Unified Mobile Malware Analysis (UMMA)

METHODOLOGY

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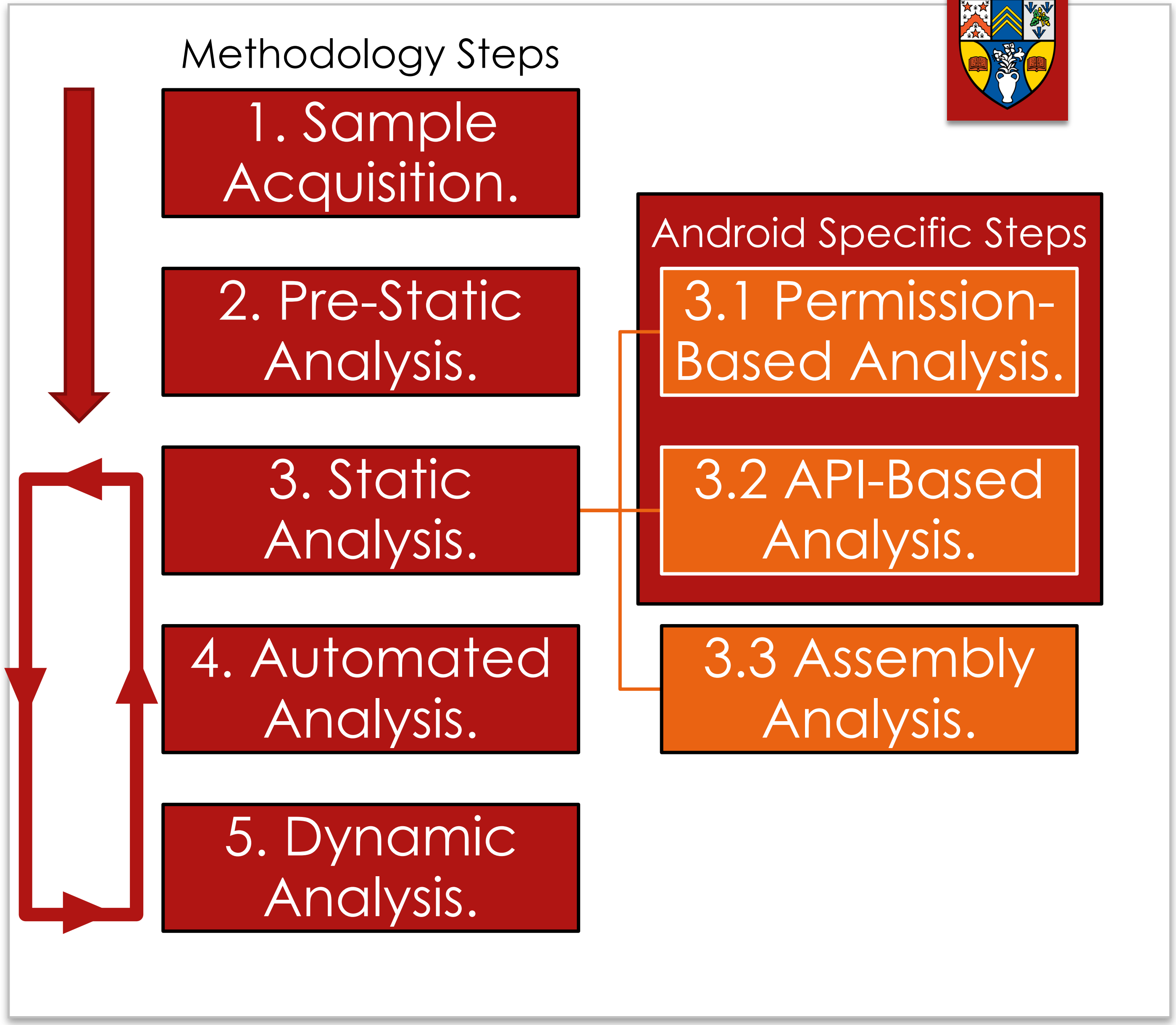
Unified Mobile Malware Analysis (UMMA) v0.3 Beta



Methodology Steps

1. Sample Acquisition.

2. Pre-Static Analysis.

3. Static Analysis.

4. Automated Analysis.

5. Dynamic Analysis.

Android Specific Steps

3.1 Permission-Based Analysis.

3.2 API-Based Analysis.

3.3 Assembly Analysis.

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1. Sample Acquisition

Setting up a safe environment:

- Create an isolated virtual environment for analysis (for Apple Silicon Parallels users, use the provided malware analysis virtual machine).
- Configure network settings to prevent accidental spreading of malware.
- Ensure that the analysis environment does not contain sensitive data.

Transferring the Malware Sample to a Safe Environment:

- Use secure methods for transferring the malware sample (e.g., password protected .zip archives).
- Limit exposure to other devices during transfer.
- Avoid opening or executing the sample outside the analysis environment.

Sample Verification:

- Confirm the integrity of the malware sample by checking hashes and digital signatures.
- Document the sample's properties, such as file type, size, and origin.

Adopting Backup Routine and Best Practices:

- Maintain backups of the analysis environment to enable quick recovery in case of accidental infection.
- Follow best practices for handling and storing malware samples to prevent accidental release or exposure.

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2. Pre-Static Analysis

- **Online Malware Analysis Platforms**:
  - In addition to VirusTotal, consider using other platforms like **Hybrid-Analysis**, **Any.Run** and specifically **Joe Sandbox**.
  - Leverage these services for more comprehensive results, as each may use different detection engines and databases and could assist in classification of the malware sample.
  - Obtain a broader understanding of the malware's behaviour, distribution, and potential impact.
- **Threat Intelligence Gathering**:
  - Research similar malware samples, campaigns, or threat actors to gain context on the sample under analysis.
  - Use platforms like **MITRE ATT&CK** and **AlienVault OTX** for threat intelligence information.
  - Correlate findings to inform subsequent stages of the analysis process.
- **String Search**:
  - Dumping strings of the sample may unveil information which could point to the malicious code segments or the lack of such.

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3. Static Analysis

- **Code and Control Flow Analysis:**
  - Disassemble or decompile the mobile malware sample (APK, IPA, or other formats) to study its code structure, logic, and functionality.
  - Identify potential malicious code patterns, encryption routines, or obfuscation techniques specific to mobile platforms.
  - Use tools like **JADX**, **apktool**, or **Hopper** for in-depth examination and control flow visualisation on mobile malware.
- **Permission-Based Analysis:**
  - Examine the requested permissions within the mobile malware sample to identify potential abuse or privacy concerns.
  - Assess the necessity of each permission based on the sample's functionality and evaluate the risk associated with granting these permissions.
  - Utilise tools like MobSF, Androguard, or Android Studio's Manifest Viewer to investigate permissions within the mobile malware.
- **API Code Analysis:**
  - Inspect the mobile malware sample's use of APIs, focusing on those that access sensitive resources, device features, or services.
  - Analyse the API calls and their implementation to identify potential vulnerabilities, malicious intent, or non-compliant usage.
  - Employ tools like JADX, Frida, or jadx-gui to explore and evaluate API calls within the mobile malware sample.

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4. Automated Analysis

Static Analysis with Automated Tools:

- Utilise automated static analysis tools like **MobSF**, Androwarn, or Quark-Engine to quickly scan the mobile malware sample and provide a high-level overview of its properties.
- Obtain insights on code structure, permissions, API usage, and potential security risks with minimal manual effort.
- Use the generated reports to inform further in-depth manual analysis, focusing on specific areas of interest or concern.

Automated Behaviour Analysis and Profiling:

- Employ tools like AppMon, DroidBox, or TaintDroid to automatically analyse and profile the mobile malware's behaviour during execution.
- Capture information on data leakage, sensitive API usage, and other potentially malicious activities or patterns.
- Compare the extracted behavioural profiles against known malware samples to identify similarities, shared code, or potential attribution.

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5. Dynamic Analysis

- Controlled Execution Environment:
  - Set up a controlled execution environment using emulators, simulators, or dedicated test devices to safely execute the mobile. malware sample
  - Isolate the test environment from production networks and ensure proper monitoring and containment to prevent unintended. consequences
  - Employ tools like **Android Emulator**, Genymotion, or iOS Simulator to create a suitable environment for dynamic analysis.
  - For MacOS users, use tools firewall tools like **LuLu** and Little Snitch to ensure restricted malware network communications.
- Real-time Behaviour Monitoring:
  - Observe the mobile malware's behaviour during runtime, including file operations, network activities, system API calls, and interactions with device hardware or sensors
  - Utilise tools like **Frida**, strace, or Logcat to monitor the malware's actions and capture detailed logs for further analysis
  - Identify any deviations from expected behaviour, potential vulnerabilities, or malicious activities that were not evident during static analysis
- Reverse Engineering and Debugging:
  - Leverage reverse engineering and debugging tools, such as IDA Pro, **JADX**, or radare2, to gain a deeper understanding of the malware's functionality and execution flow
  - Set breakpoints, inspect memory, and manipulate execution to uncover hidden functionality, anti-analysis techniques, or encryption keys
  - Use the insights gained through dynamic analysis to inform further static analysis or develop countermeasures and detection signatures

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android_analysis Script

- Script that combines several tools in one workflow:
  - Pre-Static Analysis: VirusTotal Lookup with **AndroPyTool**.
  - Static Analysis: Dumping information such as list of permission, strings, API-calls, etc. with **androguard** and producing JSON report with **AndroPyTool**.
  - Assembly Analysis: Automatically launching **jadx**, an Android specific decompiler, with Debugging Capabilities and creating **Frida** snippets.
  - Automated Analysis: Launching Mobile Security Framework (MobSF) UI in FireFox (The .apk needs to be uploaded into MobSF manually).
  - Dynamic Analysis: **MobSF** + **Frida** Dynamic Analysis within the launched MobSF window, manual **adb** configuration required.

- Usage:
  - --vtk: VirusTotal API Key. Required.
  - --f: File path to the .apk file you wish to analyse. Required.

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