit from all updates and patches

2. Custom Recovery: Before flashing Nethunter, you'll need a custom recovery installed, like TWRP. This allows for the installation of non-official firmware.

3. Backup: Using the custom recovery, create a complete backup of your device. This ensures you can restore your device to its original state if anything goes amiss.

4. Flashing Nethunter: Transfer the downloaded Nethunter build to your device. Boot into the custom recovery and flash the zip file. Follow any on-screen prompts.

5. Kernel Installation: Some devices may require a custom kernel for optimal functionality. If so, flash this post-Nethunter installation.

Configuration:

Once Nethunter is installed, proper configuration is vital:

1. Nethunter App: Upon the first launch, the Nethunter app will prompt for the necessary permissions. Grant these to ensure the app can function correctly.

2. Chroot Installation: From within the Nethunter app, you can install the Kali chroot. This gives you access to the full array of Kali Linux tools. Depending on your storage and requirements, choose between the minimal or full chroot.

3. Setting Up Services: Nethunter offers several services, such as SSHD, which can be configured to start at boot. Ensure these services are secured with strong credentials to prevent unauthorized access.

4. Updating Tools: Regularly update the tools within Nethunter to their latest versions. This can be done through the Nethunter store or the Kali chroot, depending on the tool.

5. USB Configuration: If you intend to utilize HID attacks or other USB-based features, configure these settings within the Nethunter app.

Safety Measures:

- Installing and configuring Nethunter can expose the device to potential threats, given the elevated permissions. It's essential to:
- Ensure you only download builds and tools from official or trusted sources.
- Regularly update the system and tools to benefit from the latest security patches.
- Use strong, unique passwords for any services running on the device.

List of Supported Devices from official Kali Nethunter website:

Phone	Model
ZTE	ZTE Axon 7 (Mashmallow)
Nexus	Nexus 6P (Oreo) Nexus 6P (LineageOS 17.1) Nexus 5X (Oreo) Nexus 7 (2013) (Marshmellow) Nexus 7 (LineageOS 13.0) Nexus 9 (Nougat) Nexus 5 (Marshmallow) Nexus 5 (Nougat) Nexus 10 (Lollipop) Nexus 6 (Nougat) Nexus 6 (LineageOS 16.0)
Xiaomi	Xiaomi Octophone F1 (Eleven) Xiaomi MI 9T MIUI 11 (Ten) Xiaomi Mi A3 (LineageOS 18.1)
Nokia	Nokia 3.1 (Pie) Nokia 6.1 (LineageOS 18.1)
Gemini	Gemini PDA (Nougat)
Samsung	Samsung Galaxy Tab S4 LTE (Oreo) Samsung Galaxy Tab S4 Wi-Fi (Oreo) Samsung Galaxy Tab S6 (Nougat)
LG	LG V20 International (Nougat)
Sony	Sony Xperia Z1 (Marshmellow) Sony Xperia Z1 (Pie)
OnePlus	OnePlus one (LineageOS 18.1) OnePlus 2 (LineageOS 14.1) OnePlus 3 (LineageOS 16.1) OnePlus 3/ 3T (Pie) OnePlus 3/3T (Ten) OnePlus 6/6T (Oxygen OS Eleven) OnePlus 7/7 Pro/ 7T /7T Pro (Ten) OnePlus 7/7 Pro/ 7T /7T Pro (Eleven) OnePlus 8/8 T/ 8T /8 Pro (Eleven) OnePlus 8/ 8T/ 8 Pro (Twelve) OnePlus Nord (Eleven)

Fig: List of supported Devices for Kali nethunter

Attacks with Nethunter:

- **Rubber Ducky attack with Nethunter**

  A Rubber ducky attack typically involves using a USB device, like the USB Rubber Ducky, to emulate a keyboard and inject malicious commands into a target system. Kali Nethunter, being a specialized penetration testing platform for Android devices, can potentially be used to execute such attack, through it's important to note that using these techniques for unauthorized access or against systems you don't explicit permission to test is illegal and unethical.

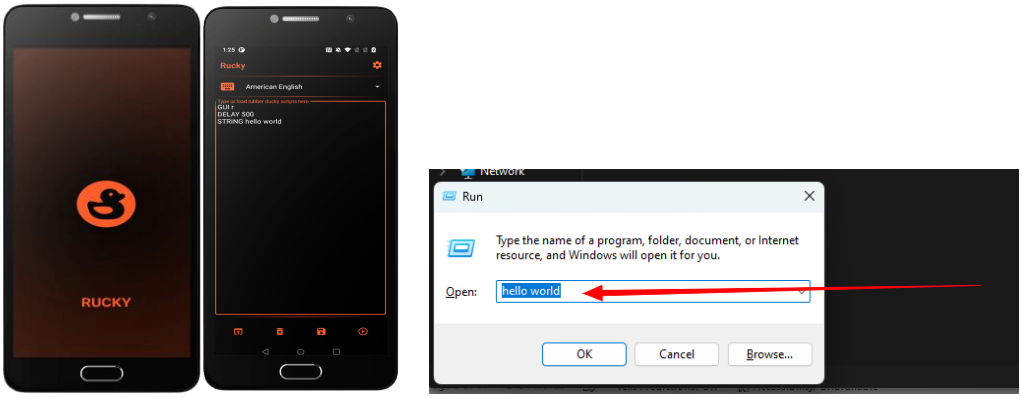


Fig: Rubber ducky app for Nethunter lite with a simple Hello world execution.

Attacks with various USB ducky Payloads:

1. **Using USB wired to Victim's PC:**
   In this scenario we use our USB and let spoof it as a keyboard. Hence when running a command on this Rubber ducky terminal performs a malicious code on the targeted PC.

1. **Attack on Windows:**

- **Fake windows repair screen:**

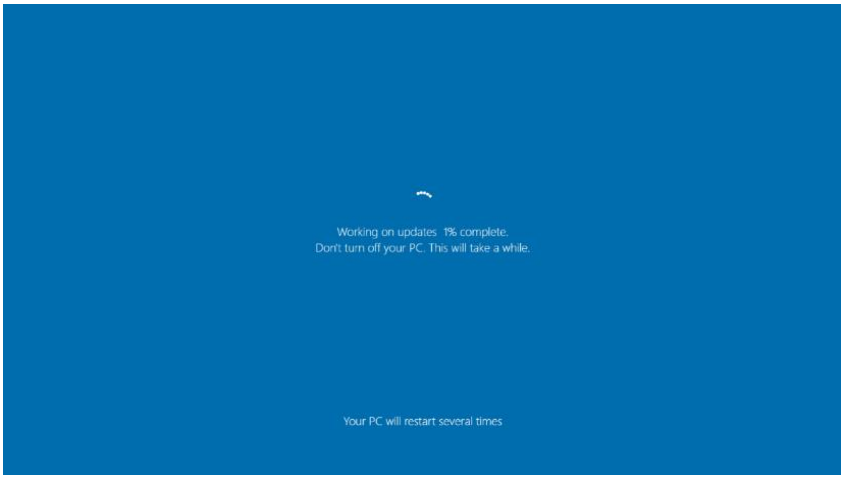


Fig: HID Attack for Fake Windows Repair Screen

In this attack we would give the fake perception of Windows repair to the Windows user.

Here we connect our Kali Nethunter Phone via USB cable to the victim's PC and apply Rubber ducky script for the fake Windows update screen.

Following the fake attack would open a browser and a windows update screen for the user.

- **Automatic payload download with windows PowerShell**

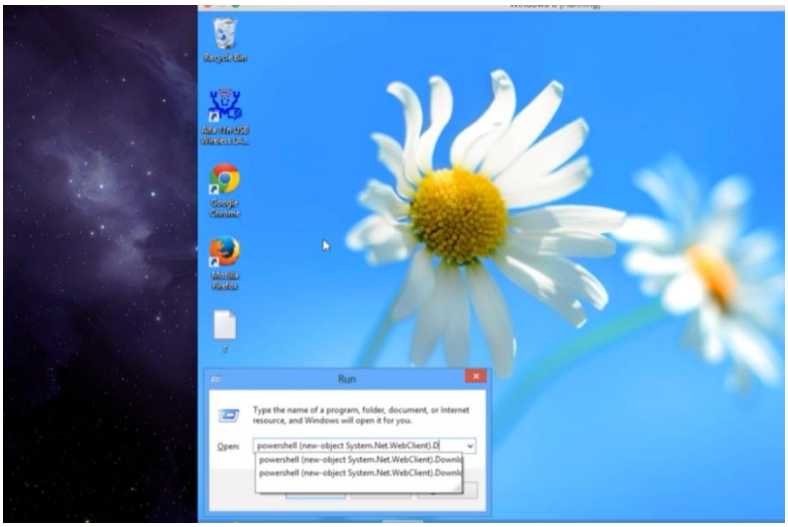


Fig: HID Attack for installation of Payload

In this attack we would host an payload to our kali Nethunter device and we would use a Rubber ducky script through Android to insert a payload inside victim's PC. Now, when the script run it will automatically open the window's PowerShell and install the payload.
Once the payload gets installed, we would get the access to the Window's PC in our meterpreter on Kali Linux.

- **Forwarding Email Attack**

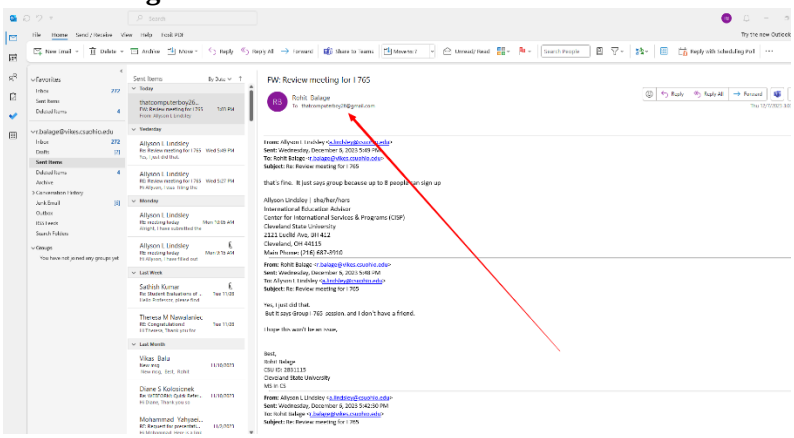


Fig: HID Attack for last email forward on Windows

In this attack we use a Rubber ducky script of forwarding last emails of outlook on the victim's PC to our desired email address.

- **Get all the download export list**

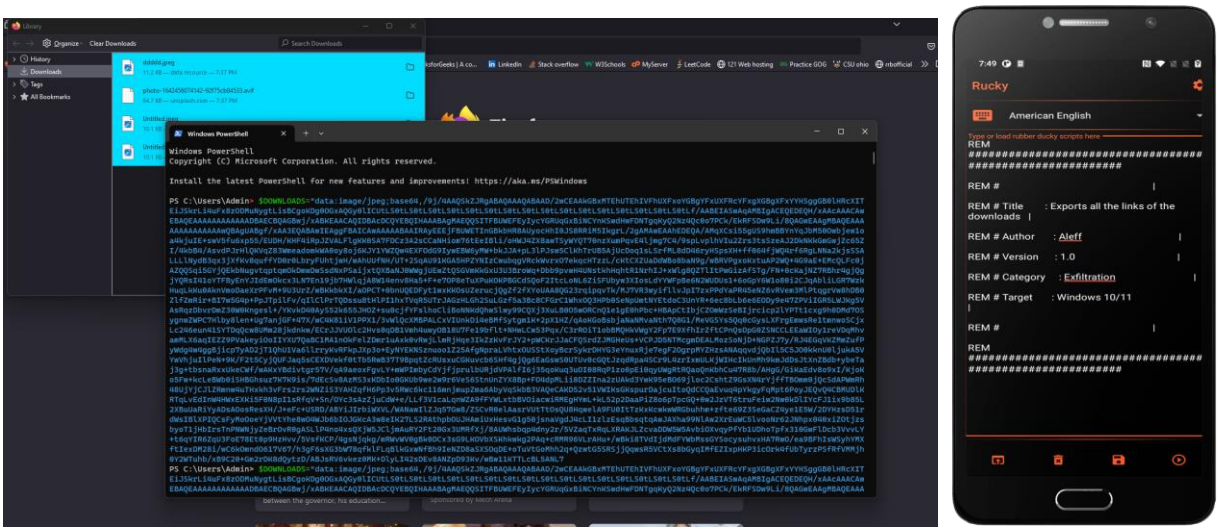


Fig: HID Attack for exporting the last 5 downloads from Firefox on Windows.

This attack contains a rubber ducky script to download and export the list of the download on the victim's PC. The script would take all of the download's list from firebox along with their link and send this to our Kali Nethunter mobile.

- **Changing the wallpaper**

Fig: HID Attack for changing the Windows wallpaper

This is a fun attack where we ambush our victim with changed wallpaper.

- **Full Black screen**

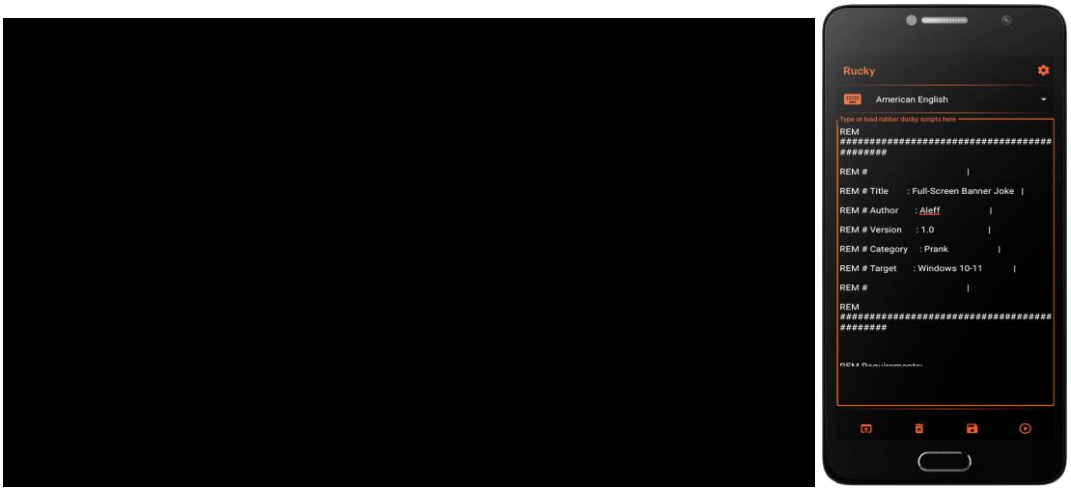


Fig: HID Attack for blackout screen

This Rubber Ducky attack will blackout the victim's screen for a while. Often this script used when we have to delay some process or distract the victim.

- **Change password of windows user**

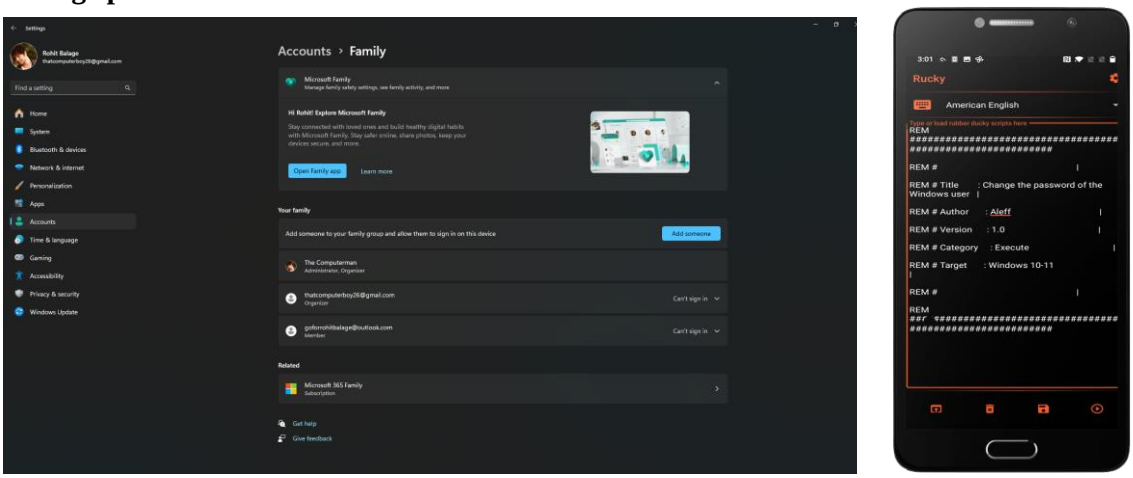


Fig: HID Attack for Changing local user password

This Rubber Ducky attack will change the local user's password on victim's PC, the script might fail if the user is only Admin, this script required a standard user login.

- **Hacker Screen**

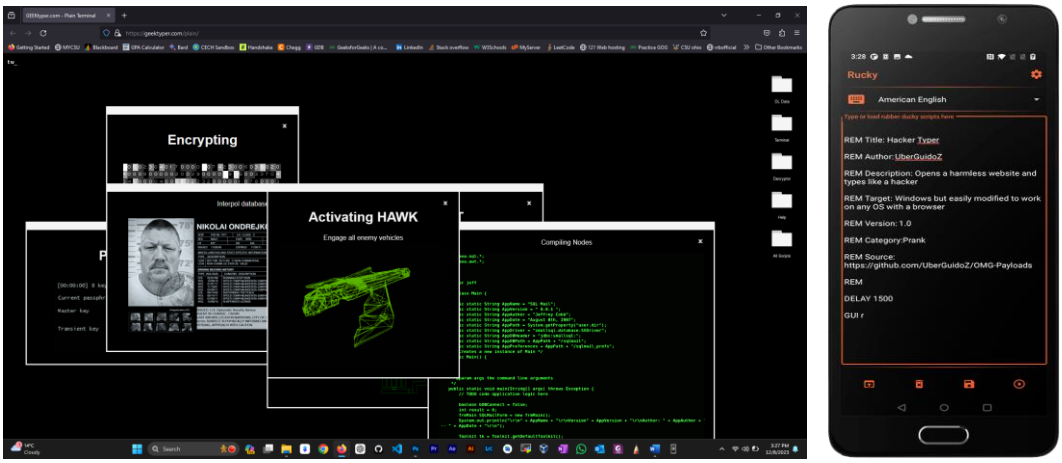


Fig: HID Attack fake hacker screen

This type of attack will ambush a person using a browser with a Hacker screen with some command prompt dialogues to give false perception.

- **Mouse move by itself**

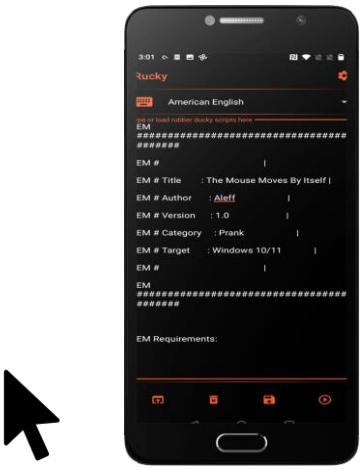


Fig: HID Attack script from Rubber Ducky app for moving of the mouse via sensor hack.

The attack involves hacking the mouse sensor. Where we manipulate the mouse to circumvent around the desktop so user won't be able to catch it.

- **Eternal Lock screen windows**

Fig: HID Attack Eternal lock screen

The attack involves the start menu of the victim's PC. The Victim's PC would automatically lock once every 2-3 minutes.

- **Copy Clipboard**

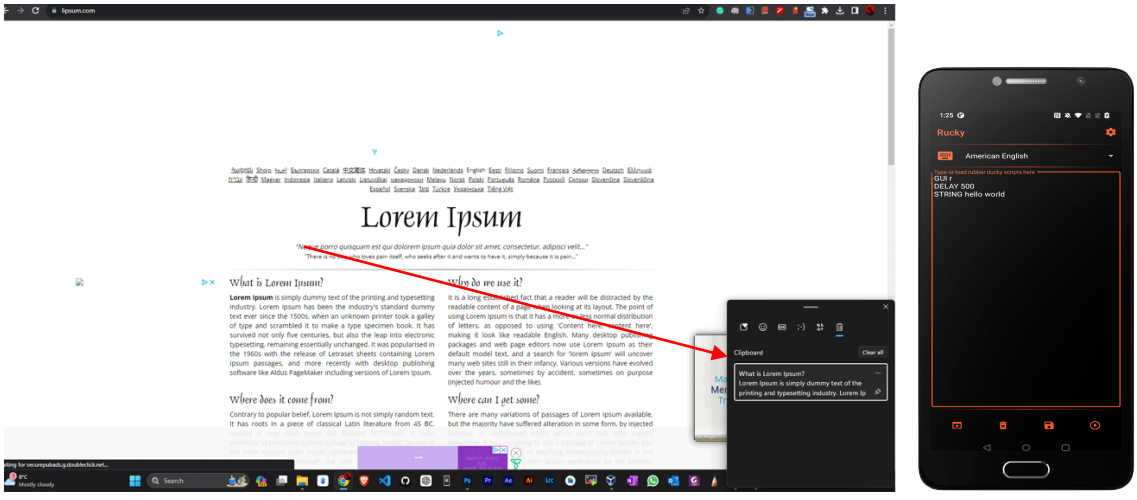


Fig: HID Attack for Copying the last clipboard text

This attack will copy all the content in the victim's clipboard with one script command.

- **Disable window's defender**

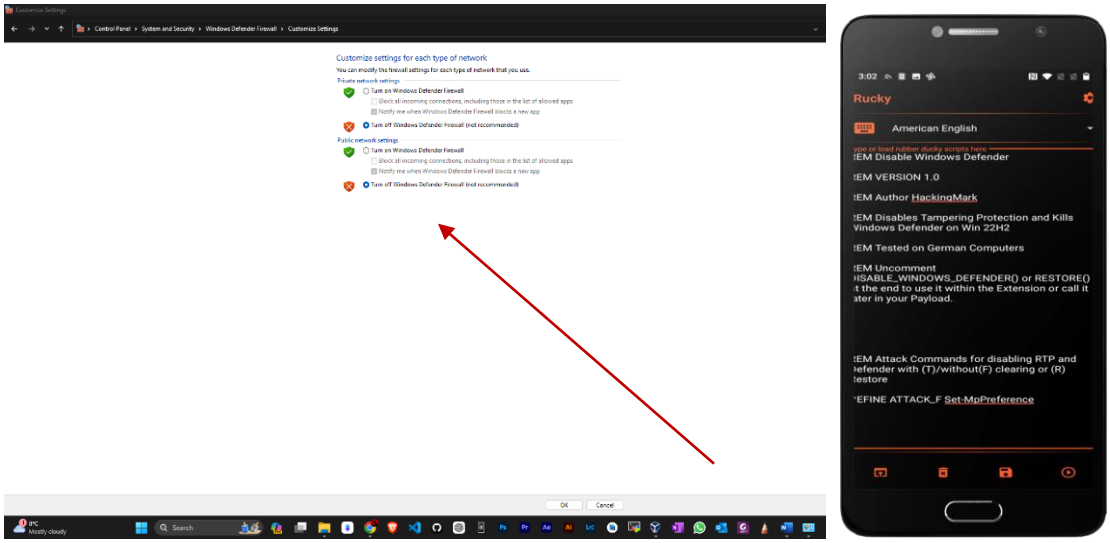
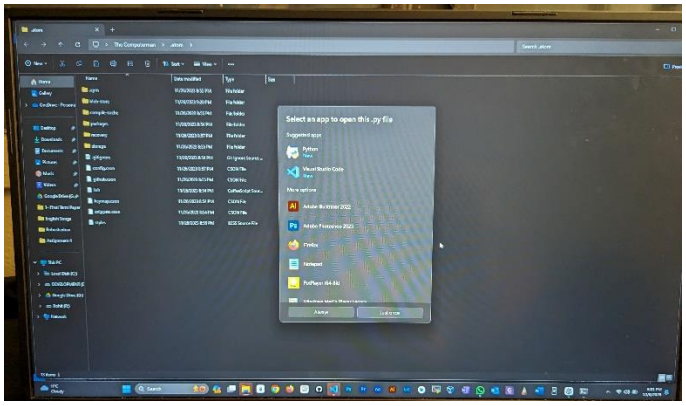


Fig: HID Attack Disabling Window's defender

This rubber ducky attack will open the settings though powershell and disable the windows defender program.

- **F-bomb**



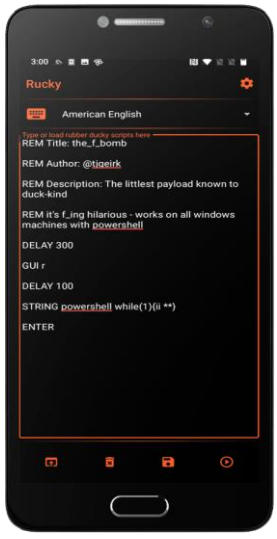


Fig: HID Attack of fbomb (duck kind)

This attack also know as Duck Kind. It will create a little payload inside which will run a shell of loops on the windows automatically and run at the same time to create a screen of multiple bomb opening folders and files. The user will be unable to work on his task as this will continuously to run until user restart the machine.

2. Attacks on Ubuntu:

- **Exfiltrate Linux log files**

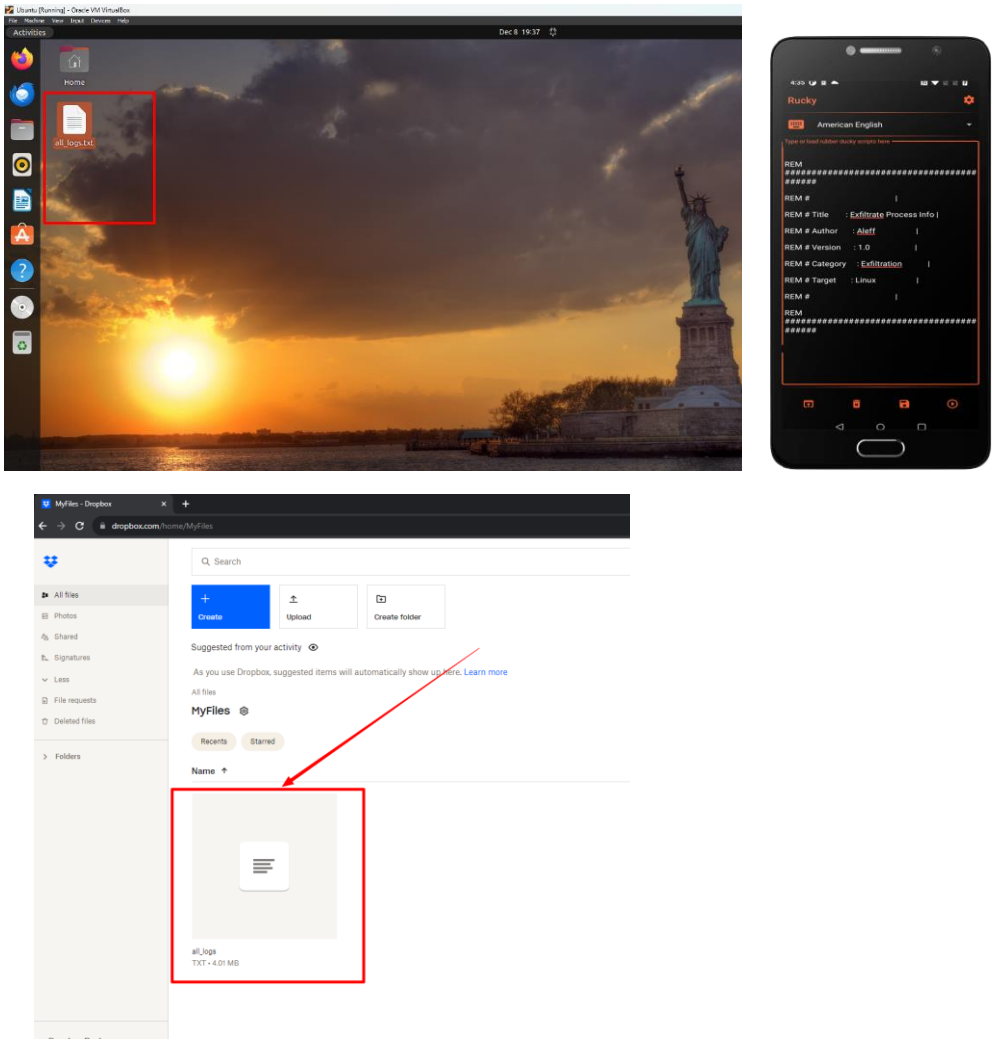


Fig: HID Attack for exfiltration of Linux Logs and send it to Dropbox

With this script we can exfiltrate all the Kali Linux logs on our Dropbox via Dropbox API.

- **Automatic URL redirector**

The attack would redirect Victim's browser to our desired payload download location and would download the payload automatically.

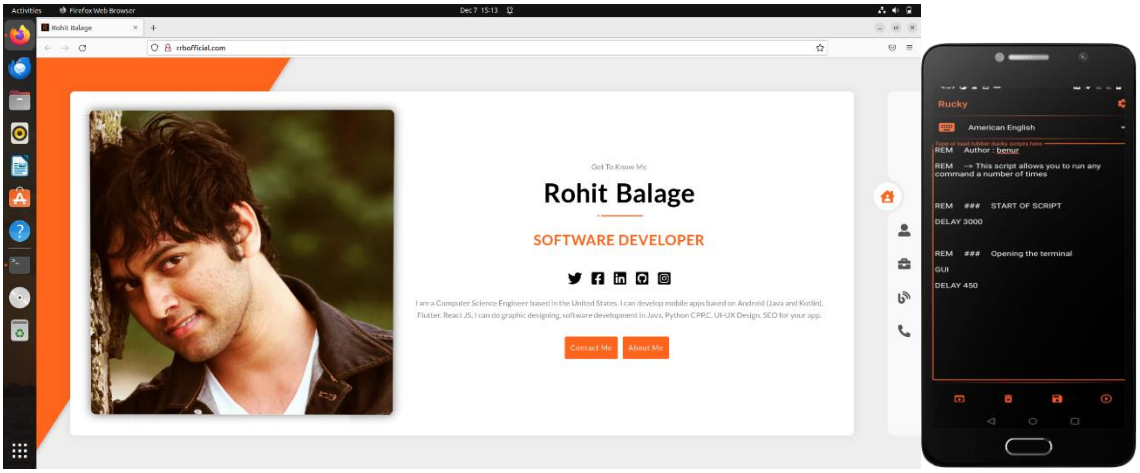


Fig: HID Attack for URL director on Linux

3. Attack on Kali Linux

- **Run a shell of loop**

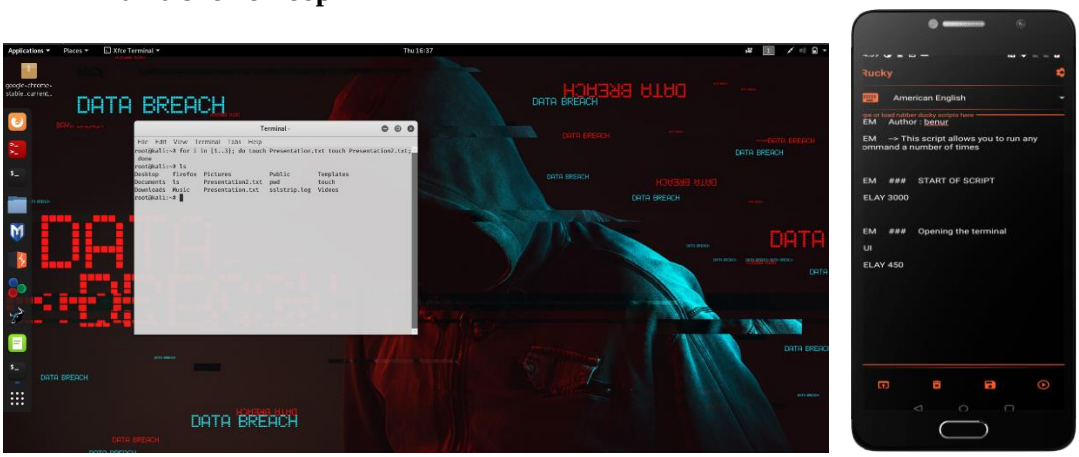


Fig: HID Attack to run shell of Linux commands on Kali Linux

This Rubber ducky attack would run a loop on Linux command on the PC and would give the attacker liberty to install a payload.

4. Attacks on Android

- **Android Cracking Phone's passcode (Android PIN BruteForce)**

This attack is a Bruteforce PIN attack. Where we try to guess the victim's phone's passcode with trial-and-error method. This is less likely to succeed, and we will wait if the phone locks with every 5 incorrect PIN codes.

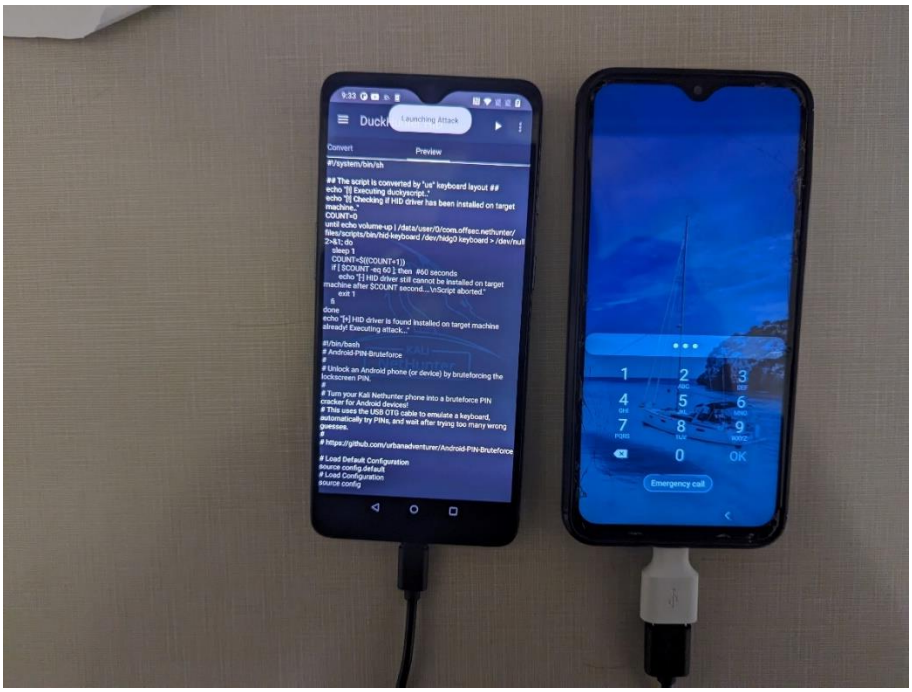


Fig: Ducky attack for Android PIN cracking BruteForce

- **Android Whats app message sender**
  This attack will open the victim's whats app messenger app and will text to our desired number with our desired set of message string.

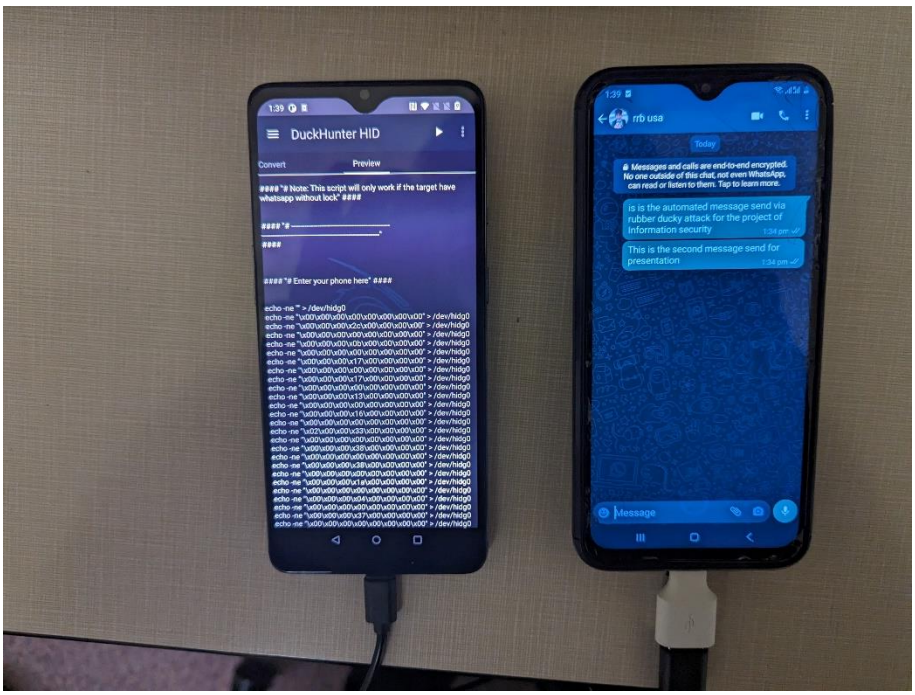


Fig: Ducky attack for whats app message hack

- **Android Browse the URL**
  This rubber ducky attack is used for redirecting a victim's phone to a desired URL and may help the attacker to get download what he wants.

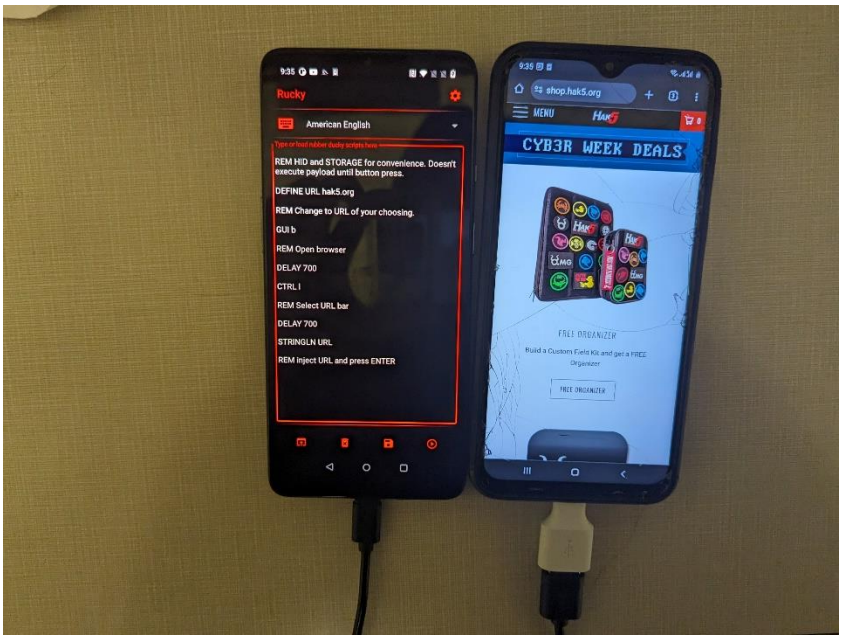


Fig: Ducky attack for Browsing desired URL on Android

- **Android Email forwarding**

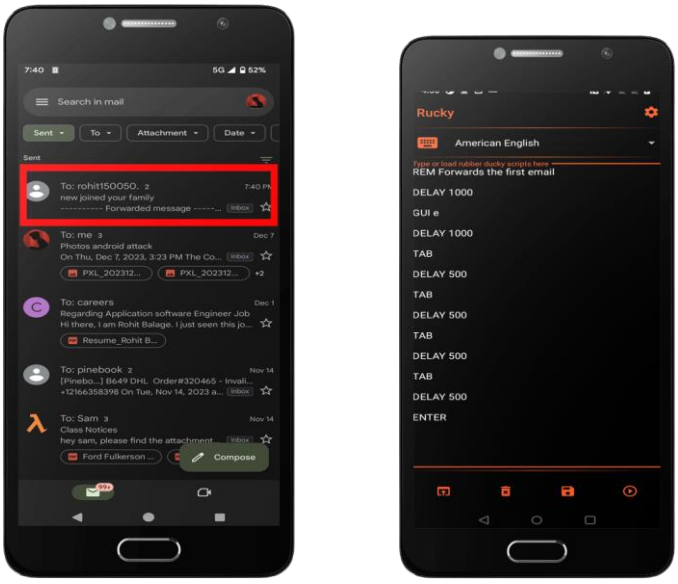


Fig: Ducky attack for forwarding last email to attacker's email

This attack will take the last email on the victim's PC and will then be forwarded to the attacker's email address.

- **Attacking Front and Back camera of victim's Android Phone:**

  We are using the tool called WishFish. The tool is made for Linux phones and Kali Nethunter device. This tool will allow you to create a server either with local host and will generate a link to send to the victim's device.

  This is a type of phishing attack where a user will assume to connect to an online meeting while in the backdoor the user's Cam will send to the server. And that's the way how we can manipulate the victim and get the images in our local Kali Nethunter device.

Fig: Camera hack using WishFish Tool

- **Wardriving**

Fig; Wardriving through wifite and wi-fi adapter

This is a process in which an attacker would garner the nearest Wi-Fi related information simply by walking down the nearest road or trail. This process requires a Wi-Fi adapter in a monitor mode inside the Wifite app on Nethunter and would help us to see the nearest vulnerable Wireless access point available.

Conclusion

This Paper has explored the multifaceted capabilities of Kali Nethunter as an advanced mobile penetration testing platform, highlighting its effectiveness in executing various cyber attacks on platform like Android, Windows, Linux. Through our examination, we have identified key attacks methodologies such as Human Interface Device (HID) attacks, Wi-Fi frame injection, camera hacking, and targeted attacks on applications like WhatsApp. These methods underscore the versatility and power of NetHunter in the realm of cybersecurity.

The Future scope of NetHunter is vast and promising. As the digital landscape continuous to evolve with emerging technologies like 5G and IoT, Nethunter's adaptability and advancement will play a crucial role The integration of AI and ML for enhanced thread detection, coupled with expanding device compatibility positions Nethunter at the forefront of Mobile penetration testing tools.

For students and budding cybersecurity professionals, Nethunter offers practical and hands-on-experience in understanding and combating real-world cybersecurity challenges. It serves as an invaluable education tool, providing insights into complexities of network security and the methodology of ethical hacking. As the cybersecurity field grows, the knowledge and skills gained from working with tools like Nethunter will be instrumental in shaping the next generation of security experts.

This exploration into Kali Nethunter not only highlights its current capabilities but also sets the stage for continued research and development in mobile cybersecurity. This responsibility lies within the cybersecurity community to ethically harness the power of tools like NetHunter, ensuring the security and integrity of our increasingly interconnected digital world.

10. References

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