Acme Inc.

Bugcrowd Plus Pen Test (PPT)
Acme Mobile Application

ACME

Created On
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Classification: Confidential

Contents

Executive Summary

Acme Inc., based in San Francisco, California, is a large importer/exporter of numerous products. As a requirement of their business, Acme Inc. maintains Android and iOS mobile applications that are responsible for gathering, transferring and storing all types of data. Acme Inc. has a requirement and obligation to ensure that this application is resilient to cyber-attack in order to protect the privacy of their customers. To assist with this, Acme Inc. employed Bugcrowd to perform a Plus Pen Test (PPT) which took place from February 20, 2023, through February 25, 2023.

The purpose of this engagement was to identify security vulnerabilities in the assets listed under Targets and Scope. Once identified, each vulnerability was rated for technical impact defined in the Findings Summary section of the report.

To perform this test, our researcher leveraged several common tools to help identify and exploit vulnerable findings in the environment.

Manual testing of the scope was performed, evaluating the assets for weaknesses as per the Bugcrowd methodology. In support of this, active scanners and scripts were used in an attempt to identify any commonly found, known vulnerabilities.

At the time of this report, 5 findings were identified, including 1 Critical, 1 High, 1 Medium, 1 Low and 1 Informational vulnerability.

The highest priority vulnerabilities include:

- Sensitive Data Exposure where the secret information is stored unencrypted and in cleartext in the database.
- Broken Authentication and Session Management where the bearer token is not invalidated. An attacker can use the token, if stolen, to maintain persistent access.

Bugcrowd has rated the overall risk to Acme Inc. – Mobile Application as Critical based on the Sensitive Data Exposure, and the Broken Authentication and Session Management. Our rating is based on the severity of the findings disclosed within this report.

It is recommended that Acme Inc. focus on critical and high severity issues first, with medium, low and informational findings being fixed once all high and critical issues are remediated.

Bugcrowd recommends that all critical, high and medium severity findings are retested once remediation activities are completed.

If not already implemented, Bugcrowd recommends taking the following high-level actions to further improve the overall security posture of the organization:

- Implement a secure development lifecycle such as Microsoft Secure Development Lifecycle (MSDL).
- Implement a static code analysis (SAST) tool into the development lifecycle to minimize the introduction of vulnerabilities in code.
- Provide regular secure development training to developers to ensure that they are aware of secure development practices and emerging threats.

The continuation of this document contains technical details of the specific vulnerabilities that were discovered throughout the PTS engagement. It should be noted that many of the details, including comments, up-to-date remediation status, images and additional contexts are not present in this document and are only available in the Bugcrowd Customer Portal.

If you have any questions or concerns as you move to remediate the items raised in this report, please do not hesitate to contact us. Bugcrowd would like to thank Acme Inc. for this engagement and look forward to working together in the future.

This report is just a summary of the information available and is a 'snapshot' in time of the state for the tested environment.

All details of the program's findings (comments, code, and any researcher provided remediation information) can be found in the Bugcrowd Crowdcontrol platform.

Reporting and Methodology

Bugcrowd Plus Pen Test (PPT) is an on-demand methodology-driven penetration test that delivers real-time results and 24/7 reporting in support of a variety of compliance initiatives. A pay-per-project model powered by CrowdMatch technology enables Bugcrowd to draw from a global network of continuously vetted pentesters to deliver faster setup without compromising on skill or experience. To support accelerated remediation and streamline integrated business processes, vulnerabilities discovered during the methodology are viewable live in the Bugcrowd Customer Console as soon as they are submitted by the pentester. Bugcrowd's in-house team of Security Engineers works in parallel to validate, prioritize, and push streaming vulnerabilities through customer-chosen SDLC integrations like GitHub, JIRA, or ServiceNow.

The Bugcrowd Pen Test service was designed and independently assessed by a leading QSA to ensure alignment with key compliance and regulatory standards.

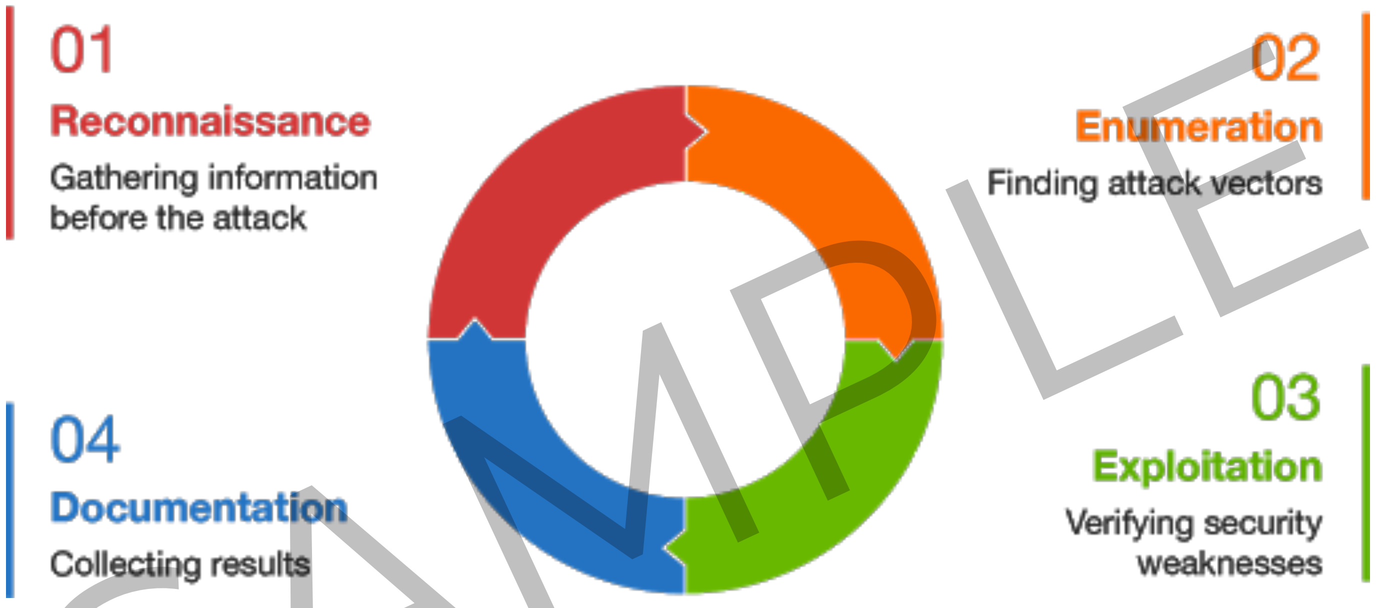
Our unique BugHunter testing methodology blends key organizational and operational elements of leading industry standards to create a unified methodology that satisfies auditor and reviewer requirements.

By leading with a best-in-class testing approach, our methodology provides enhanced risk reduction while supporting critical compliance initiatives. A review of these standards follows.

Organizational Methodology Standards

Executing a penetration test involves a proven workflow that is split into phases. Each of these phases is run in a cyclical manner allowing penetration testers to build upon findings and potentially uncover significant risk. An organizational methodology also ensures that high-level coverage of testing is done. When reviewing common organizational methodologies, Bugcrowd found similarities in the general workflow.

Bugcrowd pen testers adhere to these standards in a common workflow as shown:



Reviewed Organizational Methodology Standards:

- PCI DSS Requirement 11.2, 11.3.1, 11.3.3, 11.3.4
- NIST 800-115 - Technical Guide to Information Security Testing and Assessment 2.1 "Information Security Assessment Methodology"
- Open Source Security Testing Methodology Manual (OSSTMM)
- Penetration Testing Execution Standard (PTES)

Operational Methodology Standards

Many penetration testing models fail to provide both results and coverage. To bring value to the customer, Bugcrowd has reviewed the most common and in-depth operational Pen Test methodologies. Operational methodologies provide details on what exactly needs to be tested in a security assessment, for each endpoint.

The methodology assigned to researchers includes application and infrastructure level testing domains. Each domain contains several tests for the tester to cover in both manual and automated methods.

In order to create a complete testing methodology, Bugcrowd has pulled from the following industry standard operational methodologies:

- OWASP Testing Guide (OTG)
- Web Application Hacker Handbook Methodology (WAHHM)
- Others where applicable (SANS Top 25, CREST, WASC, PTES)

Findings Summary

Targets and Scope

Prior to penetration test launching, Bugcrowd worked with Acme Inc. to define the rules of the engagement, commonly known as the program brief, which includes the scope of work.

The following targets were considered explicitly in scope for testing:

- Acme Inc. Ordering Mobile Application
  - iOS – Version 10.1.2
  - Android – Version 10.1.2

The following items are explicitly out-of-scope:

- Fuzzing on forms
- Denial of Service attacks (DoS)

All details of the program scope and full program brief are available in the Program Brief found on the Bugcrowd Crowdcontrol platform.

Risk and Priority Key

The following priority keys are used to explain how Bugcrowd rates valid vulnerability submissions and their technical severity. As a trusted advisor, Bugcrowd provides common next steps for program owners per severity category.

Priority	Technical Severity	Example Vulnerability Types
P1	Critical Severity vulnerabilities are escalated as soon as they are validated. These issues warrant the highest security consideration and should be addressed immediately.	• Remote Code Execution • Vertical Authentication Bypass • SQL Injection • Insecure Direct Object Reference for a critical function
P2	High Severity vulnerabilities should be slated for a fix very soon. These issues still warrant prudent consideration but are often not availability or "breach level" submissions.	• Lateral Authentication Bypass • Stored Cross-Site Scripting • Cross-Site Request Forgery for a critical function • Insecure Direct Object Reference for an important function
P3	Medium Severity vulnerabilities should be slated for remediation in a major release cycle.	• Reflected Cross-Site Scripting • Cross-Site Request Forgery for an important function • Insecure Direct Object Reference for an unimportant function
P4	Low Severity vulnerabilities should be considered for remediation within the next six months.	• Cross-Site Scripting with limited impact • Cross-Site Request Forgery for an unimportant function • External Server-Side Request Forgery
P5	Informational findings are environmental information, best practices or potential accepted business risk.	• All open ports • Lack of Code Obfuscation • Autocomplete enabled • Non-exploitable SSL issues

Findings Table

Android

Index	Title	VRT	Priority
F001	Application Caches Secrets in Cleartext Database	Sensitive Data Exposure	P1
F002	Bearer Token is Not Invalidated	Broken Authentication and Session Management	P2
F003	Multiple AWS Keys Exposed in Config Files	Sensitive Data Exposure	P3

iOS

F004	Sensitive Data Stored in Application Memory	Insecure Data Storage	P4
F005	Firebase Tokens Stored in PersistedInstallation File on Device	Sensitive Data Exposure	P5

Vulnerability Details

This section outlines the full submission data for each valid finding. These findings are rarely altered from their original state from the researcher. Due to the nature of crowd-sourced security assessments, some typos or grammar errors may occur. Each finding is headlined with the submission title and priority followed by more detailed vulnerability information based on the type of finding submitted. Several other fields may appear based on the context and Vulnerability Rating Taxonomy (VRT) classification selected by a researcher.

The details may include the following:

Description

This section appears after the "Bug URL" as a free form area for the researcher to describe the context of the submission.

Bug URL

This is the specific URL path or IP target location where the vulnerability was found.

Submission Reference Number

The unique identifier for the submission visible to researchers.

CVSS Rating

The CVSS vector string for this submission, if provided, and the score calculated from that vector string.

Vulnerability Rating Taxonomy (VRT)

The Vulnerability Rating Taxonomy is the baseline guide used for classifying technical severity.

Additional Details

Several other fields may appear based on the context and VRT classification selected by a researcher, such as but not limited to Bugcrowd Application Security Engineer (ASE) curated proof of concepts, comments to the researcher or Bugcrowd, assignees, attachments, and state change metadata. These can be viewed in the Crowdcontrol platform.

F001 - Application Caches Secrets in Cleartext Database

P1

Submission Reference Number
Dc61db1253b1a6887c52fb923c58923c81d602f10fc272a8ddb

Vulnerability Rating Taxonomy (VRT)
Sensitive Data Exposure > Disclosure of Secrets > For Publicly Accessible Asset

Description

One of the application components performs improper configured CFNetwork requests which are cached to a local database on the device.

This database contains various sensitive information like token and user information. Since the database is an SQLite database, it is easy to retrieve this information. The information is stored unencrypted and in cleartext.

Steps to Reproduce:

- Use the app and log in to your account
- With an SQLite Editor open the database located at on the mobile device:

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F002 - Bearer Token is Not Invalidated

P2

Submission Reference Number
727992fe76d053e67d68fcaeb77fa88ec280b1190ee935ed

Vulnerability Rating Taxonomy (VRT)
Broken Authentication and Session Management > Failure to Invalidate Session > On Logout (Client and Server-Side)

Description

Revoking the bearer is not working correctly. Even if the application shows the logout was successful and the endpoints confirms the revocation, the token stays active. This allows the token to be used after logout and makes it impossible for the user to disable the session usage.

Steps to Reproduce:

- Login and use the Application
- Capture the traffic in Burp Suite
- View your profile via `Edit`

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F003 - Multiple AWS Keys Exposed in Configuration Files

P3

Reference Number
4e7b75cbf48b0ffcf89e5ba098bc1b134c186afafc06a

VRT
Sensitive Data Exposure > Disclosure of Secrets > For Publicly Accessible Asset

Description

3 sets of AWS access keys as well as their associated secrets are stored in the environments.json file within the iOS application. All 3 credentials appear to be valid/current.

Here is an excerpt from the .json file:

Redacted

Steps to Reproduce:

This file can be found by extracting the .ipa file and browsing the extracted files.

The credentials can be validated using the awscli tools with the following command:

```
AWS_ACCESS_KEY_ID=VCASDFOIUVIASUNV AWS_S
ECRET_ACCESS_KEY=Yfe7Y/kYTgs+dfgdzgrdrg /YSGYt/2gVpNDA aws sts get-caller-ide
ntity
```

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F004 - Sensitive Data Stored in Application Memory

P4

Submission Reference Number
dacba07473fe7c26e8dc6a626f7da6a79e5d9be31d07b61f

Vulnerability Rating Taxonomy (VRT)
Insecure Data Storage > Sensitive Application Data Stored Unencrypted

Vulnerability

Critical sensitive information like username, email, cookies, passwords are saved as plain text in the application memory file. If an attacker gets access to the device then they can use this sensitive information for further attacks.

Proof of Concept:

- Using a memory dumping tool like Fridump (`https://github.com/Nightbringer21/fridump`) dump the application memory
- Once the memory of the application is dumped, use the following command to retrieve the sensitive information:
  ```
  strings -a * | grep -E
  'password|username|email|typeemailaddress|token|session|name' -i
  ```
- Observe that the sensitive information like username, password, email and session tokens are saved in plain text

Finding Truncated for Display Purposes

F005 - Firebase Tokens Stored in PersistedInstallation File on Device

P5

Submission Reference Number
D773d2e03558533a3e4f7c4dd7d4335bbc4f07499eb8e5a18

Vulnerability Rating Taxonomy (VRT)
Sensitive Data Exposure > Disclosure of Secrets > Intentionally Public, Sample or Invalid

Vulnerability

During static analysis of the Acme's application's data storage, it was identified that there was a Firebase PersistedInstallation configuration file in the /data/data/com.acme.orders/files/ directory which contained sensitive tokens, including the AuthToken and RefreshToken as shown below:

Redacted

These tokens are required for Firebase connectivity, however, such files can also potentially allow users to interact with the backend database directly.

Mitigation:

Local device storage and the backend Firebase database configurations should be reviewed to determine if this is an acceptable risk.

Finding Truncated for Display Purposes

Closing Statement

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Summary

This report shows testing of Acme Inc. – Mobile Application from February 20, 2023, to February 25, 2023. The purpose of this assessment was to identify security issues that could adversely affect the integrity of Acme Inc. – Mobile Application. The assessment was performed under the guidelines provided in the statement of work between Acme Inc. and Bugcrowd. This document provides a high-level overview of the testing performed and the test results.

Pen Test Portfolio Overview

The Bugcrowd Pen Test portfolio provides organizations with the power of the Crowd, through two unique engagement styles designed to fit a range of security workflows and objectives. Max Pen Test (MPT), Plus Pen Test (PPT) and Standard Pen Test (SPT) are all powered by the Bugcrowd platform, enabling rapid setup, launch, and real-time results.

While Bugcrowd offers both continuous and on-demand penetration testing options, it is important to note that this document represents a point-in-time evaluation of security posture. Security threats and attacker techniques evolve rapidly, and the results of this assessment are not intended to represent an endorsement of the adequacy of current security measures against future threats. This document contains information in summary form and is therefore intended for general guidance only; it is not intended as a substitute for detailed research or the exercise of professional judgment. The information presented here should not be construed as professional advice or service.

Testing Methods

This security assessment leveraged researchers that used a combination of proprietary, public, automated, and manual test techniques throughout the assessment. Commonly tested vulnerabilities include code injection, cross-site request forgery, cross-site scripting, insecure storage of sensitive data, authorization/authentication vulnerabilities, business logic vulnerabilities, and more.

The summary of Bugcrowd's findings are as follows:

1 Critical **1 High** **1 Medium** **1 Low** **1 Informational**