FIELD NOTE / ANDROID

Bypassing Flutter TLS/SSL Verification When reFlutter Fails

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During Flutter mobile application assessments, `reFlutter` is often the fastest option for bypassing TLS/SSL verification and redirecting traffic to an interception proxy. However, it does not always work. Unsupported engine hashes, debug Flutter engines, missing `libapp.so`, or newer Flutter versions can prevent the automated workflow from continuing.

This article documents a manual approach for those cases. Instead of relying on precomputed offsets, the exact Flutter engine version used by the target application is identified, the corresponding BoringSSL revision is resolved, and the certificate verification routine is located directly inside `libflutter.so`. The final offset can then be hooked with Frida to force the verification result to success.

This workflow is intended for authorized mobile application security testing only.

Overview

Flutter embeds BoringSSL inside the Flutter engine. On Android, the relevant code is compiled into `libflutter.so`. When the application validates a TLS certificate chain, the verification flow eventually reaches a BoringSSL routine responsible for validating the certificate chain and returning either success or failure.

The manual workflow is:

1. Extract the Flutter shared libraries from the APK.
2. Identify the Flutter engine version or engine commit from the snapshot hash.
3. Resolve the BoringSSL revision used by that engine.
4. Inspect the BoringSSL source to identify the target verification function.
5. Locate the compiled function inside `libflutter.so` using Ghidra.
6. Convert the Ghidra function address into a module-relative offset.
7. Hook the function with Frida and force the return value to success.

This keeps the process deterministic and avoids guessing offsets from unrelated Flutter builds.

When manual is required

The manual workflow is useful when `reFlutter` cannot process the APK. One common failure is an unsupported Flutter engine hash:

```
❯ reflutter app-release.apk
[*] Processing...

 Engine SnapshotHash: e80067bfb076e849f6ac3ba5a047eb2e

 This engine is currently not supported.
 Most likely this flutter application uses the Debug version engine which
 More details: https://github.com/Impact-I/reFlutter
```

In this situation, `reFlutter` has already extracted the snapshot hash, but it cannot map it to a supported engine offset. The hash can still be used as the starting point for manual analysis.

Another common failure is a missing Flutter application library:

```
❯ reflutter app.apk
[*] Processing...

Is this really a Flutter app?
There was no libapp.so (Android) or App (iOS) found in the package.

 Make sure there is arm64-v8a/libapp.so or App.framework/App file in the p
```

If this error appears, verify that the APK contains the expected Flutter libraries, especially: `lib/arm64-v8a/libapp.so` and `lib/arm64-v8a/libflutter.so`. If the libraries are missing, extract the correct APK build or confirm whether the application uses a different packaging layout.

Prerequisites

The following tools are used in this workflow:

- `apktool` or `unzip`, to extract APK contents.
- `reFlutter`, to retrieve or compare Flutter engine snapshot hashes.
- `Ghidra`, to locate the compiled verification routine in `libflutter.so`.
- `Frida`, to hook the target function at runtime.
- Basic command-line tools such as `curl`, `grep`, `sed`, `awk`, `base64`, and `unzip`.

1. Identify the Flutter engine version

If `reFlutter` already printed the engine snapshot hash, that hash can be used directly. Otherwise, compute the snapshot hash from `libapp.so`.

The `get_snapshot_hash.py` script can be taken from the reFlutter repository:

```
https://github.com/Impact-I/reFlutter/blob/main/scripts/get_snapshot_hash.
```

> *"Important: compute the snapshot hash from `libapp.so`, not `libflutter.so`. Running the script against `libflutter.so` produces an invalid result for this purpose."*

Example using the wrong file:

```
❯ python get_snapshot_hash.py app-release/lib/arm64-v8a/libflutter.so
344444444444444444444444443444
```

Example using the correct file:

```
❯ python get_snapshot_hash.py app-release/lib/arm64-v8a/libapp.so
78da37fed6bf1489361a312568249f3f
```

Next, match the snapshot hash against reFlutter's engine hash table:

```
curl https://raw.githubusercontent.com/Impact-I/reFlutter/refs/heads/main/
```

Output:

```
3.41.1,3452d735bd38224ef2db85ca763d862d6326b17f,78da37fed6bf1489361a312568
```

This means:

- Flutter version: `3.41.1`
- Flutter engine commit: `3452d735bd38224ef2db85ca763d862d6326b17f`
- Snapshot hash: `78da37fed6bf1489361a312568249f3f`

1b. Generate engine hash table (optional)

If the snapshot hash is not found in `enginehash.csv`, a fresh table can be generated from the reFlutter scripts.

```
git clone https://github.com/Impact-I/reFlutter
cd reFlutter/scripts/
python gen_enginehash.py
```

This process clones Flutter release data and can take time because the Flutter repository is large.

```
❯ python gen_enginehash.py
Cloning into './flutter'...
remote: Enumerating objects: 1116920, done.
remote: Counting objects: 100% (4065/4065), done.
remote: Compressing objects: 100% (590/590), done.
remote: Total 1116920 (delta 3664), reused 3475 (delta 3475), pack-reused
Receiving objects: 100% (1116920/1116920), 377.52 MiB | 11.92 MiB/s, done.
Resolving deltas: 100% (799956/799956), done.
Updating files: 100% (15517/15517), done.
{'hash': '2c9eb20739dfec95e2c74bd3dfa4601b0a8a36aa', 'channel': 'stable',
3.41.5,052f31d115eceda8cbff1b3481fcde4330c4ae12,78da37fed6bf1489361a312568
```

```
12
13  {'hash': '66c2526ea17d655269978e62c284174913506df2', 'channel': 'beta', 'v
14  3.43.0-0.1.pre,c85c7257fc89546563dc92a0764cc96c4445b2b2,fccb1c9c3827207e1a
15
16  -----------TRUNCATED-----------------
```

If you want to search the generated table directly, you can grep the repo:

```
1  ❯ grep -rn "78da37fed6bf1489361a312568249f3f" .
2  ./enginehash.csv
3  2:3.41.1,3452d735bd38224ef2db85ca763d862d6326b17f,l
4
5  ./scripts/enginehash.tmp.csv
6  2:3.41.5,052f31d115eceda8cbff1b3481fcde4330c4ae12,l
7  4:3.41.4,e4b8dca3f1b4ede4c30371002441c88c12187ed6,l
8  6:3.41.3,327ed814500baca0480a02f8555aa84a9afe32bf,l
9  9:3.41.2,6c0baaebf70e0148f485f27d5616b3d3382da7bf,l
10 10:3.41.1,3452d735bd38224ef2db85ca763d862d6326b17f,l
11 12:3.41.0,3452d735bd38224ef2db85ca763d862d6326b17f,l
12 14:3.41.0-0.3.pre,492bf6df86d056e47d05a3d5404f3d78939b3dae,l
13 16:3.41.0-0.2.pre,15d137647e372c59e8dcb78f670ab7686a0d1031,l
14 18:3.41.0-0.1.pre,d8756bc5ef1a76d727745d21fd1cf195340c1020,l
15 19:3.41.0-0.0.pre,b267090e310ab697b55c84373da954674f653b37,l
```

You may see matches in `enginehash.csv` or `scripts/enginehash.tmp.csv`. Use the matching line that contains your hash and read the version and engine commit from it.

2. Download the exact Flutter source

Download the source archive for the matching Flutter version:

```
1  wget https://github.com/flutter/flutter/archive/refs/tags/3.41.1.zip
```

The source archive is needed because the Flutter repository contains the `DEPS` file that maps Flutter to the exact dependency revisions used by that release, including BoringSSL.

3. Find the BoringSSL revision

Read the `DEPS` file from the Flutter source archive and search for the BoringSSL revision:

```
unzip -p 3.41.1.zip | grep boringssl_rev
```

Output:

```
❯ unzip -p 3.41.1.zip | grep boringssl_rev
  'dart_boringssl_rev': '9f138d05879fcf61965d1ea9d6c8b2cfc8bc12cb',
  'https://boringssl.googlesource.com/boringssl.git' + '@' + Var('dart_bor
binary file matches (found "\0" byte around offset 586862)
```

The BoringSSL commit used by this Flutter release is:

```
9f138d05879fcf61965d1ea9d6c8b2cfc8bc12cb
```

4. Inspect the BoringSSL Source

Retrieve the relevant BoringSSL source file from the resolved commit:

```
curl "https://boringssl.googlesource.com/boringssl/+/9f138d05879fcf61965d1
| base64 --decode > ssl_x509.cc
  % Total    % Received % Xferd  Average Speed   Time    Time     Time  Cu
                                 Dload  Upload   Total   Spent    Left  Sp
```

```
100 45088    0 45088    0     0   314k      0 --:--:-- --:--:-- --:--:--
```

Explanation:

- `+/COMMIT_HASH/` pins the exact revision from `DEPS`.
- `/ssl/ssl_x509.cc` is the file path inside the repo.
- `?format=TEXT` makes the server return base64-encoded content, which we decode into the file.

Search for `ssl_crypto_x509_session_verify_cert_chain`:

- This is the BoringSSL routine that performs the certificate chain verification for a session.
- Flutter's TLS verification path eventually calls this function, so forcing its return value to success disables the check.

First locate the function and its line number:

```
grep -n "ssl_crypto_x509_session_verify_cert_chain" ssl_x509.cc
```

Example output:

```
❯ grep -n "ssl_crypto_x509_session_verify_cert_chain" ssl_x509.cc
201:static bool ssl_crypto_x509_session_verify_cert_chain(SSL_SESSION *ses
357:    ssl_crypto_x509_session_verify_cert_chain,
```

The line that contains `static bool ...` is the function definition (line 201 in this case). The other line is just a reference. Use that line number to print a small window around the function:

ssl_x509.cc

```
❯ nl -ba ssl_x509.cc | sed -n '201,266p'
   201  static bool ssl_crypto_x509_session_verify_cert_chain(SSL_SESSION
   202                                                         SSL_HANDSHAK
   203                                                         uint8_t *out
   204    *out_alert = SSL_AD_INTERNAL_ERROR;
   205    STACK_OF(X509) *const cert_chain = session->x509_chain;
   206    if (cert_chain == nullptr || sk_X509_num(cert_chain) == 0) {
```

```
8   207       return false;
9   208     }
10  209
11  210     SSL *const ssl = hs->ssl;
12  211     SSL_CTX *ssl_ctx = ssl->ctx.get();
13  212     X509_STORE *verify_store = ssl_ctx->cert_store;
14  213     if (hs->config->cert->verify_store != nullptr) {
15  214       verify_store = hs->config->cert->verify_store;
16  215     }
17  216
18  217     X509 *leaf = sk_X509_value(cert_chain, 0);
19  218     const char *name;
20  219     size_t name_len;
21  220     SSL_get0_ech_name_override(ssl, &name, &name_len);
22  221     UniquePtr<X509_STORE_CTX> ctx(X509_STORE_CTX_new());
23  222     if (!ctx ||
24  223         !X509_STORE_CTX_init(ctx.get(), verify_store, leaf, cert_cha
25  224         !X509_STORE_CTX_set_ex_data(
26  225             ctx.get(), SSL_get_ex_data_X509_STORE_CTX_idx(), ssl) ||
27  226         // We need to inherit the verify parameters. These can be de
28  227         // the context: if its a server it will verify SSL client ce
29  228         // vice versa.
30  229         !X509_STORE_CTX_set_default(
31  230             ctx.get(),
32  231             ssl->server ? "ssl_client" : "ssl_server") ||  //
33  232         // Anything non-default in "param" should overwrite anything
34  233         !X509_VERIFY_PARAM_set1(X509_STORE_CTX_get0_param(ctx.get())
35  234                                 hs->config->param) ||  //
36  235         // ClientHelloOuter connections use a different name.
37  236         (name_len != 0 &&  //
38  237          !X509_VERIFY_PARAM_set1_host(X509_STORE_CTX_get0_param(ctx.
39  238                                       name_len))) {
40  239       OPENSSL_PUT_ERROR(SSL, ERR_R_X509_LIB);
41  240       return false;
42  241     }
43  242
44  243     if (hs->config->verify_callback) {
45  244       X509_STORE_CTX_set_verify_cb(ctx.get(), hs->config->verify_cal
46  245     }
47  246
48  247     int verify_ret;
49  248     if (ssl_ctx->app_verify_callback != nullptr) {
```

```
50      249       verify_ret =
51      250           ssl_ctx->app_verify_callback(ctx.get(), ssl_ctx->app_verif
52      251     } else {
53      252       verify_ret = X509_verify_cert(ctx.get());
54      253     }
55      254
56      255     session->verify_result = X509_STORE_CTX_get_error(ctx.get());
57      256
58      257     // If |SSL_VERIFY_NONE|, the error is non-fatal, but we keep the
59      258     if (verify_ret <= 0 && hs->config->verify_mode != SSL_VERIFY_NON
60      259       *out_alert = SSL_alert_from_verify_result(session->verify_resu
61      260       return false;
62      261     }
63      262
64      263     ERR_clear_error();
65      264     return true;
66      265   }
```

You should see the `OPENSSL_PUT_ERROR` call around line 239 in that function.

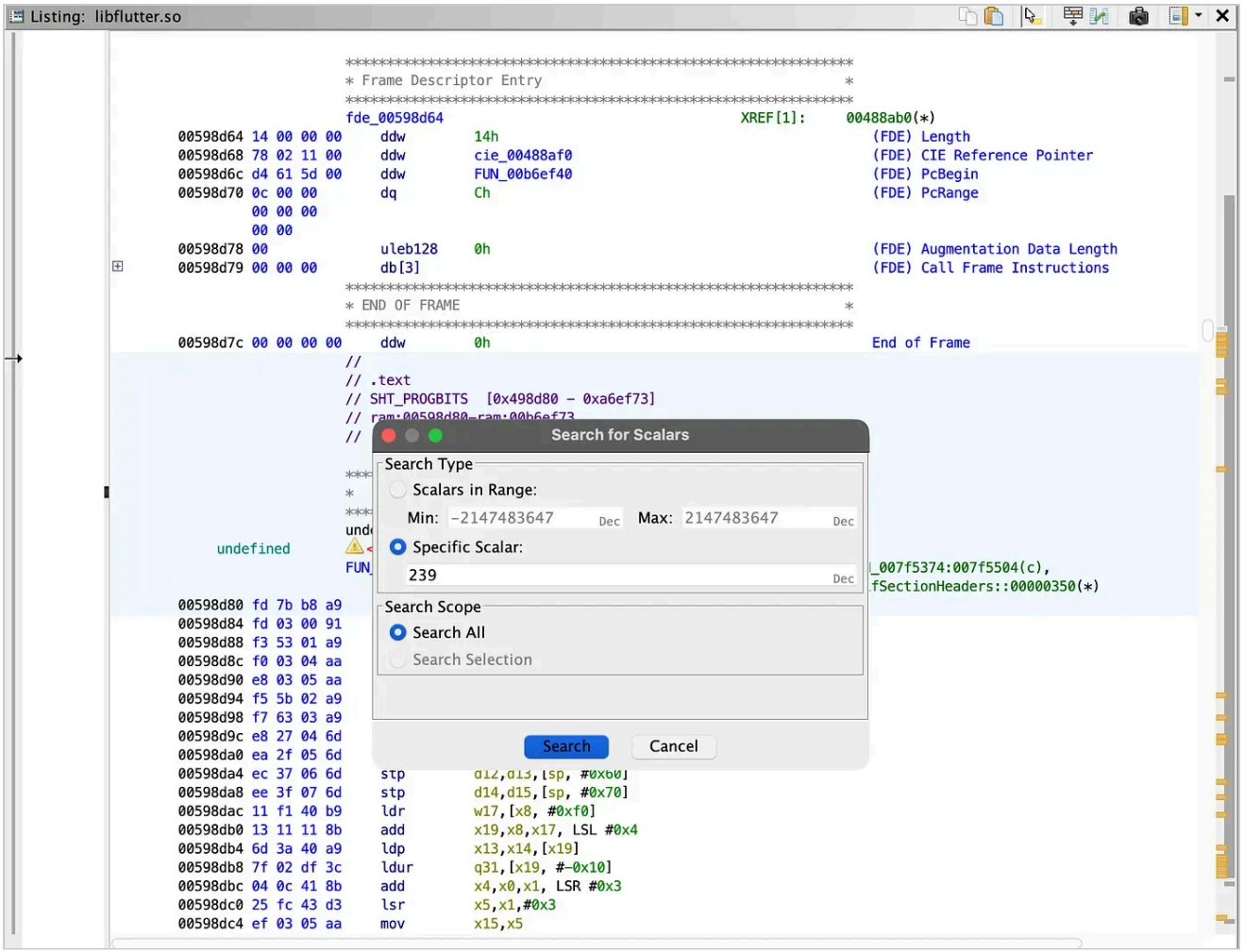
Note why the line number matters:

- `OPENSSL_PUT_ERROR` encodes the source line number into the error path.
- That line number becomes a constant in the compiled code.
- We search for that constant (239 in this example) to find the function in `libflutter.so`. If your line number is different, use your line number instead of 239.

5. Locate the function in Ghidra

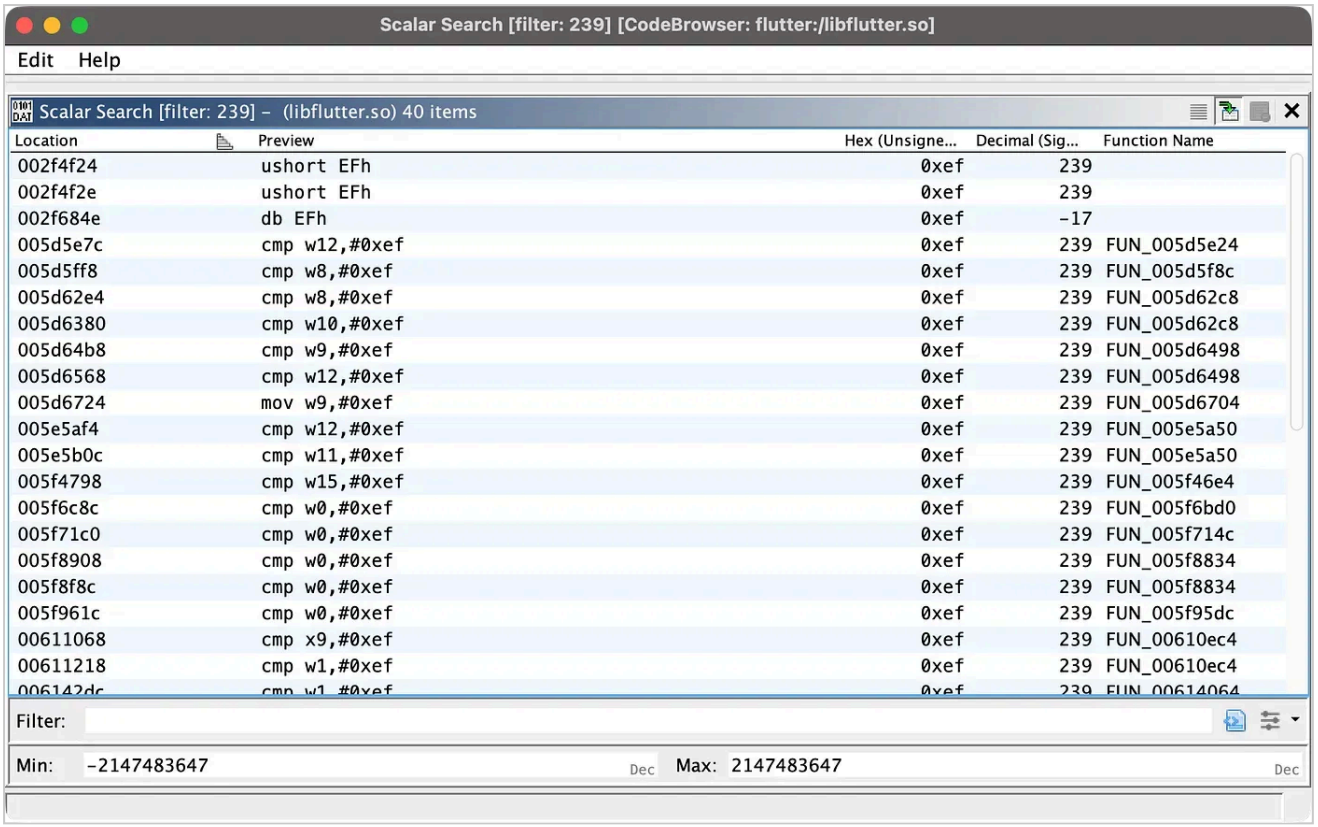
Open `libflutter.so` in Ghidra and let analysis complete.

- Search for **Scalar** value `239` (either **Search All** or **Search Selection**).



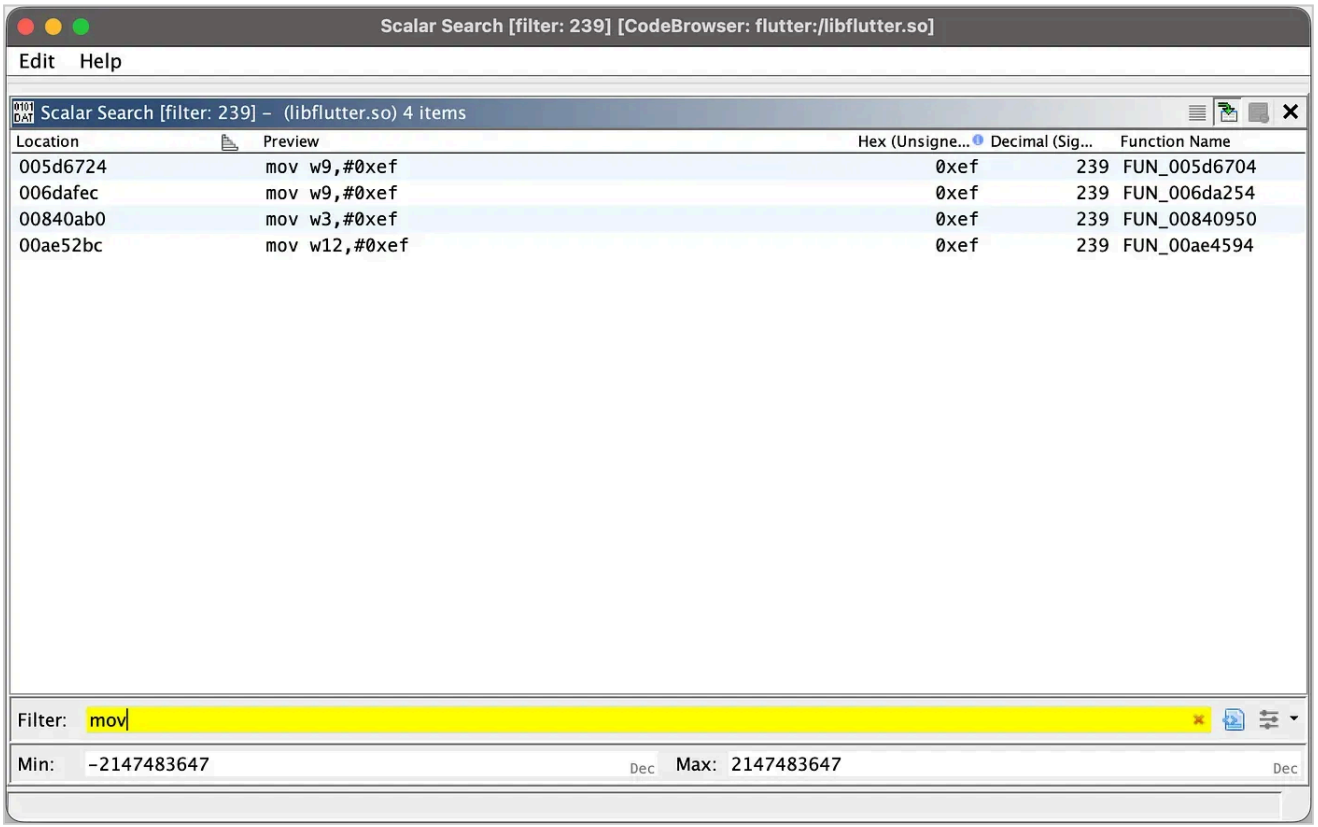
Search for Scalars

- The results will show places using that constant.



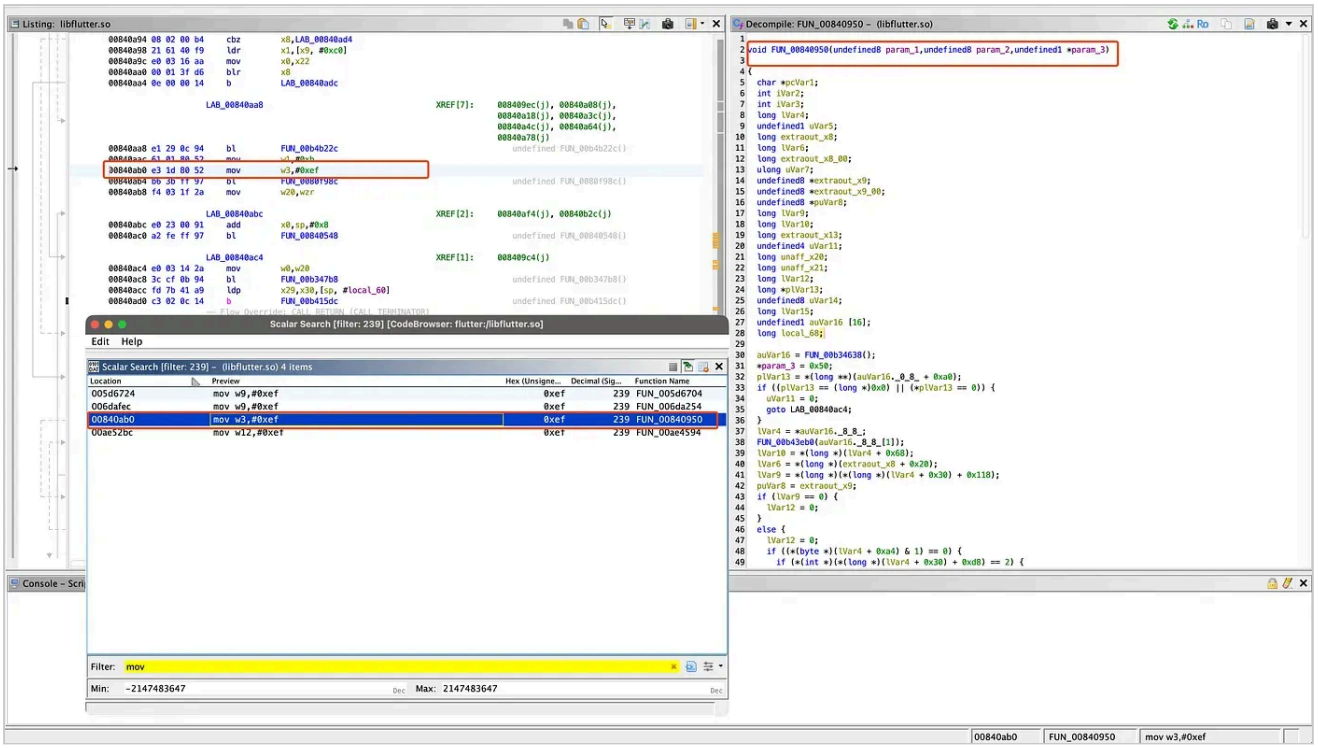
Result for 239 scalar search

- Filter by `mov` instructions.



Filter by mov instruction

- Click through candidates until the decompiler shows a function with **3 parameters** that matches the BoringSSL signature above.



In this case, the candidate function appears in Ghidra as:

```
void FUN_00840950(undefined8 param_1,undefined8 param_2,undefined1 *param_
{
  char *pcVar1;
  int iVar2;
  int iVar3;
  long lVar4;
  undefined1 uVar5;
  long extraout_x8;
  long lVar6;
  long extraout_x8_00;
  ulong uVar7;
  undefined8 *extraout_x9;
----------STRIPPED------
```

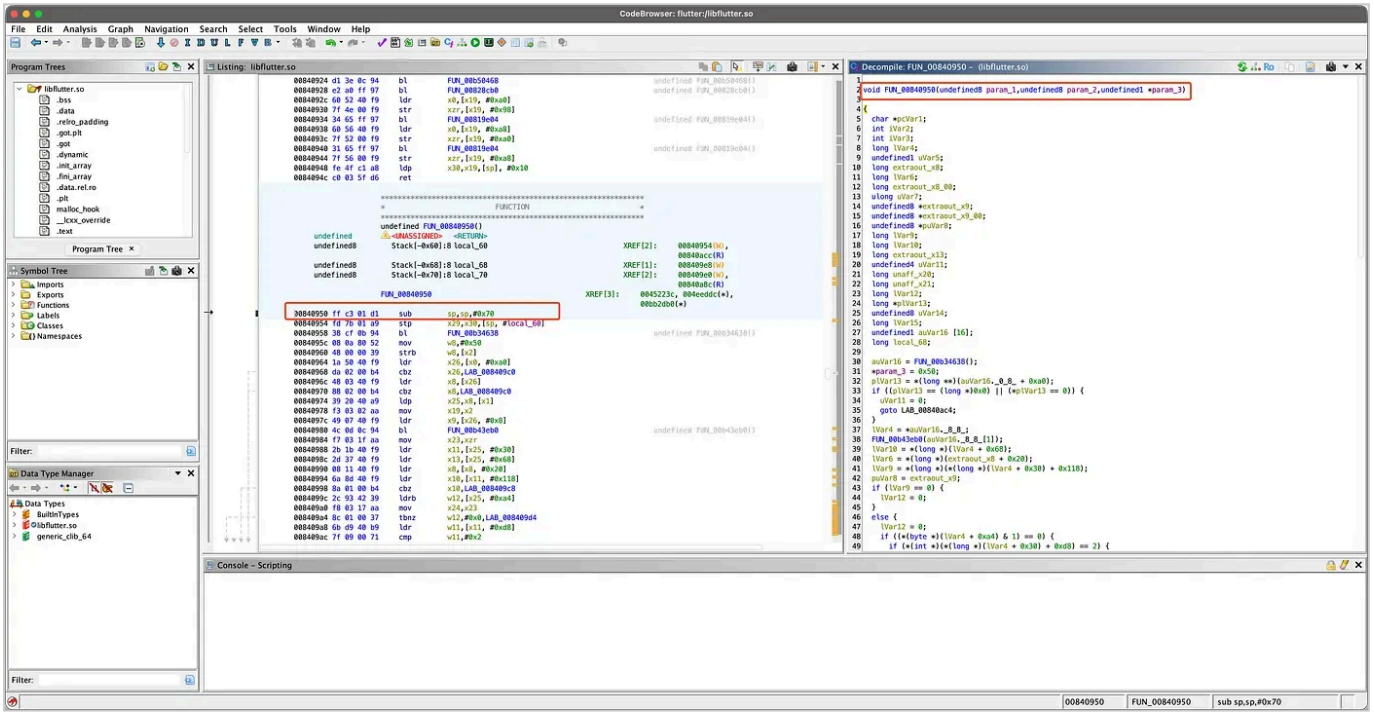
This is a strong candidate because the function has three parameters, which matches the source signature:

```
static bool ssl_crypto_x509_session_verify_cert_chain(
```

```
    SSL_SESSION *session,
    SSL_HANDSHAKE *hs,
    uint8_t *out_alert)
```

> *"In the compiled binary, argument types are not preserved, so Ghidra only marks an argument as a pointer when it can prove pointer-style usage. That is why the source shows three pointers while the decompiler may show two raw 64-bit arguments and one pointer. The count and usage still match the source, which makes this candidate more convincing."*

After we identify a candidate from the `mov` results, double-click the function(**FUN_00840950**) in the decompiler to jump to its address.



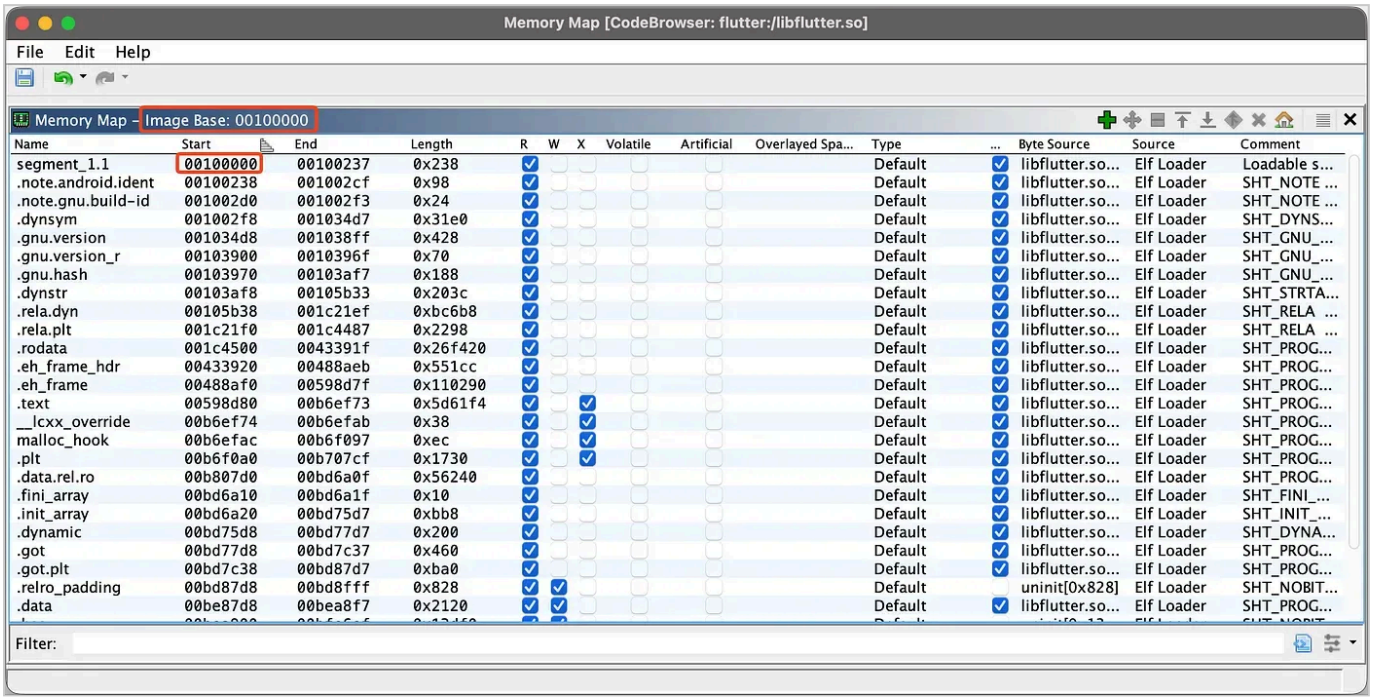
We know that the address is `0x00840950`. Keep this address, because we will use it to compute the final offset.

6. Convert the Ghidra Address to a Frida Offset

The address shown by Ghidra is an absolute address based on the image base used during analysis. Frida needs a module-relative offset from the loaded base address of `libflutter.so`.

Find the image base used by Ghidra, because the function address you see in Ghidra is an **absolute** address that includes this base. The Frida hook needs a `module offset`, so we subtract the image

base to get the final offset. Open Window → Memory Map and read the **Image Base** value. In the Memory Map window, the header shows `Image Base: 00100000` (so the base is `0x100000`).



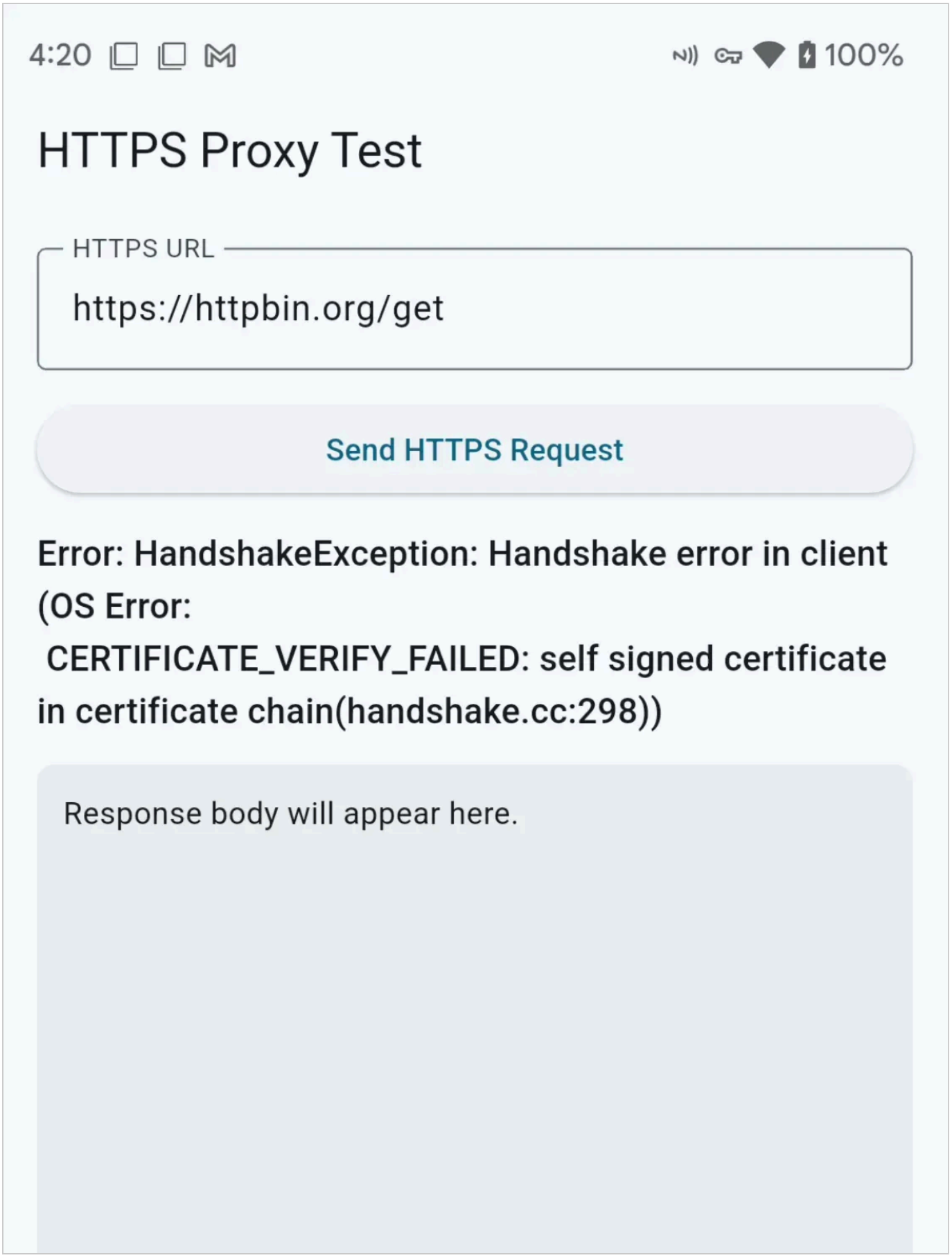
We can compute the final offset using this formula `FUNCTION_ADDRESS – 0x00100000`:

```
0x00840950 – 0x00100000 = 0x00740950
```

So our final offset: `0x00740950`

7. Hook the function with Frida

Before the hook is applied, HTTPS requests fail because the application rejects the proxy certificate.



Use Frida to hook the verification function and force it to return success. Replace `<OFFSET>` with the offset from our offset calculation above:

```
function attachNow() {
    var module = Process.findModuleByName("libflutter.so");
    if (!module) return false;

    console.log(`[+] libflutter is loaded at ${module.base}`);
    session_verify_cert_chain(module.base.add(<OFFSET>));
    return true;
}

function session_verify_cert_chain(address) {
    Interceptor.attach(address, {
        onLeave: function (retval) {
            retval.replace(0x1);
            console.log(`[+] session_verify_cert_chain retval: ${retval}`)
        }
    });
}

if (!attachNow()) {
    var do_dlopen = null;
    var call_constructor = null;

    Process.findModuleByName("linker64").enumerateSymbols().forEach(functi
        if (symbol.name.indexOf("do_dlopen") >= 0) {
            do_dlopen = symbol.address;
        }
        if (symbol.name.indexOf("call_constructor") >= 0) {
            call_constructor = symbol.address;
        }
    });

    if (!do_dlopen || !call_constructor) {
        console.log("[-] Could not find do_dlopen/call_constructor");
    } else {
        var lib_loaded = false;

        Interceptor.attach(do_dlopen, function () {
            var library_path = this.context.x0.readCString();
            if (library_path.indexOf("libflutter.so") >= 0) {
                Interceptor.attach(call_constructor, function () {
                    if (!lib_loaded) {
                        lib_loaded = true;
```

```
                        attachNow();
                    }
                });
            }
        });
    }
}
```

Run `frida-ps` to get the package name

```
❯ frida-ps -Ua | grep flutter
18665 flutter_ssl_project com.example.flutter_ssl_project
```

Run frida and attach to the current process by package name:

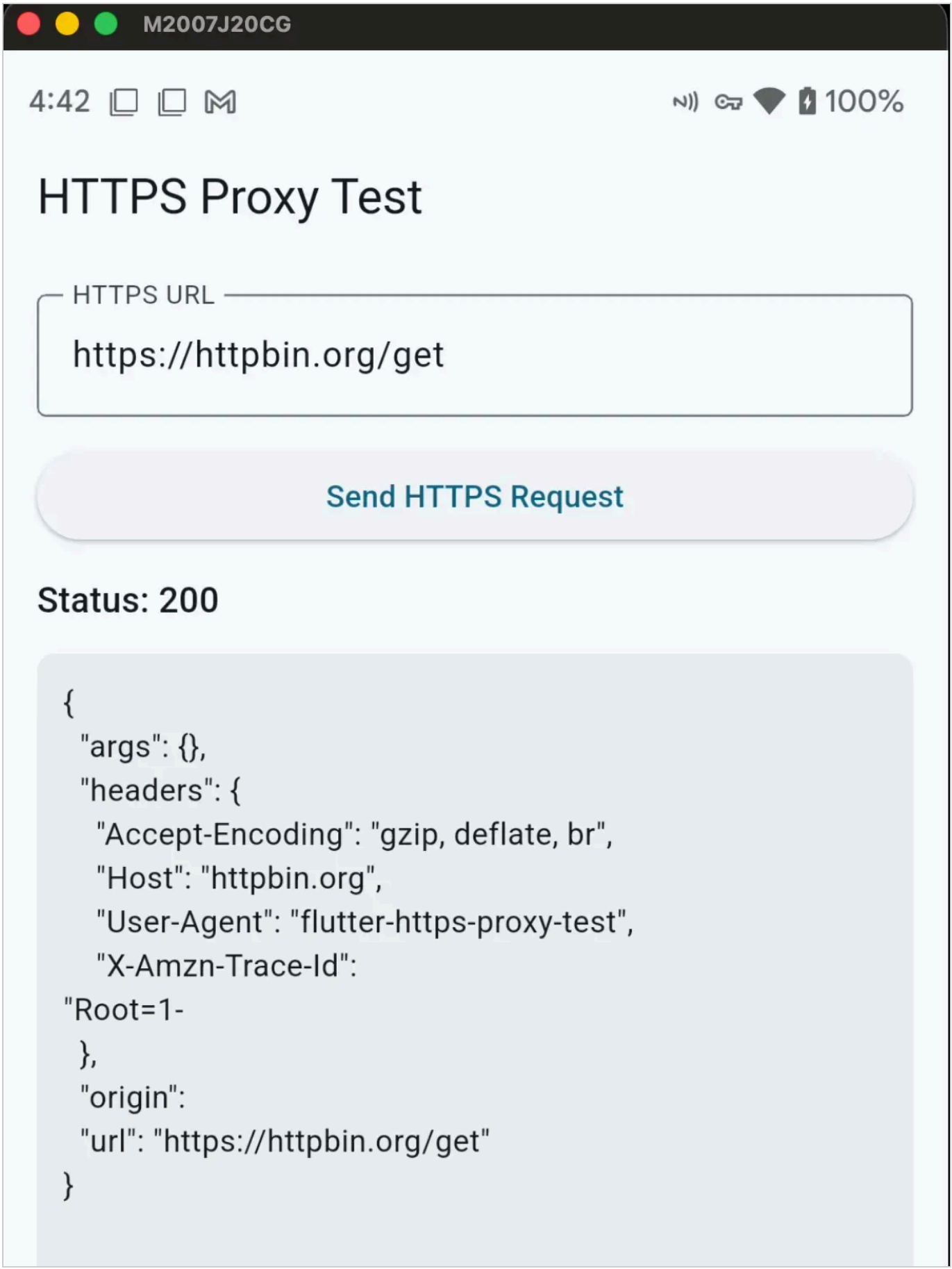
```
❯ frida -U -p $(frida-ps -Ua | grep com.example.flutter_ssl_project | awk
     ____
    / _  |   Frida 17.8.2 - A world-class dynamic instrumentation toolkit
   | (_| |
    > _  |   Commands:
   /_/ |_|       help      -> Displays the help system
   . . . .       object?   -> Display information about 'object'
   . . . .       exit/quit -> Exit
   . . . .
   . . . .   More info at https://frida.re/docs/home/
   . . . .
   . . . .   Connected to M2007J20CG (id=aded592c)

Attaching...
[+] libflutter is loaded at 0x7a3805b000
[M2007J20CG::PID::18665 ]->
```

Trigger an HTTPS request from the application using Send HTTPS Request button. If the correct function has been hooked, the Frida console should show a log similar to this:

```
[M2007J20CG::PID::18665 ]-> [+] session_verify_cert_chain retval: 0x1
```

If you do not see it, re-check the function address and base offset.

The app should be able to send HTTPS Request after we hook the **`session_verify_cert_chain`**.


M2007J20CG
4:42
100%
HTTPS Proxy Test
HTTPS URL
https://httpbin.org/get
Send HTTPS Request
Status: 200
{
"args": {},
"headers": {
"Accept-Encoding": "gzip, deflate, br",
"Host": "httpbin.org",
"User-Agent": "flutter-https-proxy-test",
"X-Amzn-Trace-Id":
"Root=1-
},
"origin":
"url": "https://httpbin.org/get"
}

Troubleshooting

No Frida log appears after sending HTTPS traffic

Re-check the calculated offset. Confirm that the Ghidra address was converted by subtracting the image base, not by using the raw Ghidra address directly.

Also confirm that the loaded library is really `libflutter.so` and that the process has not spawned a different architecture or process name.

The app crashes immediately after attaching Frida

If the offset and target function are correct but the app still crashes after Frida attaches, the crash may be caused by RASP, anti-Frida, anti-debugging, or anti-tampering controls rather than the TLS hook itself.

Validate this by attaching Frida without loading the TLS bypass script. If the app still crashes, the issue is likely related to instrumentation detection. A practical way to isolate the trigger is to test in stages: run the app normally, attach Frida without a script, attach Frida with a minimal logging script, then attach Frida with the TLS hook.

If the crash occurs before the TLS hook runs, handle the RASP or anti-instrumentation behavior first. The TLS bypass should only be debugged after the app can run stably under instrumentation.

The hook runs, but traffic still does not appear in Burp

The TLS verification bypass may be working, but traffic routing may still be incorrect. Check proxy configuration, Android network security settings, VPN or Zscaler routing, Burp listener binding, and whether the application ignores system proxy settings.

For Flutter apps, it is also common to combine this TLS bypass with traffic redirection techniques such as `adb reverse`, iptables redirection, or application-specific proxy forcing depending on the test environment.

The source function does not look exactly the same

BoringSSL changes over time. Different Flutter versions may use slightly different source code, line numbers, or function layouts. Always resolve the BoringSSL revision from the matching Flutter source instead of copying offsets from another app or another Flutter version.

Conclusion

When `reFlutter` cannot process a Flutter APK, the TLS/SSL verification bypass can still be performed manually. The key is to avoid guessing offsets. By identifying the exact Flutter engine version, resolving

the matching BoringSSL revision, locating the certificate-chain verification routine in `libflutter.so`, and converting the Ghidra address into a Frida module offset, the hook can be built in a repeatable and reliable way.

This approach is especially useful for unsupported Flutter engine hashes, debug Flutter builds, and cases where automated patching is not possible.

Originally published on Medium (https://medium.com/@petruknisme/bypassing-flutter-tls-ssl-verification-when-reflutter-fails-a4c41ff758a3).

Android # Security # Reverse Engineering