



Security Assessment



Vital Block Verified on April 12th, 2023

 @Vital-Block

 @VB_Audit

 info@vitalblock.org



 www.vitalblock.org



PREPARED FOR:
ZKGAMES



INTRODUCTION

Auditing Company	 VITAL BLOCK SECURITY
Client Project	 ZKGAMES
Methodology	Automated Analysis, Manual Code Review
Zksolc Version	v1.3.5
Compiler Version	0.8.14
Contract Address	0xda941d75C8c4a5b4EdABe891314bD8b24251Ac75
Network	ZKSYNC CHAIN
Token Type	ERC20
Website	https://zkgame.io/
Telegram	https://t.me/zkgame_io
Twitter	https://twitter.com/zkGame_io
Discord	https://discord.com/invite/kTJS7QWKCj
Doc	https://docs.zkgame.io/
Prelim Report Date	April 12, 2023
Final Report Date	April 12, 2023



Verify the authenticity of this report on our GitHub Repo: <https://www.github.com/vital-block>



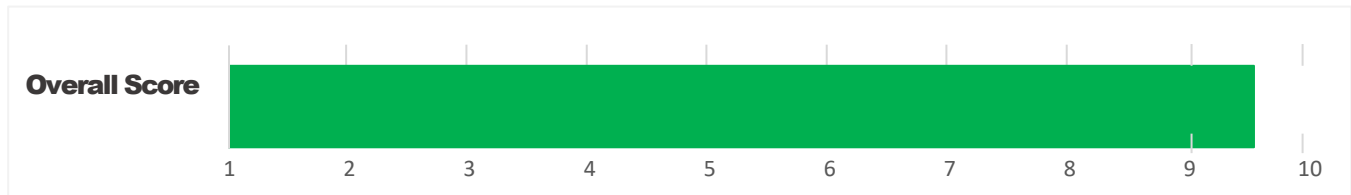
EXECUTIVE SUMMARY


Vital Block has performed the automated and manual analysis of the ZKGAMES.Sol code. The code was

reviewed for common contract vulnerabilities and centralized exploits. Here's a quick audit summary:

Status	Critical ! 🔴	Major " 🟡	Medium # 🟡	Minor \$ 🟢	Unknown % 🟤
Open	0	0	0	2	0
Acknowledged	0	0	1	2	0
Resolved	0	0	0	0	0
Noteworthy OnlyOwner Privileges	Set Taxes and Ratios, Airdrop, Set Protection Settings, Set Reward Properties, Set Reflector Settings, Set Swap Settings, Set Pair and Router				

ZKGAMES Smart contract has achieved the following score: **95.0**



 Please note that smart contracts deployed on blockchains aren't resistant to exploits, vulnerabilities and/or hacks. Blockchain and cryptography assets utilize new and emerging technologies. These technologies present a high level of ongoing risks. For a detailed understanding of risk severity, source code vulnerability, and audit limitations, kindly review the audit report thoroughly.

 Please note that centralization privileges regardless of their inherited risk status - constitute an elevated impact on smart contract safety and security.



SCOPE OF WORK

Vital Block was consulted by ZKGAMES to conduct the smart contract audit of its .Sol source code.
The audit scope of work is strictly limited to mentioned .SOL file only:

- ZKGAMES.Sol

 External contracts and/or interfaces dependencies are not checked due to being out of scope.

Verify audited contract's contract address and deployed link below:

Public Contract.	
0xda941d75C8c4a5b4EdABe891314bD8b24251Ac75	
Contract Name	ZKGAMES
Token Symbol	ZKG
Decimals	18
Blockchain	ZKSYNC CHAIN

AUDIT METHODOLOGY

Smart contract audits are conducted using a set of standards and procedures. Mutual collaboration is essential to performing an effective smart contract audit. Here's a brief overview of Vital Block auditing process and methodology:

CONNECT

- The onboarding team gathers source codes, and specifications to make sure we understand the size, and scope of the smart contract audit.

AUDIT

- Automated analysis is performed to identify common contract vulnerabilities. We may use the following third-party frameworks and dependencies to perform the automated analysis:
 - Remix IDE Developer Tool
 - Open Zeppelin Code Analyzer
 - SWC Vulnerabilities Registry
 - DEX Dependencies, e.g., Pancakeswap, Uniswap
- Simulations are performed to identify centralized exploits causing contract and/or trade locks.
- A manual line-by-line analysis is performed to identify contract issues and centralized privileges.

We may inspect below mentioned common contract vulnerabilities, and centralized exploits:

Centralized Exploits	<ul style="list-style-type: none">○ Token Supply Manipulation○ Access Control and Authorization○ Assets Manipulation○ Ownership Control○ Liquidity Access○ Stop and Pause Trading○ Ownable Library Verification
----------------------	---



Common Contract Vulnerabilities

- **Integer Overflow**
- **Lack of Arbitrary limits**
- **Incorrect Inheritance Order**
- **Typographical Errors**
- **Requirement Violation**
- **Gas Optimization**
- **Coding Style Violations**
- **Re-entrancy**
- **Third-Party Dependencies**
- **Potential Sandwich Attacks**
- **Irrelevant Codes**
- **Divide before multiply**
- **Conformance to Solidity Naming Guides**
- **Compiler Specific Warnings**
- **Language Specific Warnings**

REPORT

- **The auditing team provides a preliminary report specifying all the checks which have been performed and the findings thereof.**
- **The client's development team reviews the report and makes amendments to the codes.**
- **The auditing team provides the final comprehensive report with open and unresolved issues.**

PUBLISH

- **The client may use the audit report internally or disclose it publicly.**






 **It is important to note that there is no pass or fail in the audit, it is recommended to view the audit**

as an unbiased assessment of the safety of solidity codes.



RISK CATEGORIES

Smart contracts are generally designed to hold, approve, and transfer tokens. This makes them very tempting attack targets. A successful external attack may allow the external attacker to directly exploit. A successful centralization-related exploit may allow the privileged role to directly exploit. All risks which are identified in the audit report are categorized here for the reader to review:

Risk Type	Definition
Critical ! 	These risks could be exploited easily and can lead to asset loss, data loss, asset, or data manipulation. They should be fixed right away.
Major " 	These risks are hard to exploit but very important to fix, they carry an elevated risk of smart contract manipulation, which can lead to high-risk severity.
Medium # 	These risks should be fixed, as they carry an inherent risk of future exploits, and hacks which may or may not impact the smart contract execution. Low-risk re-entrancy-related vulnerabilities should be fixed to deter exploits.
Minor \$ 	These risks do not pose a considerable risk to the contract or those who interact with it. They are code-style violations and deviations from standard practices. They should be highlighted and fixed nonetheless.
Unknown % 	These risks pose uncertain severity to the contract or those who interact with it. They should be fixed immediately to mitigate the risk uncertainty.

All statuses which are identified in the audit report are categorized here for the reader to review:

Status Type	Definition
Open	Risks are open.
Acknowledged	Risks are acknowledged, but not fixed.
Resolved	Risks are acknowledged and fixed.



CENTRALIZED PRIVILEGES

Centralization risk is the most common cause of cryptography asset loss. When a smart contract has a privileged role, the risk related to centralization is elevated.

There are some well-intended reasons have privileged roles, such as:

- **Privileged roles can be granted the power to `pause()` the contract in case of an external attack.**
- **Privileged roles can use functions like, `include()`, and `exclude()` to add or remove wallets from fees, swap checks, and transaction limits. This is useful to run a presale and to list on an exchange.**






Authorizing privileged roles to externally-owned-account (EOA) is dangerous. Lately, centralization-related losses are increasing in frequency and magnitude.

- **The client can lower centralization-related risks by implementing below mentioned practices:**
- **Privileged role's private key must be carefully secured to avoid any potential hack.**
- **Privileged role should be shared by multi-signature (multi-sig) wallets.**
- **Authorized privilege can be locked in a contract, user voting, or community DAO can be introduced to unlock the privilege.**
- **Renouncing the contract ownership, and privileged roles.**
- **Remove functions with elevated centralization risk.**

 **Understand the project's initial asset distribution. Assets in the liquidity pair should be locked. Assets outside the liquidity pair should be locked with a release schedule.**



AUTOMATED ANALYSIS

Symbol	Definition
	Function modifies state
	Function is payable
	Function is internal
	Function is private
	Function is important

```

**ZKGAMES** | Interface | |||
| L | totalSupply | External | ! | NO |
| L | decimals | External | ! | NO |
| L | symbol | External | ! | NO |
| L | name | External | ! | NO |
| L | getOwner | External | | NO |
| L | balanceOf | External | ! | NO |
| L | transfer | External | " ! ! | NO |
| L | allowance | External | ! | NO |
| L | approve | External | " ! ! | NO |
| L | transferFrom | External | " | NO |
|||||
**IFactoryV2** | Interface | |||
| L | getPair | External | | NO |
| L | createPair | External | " | NO |
|||||
**IV2Pair** | Interface | |||
| L | factory | External | | NO |
| L | getReserves | External | | NO |
| L | sync | External | " | NO |

```



|||||

```

**IRouter01** | Interface | |||
| L | factory | External ¶ | |NO¶|
| L | ETH | External ¶ | |NO¶|
| L | addLiquidityETH | External ¶ | # |NO¶|
| L | addLiquidity | External ¶ | " |NO¶|
| L | swapExactETHForTokens | External ¶ | # |NO¶|
| L | getAmountsOut | External ¶ | |NO¶|
| L | getAmountsIn | External ¶ | |NO¶|

```

|||||

```

**IRouter02** | Interface | IRouter01 |||
| L | swapExactTokensForETHSupportingFeeOnTransferTokens | External ¶ | " |NO¶|
| L | swapExactETHForTokensSupportingFeeOnTransferTokens | External ¶ | # |NO¶|
| L | swapExactTokensForTokensSupportingFeeOnTransferTokens | External ¶ | " ! ● |NO¶|
| L | swapExactTokensForTokens | External ¶ | " |NO¶|

```

|||||

```

**Protections** | Interface | |||
| L | checkUser | External ¶ | " ! ● |NO¶|
| L | setLaunch | External ¶ | " |NO¶|
| L | setLpPair | External ¶ | " |NO¶|
| L | ZKG | External ¶ | " |NO¶|
| L | removeSniper | External ¶ | " |NO¶|

```

|||||

```

**Cashier** | Interface | |||
| L | setRewardsProperties | External ¶ | " |NO¶|
| L | tally | External ¶ | " |NO¶|
| L | load | External ¶ | # |NO¶|
| L | cashout | External ¶ | " |NO¶|
| L | giveMeWelfarePlease | External ¶ | " |NO¶|
| L | getTotalDistributed | External ¶ | |NO¶|
| L | getUserInfo | External ¶ | |NO¶|
| L | getUserRealizedRewards | External ¶ | |NO¶|

```



```

| L | getPendingRewards | External | | | NO |
| L | initialize | External | | " | NO |
| L | getCurrentReward | External | | | NO |
|||||
| **ETH** | Implementation | SafeMath | |||
| L | <Constructor> | Public | | # | NO |
| L | transferOwner | External | | " | onlyOwner |
| L | renounceOwnership | External | | " | NO |
| L | setOperator | Public | | " | NO |
| L | renounceOriginalDeployer | External | | " | NO |
| L | <Receive Ether> | External | | # | NO |
| L | totalSupply | External | | | NO |
| L | decimals | External | | | NO |
| L | symbol | External | | | NO |
| L | name | External | | | NO |
| L | getOwner | External | | ! | NO |
| L | balanceOf | Public | | ! | NO |
| L | allowance | External | | ! | NO |
| L | approve | External | | " ! | NO |
| L | _approve | Internal | $ | " | |
| L | approveContractContingency | Public | | " ! | onlyOwner |
| L | transfer | External | | " | NO |
| L | transferFrom | External | | " | NO |
| L | setNewRouter | External | | " | onlyOwner |
| L | setLpPair | External | | " | onlyOwner |
| L | setInitializers | External | | " | onlyOwner |
| L | isExcludedFromFees | External | | | NO |
| L | isExcludedFromDividends | External | | | NO |
| L | isExcludedFromProtection | External | | | NO |
| L | setDividendExcluded | Public | | " | onlyOwner |
| L | setExcludedFromFees | Public | | " | onlyOwner |

```



GZT-02 POSSIBLE OVERFLOW

Category	Severity ●	Location	Status
Status Mathematical Operations	Minor	contracts/code/ZKGAMES.sol	Acknowledged

Description

In `updateForMinter`, the following equation is used inside an unchecked block

```
function _mint(address account, uint256 amount) internal virtual {  
    require(account != address(0), "ERC20: mint to the zero address");
```

Minter can not issue more `ZKG` tokens indefinitely.

Note that as of the date of publishing, the above review reflects the current understanding of known security patterns as they relate to the EMT contract.

Recommendation

We recommend either checking for overflow in this case, or ensuring that the `PairsIn` is close enough it will never cause an overflow.

Vulnerability Run check

Risk Analysis

✔ Contract source code verified

This token contract is open source. You can check the contract code for details. Unsourced token contracts are likely to have malicious functions to defraud their users of their assets.

✔ No mint function

Mint function is transparent or non-existent. Hidden mint functions may increase the amount of tokens in circulation and effect the price of the token.

✔ Owner cant change balance

The contract owner does not have the authority to modify the balance of tokens at other addresses.

✔ No Proxy

There is no proxy in the contract. The proxy contract means contract owner can modify the function of the token and possibly effect the price.

✔ No function to retrieve ownership

If this function exists, it is possible for the project owner to regain ownership even after relinquishing it.



Honeypot Risk

✔ This does not appear to be a honeypot

We are not aware of any code that prevents the sale of tokens.

✔ No Anti Whale

There is no limit to the number of token transactions. The number of scam token transactions may be limited (honeypot risk).

✔ No whitelist function

Whitelist function found






✔ No trading cooldown

The token contract has no trading cooldown function. If there is a trading cooldown function, the user will not be able to sell the token within a certain time or block after buying.

✔ No blacklist function

No blacklist function is included.

OPTIMIZATIONS | ZKGAMES

ID	Title	Category	Status
GZT- 007	Logarithm Refinement Optimization	Gas Optimization	Acknowledged 
GZT- 323	Checks Can Be Performed Earlier	Gas Optimization	Acknowledged 
GZT- 679	Unnecessary Use Of SafeMath	Gas Optimization	Acknowledged 
GZT- 122	Struct Optimization	Gas Optimization	Acknowledged 
GZT-067	Unused State Variable	Gas Optimization	Acknowledged 

General Detectors



Public Functions Should be Declared External

Some functions in this contract should be declared as external in order to save gas.



Attention
Required



Numeric Notation Best Practices

The numeric notation used in this contract is unconventional, possibly worsening the reading/debugging experience

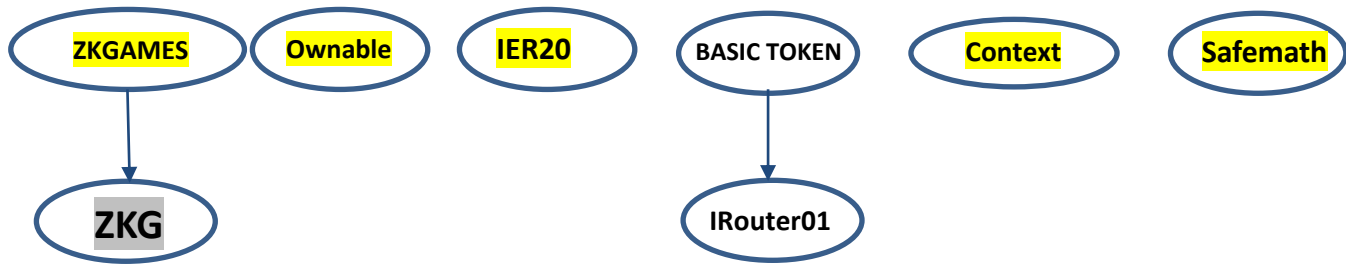


Attention
Required

- ✓ No compiler version inconsistencies found
- ✓ No unchecked call responses found
- ✓ No vulnerable self-destruct functions found
- ✓ No assertion vulnerabilities found
- ✓ No old solidity code found
- ✓ No external delegated calls found
- ✓ No external call dependency found
- ✓ No vulnerable authentication calls found
- ✓ No invalid character typos found
- ✓ No RTL characters found
- ✓ No dead code found
- ✓ No risky data allocation found
- ✓ No uninitialized state variables found
- ✓ No uninitialized storage variables found
- ✓ No vulnerable initialization functions found
- ✓ No risky data handling found
- ✓ No number accuracy bug found
- ✓ No out-of-range number vulnerability found
- ✓ No map data deletion vulnerabilities found
- ✓ No tautologies or contradictions found
- ✓ No faulty true/false values found
- ✓ No inaccurate divisions found
- ✓ No redundant constructor calls found
- ✓ No vulnerable transfers found
- ✓ No vulnerable return values found
- ✓ No uninitialized local variables found
- ✓ No default function responses found
- ✓ No missing arithmetic events found
- ✓ No missing access control events found
- ✓ No redundant true/false comparisons found
- ✓ No state variables vulnerable through function calls found
- ✓ No buggy low-level calls found
- ✓ No expensive loops found
- ✓ No bad numeric notation practices found
- ✓ No missing constant declarations found
- ✓ No missing external function declarations found
- ✓ No vulnerable payable functions found
- ✓ No vulnerable message values found



INHERITANCE GRAPH



Identifier	Definition	Severity
CEN-12	Centralization privileges of ZKGAMES	Medium # 🟡

Vulnerability 0 : No important security issue detected.

Threat level: Low

```

1026 contract ZkGame is Ownable, ERC20 {
1027     using SafeMath for uint256;
1028
1029
1030     IMuteSwitchRouterDynamic public muteSwitchRouterDynamic;
1031     address public muteSwitchPairDynamic;
1032     address public marketingAndBuybackAddress;
1033     uint256 public buyFee = 2;
1034     uint256 public sellFee = 3;
1035     bool inSwapAndLiquify = false;
1036     bool stablePair = false;
1037
1038     mapping(address => bool) public isExcludedFromFee;
1039     uint256 public numTokensSellToFee = 10000 * 1e18;
1040
1041
1042     constructor(address _router) ERC20("zkGame Token", "ZKG") {
1043         _mint(_msgSender(), 100_000_000 * (10**18));
1044         IMuteSwitchRouterDynamic _muteSwitchRouterDynamic = IMuteSwitchRouterDynamic(_router);
1045         muteSwitchRouterDynamic = _muteSwitchRouterDynamic;
1046         marketingAndBuybackAddress = address(0xf435E128f4954f2388f80448458e5903fd0d635B);
1047         isExcludedFromFee[_msgSender()] = true;
1048         isExcludedFromFee[marketingAndBuybackAddress] = true;
1049         isExcludedFromFee[address(this)] = true;
  
```


MANUAL REVIEW

ZKGAMES: zkGame is an online betting platform that operates on the zkSync Era Mainnet. It assures transparency and fairness in its games by employing tamper-proof mechanics and VRF technology.

ARBISHIELD: ZKGAMES

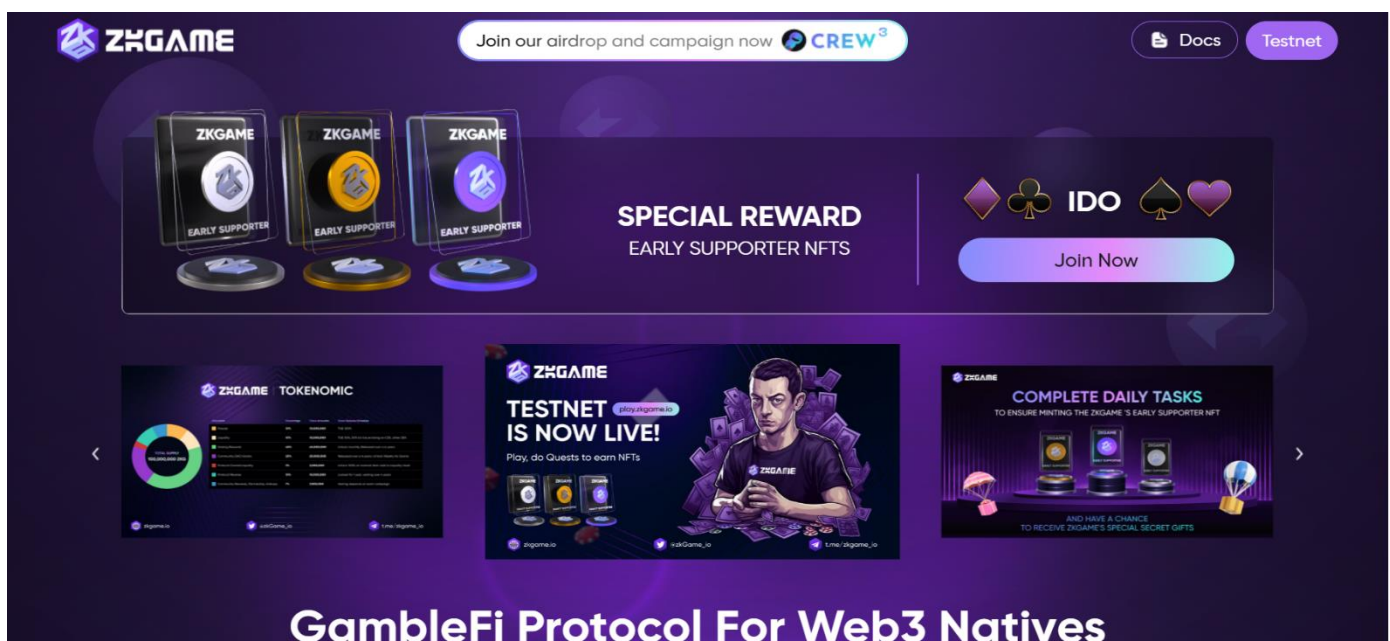
Ticker: ZKG

Decimals: 18

Chain/Standard: ZKSYNC Network



Outstanding Features of ZKGAMES Launching On ZKSYNC Network



The screenshot displays the ZKGAME website interface. At the top, there's a navigation bar with the ZKGAME logo, a link to 'Join our airdrop and campaign now' with a CREW logo, and buttons for 'Docs' and 'Testnet'. The main content area features three 'EARLY SUPPORTER' NFTs, a 'SPECIAL REWARD' section for 'EARLY SUPPORTER NFTS', and an 'IDO' section with a 'Join Now' button. Below these, there are three featured sections: 'ZKGAME TOKENOMIC' with a pie chart, 'TESTNET IS NOW LIVE!' with a person playing cards, and 'COMPLETE DAILY TASKS' with a person playing cards. The bottom of the page has a large banner that reads 'GambleFi Protocol For Web3 Natives'.



ISSUES CHECKING STATUS

Issue Description

Checking Status

1.	Compiler errors.	PASSED
2.	Race Conditions and reentrancy. Cross-Function Race Conditions.	PASSED
3.	Possible Delay In Data Delivery.	PASSED
4.	Oracle calls.	PASSED
5.	Front Running.	PASSED
6.	Sol Dependency.	PASSED
7.	Integer Overflow And Underflow.	PASSED
8.	DoS with Revert.	PASSED
9.	Dos With Block Gas Limit.	PASSED
10.	Methods execution permissions.	PASSED
11.	Economy Model of the contract.	PASSED
12.	The Impact Of Exchange Rate On the solidity Logic.	PASSED
13.	Private use data leaks.	PASSED
14.	Malicious Event log.	PASSED
15.	Scoping and Declarations.	PASSED
16.	Uninitialized storage pointers.	PASSED
17.	Arithmetic accuracy.	PASSED
18.	Design Logic.	PASSED
19.	Cross-Function race Conditions	PASSED
20.	Save Upon solidity contract Implementation and Usage.	PASSED
21.	Fallback Function Security	PASSED



AUDIT RESULT

PASSED

SMART CONTRACT AUDIT OF ZKGAMES

Vulnerability Scan

REENTRANCY

Severity

Major

Confidence Parameter

Certain

Vulnerability Description

NOTE: In a re-entrance attack, a malicious contract calls back into the calling contract before the first invocation of the function is finished. This may cause the different invocations of the function to interact in undesirable ways, especially in cases where the function is updating state variables after the external calls.

Scanning Line:

```
*/
function _transfer(
    address from,
    address to,
    uint256 amount
) internal virtual {
    require(from != address(0), "ERC20: transfer from the
zero address");
    require(to != address(0), "ERC20: transfer to the zero
address");

    _beforeTokenTransfer(from, to, amount);

    uint256 fromBalance = _balances[from];
    require(fromBalance >= amount, "ERC20: transfer amount
exceeds balance");
    unchecked {
        _balances[from] = fromBalance - amount;
        // Overflow not possible: the sum of all balances
is capped by totalSupply, and the sum is preserved by
// decrementing then incrementing.
        _balances[to] += amount;
    }

    emit Transfer(from, to, amount);

    _afterTokenTransfer(from, to, amount);
}
```

Repository:

<https://github.com/ZKGAMES>

All Audited Files

ZKGAMES.sol

Contract Creator

0x5E1b5f910E7D955a479d1AAc39c754c69724a7D1

Creator Txn Hash

0xe62518836705fa7c938010b1117f890a15128075fbc3d6466d723fb07af8d7b7

Contracts:

Contract:

TOKEN: **0xda941d75C8c4a5b4EdABe891314bD8b24251Ac75**



Identifier	Definition	Severity
CEN-02	Initial asset distribution	Minor 

```
function tryAdd(uint256 a, uint256 b) internal pure returns (bool, uint256) {  
    unchecked {  
        uint256 c = a + b;  
        if (c < a) return (false, 0);  
        return (true, c);  
    }  
}
```

Description:

Floating point calculations can vary across different architectures.

Recommendation: Replace with sdk.Dec .

Alleviation:

This exhibit was acknowledged and ultimately discarded by the **ZKGAMES** team due to low severity. We consider the exhibit fully attended to as it doesn't impose any meaningful security concerns.

RECOMMENDATION

Project stakeholders should be consulted during the initial asset distribution process.



RECOMMENDATION

Deployer and/or contract owner private keys are secured carefully.

Please refer to PAGE-09 CENTRALIZED PRIVILEGES for a detailed understanding.

ALLEVIATION

ZKGAMES project team understands the centralization risk. Some functions are provided privileged access to ensure a good runtime behaviour in the project



Identifier	Definition	Severity
COD-10	Third Party Dependencies	Minor 

A smart contract is interacting with third-party protocols e.g., Uniswap, Pancakeswap router, cashier contract,

And protections contract. The scope of the audit treats third-party entities as black boxes and assumes their functional correctness. However, in the real world, third parties can be compromised and exploited. Moreover, upgrades in third parties can create severe impacts, e.g., increased transactional fees, deprecation of previous routers, etc.

RECOMMENDATION

Inspect and validate third party dependencies regularly, and mitigate severe impacts whenever necessary.



CERTIFICATE BY VITAL BLOCK SECURITY



DISCLAIMERS

Vital Block Security provides the easy-to-understand audit of Solidity, Move, and Raw source codes (commonly known as smart contracts).

The smart contract for this particular audit was analyzed for common contract vulnerabilities, and centralization exploits. This audit report makes no statements or warranties on the security of the code. This audit report does not provide any warranty or guarantee regarding the absolute bug-free nature of the smart contract analyzed, nor do they provide any indication of the client's business, business model, or legal compliance. This audit report does not extend to the compiler layer, any other areas beyond the programming language, or other programming aspects that could present security risks. Cryptographic tokens are emergent technologies, they carry high levels of technical risks and uncertainty. You agree that your access and/or use, including but not limited to any services, reports, and materials, will be at your sole risk on an as-is, where-is, and as-available basis. This audit report could include false positives, false negatives, and other unpredictable results.

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ABOUT VITAL BLOCK

Vital Block provides intelligent blockchain Security Solutions. We provide solidity and Raw Code Review, testing, and auditing services. We have Partnered with 15+ Crypto Launchpads, audited 50+ smart contracts, and analyzed 200,000+ code lines. We have worked on major public blockchains e.g., Ethereum, Binance, Cronos, Doge, Polygon, Avalanche, Metis, Fantom, Bitcoin Cash, Aptos, Oasis, etc.

Vital Block is Dedicated to Making Defi & Web3 A Safer Place. We are Powered by Security engineers, developers, UI experts, and blockchain enthusiasts. Our team currently consists of 5 core members, and 4+ casual contributors.

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Vital Block Dedicated to securing Public and Private Blockchain Ecosystem