Smart Contract Audit Report

IOTAMPC Smart Contract

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1 EXECUTIVE SUMMARY

Numen Cyber Technology was engaged by IOTAMPC to review smart contract implementation. The assessment was conducted in accordance with our systematic approach to evaluate potential security issues based upon customer requirement. The report provides detailed recommendations to resolve the issue and provide additional suggestions or recommendations for improvement.

The four medium risk findings are mainly denial of service risks.

The outcome of the assessment outlined in chapter 3 provides the system's owners a full description of the vulnerabilities identified, the associated risk rating for each vulnerability, and detailed recommendations that will resolve the underlying technical issue.

METHODOLOGY

To standardize the evaluation, we define the following terminology based on OWASP Risk Rating Methodology [10] which is the gold standard in risk assessment using the following risk models:

- Likelihood: represents how likely a particular vulnerability is to be uncovered and exploited in the wild.
- Impact: measures the technical loss and business damage of a successful attack.
- Severity: determine the overall criticality of the risk.

Likelihood and impact are categorized into three ratings: High, Medium and Low. Severity is determined by likelihood and impact and can be classified into four categories accordingly, Critical, High, Medium, Low shown in table 1.1.

Table 1.1: Overall Risk Severity

To evaluate the risk, we will be going through a list of items, and each would be labelled with a severity category. The audit was performed with a systematic approach guided by a comprehensive assessment list carefully designed to identify known and impactful security issues. If our tool or analysis does not identify any issue, the contract can be considered safe regarding the assessed item. For any discovered issue, we might further deploy contracts on our private test environment and run tests to confirm the findings. If necessary, we would additionally build a PoC to demonstrate the possibility of exploitation. The concrete list of check items is shown in Table 1.2.

- Basic Coding Bugs: We first statically analyze given smart contracts with our proprietary static code analyzer for known coding bugs, and then manually verify (reject or confirm) all the issues found by our tool.

- Code and business security testing: We further review business logics, examine system operations, and place DeFi-related aspects under scrutiny to uncover possible pitfalls and/or bugs.

- Additional Recommendations: We also provide additional suggestions regarding the coding and development of smart contracts from the perspective of proven programming practices.

Category	Assessment Item
Basic Coding Assessment	Apply Verification Control
	Authorization Access Control
	Forged Transfer Vulnerability
	Forged Transfer Notification
	Numeric Overflow
	Transaction Rollback Attack
	Transaction Block Stuffing Attack
	Soft fail Attack
	Hard fail Attack
	Abnormal Memo
	Abnormal Resource Consumption
	Secure Random Number
Advanced Source Code Scrutiny	Asset Security
	Cryptography Security
	Business Logic Review
	Source Code Functional Verification
	Account Authorization Control
	Sensitive Information Disclosure

	Circuit Breaker
	Blacklist Control
	System API Call Analysis
	Contract Deployment Consistency Check
Additional Recommendations	Semantic Consistency Checks
	Following Other Best Practices

Table 1.2: The Full List of Assessment Items

To better describe each issue we identified, we categorize the findings with Common Weakness Enumeration (CWE-699) [14], which is a community-developed list of software weakness types to better delineate and organize weaknesses around concepts frequently encountered in software development.

2 FINDINGS OVERVIEW

2.1 PROJECT INFO AND CONTRACT ADDRESS

Project Name: IOTAMPC

Project URL: https://github.com/TanglePay/smpc-node

Audit Time: 2023/2/27 - 2023/3/14

Language: go-lang

Commit Hash: 6717c6cf0e0108932f9e80428f57022b8810f1f0

Contract Name	Source Code Link
IOTAMPC	https://github.com/TanglePay/smpc-node

2.2 SUMMARY

Severity	Found	
Critical	0	
High	0	
Medium	4	
Low	0	
Informational	0	

2.3 KEY FINDINGS

The four medium risk findings are mainly denial of service risks.

ID	Severity	Findings Title	Status	Confirm
NVE-001	Medium	Denial of Service	Ignore	Ignore
NVE-002	Medium	Denial of Service	Ignore	Ignore
NVE-003	Medium	Denial of Service	Ignore	Ignore
NVE-004	Medium	Denial of Service	Ignore	Ignore

Table 2.1: Key Audit Findings

3 Detailed Description of Findings

3.1 Denial of Service

ID: NVE-001

Location: rpc/smpc/rpc.go

Severity: Medium

Category: Denial of Service

Likelihood: Low

Impact: Medium

Description:

A maliciously crafted HTTP/2 stream could cause excessive CPU consumption in the HPACK decoder, sufficient to cause a denial of service from a small number of small requests.

```
685 func startRPCServer() error {      TpSmpc, 2 months ago • init …
686     go func() {
687         server = rpc.NewServer()//@audit startRPCServer calls net/http.Server.Serve,
688                                 //which eventually calls
689                                 //golang.org/x/net/http2.HeadersFrame.StreamEnded
690         service := new(Service)
691         if err := server.RegisterName("smpc", service); err != nil {
692             panic(err)
693         }
694
695         // All APIs registered, start the HTTP listener
696         var (
697             listener net.Listener
698             err      error
699         )
```

Recommendations:

Instead of use the package net/http@go1.19.1, please update to net/http@go1.20.1. And update the module golang.org/x/net to 0.7.0

Result: Pass

Fix Result:

Ignore

Confirm to upgrade the version of golang official standard library.

The underlying security depends on the anyswap package, so it is necessary to keep an eye on the anyswap library and update it in time.

3.2 Denial of Service

ID: NVE-001

Location: rpc/smpc/rpc.go

Severity: Medium

Category: Denial of Service

Likelihood: Low

Impact: Medium

Description:

Large handshake records may cause panics in crypto/tls. Both clients and servers may send large TLS handshake records which cause servers and clients, respectively, to panic when attempting to construct responses. This affects all TLS 1.3 clients, TLS 1.2 clients which explicitly enable session resumption (by setting Config.ClientSessionCache to a non-nil value), and TLS 1.3 servers which request client certificates (by setting Config.ClientAuth >= RequestClientCert).

Recommendations:

Update crypto/tls@go1.18 to crypto/tls@go1.20.1

Result: Pass

Fix Result:

Ignore

Confirm to upgrade the version of golang official standard library.

The underlying security depends on the anyswap package, so it is necessary to keep an eye on the anyswap library and update it in time.

3.3 Denial of Service

ID: NVE-001

Location: rpc/smpc/rpc.go

Severity: Medium

Category: Denial of Service

Likelihood: Low

Impact: Medium

Description:

A denial of service is possible from excessive resource consumption in net/http and mime/multipart. Multipart form parsing with mime/multipart.Reader.ReadForm can consume largely unlimited amounts of memory and disk files. This also affects form parsing in the net/http package with the Request methods FormFile, FormValue, ParseMultipartForm, and PostFormValue. ReadForm takes a maxMemory parameter, and is documented as storing "up to maxMemory bytes +10MB (reserved for non-file parts) in memory". File parts which cannot be stored in memory are stored on disk in temporary files. The unconfigurable 10MB reserved for non-file parts is excessively large and can potentially open a denial of service vector on its own. However, ReadForm did not properly account for all memory consumed by a parsed form, such as map entry overhead, part names, and MIME headers, permitting a maliciously crafted form to consume well over 10MB. In addition, ReadForm contained no limit on the number of disk files created, permitting a relatively small request body to create a large number of disk temporary files. With fix, ReadForm now properly accounts for various forms of memory overhead, and should now stay within its documented limit of 10MB + maxMemory bytes of memory consumption. Users should still be aware that this limit is high and may still be hazardous. In addition, ReadForm now creates at most one on-disk temporary file, combining multiple form parts into a single temporary file. The mime/multipart.File interface type's documentation states, "If stored on disk, the File's underlying concrete type will be an *os.File.".

This is no longer the case when a form contains more than one file part, due to this coalescing of parts into a single file. The previous behavior of using distinct files for each form part may be reenabled with the environment variable GODEBUG=multipartfiles=distinct. Users should be aware that multipart.ReadForm and the http.Request methods that call it do not limit the amount of disk consumed by temporary files. Callers can limit the size of form data with http.MaxBytesReader.

```
692    service := new(Service) //@audit startRPCServer calls net/http.Server.Serve,
693                            //which eventually calls
694                            //mime/multipart.Reader.ReadForm
695    if err := server.RegisterName("smpc", service); err != nil {
696        panic(err)
697    }
698
```

Recommendations:

Update mime/multipart@go1.18 to mime/multipart@go1.20.1

Result: Pass

Fix Result:

Ignore

Confirm to upgrade the version of golang official standard library.

The underlying security depends on the anyswap package, so it is necessary to keep an eye on the anyswap library and update it in time.

3.4 DENIAL OF SERVICE

ID: NVE-001

Location: smpc/base.go

Severity: Medium

Category: stack exhaustion

Likelihood: Low

Impact: Medium

Description:

Calling Decoder.Decode on a message which contains deeply nested structures can cause a panic due to stack exhaustion.

Recommendations:

Update encoding/gob@go1.18 to encoding/gob@go1.18.4cd

Result: Pass

Fix Result:

Ignore

Confirm to upgrade the version of golang official standard library.

The underlying security depends on the anyswap package, so it is necessary to keep an eye on the anyswap library and update it in time.

4 CONCLUSION

In this audit, we thoroughly analyzed IOTAMPC smart contract implementation. The problems found are described and explained in detail in Section 3.The problems found in the audit have been brought up to the project party, ignored issues are in line with the project design. We therefore deem the audit result to be a PASS. To improve this report, we greatly appreciate any constructive feedbacks or suggestions, on our methodology, audit findings, or potential gaps in scope/coverage.

5 APPENDIX

5.1 BASIC CODING ASSESSMENT

5.1.1 Apply Verification Control

- Description: The security of apply verification
- Result: Not found
- Severity: Critical

5.1.2 Authorization Access Control

- Description: Permission checks for external integral functions
- Result: Not found
- Severity: Critical

5.1.3 Forged Transfer Vulnerability

- Description: Assess whether there is a forged transfer notification vulnerability in the contract
- Result: Not found
- Severity: Critical

5.1.4 Transaction Rollback Attack

- Description: Assess whether there is transaction rollback attack vulnerability in the contract.
- Result: Not found
- Severity: Critical

5.1.5 Transaction Block Stuffing Attack

- Description: Assess whether there is transaction blocking attack vulnerability.
- Result: Not found
- Severity: Critical

5.1.6 soft fail Attack Assessment

- Description: Assess whether there is soft fail attack vulnerability.
- Result: Not found
- Severity: Critical

5.1.7 hard fail Attack Assessment

- Description: Examine for hard fail attack vulnerability
- Result: Not found
- Severity: Critical

5.1.8 Abnormal Memo Assessment

- Description: Assess whether there is abnormal memo vulnerability in the contract.
- Result: Not found
- Severity: Critical

5.1.9 Abnormal Resource Consumption

- Description: Examine whether abnormal resource consumption in contract processing.
- Result: Not found
- Severity: Critical

5.1.10 Random Number Security

- Description: Examine whether the code uses insecure random number.
- Result: Not found
- Severity: Critical

5.2 Advanced Code Scrutiny

5.2.1 Cryptography Security

- Description: Examine for weakness in cryptograph implementation.
- Results: Not Found
- Severity: High

5.2.2 Account Permission Control

- Description: Examine permission control issue in the contract
- Results: Not Found
- Severity: Medium

5.2.3 Malicious Code Behaviour

- Description: Examine whether sensitive behaviour present in the code
- Results: Not found
- Severity: Medium

5.2.4 Sensitive Information Disclosure

- Description: Examine whether sensitive information disclosure issue present in the code.
- Result: Not found

- Severity: Medium

5.2.5 System API

- Description: Examine whether system API application issue present in the code
- Results: Not found
- Severity: Low

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This report should not be used in any way to make decisions around investment or involvement with any particular project. This report in no way provides investment advice, nor should be leveraged as investment advice of any sort. This report represents an extensive assessing process intending to help our customers increase the quality of their code while reducing the high level of risk presented by cryptographic tokens and blockchain technology.

Blockchain technology and cryptographic assets present a high level of ongoing risk. Numen's position is that each company and individual are responsible for their own due diligence and continuous security. Numen's goal is to help reduce the attack vectors and the high level of variance associated with utilizing new and consistently changing technologies, and in no way claims any guarantee of security or functionality of the technology we agree to analyze.

REFERENCES

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[9] MITRE. CWE CATEGORY: Resource Management Errors. https://cwe.mitre.org/data/ definitions/399.html.

[10] OWASP. Risk Rating Methodology. https://www.owasp.org/index.php/OWASP_Risk_Rating_Methodology

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