SharkTeam

No. 20240429035C

Smart Contract Audit Report

Web3Go

Apr. 29th, 2024

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1. Overview

SharkTeam recently received the requirements for Web3Go smart contracts audit. In this audit, the SharkTeam security experts communicate with Web3Go team to conduct smart contract security audit under controllable operation, so as to avoid any risk in the audit process as far as possible.

Project Overview :

Project Name	Web3Go
Description	ERC1155, NFT, Proxy
Language	Solidity
Blockchain	OPBNB Mainnet
Codebase	Private Repo
MD5	cf8ddf285ede9fd1e619b00d08773eb4

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Audit methods :

Firstly, through static analysis, dynamic analysis and other analysis technologies, the smart contracts in the project were automatically scanned and manually reviewed; after that, the SharkTeam security experts conducted a detailed manual audit of the smart contracts line-by-line. From the four dimensions of high-level language, virtual machine, blockchain, and business logic, nearly 200 audit items of smart contracts have been comprehensively audited.

Core Audit Types:

For smart contract, SharkTeam's audit items cover 4 layers: language, virtual machine, blockchain, and business, and 6 severity levels of critical (abbreviated as CR) risk, high risk, medium (abbreviated as MED) risk, low risk, informational (abbreviated as INFO) risk and optimizable (abbreviated as OPT) risk. Below are some common (but not all) vulnerabilities, most of which are high-risk or above.

- Function Visibility
- Reentrancy Vulnerability
- Contract and Storage Initialization
- Token Minting and Burning
- Authorization vulnerability and Access Control
- Centralization of Power
- Function Logic Vulnerability
- Flashloan and Price Manipulation
- DAO Proposal Attack
- Contract Upgrade Issues
- Randomness and Revert Attack
- Insufficient Randomness
- Integer Overflow/Underflow
- Divide Before Multiply and Integer Precision
- Unchecked/Unused Return Values
- Blockchain Timestamp Dependency
- Transaction Order Dependency and Front Running
- Denial of Service (DoS)

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Audit Scope :

Contract Name	OPBNB Mainnet Address
Proxy Admin	0x0a55f7fd7d45e3606096481adc95875468e14c3e
SBT721 Proxy	0xe5116e725a8c1bf322df6f5842b73102f3ef0cee
SBT721 Implement	0x98e9abb25f4b7ab633179bd4ac99f2b3ec099322
NFTPiece	0x2c085411ca401a84a9d98dec415282fa239d53bb
NFTMerge	0x4c0578ca071b38702182ef4975da6ad51a3f84f0
VendingMachineUpgradeable Proxy	0x00a9de8af37a3179d7213426e78be7dfb89f2b19
VendingMachineUpgradeable Implement	0x8204b622f152e8347b2b24200794ab90bbf2daca
WhiteNoise	0x5460ae5e02a33957b57e306f1f372306362cb8d2

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Audit results :

Web3Go smart contracts audit results: **Pass**.

2. Findings

2.1 Summary

Vulnerability list：

ID	Item	Severity	Category	Status
1	Signature-Replay-Risk	▨ INFO	Blockchain	ⓘ Unfixed
2	Centralization-Risk	▨ INFO	Business	ⓘ Unfixed
3	State-Variables-Could-Be-Declared-Constant	🟩 OPT	Language	ⓘ Unfixed

2.2 Detailed Results

2.2.1 Signature-Replay-Risk [Info]

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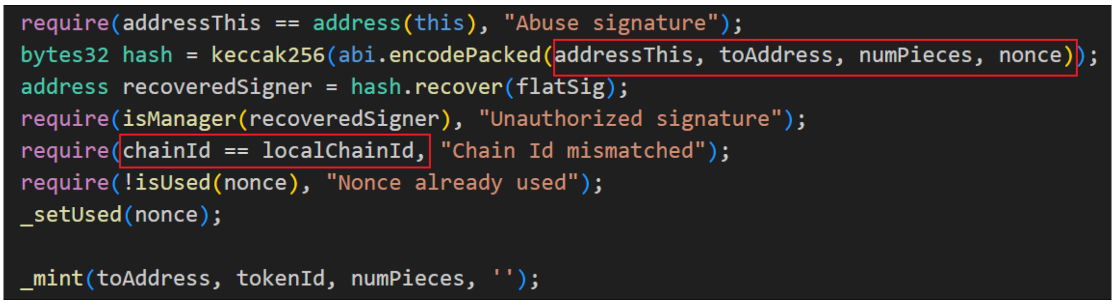
Description:

In the claim function of the NFTPiece contract, the hash contains the nonce, but does not contain the chainId, which makes flatSig risk cross-chain replay. If the contract will only be deployed and used in the current public chain, this risk will be difficult to exploit.



```
require(addressThis == address(this), "Abuse signature");
bytes32 hash = keccak256(abi.encodePacked(addressThis, toAddress, numPieces, nonce));
address recoveredSigner = hash.recover(flatSig);
require(isManager(recoveredSigner), "Unauthorized signature");
require(chainId == localChainId, "Chain Id mismatched");
require(!isUsed(nonce), "Nonce already used");
_setUsed(nonce);

_mint(toAddress, tokenId, numPieces, '');
```

Recommendation:

When calculating hash, in addition to nonce, it is recommended to add chainId.

2.2.2 Centralization-Risk [Info]

Description:

The _owner in ProxyAdmin, SBT721, NFTPiece and VendingMachineUpgradeable contracts, the _managers in SBT721 and NFTPiece contracts and the _minters in SBT721 contract are centralized high-privilege accounts that are closely related to the core business. In particular, the _owner can pause the contract, and _managers have the authority to mint tokens.

Once the private key is leaked or stolen, the project will suffer a devastating blow.

Recommendation:

Properly keep the private keys of the high-privilege accounts secure. And try to avoid the loss, leakage, theft, etc. of any private key as much as possible.

In addition, it is necessary to strengthen the management of high-privilege accounts and avoid adding untrusted addresses as high-privilege accounts.

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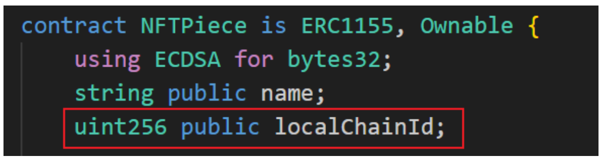
2.2.3 State-Variables-Could-Be-Declared-Constant [OPT]

Description:

The state variable localChainId in the NFTPiece contract has never been modified after it is initialized in the constructor. So it can be declared as constant or immutable.



```
contract NFTPiece is ERC1155, Ownable {
    using ECDSA for bytes32;
    string public name;
    uint256 public localChainId;
```

Recommendation:

Declare the state variable localChainId in the NFTPiece contract as constant or immutable.

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Appendix A: Smart Contract Audit Items

ID	Item	Category	Severity
TVE-001	Different-Pragma-Directives-Are-Used	Language	INFO
TVE-002	Incorrect-Versions-of-Solidity	Language	OPT
TVE-003	Solidity-Version-Is-Outdated	Language	INFO
TVE-004	Reentrancy-Eth-Vulnerabilities	VM	CR
TVE-005	Reentrancy-No-Eth-Vulnerabilities	VM	MED
TVE-006	Reentrancy-Benign-Vulnerabilities	VM	LOW
TVE-007	Reentrancy-Events-Vulnerabilities	VM	LOW
TVE-008	Reentrancy-Unlimited-Gas-Vulnerabilities	VM	OPT
TVE-009	Erc777-Callbacks-And-Reentrancy	Language	CR
TVE-010	State-Variable-Shadowing	Language	HIGH
TVE-011	State-Variable-Shadowing-From-Abstract-Contracts	Language	MED
TVE-012	Builtin-Symbol-Shadowing	Language	LOW
TVE-013	Local-Variable-Shadowing	Language	LOW
TVE-014	Uninitialized-Local-Variables	Language	MED
TVE-015	Uninitialized-Storage-Variables	Language	HIGH
TVE-016	Uninitialized-State-Variables	Language	HIGH
TVE-017	Dos-Attack-Call-Failed	Language	MED
TVE-018	DoS-With-Block-Gas-Limit	VM	MED
TVE-019	Unused-State-Variable	Language	OPT

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TVE-020	Variable-Names-Too-Similar	Language	INFO
TVE-021	State-Variables-Could-Be-Declared-Constant	Business	OPT
TVE-022	Local-Variables-Are-Not-Used	Language	OPT
TVE-023	Unrestricted-State-Variable-Writing	Language	HIGH
TVE-024	Arbitrary-Jump-Function-Type-Variable	Language	MED
TVE-025	State-Variable-Access-Permissions-Default	Language	INFO
TVE-026	Variable-Classification-And-Sorting	Business	HIGH
TVE-027	Dangerous-State-Variable-Shadowing	Language	HIGH
TVE-028	Modifier-To-Modify-State-Variables	Language	HIGH
TVE-029	There-Are-External-Calls-In-The-Modifier	Language	HIGH
TVE-030	Incorrect-Modifier	Language	LOW
TVE-031	Multiple-Constructor-Schemes	Language	HIGH
TVE-032	Reused-Base-Constructors	Language	MED
TVE-033	Void-Constructor	Language	LOW
TVE-034	Incorrect-Constructor-Name	Language	LOW
TVE-035	Suicidal	Language	HIGH
TVE-036	Fallback-And-Receive()	Language	HIGH
TVE-037	Function-Initializing-State	Language	INFO
TVE-038	Unimplemented-Functions	Language	OPT
TVE-039	Public-Function-Could-Be-Declared-External	Business	OPT
TVE-040	Function-Default-Permissions	Language	INFO

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TVE-041	Unprotected-Withdraw-Function	Language	CR
TVE-042	Unchecked-Send	Language	MED
TVE-043	Unchecked-Transfer	Language	HIGH
TVE-044	Missing-Events-Access-Control	Language	LOW
TVE-045	Missing-Events-Arithmetic	Language	LOW
TVE-046	Unindexed-Erc20-Event-Oarameters	Language	INFO
TVE-047	Incorrect-Erc20-Interface	Business	MED
TVE-048	Incorrect-Erc721-Interface	Business	MED
TVE-049	Erc20-Approve()-Race-Condition	Language	CR
TVE-050	Costly-Operations-Inside-A-Loop	Language	OPT
TVE-051	Calls-Inside-A-Loop	Language	LOW
TVE-052	Unchecked-Low-Level-Calls	Language	MED
TVE-053	Low-Level-Calls	Language	INFO
TVE-054	Controlled-Delegatecall	VM	HIGH
TVE-055	Message-Call-With-Hard-Coded-Gas-Number	VM	LOW
TVE-056	Public-Mappings-With-Nested-Variables	Language	HIGH
TVE-057	Deletion-On-Mapping-Containing-A-Structure	Language	MED
TVE-058	Functions-Send-Ether-To-Arbitrary-Destinations	Language	CR
TVE-059	Missing-Zero-Address-Validation	Language	LOW
TVE-060	Critical-Address-Change	Language	INFO
TVE-061	Signature-Replay	VM	CR

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TVE-062	Lack-of-Protection-From-Signature-Replay-Attacks	VM	CR
TVE-063	Redundant-Statements	Language	OPT
TVE-064	Unreached-Code	Language	OPT
TVE-065	Code-Not-Achieve-The-Desired-Effect	Language	LOW
TVE-066	Weak-Prng	Blockchain	HIGH
TVE-067	Block-Timestamp	Blockchain	LOW
TVE-068	Block-Values-As-Time-Proxies	Blockchain	HIGH
TVE-069	Missing-Inheritance	Language	OPT
TVE-070	Incorrect-Order-of-Inheritance	Language	LOW
TVE-071	Whether-To-Inherit	Business	LOW
TVE-072	Boolean-Equality	Language	INFO
TVE-073	Misuse-of-A-Boolean-Constant	Language	MED
TVE-074	Tautology-Or-Contradiction	Language	MED
TVE-075	Dangerous-Strict-Equalities	Language	MED
TVE-076	Dangerous-Unary-Expressions	Language	LOW
TVE-077	Misuse-of-Assert	Language	OPT
TVE-078	Dangerous-Usage-of-tx.origin	Language	MED
TVE-079	Unexpected-Ether-And-this.balance	Language	MED
TVE-080	Integer-Overflow	Language	CR
TVE-081	Divide-Before-Multiply	Language	MED
TVE-082	Too-Many-Digits	Language	INFO

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TVE-083	Dirty-High-Order-Bits	Language	LOW
TVE-084	Modifying-Storage-Array-By-Value	Language	HIGH
TVE-085	Array-Length-Assignment	Language	HIGH
TVE-086	Incorrect-Shift-In-Assembly	Language	HIGH
TVE-087	Name-Reused	Language	HIGH
TVE-088	Right-To-Left-Override-Character	Language	HIGH
TVE-089	Unprotected-Upgradeable-Contract	Language	HIGH
TVE-090	Contracts-That-Lock-Ether	Business	HIGH
TVE-091	Unused-Return	Business	MED
TVE-092	Assembly-Usage	Language	INFO
TVE-093	Deprecated-Standards	Language	OPT
TVE-094	Conformance-To-Solidity-Naming-Conventions	Language	OPT
TVE-095	Hash-Collision-With-Multiple-Variable-Length-Parameters	VM	HIGH
TVE-096	Lack-of-Proper-Signature-Verification	VM	HIGH
TVE-097	Insufficient-Gas	VM	LOW
TVE-098	Private-On-Chain-Data	Business	LOW
TVE-099	Condition-Violation	Language	LOW
TVE-100	Write-Repeatedly	Language	MED
TVE-101	Incorrect-Access-Control	Language	HIGH
TVE-102	Transaction-Order-Dependence	Blockchain	HIGH
TVE-103	Contract-Check	Language	LOW

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TVE-104	Deprecated-Keywords	Language	OPT
TVE-105	Unprotected-Initializer-In-Upgradeable-Contract	Business	CR
TVE-106	Initialize-State-Variables-In-Upgradeable-Contract	Business	HIGH
TVE-107	Import-Upgradeable-Contracts	Business	HIGH
TVE-108	Avoid-Using-Selfdestruct-Or-Delegatecall-In-Upgradeable-Contracts	Business	HIGH
TVE-109	State-Variables-In-Upgradable-Contracts	Business	HIGH
TVE-110	Function-Id-Collision-Between-Agents-And-Upgrable-Contracts	Business	HIGH
TVE-111	Functions-Shadowing	Business	HIGH
TVE-112	Initialization-Function-Is-Called-Multiple-Times	Business	HIGH
TVE-113	Initialization-Function-of-The-Proxy-Contract-Is-Not-Called	Business	LOW
TVE-114	Check-the-Content-That-Must-Be-Initialized-During-Deployment-Combined-With-Business	Business	LOW
TVE-115	Check-For-Required-Initialization	Business	LOW
TVE-116	Check-Whether-The-Initialization-Function-Conforms-To-Openzeppelin	Business	LOW
TVE-117	Variables-That-Should-Not-Be-Constant	Language	LOW
TVE-118	Initialize-Functions-Are-Not-Called	Language	LOW
TVE-119	Initializer()-Is-Not-Called	Language	LOW
TVE-120	Incorrect-Variables-With-The-V2	Language	LOW
TVE-121	Incorrect-Variables-With-The-Proxy	Language	LOW
TVE-122	State-Variable-Initialized	Language	LOW
TVE-123	Variables-That-Should-Be-Constant	Language	LOW
TVE-124	Extra-Variables-In-The-Proxy	Language	LOW

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TVE-125	Missing-Variables	Language	LOW
TVE-126	Extra-Variables-In-The-V2	Language	LOW
TVE-127	Initializable-Is-Not-Inherited	Language	LOW
TVE-128	Initializable-Is-Missing	Language	LOW
TVE-129	Initialize-Function	Language	LOW
TVE-130	Initializer()-Is-Missing	Language	HIGH
TVE-131	Abiencoderv2-Array	Language	HIGH
TVE-132	Storage-Type-Signed-Integer-Array-Error	Language	HIGH
TVE-133	Enumeration-Conversion	Language	MED
TVE-134	Constant-Function-Using-Assembly-Code	Language	MED
TVE-135	Constant-Function-To-Modify-State-Variables	Language	MED
TVE-136	Uninitialized-Function-Pointer-In-The-Constructor	Language	LOW
TVE-137	Pre-Declared-Usage-of-Local-Variables	Language	LOW
TVE-138	Implicit-Constructor-Callvalue-Check	Language	MED
TVE-139	Incorrect-Event-Signature-In-Library	VM-layer	LOW
TVE-140	Call-An-Uninitialized-Function-Pointer-In-The-Constructor	Language	LOW
TVE-141	Dynamic-Constructor-Parameters-Are-Abiencoderv2	Language	LOW
TVE-142	Storage-Array-of-Multi-Slot-Elements-With-Abiencoderv2	Language	LOW
TVE-143	Use-Abiencoderv2-To-Read-Calldata-Structure-Containing-Static-Size-And-Dynamic-Encoding-Members	Language	LOW
TVE-144	Package-Storage-Using-abiencoderv2	Language	LOW
TVE-145	Incorrect-Loading-Using-Yul-Optimizer-And-Abiencoderv2	Language	LOW

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TVE-146	Use-Abiencoderv2-To-Dynamically-Encode-Base-Type-Array-Slices	Language	LOW
TVE-147	When-Using-Abiencoderv2-The-Formatting-Process-Lacks-Escaping	Language	LOW
TVE-148	Double-Shift-Overflow	Language	HIGH
TVE-149	Incorrect-Byte-Instruction-Optimization	Language	LOW
TVE-150	Use-Yul-Optimizer-To-Remove-Necessary-Assignments	Language	LOW
TVE-151	Private-Method-Is-Overridden	Language	LOW
TVE-152	Multi-Stack-Slot-Component-of-Tuple-Assignment	Language	LOW
TVE-153	Dynamic-Array-Cleanup	Language	LOW
TVE-154	Empty-Byte-Array-Copy	Language	LOW
TVE-155	Memory-Array-Creation-Overflow	Language	LOW
TVE-156	Calldata-Using-For	Language	LOW
TVE-157	Free-Function-Redefinition	Language	LOW
TVE-158	Token-Standard	Business	LOW
TVE-159	Asset-Lock	Business	CR
TVE-160	High-Authority-Address-Check	Business	CR
TVE-161	DAO-Proposal-Attack	Business	CR
TVE-162	Flash-Loan-Attack	Business	CR
TVE-163	Manipulating-Price-Oracles	Business	CR
TVE-164	Minting-And-Burning-Vulnerability	Business	HIGH
TVE-165	Exchange-Business-Vulnerability	Business	HIGH
TVE-166	Insufficient-Liquidity	Business	HIGH

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TVE-167	Lending-Business-Vulnerability	Business	HIGH
TVE-168	Aggregate-Revenue-Vulnerability	Business	HIGH
TVE-169	Single-Currency-Pledge-Vulnerability	Business	HIGH
TVE-170	Referral-Reward-Vulnerability	Business	HIGH
TVE-171	Cross-Platform-Trading-Vulnerability	Business	HIGH
TVE-172	Standard-Library-Functions-Vulnerability	Business	HIGH

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Appendix B: Vulnerability Severity Classification

- 🟥 Critical Risk, abbreviated as CR,
- 🟥 High Risk, abbreviated as HIGH,
- 🟧 Medium Risk, abbreviated as MED,
- 🟦 Low Risk, abbreviated as LOW,
- ⬜ Informational Risk, abbreviated as INFO,
- 🟩 Optimizable Risk, abbreviated as OPT.

Rating is mainly based on the degree of harm and difficulty of utilization of the risk, supplemented by a comprehensive judgment of other factors.

The degree of harm is mainly defined based on the impact on the three dimensions of asset ownership, business integrity impact and contract availability, and is divided into five harm levels: severe harm, high harm, medium harm, low harm and potential harm;

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Exploitation difficulty is mainly defined based on the three dimensions of attack vector, attack complexity, and authentication, and is divided into four difficulty levels: low difficulty, medium difficulty, high difficulty, and extremely high difficulty.

	Critical	**High**	**Medium**	**Low**	**Potential**
Low	CR	HIGH	MED	LOW	INFO/OPT
Medium	HIGH	MED	LOW	LOW	INFO/OPT
High	MED	LOW	LOW	INFO/OPT	INFO/OPT
Ex-high	LOW	LOW	INFO/OPT	INFO/OPT	INFO/OPT

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About SharkTeam

SharkTeam’ s vision is to protect the security of the Web3 world. The team is composed of experienced security professionals and senior researchers from all over the world. SharkTeam is proficient in the underlying theory of blockchain and smart contracts, and provides services including on-chain analysis, risk detection and alerts, smart contract auditing, crypto asset recovery, etc.

SharkTeam also developed the AI-driven risk detection and alerting platform ChainAegis, supporting unlimited levels of in-depth graph analysis. This capability effectively combats the risk of Advanced Persistent Threat (APT) in the Web3 world. SharkTeam has established long-term cooperative relationships with key players in various fields of the Web3 world, such as Polkadot, Moonbeam, Polygon, Sui, OKX, imToken, Collab.Land, TinTinLand, etc.

We implement almost 200 auditing contents that cover four aspects: high-level language layer, virtual machine layer, blockchain layer, and business logic layer, ensuring that smart contracts are completely guaranteed and safe.

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In Math, We Trust!

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