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Space Fi

Audit

Security Assessment
28. March, 2023

For

PINETWORK SPACEP

SolidProof_io

@solidproof_io

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Version	Date	Description
1.0	27. March 2023	• Layout project • Automated- /Manual-Security Testing • Summary

Network
Ethereum (ERC20)

Website
https://space-pi.com

Telegram
https://t.me/SpacePi_com

Twitter
https://twitter.com/SpacePi_Com

Description

SpacePi Token, SpacePi, combines the two blockchain categories of NFT and metauniverse, aims to create a decentralized online virtual reality game platform, integrating characters, props and life storylines into virtual social interaction, where players can buy weapons, armor and prop gems in the virtual world. Participate in different collection to develop virtual, life, action and other games. Thus, SpacePi is the first and only cross metaverse and NFT domain project.All the benefits of SpacePi are presented as the native token SpacePi in the game.

Project Engagement

During the 25th of March 2023, **SpacePi Team** engaged Solidproof.io to audit smart contracts that they created. The engagement was technical in nature and focused on identifying security flaws in the design and implementation of the contracts. They provided Solidproof.io with access to their code repository and whitepaper.

Logo

Contract Link

v1.0

- Github
  - https://github.com/SpacePiCom/Contract
  - Commit: https://github.com/SpacePiCom/Contract/commit/f8ee86c5515982f75fd36b1a9b10198e45499480

Vulnerability & Risk Level

Risk represents the probability that a certain source-threat will exploit vulnerability, and the impact of that event on the organization or system. Risk Level is computed based on CVSS version 3.0.

Level	Value	Vulnerability	Risk (Required Action)
Critical	9 - 10	A vulnerability that can disrupt the contract functioning in a number of scenarios, or creates a risk that the contract may be broken.	Immediate action to reduce risk level.
High	7 – 8.9	A vulnerability that affects the desired outcome when using a contract, or provides the opportunity to use a contract in an unintended way.	Implementation of corrective actions as soon aspossible.
Medium	4 – 6.9	A vulnerability that could affect the desired outcome of executing the contract in a specific scenario.	Implementation of corrective actions in a certain period.
Low	2 – 3.9	A vulnerability that does not have a significant impact on possible scenarios for the use of the contract and is probably subjective.	Implementation of certain corrective actions or accepting the risk.
Informational	0 – 1.9	A vulnerability that have informational character but is not effecting any of the code.	An observation that does not determine a level of risk

Auditing Strategy and Techniques Applied

Throughout the review process, care was taken to evaluate the repository for security-related issues, code quality, and adherence to specification and best practices. To do so, reviewed line-by-line by our team of expert pentesters and smart contract developers, documenting any issues as there were discovered.

Methodology

The auditing process follows a routine series of steps:

1. Code review that includes the following:
    i) Review of the specifications, sources, and instructions provided to SolidProof to make sure we understand the size, scope, and functionality of the smart contract.
    ii) Manual review of code, which is the process of reading source code line-by-line in an attempt to identify potential vulnerabilities.
    iii) Comparison to specification, which is the process of checking whether the code does what the specifications, sources, and instructions provided to SolidProof describe.

2. Testing and automated analysis that includes the following:
    i) Test coverage analysis, which is the process of determining whether the test cases are actually covering the code and how much code is exercised when we run those test cases.
    ii) Symbolic execution, which is analysing a program to determine what inputs causes each part of a program to execute.

3. Best practices review, which is a review of the smart contracts to improve efficiency, effectiveness, clarify, maintainability, security, and control based on the established industry and academic practices, recommendations, and research.

4. Specific, itemized, actionable recommendations to help you take steps to secure your smart contracts.

Used Code from other Frameworks/Smart Contracts (direct imports)

Imported packages:

- Context
- Ownable
- IERC165
- IERC721
- IERC721Enumerable
- Math
- Strings
- ECDSA
- ReentrancyGuard
- MerkleProof
- SafeMath
- IRelationship
- Relationship
- IMintNft
- IERC20
- ERC721Distributor

- Context
- Ownable
- IERC20Permit
- IERC20
- Address
- SafeERC20
- MerkleProof
- IMerkleDistributor
- MerkleDistributor
- MerkleDistributorWithDeadline

- Context
- Ownable
- IERC20
- IERC20Metadata
- ERC20
- IERC20Permit
- Address
- SafeERC20
- ReentrancyGuard
- SafeMath
- EnumerableSet
- IMasterChefBSC
- IMintNft
- NFTMiner

- Context
- Ownable
- ReentrancyGuard
- IERC20
- SafeMath
- IRelationship
- Relationship
- FixedDeposit

- IERC20
- SafeMath
- ERC20
- SpacePiERC20Token

Tested Contract Files

This audit covered the following files listed below with a SHA-1 Hash.

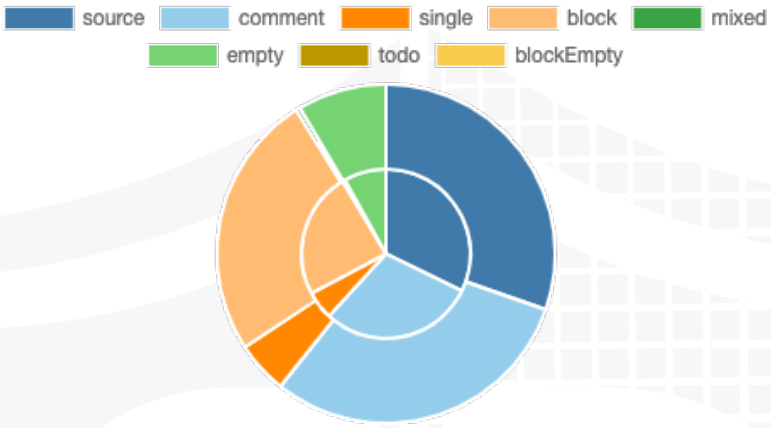
A file with a different Hash has been modified, intentionally or otherwise, after the security review. A different Hash could be (but not necessarily) an indication of a changed condition or potential vulnerability that was not within the scope of this review.

v1.0

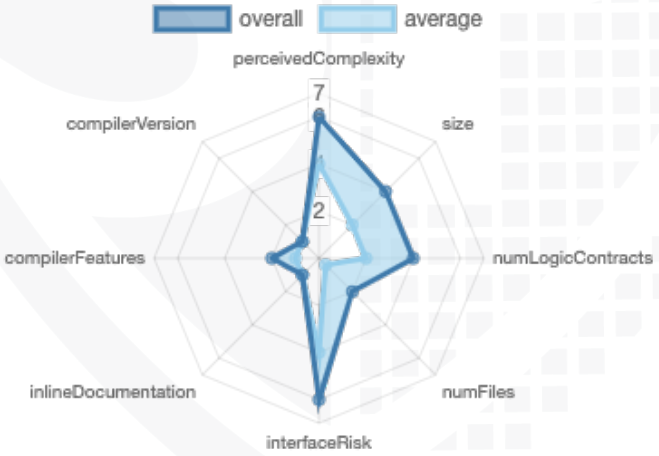
File Name	SHA-1 Hash
contracts/StakeSpacePi.sol	e21de412925838c2477b9e26c2910829e5d4890d
contracts/SpacePiToken.sol	f1a79fb594eef6c5950e7b7d9daeabcf4c082211
contracts/MerkleDistributorWithDeadline.sol	bd82f0de565b313f75a8510d208e160e563cd6c2
contracts/ERC721Distributor.sol	5d08674259365d1489312289743b60691f779dd4
contracts/NFTMiner.sol	b08b3e3d8a55e36564cf5e73d129e22e4b04eee4

Metrics

Source Lines
v1.0



Risk Level
v1.0



Capabilities

Components

Version	Contracts	Libraries	Interfaces	Abstract
1.0	10	14	17	11

Exposed Functions

This section lists functions that are explicitly declared public or payable. Please note that getter methods for public stateVars are not included.

Version	Public	Payable
1.0	165	1

Version	External	Internal	Private	Pure	View
1.0	80	340	32	96	119

State Variables

Version	Total	Public
1.0	76	42

Capabilities

Version	Solidity Versions observed	Experimental Features	Can Receive Funds	Uses Assembly	Has Destroyable Contracts

1.0	`^0.8.0`
	`^0.5.0`
	`^0.8.1`
			`yes`	`yes` (13 asm blocks)	

Version	Transfers ETH	Low-Level Calls	DelegateCall	Uses Hash Functions	EC Recover	New/ Create/ Create2
1.0	`yes`		`yes`	`yes`	`yes`	

Inheritance Graph

v1.0

CallGraph
v1.0

Scope of Work/Verify Claims

The above token Team provided us with the files that needs to be tested (Github, Bscscan, Etherscan, files, etc.). The scope of the audit is the main contract (usual the same name as team appended with .sol).

We will verify the following claims:

1. Is contract an upgradeable
2. Overall checkup (Smart Contract Security)

Is contract an upgradeable

Name	
Is contract an upgradeable?	No

Correct implementation of Token standard

ERC20				
Function	**Description**	**Exist**	**Tested**	**Verified**
TotalSupply	Provides information about the total token supply	✓	✓	✓
BalanceOf	Provides account balance of the owner's account	✓	✓	✓
Transfer	Executes transfers of a specified number of tokens to a specified address	✓	✓	✓
TransferFrom	Executes transfers of a specified number of tokens from a specified address	✓	✓	✓
Approve	Allow a spender to withdraw a set number of tokens from a specified account	✓	✓	✓
Allowance	Returns a set number of tokens from a spender to the owner	✓	✓	✓

ERC721				
Function	**Description**	**Exist**	**Tested**	**Verified**
BalanceOf	Count all NFTs assigned to an owner	✓	✓	✓
OwnerOf	Find the owner of an NFT	✓	✓	✓
SafeTransferFrom	Transfers the ownership of an NFT from one address to another address	✓	✓	✓
SafeTransferFrom	See above - Difference is that this function has an extra data parameter	✓	✓	✓
TransferFrom	Transfer ownership of an NFT	✓	✓	✓
Approve	Change or reaffirm the approved address for an NFT	✓	✓	✓
SetApprovalForAll	Enable or disable approval for a third party ("operator") to manage all of `msg.sender`'s assets	✓	✓	✓
GetApproved	Get the approved address for a single NFT	✓	✓	✓
IsApprovedForAll	Query if an address is an authorized operator for another address	✓	✓	✓
SupportsInterface	Query if a contract implements an interface	✓	✓	✓
Name	Provides information about the name	✓	✓	✓
Symbol	Provides information about the symbol	✓	✓	✓
TokenURI	Provides information about the TokenUri	✓	✓	✓

Write functions of contract v1.0

MERKLEDISTRIBUTORWITHDEADLINE

- claim
- renounceOwnership
- setLimit
- transferOwnership
- withdraw

SPACEPIERC20TOKEN

- approve
- burn
- decreaseAllowance
- increaseAllowance
- transfer
- transferFrom

ERC721DISTRIBUTOR

- binding
- claim
- removePrice
- renounceOwnership
- setCashier
- setEnds
- setNFT
- setPrice
- setStart
- setTotal
- transferOwnership

FIXEDDEPOSIT

- addPool
- binding
- claim
- deposit
- renounceOwnership
- setEnds
- setPool
- setPoolApr
- setPoolLocked
- setStart
- transferOwnership
- withdraw

NFTMINER

- add
- addMultLP
- approve
- burnForExchangeNFT
- deposit
- increaseAllowance
- massUpdatePools
- decreaseAllowance
- emergencyWithdraw
- renounceOwnership
- replaceMultLP
- set
- setMultLP
- setNFT
- setPause
- setPerBlock
- setPoolCorr
- transfer
- transferFrom
- transferOwnership
- updatePool
- withdraw

Overall checkup (Smart Contract Security)

Tested	Verified
✓	✓

Legend

Attribute	Symbol
Verified / Checked	✓
Partly Verified	⚑
Unverified / Not checked	✗
Not available	–

Modifiers and public functions

v1.0

ERC721Distributor

- removePrice
  - onlyOwner
- setPrice
  - onlyOwner
- setTotal
  - onlyOwner
- setNFT
  - onlyOwner
- setCashier
  - onlyOwner
- claim
  - nonReentrant
  - inDuration

MerkleDistributorWithDeadline

- claim
- withdraw
  - onlyOwner
- setLimit
- claim
- renounceOwnership
  - onlyOwner
- transferOwnership
  - onlyOwner

NFTMiner

- setNFT
  - onlyOwner
- setPerBlock
  - onlyOwner
- addMultLP
  - onlyOwner
- setPause
  - onlyOwner
- setMultLP
  - onlyOwner
- replaceMultLP
  - onlyOwner
- add
  - onlyOwner
- set
  - onlyOwner
- setPoolCorr
  - onlyOwner
- massUpdatePools
- updatePool
- deposit
  - notPause
  - isOpening
- withdraw
  - notPause
- emergencyWithdraw
  - notPause
- burnForExchangeNFT
  - hasQuota

- transfer
- approve
- transferFrom
- increaseAllowance
- decreaseAllowance

StakeSpacePi

- addPool
  - onlyOwner
- setPoolApr
  - onlyOwner
- setPoolLocked
  - onlyOwner
- setPool
  - onlyOwner
- deposit
  - nonReentrant
  - onlyInvited
  - inDuration
- withdraw
  - nonReentrant
  - onlyUnLock
- claim
  - nonReentrant
- setEnds
  - onlyOwner
- setStart
  - onlyOwner
- binding
  - inDuration

Comments

- StakeSpacePi
  - Owner is able to
    - Set start to an arbitrary value without limitations
    - Set end to an arbitrary value without limitations
      - It will lock user funds if the owner set the end time to a expired timestamp.
- SpacePiToken
  - Anyone can burn own tokens
- NftMiner
  - burnForExchangeNFT

        - Since the withdrawCoin is called with the amount of 0 the require statement in L2167 is unnecessary because the user amount cannot below 0
    - Owner is able to
        - pause following functions
            - If it is not paused
                - replaceMultiLP function
            - If it is paused
                - Deposit
                - Withdraw
                - emergencyWithdraw
        - Set pool correspond without any limitations
        - Update the given pool's coin allocation point
        - Add a new lp to the pool
        - Add multi lp
        - Set the perBlock variable without any limitations
        - Replace multi lp
        - Set multi lp token and chef
        - Set pause
        - Update nft address
- MerkleDistributorWithDeadline
    - Owner is able to withdraw all contract tokens after the end time is expired
- ERC721Distributor
    - Owner is able to set
        - the cashier
        - The nft address
        - Total variable to an arbitrary value
        - Set prices to any value
        - Remove prices

Please check if an OnlyOwner or similar restrictive modifier has been forgotten.

Source Units in Scope
v1.0

Type	File	Logic Contracts	Interfaces	Lines	nLines	nSLOC	Comment Lines	Complex. Score	Capabilities
📝📚🔍🎨	contracts/StakeSpacePi.sol	6	2	811	708	358	334	239	🔷🧱🔆Σ
📝📚🔍	contracts/SpacePiToken.sol	3	1	487	403	123	297	100	💰🔷🔆
📝📚🔍🎨	contracts/MerkleDistributorWithDeadline.sol	7	3	973	752	328	438	250	🖥️👥🧱🔆Σ
📝📚🔍🎨	contracts/ERC721Distributor.sol	10	6	1747	1517	738	729	571	🖥️🧱📤🔆Σ
📝📚🔍🎨	contracts/NFTMiner.sol	9	5	2239	1978	941	964	663	🖥️👥🔆Σ
📝📚🔍🎨	**Totals**	**35**	**17**	**6257**	**5358**	**2488**	**2762**	**1823**	🖥️💰🔷👥🧱📤🔆Σ

Legend

Attribute	Description
Lines	total lines of the source unit
nLines	normalised lines of the source unit (e.g. normalises functions spanning multiple lines)
nSLOC	normalised source lines of code (only source-code lines; no comments, no blank lines)
Comment Lines	lines containing single or block comments
Complexity Score	a custom complexity score derived from code statements that are known to introduce code complexity (branches, loops, calls, external interfaces, ...)

Audit Results

Critical issues

No critical issues

High issues

Issue	File	Type	Line	Description
#1	MerkleDistributor WithDeadline.sol	Claim	919	Anyone is able to set the "perUserClaimLimit" for the contract. This represents the amount of tokens that will be transferred to the claim caller. It is recommended to add an onlyOwner modifier. Keep in mind that the value should not be able to set to 0 because nobody can claim tokens anymore otherwise.

Medium issues

No medium issues

Low issues

Issue	File	Type	Line	Description
#1	All	Contract doesn't import npm packages from source (like OpenZeppelin etc.)	—	We recommend to import all packages from npm directly without flatten the contract. Functions could be modified or can be susceptible to vulnerabilities
#2	All	A floating pragma is set	—	The current pragma Solidity directive is „"^0.8.0".
#3	ERC721 Distributor.sol	Missing Zero Address Validation (missing-zero-check)	1689, 1693	Check that the address is not zero
#4	SpacePi Token.sol	Local variables shadowing	445	Rename the local variables that shadow another component

#5	NFTMiner.sol	Missing Events Arithmetic	All Owner Functions	Emit an event for critical parameter changes

Informational issues

Issue	File	Type	Line	Description
#1	NFTMiner.sol	State variables that could be declared immutable	1828, 1819, 1818	Add the `immutable` attributes to state variables that never change
#2	NFTMiner.sol	Unused return values	1861, 1890	Ensure that all the return values of the function calls are used and handle both success and failure cases if needed by the business logic
#3	ERC721Distributor.sol	Misspelling	See description	Change following words: - transferStranded Make sure to change it everywhere else as well.
#4	All	NatSpec documentation missing	—	If you started to comment your code, also comment all other functions, variables etc.
#5	MerkleDistributorWithDeadline.sol	Multiple SPDX	See description	Remove or combine spdx licenses

Audit Comments

We recommend you to use the special form of comments (NatSpec Format, Follow link for more information https://docs.soliditylang.org/en/latest/natspec-format.html) for your contracts to provide rich documentation for functions, return variables and more. This helps investors to make clear what that variables, functions etc. do.

28. March 2023:

- There is still an owner (Owner still has not renounced ownership)
- Owner can deploy a new version of the contract which can change any limit and give owner new privileges
- The actual code of the interface IMasterChefBSC used in the NFTMiner contract was not provided in the audit scope so we cannot comment on its security.
- Read whole report and modifiers section for more information

SWC Attacks

ID	Title	Relationships	Status
SWC-136	Unencrypted Private Data On-Chain	CWE-767: Access to Critical Private Variable via Public Method	PASSED
SWC-135	Code With No Effects	CWE-1164: Irrelevant Code	PASSED
SWC-134	Message call with hardcoded gas amount	CWE-655: Improper Initialization	PASSED
SWC-133	Hash Collisions With Multiple Variable Length Arguments	CWE-294: Authentication Bypass by Capture-replay	PASSED
SWC-132	Unexpected Ether balance	CWE-667: Improper Locking	PASSED
SWC-131	Presence of unused variables	CWE-1164: Irrelevant Code	NOT PASSED
SWC-130	Right-To-Left-Override control character (U+202E)	CWE-451: User Interface (UI) Misrepresentation of Critical Information	PASSED
SWC-129	Typographical Error	CWE-480: Use of Incorrect Operator	PASSED
SWC-128	DoS With Block Gas Limit	CWE-400: Uncontrolled Resource Consumption	PASSED

SWC-127	Arbitrary Jump with Function Type Variable	CWE-695: Use of Low-Level Functionality	PASSED
SWC-125	Incorrect Inheritance Order	CWE-696: Incorrect Behavior Order	PASSED
SWC-124	Write to Arbitrary Storage Location	CWE-123: Write-what-where Condition	PASSED
SWC-123	Requirement Violation	CWE-573: Improper Following of Specification by Caller	PASSED
SWC-122	Lack of Proper Signature Verification	CWE-345: Insufficient Verification of Data Authenticity	PASSED
SWC-121	Missing Protection against Signature Replay Attacks	CWE-347: Improper Verification of Cryptographic Signature	PASSED
SWC-120	Weak Sources of Randomness from Chain Attributes	CWE-330: Use of Insufficiently Random Values	PASSED
SWC-119	Shadowing State Variables	CWE-710: Improper Adherence to Coding Standards	NOT PASSED
SWC-118	Incorrect Constructor Name	CWE-665: Improper Initialization	PASSED
SWC-117	Signature Malleability	CWE-347: Improper Verification of Cryptographic Signature	PASSED

SWC-116	Timestamp Dependence	CWE-829: Inclusion of Functionality from Untrusted Control Sphere	**PASSED**
SWC-115	Authorization through tx.origin	CWE-477: Use of Obsolete Function	**PASSED**
SWC-114	Transaction Order Dependence	CWE-362: Concurrent Execution using Shared Resource with Improper Synchronization ('Race Condition')	**PASSED**
SWC-113	DoS with Failed Call	CWE-703: Improper Check or Handling of Exceptional Conditions	**PASSED**
SWC-112	Delegatecall to Untrusted Callee	CWE-829: Inclusion of Functionality from Untrusted Control Sphere	**PASSED**
SWC-111	Use of Deprecated Solidity Functions	CWE-477: Use of Obsolete Function	**PASSED**
SWC-110	Assert Violation	CWE-670: Always-Incorrect Control Flow Implementation	**PASSED**
SWC-109	Uninitialized Storage Pointer	CWE-824: Access of Uninitialized Pointer	**PASSED**
SWC-108	State Variable Default Visibility	CWE-710: Improper Adherence to Coding Standards	**PASSED**
SWC-107	Reentrancy	CWE-841: Improper Enforcement of Behavioral Workflow	**PASSED**
SWC-106	Unprotected SELFDESTRUCT Instruction	CWE-284: Improper Access Control	**PASSED**

SWC-105	Unprotected Ether Withdrawal	CWE-284: Improper Access Control	PASSED
SWC-104	Unchecked Call Return Value	CWE-252: Unchecked Return Value	PASSED
SWC-103	Floating Pragma	CWE-664: Improper Control of a Resource Through its Lifetime	NOT PASSED
SWC-102	Outdated Compiler Version	CWE-937: Using Components with Known Vulnerabilities	PASSED
SWC-101	Integer Overflow and Underflow	CWE-682: Incorrect Calculation	PASSED
SWC-100	Function Default Visibility	CWE-710: Improper Adherence to Coding Standards	PASSED

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