# Pentesting Report: Smart WiFi Camera

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## 1 Executive summary

Give the high lights of your report, what are your key results and recommendations?

## 2 High-level description of the device

What is the device and what does it do? How does it work? Does it take commands, from a phone app? A cloud server? How does the user set it up? Etc.
The Goowls smart home camera, shown in figure 1:

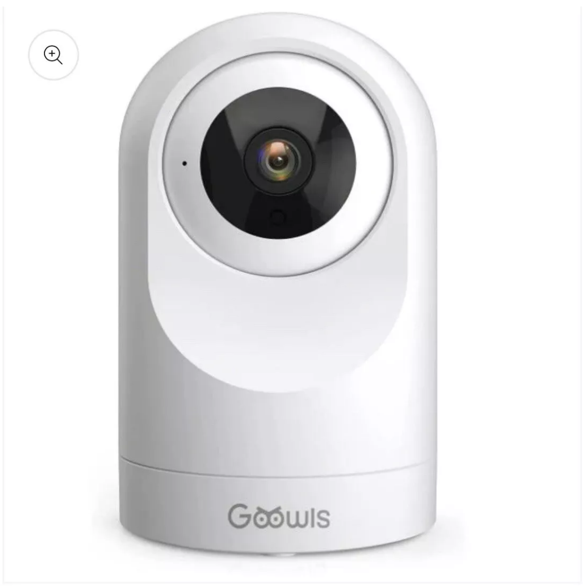


Figure 1: conponent of smart home camera

The Goowls Smart Home Camera is a versatile security device designed to enhance home monitoring. Users can integrate multiple Goowls cameras into their smart home ecosystem, allowing comprehensive surveillance across various areas of their residence.
Central to this system is the camera itself, which offers 1080p high-definition video quality for clear and detailed footage. Equipped with two-way audio, it enables real-time communication between the user and individuals near the camera. The device supports both local storage via

a 4-64 GB Class 10 TF card and cloud storage options, providing flexibility in video recording management.
To operate the Goowls camera, users need to download the YI IoT app, available on both the Apple App Store and Google Play Store. Once installed and configured, the app allows users to view live video feeds, replay recorded footage, and receive motion detection alerts. Additionally, users can assign specific names to each camera's location (e.g., "Living Room" or "Nursery") for organized monitoring.
The Goowls camera is compatible with Amazon Alexa, enabling voice-controlled access to live feeds. To set up this feature, users must add the YI IoT skill to their Alexa app and link their account. Once connected, voice commands can be used to display camera feeds on Alexa-enabled devices.

## 3 Investigating the device

### 3.1 Analysing the device setup

Describe the technical details of how the device is set up by the user. What protocols are used and how? How did you fine this out? Give technical details, and enough information to ensure that your analysis is repeatable by someone else.

### 3.2 Analysing the device in use

Describe the technical details of how the device is used after set up. What protocols are used and how? How did you fine this out. Give technical details, and enough information to ensure that your analysis is repeatable by someone else.

### 3.3 Analysing the apk file

To further analyse the app, the app was decompiled by first downloading the apk file (via Google Play) and then using dex2jar and jadx-gui to decompile the apk.
This process was able to retrieve most of the classes used by the app, and this code was then analysed to check for possible vulnerabilities in the app.
Because the code base of the app was so large, we focused and searched for specific keywords, which was more efficient and useful than going through the entire code. The keywords used were as follows:

- encryption, key, RSA, AES, SHA, ciphersuite - for details related to the security aspect of the app

There following are the interesting results from these findings :

1. AES

   It shows that it use AES-CBC as encryption method.

```java
public final Cipher d(boolean retry) throws Exception {
    Key b10 = b();
    Cipher cipher = Cipher.getInstance("AES/CBC/PKCS7Padding");
    try {
        cipher.init(3, b10);
    } catch (KeyPermanentlyInvalidatedException e10) {
        this.f9903a.deleteEntry(f9897b);
        if (!retry) {
            throw new Exception("Could not create the cipher for
fingerprint authentication.", e10);
        }
        d(false);
    }
    return cipher;
}
```

Listing 1: com.ants360.yicamera.base.p.java

2. RSA

   It shows that it generate key pair for RSA.

```java
public static final PublicKey c(@k String key) {
    e0.p(key, "key");
    byte[] decode = Base64.decode(u.l2(u.l2(u.l2(key, "\n", "", false, 4,
 null), "-----BEGIN PUBLIC KEY-----", "", false, 4, null), "-----END
PUBLIC KEY-----", "", false, 4, null), 0);
    e0.o(decode, "decode(pubKeyString, Base64.DEFAULT)");
    PublicKey generatePublic = KeyFactory.getInstance("RSA").
generatePublic(new X509EncodedKeySpec(decode));
    e0.o(generatePublic, "kf.generatePublic(x509publicKey)");
}
```

Listing 2: v4.c.java

3. SHA-256

   It shows that it uses SHA-256 as hashing algorithm.

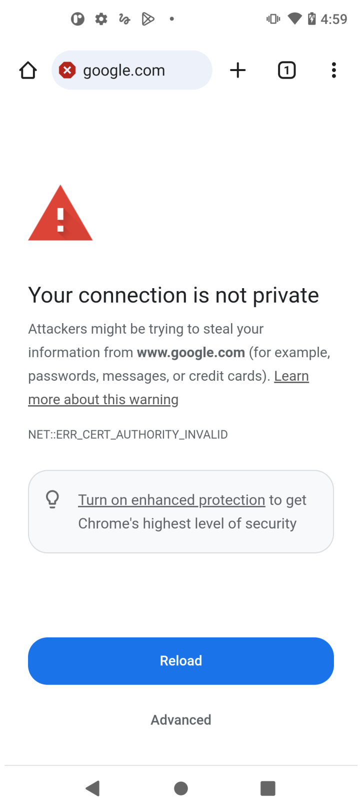
```java
public final byte[] d(String key) {
    byte[] bytes = "gcQu4mcDjQkPjcX1YY2X6xNaWyiWF0dD".getBytes();
    try {
        MessageDigest messageDigest = MessageDigest.getInstance("SHA-256"
);
        messageDigest.reset();
        return messageDigest.digest(key.getBytes("UTF-8"));
    } catch (UnsupportedEncodingException e10) {
        e10.printStackTrace();
        return bytes;
    } catch (NoSuchAlgorithmException e11) {
        e11.printStackTrace();
        return bytes;
    }
}
```

Listing 3: com.xiaoyi.base.util.y.java

## 4 Possible attacks against the device

### 4.1 Attacks by a local attacker with wi-fi access

For an attacker with wifi access, he can use burp to conduct a man-in-the-middle attack when the user's mobile phone already has a forged certificate installed. When the device sends data to the server, its packets will be intercepted by burp, if the certificate is successfully installed, then the browser will not have a security alert, on the contrary, it will warn the user that the connection is not private, as shown in Figure 2. When the packet is intercepted, the contents can be tampered with by burp and sent to the server, and the server's response message can also be intercepted by burp, so that the man-in-the-middle attack is fully realised.



Your connection is not private

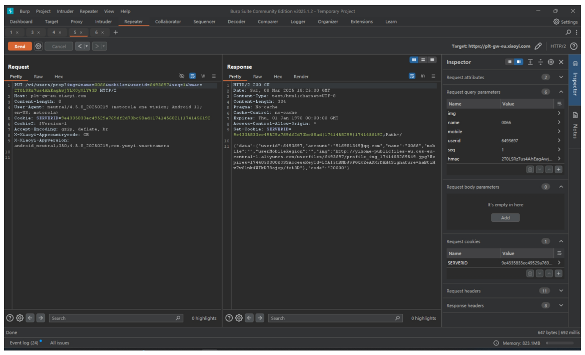
Attackers might be trying to steal your information from **www.google.com** (for example, passwords, messages, or credit cards). Learn more about this warning

NET::ERR_CERT_AUTHORITY_INVALID

Turn on enhanced protection to get Chrome's highest level of security

Figure 2: Connection is not private

We carried out the man-in-the-middle attack by modifying the username in the app. In our man-in-the-middle attack on the device, we found that every time a request is sent, the message generated by the client carries a message authentication code, and when the message is tampered with, the server will fail to authenticate and reject the request, and then force the client to log out.
Since the message authentication code is generated based on the content of the packet, we believe that we can carry out a replay attack, will have intercepted the successful access to the packet to save, and in the user to modify the packet sent to the server again using burp, the results of the verification of the re-sent packet is valid, the user unknowingly by us to modify the data on the server side. As shown in the Figure 33, we have used burp to intercept the packet in which the user changed his username to 0066. After the user changed his username to something else (e.g. 01), we re-sent the packet to the server to change his username to 0066, and as shown in Figure 4 that after the user logged in again, his username has changed to 00, which proves that we have successfully carried out the man-in-the-middle attack.

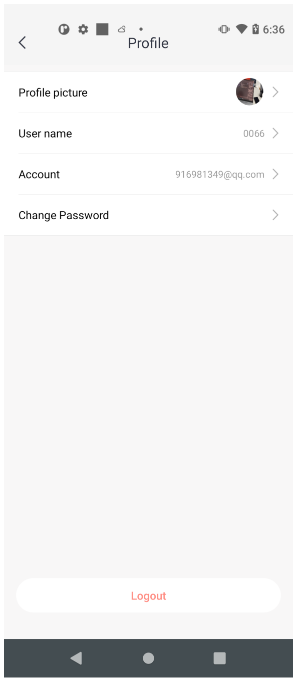


```
PUT /v4/users/prop?img=&name=0066&mobile=&userid=6493697&seq=1&hmac=2T0LSRz7us4AhEagAwjYLX0yX1Y%3D HTTP/2
Host: plt-gw-eu.xiaoyi.com
Content-Length: 0
User-Agent: neutral/4.5.8_20250219 (motorola one vision; Android 11; en-US; motorola)
Cookie: SERVERID=9e4335833ec49529a769df2d73bc58ad|1741456821|1741456192
Cookie2: $Version=1
Accept-Encoding: gzip, deflate, br
X-Xiaoyi-Appcountrycode: GB
X-Xiaoyi-Appversion: android_neutral;350;4.5.8_20250219;com.yunyi.smartcamera
```

```
HTTP/2 200 OK
Date: Sat, 08 Mar 2025 18:25:00 GMT
Content-Type: text/html;charset=UTF-8
Content-Length: 334
Pragma: No-cache
Cache-Control: no-cache
Expires: Thu, 01 Jan 1970 00:00:00 GMT
Access-Control-Allow-Origin: *
Set-Cookie: SERVERID=9e4335833ec49529a769df2d73bc58ad|1741458299|1741456192;Path=/

{"data":{"userid":6493697,"account":"916981349@qq.com","name":"0066","mobile":"","userMobileRegion":"","img":"http://yihome-publicfiles-eu.oss-eu-central-1.aliyuncs.com/userfiles/6493697/profile_img_1741458269549.jpg?Expires=1744050300&OSSAccessKeyId=LTAI5tBMbJvPGQkZeADXrDHH&Signature=haBtiHv7v6lnk4WTkD78ojop/fo%3D"},"code":"20000"}
```

Figure 3: Burp



Profile

| | |
|---|---|
| Profile picture | |
| User name | 0066 |
| Account | 916981349@qq.com |
| Change Password | |

Figure 4: Name changed

### 4.2 Attacks by a local attacker without wi-fi access

Reset button

### 4.3 Attacks by a remote attacker

None

## 5 Analysis of the weaknesses found

MITM attack
Brute force attack
DDOS attack

## A Additional technical information

Include additional technical information to support your report. APK files, pcap files, Burp logs, a proof of concept attack code can be given to me on a USB stick.