OWASP

Open Web Application
Security Project

OWASP Mobile Top Ten 2014
Meet the New Addition

Agenda

- OWASP Mobile Top Ten 2014
  - – Lack of Binary Protections added
  - – Why is Binary Protection important?
- What Risks Need to be Mitigated?
- Where to Go For Further Guidance

What’s “Lack of Binary Protections” All About?

OWASP MOBILE TOP 2014

OWASP Mobile Top Ten 2014

- Unveiled at AppSec California 2014
  - January 2014;
  - Categories based on data collected by a number of different security vendors, consultancies;

- New Category Introduced:

  “Lack of Binary Protections”

Mobile Top Ten 2013 -> 2014

Category	2013	2014
M1	Insecure Data Storage	2013 M2 + 2013 M10
M2	Weak Server Side Controls	2013 M1
M3	Insufficient Transport Layer Protection	2013 M3
M4	Client Side Injection	2013 M8 + 2013 M10
M5	Poor Authorization and Authentication	2013 M5
M6	Improper Session Handling	2013 M9
M7	Security Decisions via Untrusted Input	2013 M4
M8	Side Channel Data Leakage	2013 M7
M9	Broken Cryptography	2013 M6
M10	Sensitive Information Disclosure	**Lack of Binary Protections**

What is "Lack of Binary Protections" All About?

1. Software in untrusted environments is exposed to reverse-engineering, analysis, modification, and exploitation by attackers

2. Attackers can directly access the binary and compromise its integrity with various tools and techniques

3. Attackers may cause brand, revenue, or IP loss through reverse-engineering

What Do Binary Attacks Result In?

Compromise (disable, circumvent) of **security controls**, e.g., authentication, encryption, license management / checking, DRM, root / jailbreak detection

Exposure of **sensitive application information**, e.g., keys, certificates, credentials, metadata

Tampering with **critical business logic, control flows, and program operations**

What Do Binary Attacks Result In?

Insertion of **malware or exploits** in the application and repackaging

Exposure of **application internals** (logic, vulnerabilities) via reverse-engineering

IP theft (e.g., proprietary algorithms) via reverse-engineering

Piracy and unauthorized distribution

How Prevalent Are Binary Attacks?

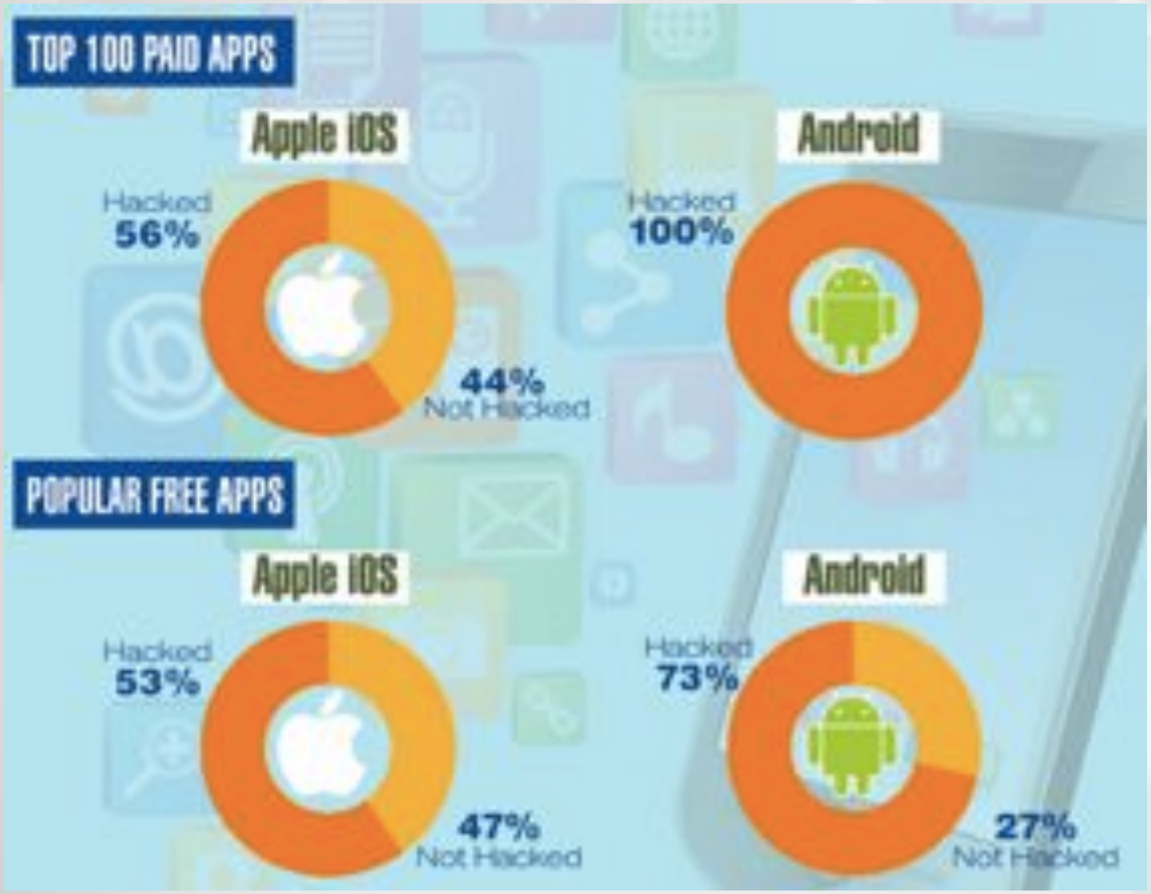
- HP Research Reveals Nine out of 10 Mobile Applications Vulnerable to Attack, 18 November 2013:

  “86 percent of applications tested lacked binary hardening, leaving applications vulnerable to information disclosure, buffer overflows and poor performance.”

- Arxan Research - State of Security in the App Economy, Volume 2, November 2013:

  “Adversaries have hacked 78 percent of the top 100 paid Android and iOS apps in 2013.”

2013 Arxan Study

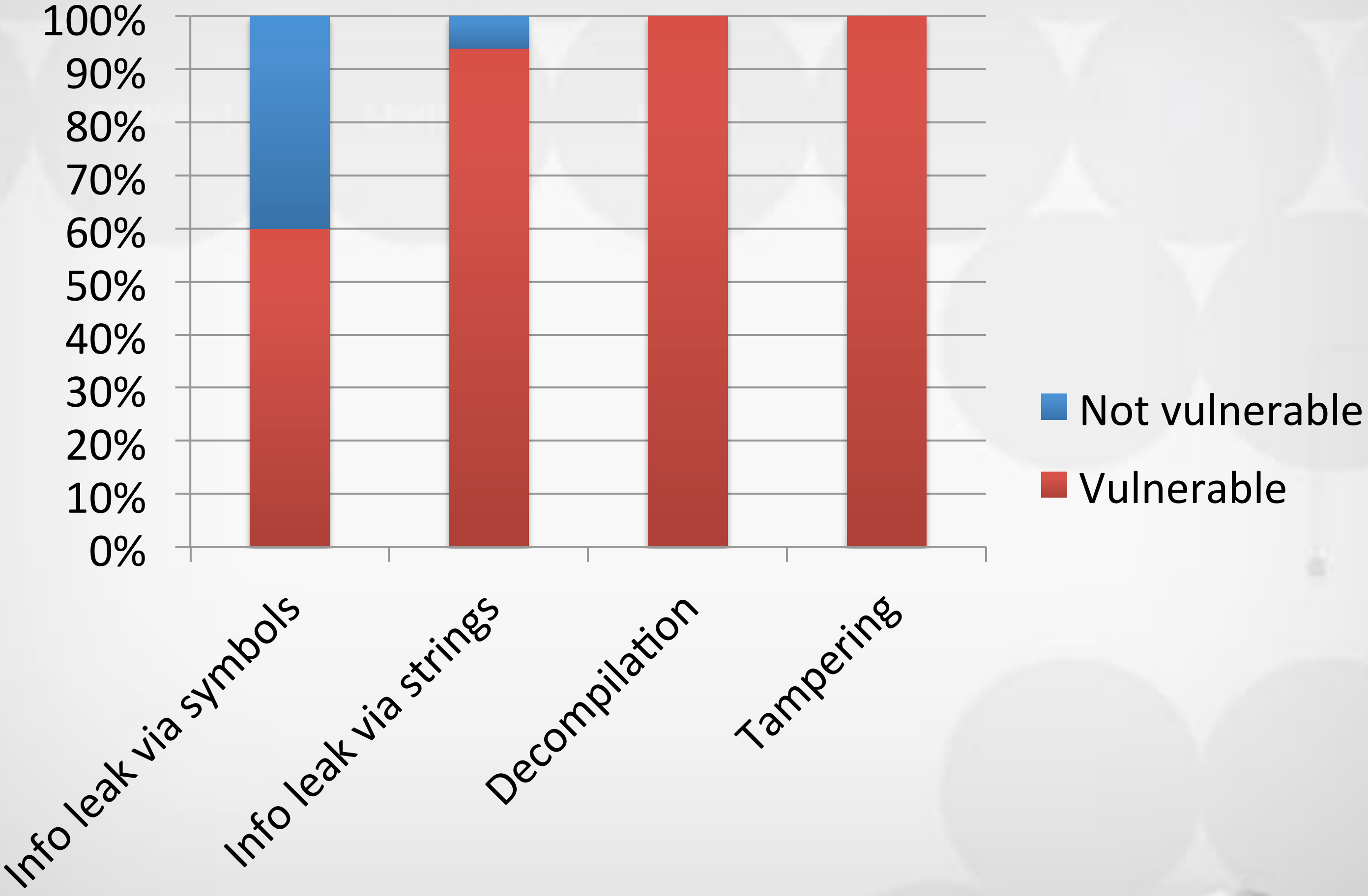


- Analyzed Top 100 Apps for Android / iPhone for serious flaws
- Binary / HTML Modification extremely common

Goals of Binary Attacks

- What were the hackers interested in doing with these cracked apps?
  - Security Control Bypass
  - Adware / Spyware Code Injection
  - Repackaging (IP Theft)
  - Stealing Information About Users

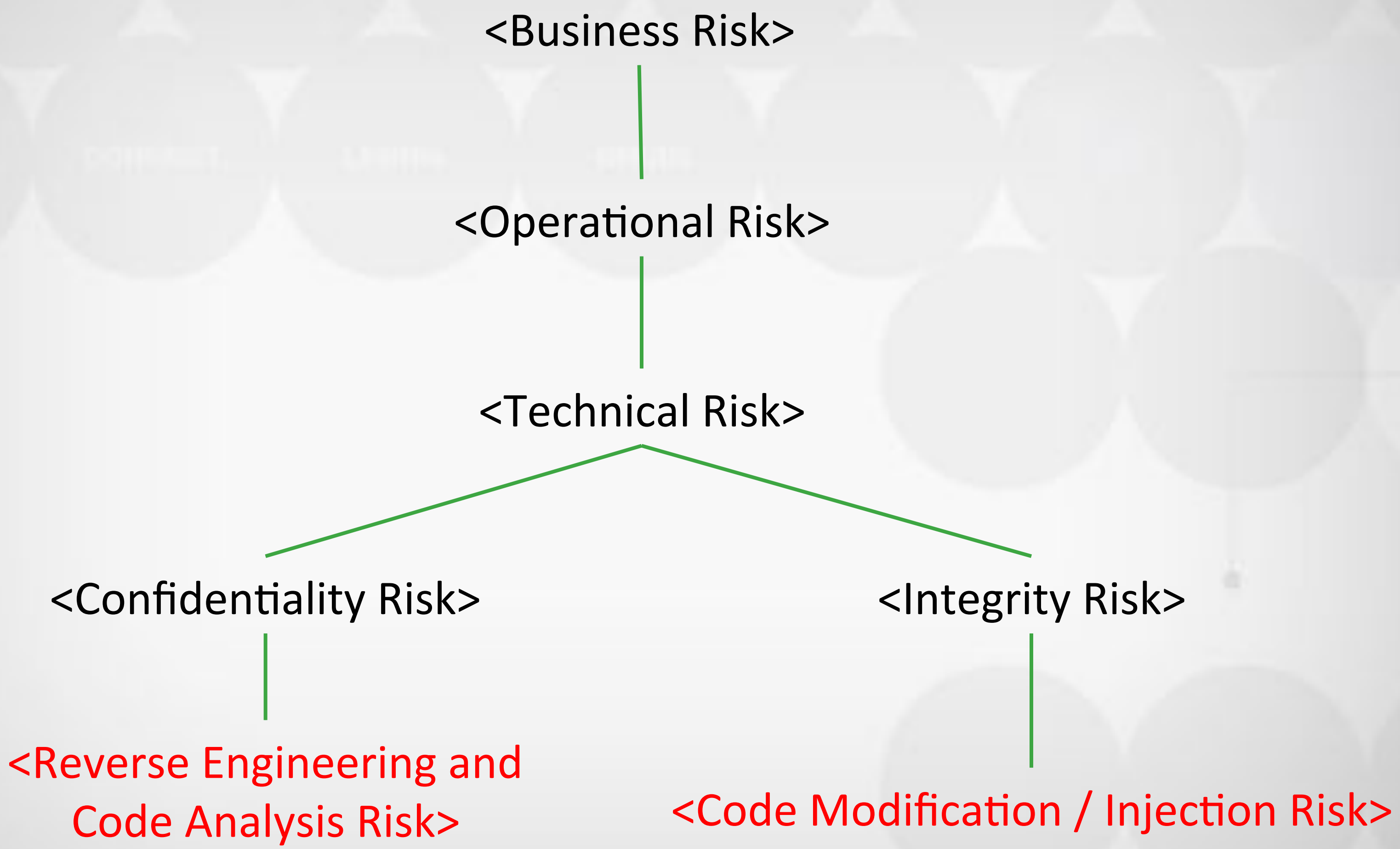
2012 Arxan Study – Android Banking Vulnerabilities



Technical Risks and Solutions

WHAT RISKS NEED TO BE MITIGATED?

Android / iPhone Technical Risks



<Business Risk>

<Operational Risk>

<Technical Risk>

<Confidentiality Risk>

<Integrity Risk>

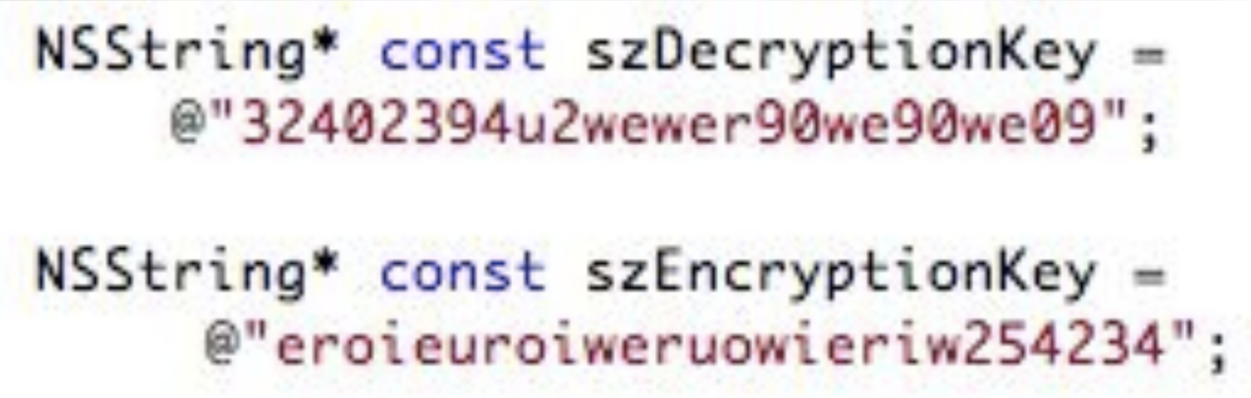
<Reverse Engineering and Code Analysis Risk>

<Code Modification / Injection Risk>

Reverse Engineering Risks

- Reverse Engineering Risks
  - Exposed Method Signatures
  - API Monitoring
  - Exposed Data Symbols
  - Exposed String Tables
  - Algorithm Decompilation and Analysis
  - Application Decryption

Cryptographic Key Theft



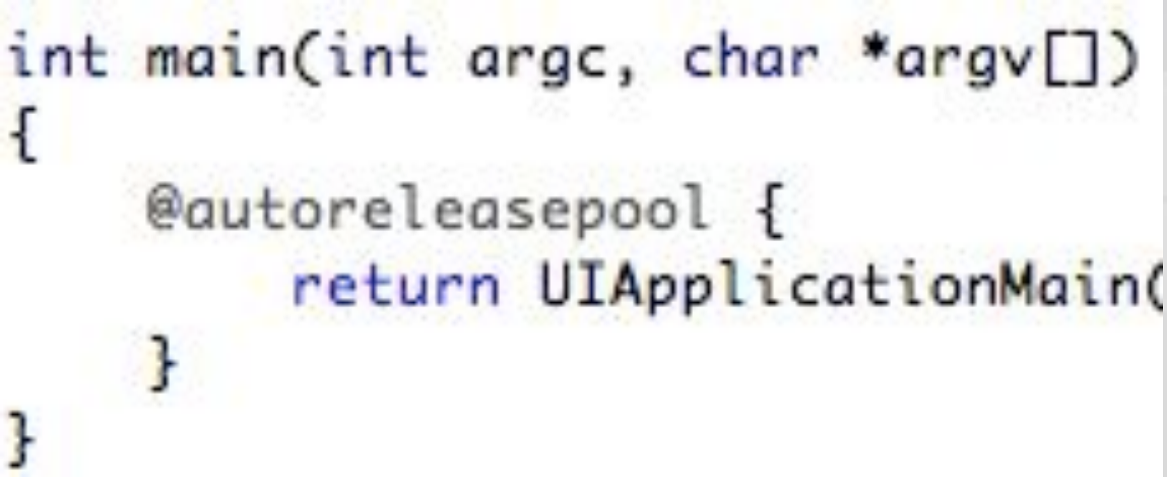
```
NSString* const szDecryptionKey =
    @"32402394u2wewer90we90we09";

NSString* const szEncryptionKey =
     @"eroieuroiweruowieriw254234";
```

Flag hardcoded keys that could be easily found by an attacker through static or dynamic analysis.

AntiDebugger Checks

Common app entrypoints should check for the unauthorized presence of a debugger.



```
int main(int argc, char *argv[])
{
    @autoreleasepool {
        return UIApplicationMain(
    }
}
```

Code Modification Risks

- Code Modification Technical Risks
  - Repackaging
  - Method Swizzle With Behavioral Change
  - Security Control Bypass
  - Automated Jailbreak / Root Detection Disable
  - Presentation Layer Modification
  - Cryptographic Key Replacement

Swizzling w/Behavioral Change

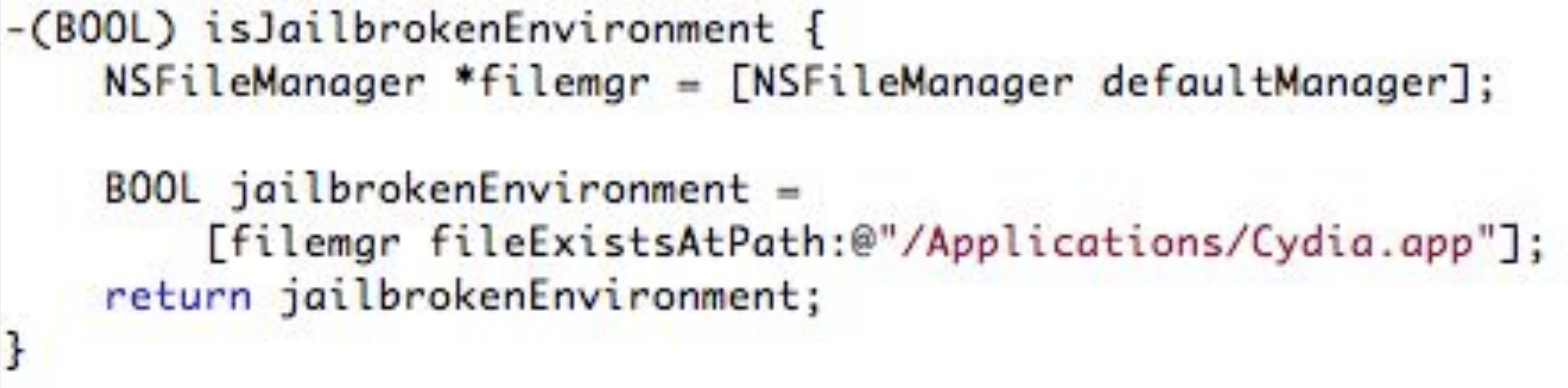
This method will likely be swizzled and modified by an attacker

```
// Transaction-request delegate
- (IBAction)performTransaction:(id)sender
{
    if([self loginUserWithUsername:username
incomingPassword:password] != true)
    {
        UIAlertView *alert = [[UIAlertView
alloc] initWithTitle:@"Invalid User"
message:@"Authentication Failure" delegate:self
cancelButtonTitle:@"OK" otherButtonTitles:nil];

        [alert show];
        return;
    }

    // Perform sensitive operation here
}
```

Automated Jailbreak Bypass



```
-(BOOL) isJailbrokenEnvironment {
    NSFileManager *filemgr = [NSFileManager defaultManager];

    BOOL jailbrokenEnvironment =
        [filemgr fileExistsAtPath:@"/Applications/Cydia.app"];
    return jailbrokenEnvironment;
}
```

NOTE: Methods that appear to return a simple yes/no response and appear to be doing something sensitive are excellent candidates for simple code modification.

Useful OWASP Projects

FURTHER GUIDANCE

Practical Solutions

1. Implement Adequate Algorithms for
   - Jailbreak / Root Detection (see xcon);
   - Checksum Controls;
   - Certificate Pinning Controls; and
   - Debugger Detection Controls

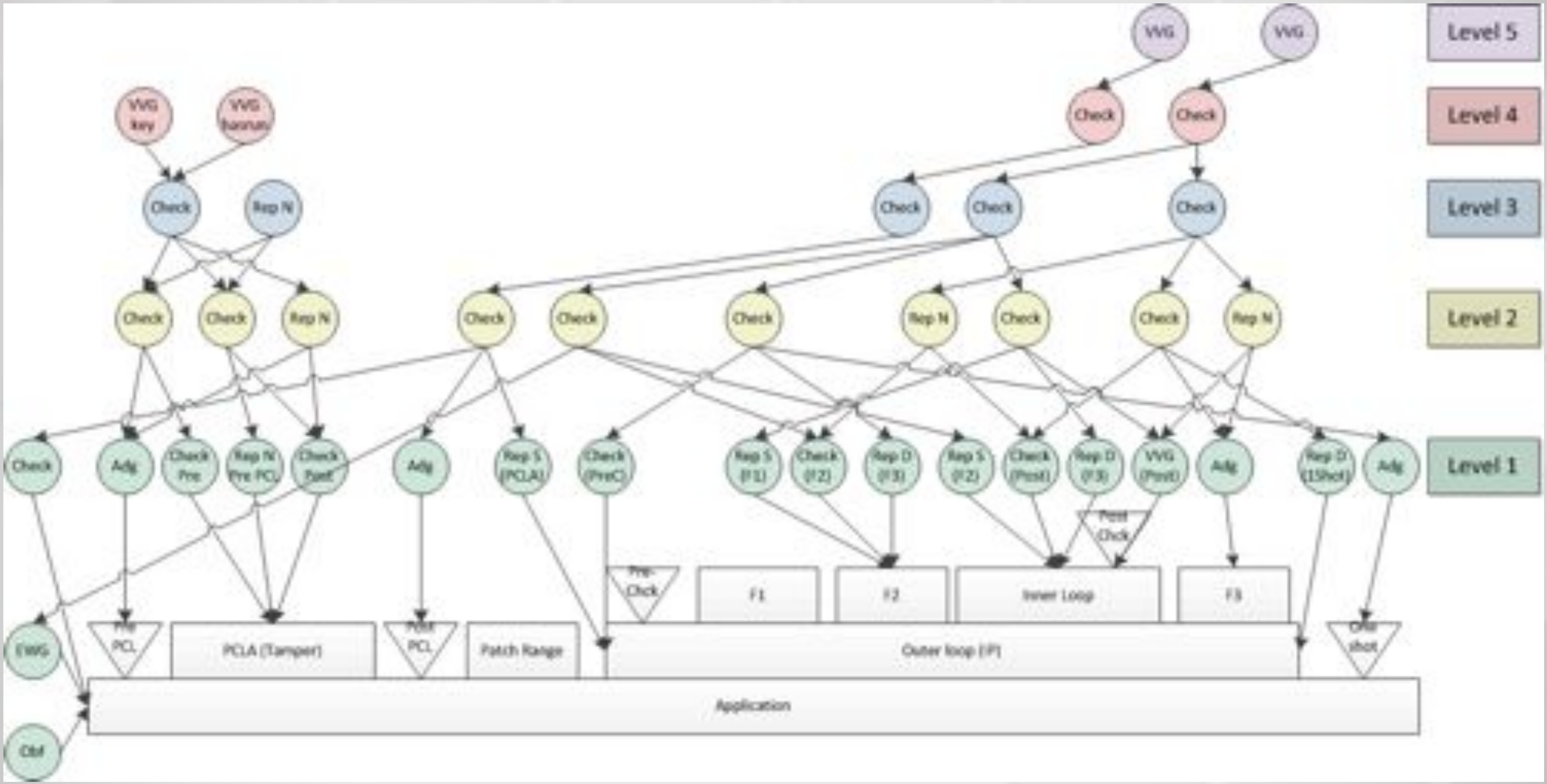
2. Protect these algorithms from:
   - Reverse Engineering
   - Unauthorized Code Modifiation

Practical Solutions

Your mobile app must be able to:

1. Prevent an adversary from reverse engineering sensitive parts of your app;
2. Detect at runtime that code modification has occurred;
3. React appropriately at runtime to integrity violations

Practical Solutions:
Follow a "Defense in Depth" Approach



Conclusions

- Binary attacks are extremely common and are much riskier than you think…
- OWSAP Mobile Top Ten 2014 Category "Lack of Binary Protections" is new and directly addresses this new threat
- To mitigate this threat, your app must strive to prevent reverse engineering and code modifications by an adversary

Useful OWASP Projects

- Check out "OWASP Mobile Top Ten 2014 Project – M10" For More Information

  https://www.owasp.org/index.php/Mobile_Top_10_2014-M10

- For more specific guidance and recommendations:

Reverse Engineering and Code Modification Prevention OWASP Project

https://www.owasp.org/index.php/OWASP_Reverse_Engineering_and_Code_Modification_Prevention_Project

For more info on Arxan Technologies: http://www.arxan.com

THANK YOU!