

Niftify

NFT

Smart Contract Audit Final Report



September 04, 2021

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This audit does not provide a security or correctness guarantee of the audited smart contract. Securing smart contracts is a multistep process, therefore running a bug bounty program as a complement to this audit is strongly recommended.

Introduction

1. About Niftify

Niftify is on a mission to create a strong community of NFT enthusiasts (content creators, traders, investors, etc.) wanting to buy, sell or trade NFTs, in a hassle-free environment.

There are already several NFT marketplaces, most of which need programming expertise to make successful use of them, which introduces more difficulty and the lack of accessibility. They are typically complex to use and difficult to understand and require in-depth trading knowledge and programming skills, which alienates new customers and proves to be time-consuming for the more experienced traders.

Users can only buy Non-fungible tokens (NFTs) with cryptocurrencies. While on a worldwide scale a high percentage of users do not have access to cryptocurrencies or simply do not want to use them, not to talk of using to purchase a simple NFT.

Another issue NFTs are facing is the fact that only traditional media types such as art, music, videos as well as gaming assets are on the market.

Visit <https://niftify.io/> to know more about.

2. About ImmuneBytes

ImmuneBytes is a security start-up to provide professional services in the blockchain space. The team has hands-on experience in conducting smart contract audits, penetration testing, and security consulting. ImmuneBytes's security auditors have worked on various A-league projects and have a great understanding of DeFi projects like AAVE, Compound, 0x Protocol, Uniswap, dydx.

The team has been able to secure 75+ blockchain projects by providing security services on different frameworks. ImmuneBytes team helps start-up with a detailed analysis of the system ensuring security and managing the overall project.

Visit <http://immunebytes.com/> to know more about the services.

Documentation Details

The Niftify team has provided the following doc for the purpose of audit:

1. <https://niftify.io/lightpaper>
2. <https://docs.google.com/document/d/1s6r7jG7lWeOlctJnCSBneg1ZC0xH2AtcyYwjQnAE14o/edit>

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Audit Process & Methodology

ImmuneBytes team has performed thorough testing of the project starting with analyzing the code design patterns in which we reviewed the smart contract architecture to ensure it is structured and safe use of third-party smart contracts and libraries.

Our team then performed a formal line-by-line inspection of the Smart Contract in order to find any potential issues like Signature Replay Attacks, Unchecked External Calls, External Contract Referencing, Variable Shadowing, Race conditions, Transaction-ordering dependence, timestamp dependence, DoS attacks, and others.

In the Unit testing phase, we run unit tests written by the developer in order to verify the functions work as intended. In Automated Testing, we tested the Smart Contract with our in-house developed tools to identify vulnerabilities and security flaws.

The code was audited by a team of independent auditors which includes -

1. Testing the functionality of the Smart Contract to determine proper logic has been followed throughout.
2. Analyzing the complexity of the code by thorough, manual review of the code, line-by-line.
3. Deploying the code on testnet using multiple clients to run live tests.
4. Analyzing failure preparations to check how the Smart Contract performs in case of bugs and vulnerabilities.
5. Checking whether all the libraries used in the code are on the latest version.
6. Analyzing the security of the on-chain data.

Audit Details

- Project Name: Niftify
- Contracts Name: NiftifyERC1155.sol, NiftifyERC721.sol, TokenStorage.sol, NiftifyNFTVoucher.sol
- Languages: Solidity(Smart contract), Javascript(Unit Testing)
- Github commit for initial audit: [19d63f7369e3b3c61a860ea147ac7bfb8c689ad7](#)
- Github commit for final audit: [3c1bbedfe56a2ac56579869c6652583567e14387](#)
- Platforms and Tools: Remix IDE, Truffle, Ganache, Solhint, Contract Library, Slither, SmartCheck

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Audit Goals

The focus of the audit was to verify that the smart contract system is secure, resilient, and working according to its specifications. The audit activities can be grouped into the following three categories:

1. Security: Identifying security-related issues within each contract and within the system of contracts.
2. Sound Architecture: Evaluation of the architecture of this system through the lens of established smart contract best practices and general software best practices.
3. Code Correctness and Quality: A full review of the contract source code. The primary areas of focus include:
 - a. Correctness
 - b. Readability
 - c. Sections of code with high complexity
 - d. Quantity and quality of test coverage

Security Level References

Every issue in this report was assigned a severity level from the following:

High severity issues will bring problems and should be fixed.

Medium severity issues could potentially bring problems and should eventually be fixed.

Low severity issues are minor details and warnings that can remain unfixed but would be better fixed at some point in the future.

Issues	<u>High</u>	<u>Medium</u>	<u>Low</u>
Open	-	-	-
Closed	-	1	2

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Contract: TokenStorage

High Severity Issues

No issues were found.

Medium severity issues

1. Operator Role has not been set up in the contract

Line no - 8

Explanation:

The **OPERATOR_ROLE** in the TokenStorage contract has not been assigned to any particular address within the contract.

Is this Intended?

While the **Minter** and **Redeemer** roles can be handled later via admin, the operator role might need an initial setup as functions like **setBlocked** uses **Operator_Roles** as a requirement, in the contract.

```
66
67     function setBlocked(uint256 _tokenId, bool _value) external onlyOperator {
68         _blocked[_tokenId] = _value;
69     }
70
```

Recommendation:

If the above-mentioned scenario is not intended, then the Operator Role should be assigned to a particular address during deployment.

Amended (September 4th, 2021): The issue has been fixed by the Niftify team and is no longer present in commit [3c1bbedfe56a2ac56579869c6652583567e14387](https://github.com/Niftify/TokenStorage/commit/3c1bbedfe56a2ac56579869c6652583567e14387).

Low Severity Issues

1. Absence of Error messages in Require Statements

Line no - 47

Explanation:

The **TokenStorage** contract includes a **require statement** in the **_setRoyalty** function(at the above-mentioned line) that doesn't contain any error message within itself.

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While this makes it troublesome to detect the reason behind a particular function revert, it also reduces the readability of the code.

Recommendation:

Error Messages must be included in every require statement in the contract.

Amended (September 4th, 2021): The issue has been fixed by the Niftify team and is no longer present in commit [3c1bbedfe56a2ac56579869c6652583567e14387](https://github.com/immunebytes/immunebytes/commit/3c1bbedfe56a2ac56579869c6652583567e14387).

2. External Visibility should be preferred

Explanation:

Those functions that are never called throughout the contract should be marked as **external** instead of **public** visibility.

This will effectively result in Gas Optimization as well.

The following function in the TokenStorage contract has been assigned **public visibility** but never called from within the contract:

- **metadataHash() #Line 22**

Recommendation:

If the **PUBLIC** visibility of the above-mentioned functions is not intended, then the **EXTERNAL** visibility keyword should be preferred.

Amended (September 4th, 2021): The issue has been fixed by the Niftify team and is no longer present in commit [3c1bbedfe56a2ac56579869c6652583567e14387](https://github.com/immunebytes/immunebytes/commit/3c1bbedfe56a2ac56579869c6652583567e14387).

Recommendations

1. Coding Style Issues in the Contract

Explanation:

Code readability of a Smart Contract is largely influenced by the Coding Style issues and in some specific scenarios may lead to bugs in the future.

During the automated testing, it was found that the **TokenStorage** contract had quite a few code-style issues.

```
INFO:Detectors:
Parameter TokenStorage.metadataHash(uint256)._tokenId (myFlats/flatTokenStorage.sol#471) is not in mixedCase
Parameter TokenStorage.creator(uint256)._tokenId (myFlats/flatTokenStorage.sol#483) is not in mixedCase
Parameter TokenStorage.royalty(uint256)._tokenId (myFlats/flatTokenStorage.sol#491) is not in mixedCase
Parameter TokenStorage.royaltyInfo(uint256,uint256)._tokenId (myFlats/flatTokenStorage.sol#500) is not in mixedCase
Parameter TokenStorage.royaltyInfo(uint256,uint256)._salePrice (myFlats/flatTokenStorage.sol#500) is not in mixedCase
Parameter TokenStorage.blocked(uint256)._tokenId (myFlats/flatTokenStorage.sol#512) is not in mixedCase
Parameter TokenStorage.setBlocked(uint256,bool)._tokenId (myFlats/flatTokenStorage.sol#516) is not in mixedCase
Parameter TokenStorage.setBlocked(uint256,bool)._value (myFlats/flatTokenStorage.sol#516) is not in mixedCase
Parameter TokenStorage.supportsInterface(bytes4)._interfaceId (myFlats/flatTokenStorage.sol#520) is not in mixedCase
```

Recommendation:

Therefore, it is recommended to fix the issues like naming convention, indentation, and code layout issues in a smart contract.

Acknowledged (September 4th, 2021): Intensional functionality by the developers.

“Coding style issues - with the names like `_tokenId` we do not understand the issue listed in the audit. We are using `mixedCase`, that is `tokenId` and adding `_` in the front as it should be the exception. We are adding `_` to tell that this is a private variable or function variable - private within the function as an input.”

2. NatSpec Annotations must be included

Explanation:

The smart contracts do not include the NatSpec annotations adequately.

Recommendation:

Cover by NatSpec all Contract methods.

Amended (September 4th, 2021): The issue has been fixed by the Niftify team and is no longer present in commit [3c1bbedfe56a2ac56579869c6652583567e14387](https://github.com/0xNifty/0xNifty/commit/3c1bbedfe56a2ac56579869c6652583567e14387).

3. Multiplication is being performed on the result of Division

Line no - 83-94

Explanation:

During the automated testing of the **TokenStorage** contract, it was found that the contract includes a function that performs multiplication on the result of a Division.

Integer Divisions in Solidity might truncate. Moreover, this performing division before multiplication might lead to a loss of precision.

The following function involves division before multiplication in the mentioned lines:

- **mulScale** at 83-94

The automated Test result has been attached below:

```
TokenStorage.mulScale(uint256,uint256,uint32) (myFlats/flatTokenStorage.sol#532-543) performs a multiplication on the result of a division:  
-c = y / scale (myFlats/flatTokenStorage.sol#539)  
-a * c * scale + a * d + b * c + (b * d) / scale (myFlats/flatTokenStorage.sol#542)  
Reference: https://github.com/crytic/slither/wiki/Detector-Documentation#divide-before-multiply
```

Recommendation:

Solidity doesn't encourage arithmetic operations that involve division before multiplication. Therefore it is highly recommended to write extensive test cases to ensure the function behavior is as per the expectation. The above-mentioned functions should be redesigned only if they do not lead to expected results.

Acknowledged (September 4th, 2021): Intensional functionality by the developers.

Note by team:

"Multiplication as a result of division - we don't see this as an issue, because we are correctly handling the remainder of the division. We need this scale, because to calculate royalty we use scale - 100 000 000 = 100%. We have added test cases to support these test but would love if you can provide any cases where this fails. We think this comes just from automated tests as people do this without using the remainder properly."

Contract NiftifyERC721

High Severity Issues

No issues were found.

Medium severity issues

No issues were found.

Low Severity Issues

No issues were found.

Recommendations

1. Coding Style Issues in the Contract

Explanation:

Code readability of a Smart Contract is largely influenced by the Coding Style.

During the automated testing, it was found that the **NiftifyERC721** contract had quite a few code-style issues.

```
Parameter NiftifyERC721.redeem(NiftifyNFTVouchers.ERC721Voucher)._voucher (myFlats/flaterc721.sol#2027) is not in mixedCase
Parameter NiftifyERC721.mint(NiftifyNFTVouchers.ERC721Voucher). voucher (myFlats/flaterc721.sol#2044) is not in mixedCase
Parameter NiftifyERC721.mintAndTransfer(NiftifyNFTVouchers.ERC721Voucher,address). voucher (myFlats/flaterc721.sol#2058) is not in mixedCase
Parameter NiftifyERC721.mintAndTransfer(NiftifyNFTVouchers.ERC721Voucher,address). receiver (myFlats/flaterc721.sol#2058) is not in mixedCase
Parameter NiftifyERC721.updateMetadataHash(NiftifyNFTVouchers.UpdateMetadataHashVoucher). voucher (myFlats/flaterc721.sol#2066) is not in mixedCase
Parameter NiftifyERC721.supportsInterface(bytes4). interfaceId (myFlats/flaterc721.sol#2098) is not in mixedCase
Reference: https://github.com/crytic/slither/wiki/Detector-Documentation#conformance-to-solidity-naming-conventions
```

Recommendation:

Therefore, it is quite effective to fix the issues like naming convention, indentation, and code layout issues in a smart contract.

Acknowledged (September 4th, 2021): Intensional functionality by the developers.

“Coding style issues - with the names like `_tokenId` we do not understand the issue listed in the audit. We are using `mixedCase`, that is `tokenId` and adding `_` in the front as it should be the exception. We are adding `_` to tell that this is a private variable or function variable - private within the function as an input.”

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2. NatSpec Annotations must be included

Explanation:

The smart contracts do not include the NatSpec annotations adequately.

Recommendation:

Cover by NatSpec all Contract methods.

Amended (September 4th, 2021): The issue has been fixed by the Niftify team and is no longer present in commit [3c1bbedfe56a2ac56579869c6652583567e14387](#).

Contract NiftyERC1155

High Severity Issues

No issues were found.

Medium severity issues

No issues were found.

Low Severity Issues

No issues were found.

Recommendations

1. Coding Style Issues in the Contract

Explanation:

Code readability of a Smart Contract is largely influenced by the Coding Style.

During the automated testing, it was found that the **NiftyERC1155** contract had quite a few code-style issues.

```
Parameter NiftyERC1155.redeem(NiftyNFTVouchers.ERC1155Voucher)._voucher (myFlats/Flaterc1155.sol#2131) is not in mixedCase
Parameter NiftyERC1155.mint(NiftyNFTVouchers.ERC1155Voucher)._voucher (myFlats/Flaterc1155.sol#2157) is not in mixedCase
Parameter NiftyERC1155.mintAndTransfer(NiftyNFTVouchers.ERC1155Voucher,address)._voucher (myFlats/Flaterc1155.sol#2174) is not in mixedCase
Parameter NiftyERC1155.mintAndTransfer(NiftyNFTVouchers.ERC1155Voucher,address)._receiver (myFlats/Flaterc1155.sol#2174) is not in mixedCase
Parameter NiftyERC1155.updateMetadataHash(NiftyNFTVouchers.UpdateMetadataHashVoucher)._voucher (myFlats/Flaterc1155.sol#2188) is not in mixedCase
Parameter NiftyERC1155.supportsInterface(bytes4)._interfaceId (myFlats/Flaterc1155.sol#2225) is not in mixedCase
Reference: https://github.com/crytic/slither/wiki/Detector-Documentation#conformance-to-solidity-naming-conventions
```

Recommendation:

Therefore, it is recommended to fix the issues like naming convention, indentation, and code layout issues in a smart contract.

Acknowledged (September 4th, 2021): Intensional functionality by the developers.

“Coding style issues - with the names like `_tokenId` we do not understand the issue listed in the audit. We are using mixedCase, that is tokenId and adding `_` in the front as it should be the exception. We are adding `_` to tell that this is a private variable or function variable - private within the function as an input.”

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2. NatSpec Annotations must be included

Explanation:

The smart contracts do not include the NatSpec annotations adequately.

Recommendation:

Cover by NatSpec all Contract methods.

Amended (September 4th, 2021): The issue has been fixed by the Niftify team and is no longer present in commit [3c1bbedfe56a2ac56579869c6652583567e14387](#).

Contract NiftifyNFTVouchers

High Severity Issues

No issues were found.

Medium severity issues

No issues were found.

Low Severity Issues

No issues were found.

Recommendations

--

Unit Test

1. ERC1155

```

NiftyfyERC1155
Vouchers
  ✓ Should redeem NFT from signature (87ms)
  ✓ Should fail to redeem voucher, that was already redeemed (167ms)
Minting
  ✓ Anyone should be able to mint any token with admins signature (87ms)
  ✓ Anyone should be able to mint and transfer any token with admin signature (85ms)
  ✓ Should not be able to mint token with non operator signature (43ms)
Storage
  ✓ Should be able to get hash of any token
  ✓ Should be able to get creator address of any token
  ✓ Should be able to get royalty of any token
UpdateHash
  ✓ Should be able to update hash with owner & creator signatures for token with supply==1 (55ms)
  ✓ Should not be able to update hash with signatures not from owner or creator (77ms)
  ✓ Should not be able to update metadata hash for token with supply > 1 (59ms)
Block tokens
  ✓ Operator should be able to block any token (42ms)
  ✓ Operator should be able to unblock any token
Pausable
  ✓ Operator should be able to pause/unpause contract
  ✓ Non operator should not be able to pause/unpause contract (53ms)
  ✓ Transactions should not work while paused (73ms)
Royalty calculation
  ✓ Should calculate royalty correctly
  ✓ Shouldn't overflow when calculating royalty

18 passing (9s)
  
```

2. ERC721

```

NiftyfyERC721
Vouchers
  ✓ Should redeem an NFT from signature (101ms)
  ✓ Should fail to redeem voucher, that was already redeemed (155ms)
Minting
  ✓ Anyone should be able to mint any token with admin signature (92ms)
  ✓ Anyone should be able to mint and transfer any token with admin signature (76ms)
  ✓ Should not be able to mint token with non operator signature (45ms)
Storage
  ✓ Should be able to get hash of any token
  ✓ Should be able to get creator address of any token
  ✓ Should be able to get royalty of any token
UpdateHash
  ✓ Should be able to update hash with owner & creator signatures (76ms)
  ✓ Should not be able to update hash with signatures not from owner or creator (100ms)
Block tokens
  ✓ Operator should be able to block any token (40ms)
  ✓ Operator should be able to unblock any token
Pausable
  ✓ Operator should be able to pause/unpause contract (46ms)
  ✓ Non operator should not be able to pause/unpause contract (80ms)
  ✓ Transactions/minting should not work while paused (64ms)
Royalty calculation
  ✓ Should calculate royalty correctly
  ✓ Shouldn't overflow when calculating royalty

17 passing (3s)
  
```

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Automated Test Results

1. TokenStorage

```

Compiled with solc
Number of lines: 568 (+ 0 in dependencies, + 0 in tests)
Number of assembly lines: 0
Number of contracts: 8 (+ 0 in dependencies, + 0 tests)

Number of optimization issues: 4
Number of informational issues: 19
Number of low issues: 0
Number of medium issues: 1
Number of high issues: 0

ERCs: ERC165

+-----+-----+-----+-----+-----+
| Name | # functions | ERCS | ERC20 info | Complex code | Features |
+-----+-----+-----+-----+-----+
| Strings | 4 | | | Yes | |
| TokenStorage | 34 | ERC165 | None Found | No | |
+-----+-----+-----+-----+-----+

INFO:Slither:myFlats/flatTokenStorage.sol analyzed (8 contracts)

```

2. NiftyNFTVouchers

```

Compiled with solc
Number of lines: 445 (+ 0 in dependencies, + 0 in tests)
Number of assembly lines: 0
Number of contracts: 3 (+ 0 in dependencies, + 0 tests)

Number of optimization issues: 0
Number of informational issues: 23
Number of low issues: 1
Number of medium issues: 0
Number of high issues: 0

+-----+-----+-----+-----+-----+
| Name | # functions | ERCS | ERC20 info | Complex code | Features |
+-----+-----+-----+-----+-----+
| ECDSA | 9 | | | No | Ecrecover |
| NiftyNFTVouchers | 9 | | | No | Assembly |
+-----+-----+-----+-----+-----+

INFO:Slither:myFlats/flatVouchers.sol analyzed (3 contracts)

```

This audit does not provide a security or correctness guarantee of the audited smart contract. Securing smart contracts is a multistep process, therefore running a bug bounty program as a complement to this audit is strongly recommended.

3. NiftifyERC1155

```

Compiled with solc
Number of lines: 2236 (+ 0 in dependencies, + 0 in tests)
Number of assembly lines: 0
Number of contracts: 21 (+ 0 in dependencies, + 0 tests)

Number of optimization issues: 9
Number of informational issues: 59
Number of low issues: 11
Number of medium issues: 9
Number of high issues: 0

ERCs: ERC165
INFO:Slither:myFlats/flaterc1155.sol analyzed (21 contracts)

```

Name	# functions	ERCS	ERC20 info	Complex code	Features
IERC1155Receiver	3	ERC165		No	
Address	11			No	Send ETH
					Delegatecall
					Assembly
ECDSA	9			No	Ecrecover
					Assembly
Strings	4			Yes	
NiftifyERC1155	93	ERC165		No	Ecrecover

4. NiftifyERC721

```

Compiled with solc
Number of lines: 2109 (+ 0 in dependencies, + 0 in tests)
Number of assembly lines: 0
Number of contracts: 21 (+ 0 in dependencies, + 0 tests)

Number of optimization issues: 11
Number of informational issues: 56
Number of low issues: 4
Number of medium issues: 2
Number of high issues: 0

ERCs: ERC165, ERC721
INFO:Slither:myFlats/flaterc721.sol analyzed (21 contracts)

```

Name	# functions	ERCS	ERC20 info	Complex code	Features
IERC721Receiver	1			No	
Address	11			No	Send ETH
					Delegatecall
					Assembly
Strings	4			Yes	
ECDSA	9			No	Ecrecover
					Assembly
NiftifyERC721	99	ERC165, ERC721		No	Ecrecover
					Assembly

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Concluding Remarks

While conducting the audits of the Niftify smart contract, it was observed that the contract contained Medium and Low severity issues along with a few areas of recommendations.

Our auditors suggest that Medium and Low severity issues should be resolved by Niftify developers. The recommendations given will improve the operations of the smart contract.

- ***The Niftify team has fixed the issues based on the auditor's recommendations.***

Disclaimer

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Our team does not endorse the Niftify platform or its product nor this audit is investment advice.

Notes:

- Please make sure contracts deployed on the mainnet are the ones audited.
- Check for the code refactor by the team on critical issues.

ImmuneBytes