Cyberscope

Audit Report

The Worldwide Token

July 2023

SHA256 9871d0a93032725f67f0936d954ae92e088e1a48051a9311f2ff3df8aaad0c3c

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Analysis

● Critical ● Medium ● Minor / Informative ● Pass

Severity	Code	Description	Status
●	ST	Stops Transactions	Passed
●	OTUT	Transfers User's Tokens	Passed
●	ELFM	Exceeds Fees Limit	Passed
●	MT	Mints Tokens	Multisign
●	BT	Burns Tokens	Passed
●	BC	Blacklists Addresses	Passed

Diagnostics

● Critical ● Medium ● Minor / Informative

Severity	Code	Description	Status
●	MM	Multisig Misimplementation	Unresolved
●	MWV	Multisig Wallet Vulnerability	Unresolved
●	CR	Code Repetition	Unresolved
●	RCS	Redundant Conditional Statement	Unresolved
●	RSK	Redundant Storage Keyword	Unresolved
●	IDI	Immutable Declaration Improvement	Unresolved
●	L04	Conformance to Solidity Naming Conventions	Unresolved
●	L13	Divide before Multiply Operation	Unresolved
●	L16	Validate Variable Setters	Unresolved

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Review

Contract Name	BEP20Token
Testing Deploy	https://testnet.bscscan.com/address/0x59fb0136341106fe82f8d3c1bc39a4f8ebfb1168
Symbol	WORLD
Decimals	4

Audit Updates

Initial Audit	13 Jul 2023 https://github.com/cyberscope-io/audits/blob/main/1-world/v1/audit.pdf
Corrected Phase 2	17 Jul 2023 https://github.com/cyberscope-io/audits/blob/main/1-world/v2/audit.pdf
Corrected Phase 3	21 Jul 2023

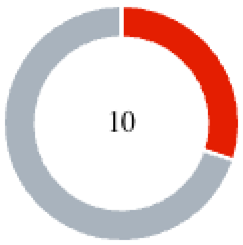
Source Files

Filename	SHA256
contracts/WorldToken.sol	9871d0a93032725f67f0936d954ae92e088e1a48051a9311f2ff3df8aaad0c3c

Overview

The audit scope is to check for security vulnerabilities, validate the business logic and propose potential optimizations. The contract is missing the fundamental principles of a Solidity smart contract regarding gas consumption, code readability, and data structures. According to the previously mentioned issues, the contract cannot be assumed that it is in a production-ready state. Given these issues, it is not advisable to assume that the contract is in a production-ready state. The development team is strongly encouraged to re-evaluate the business logic and Solidity guidelines to ensure that the contract adheres to established best practices and security measures. It is recommended that the team review the contract’s gas consumption and optimize it accordingly to minimize costs and improve the contract’s efficiency. The code’s readability should also be improved by simplifying function definitions and using descriptive variable names, as this will enhance the contract’s auditability and maintenance.

Findings Breakdown



●	Critical	3
●	Medium	0
●	Minor / Informative	7

Severity		Unresolved	Acknowledged	Resolved	Other
●	Critical	2	0	0	1
●	Medium	0	0	0	0
●	Minor / Informative	7	0	0	0

MT - Mints Tokens

Criticality	Critical
Location	contracts/WorldToken.sol#L447
Status	Multisign

Description

The contract owner has the authority to mint tokens. The owner may take advantage of it by calling the `mintProfit` function. As a result, the contract tokens will be highly inflated.

```
function mintProfit() public onlyOwner returns (uint256) {
    bytes memory data = abi.encodeWithSignature("contractMintProfit()");
    uint256 tx_index = submitTransaction(data);
    emit SendDistributeTxToConfirm(tx_index);
    return tx_index;
}
```

Recommendation

The team should carefully manage the private keys of the owner’s account. Renouncing the ownership will eliminate the threats but it is non-reversible.

MM - Multisig Misimplementation

Criticality	Critical
Location	contracts/WorldToken.sol#L302
Status	Unresolved

Description

The contract incorporates a custom multisig wallet implementation. However, any admin function that requires a multisig pattern will not be able to proceed. The `executeTransaction` function includes the following condition, where a transaction's confirmations must be equal to the required confirmations. As a result, every invocation of the `confirmTransaction` function will revert.

```
require(
    transaction.numConfirmations == numConfirmationsRequired,
    "cannot execute tx"
);
```

Recommendation

The team is advised to take these segments into consideration and rewrite them so that the multisig functionality works as expected. A recommended approach would be to modify the the `confirmTransaction` function so that it executes the transaction only when the confirmations have reached the required threshold.

```
function confirmTransaction(
    uint _txIndex
) public onlyOwner txExists(_txIndex) notExecuted(_txIndex)
notConfirme(_txIndex) {
    Transaction storage transaction = transactions[_txIndex];
    transaction.numConfirmations += 1;
    isConfirmed[_txIndex][msg.sender] = true;

    emit ConfirmTransaction(msg.sender, _txIndex);

    if (transaction.numConfirmations >= numConfirmationsRequired) {
        executeTransaction(_txIndex);
    }
}
```

MWV - Multisig Wallet Vulnerability

Criticality	Critical
Location	contracts/WorldToken.sol
Status	Unresolved

Description

The implementation of the multisig wallet functionality in the contract grants any authorized owner the authority to add or remove authorized wallets by utilizing the `addOwner` and `removeOwner` methods, respectively. However, this approach poses a significant security vulnerability. If any of the authorized owners' wallet is compromised, an attacker could exploit this situation by removing all other authorized wallets and executing any proposal without legitimate authorization.

Recommendation

The team should carefully manage the private keys of the owner's account.

CR - Code Repetition

Criticality	Minor / Informative
Location	contracts/WorldToken.sol#L367,384,400,584,609
Status	Unresolved

Description

The contract contains repetitive code segments. There are potential issues that can arise when using code segments in Solidity. Some of them can lead to issues like gas efficiency, complexity, readability, security, and maintainability of the source code. It is generally a good idea to try to minimize code repetition where possible.

The functionality between the three tax functions can be reused.

```
if (tax > 15) {
    tax = 15;
}
if (tax < 5) {
    tax = 5;
}
```

The `claim` and `getClaimRewardsCount` functions share some code segments which are identical.

```
uint256 total = 0;
for (uint256 i = 0; i < claimList.length; i++) {
    total += balances[claimList[i]];
}
uint256 myBalance = balances[_msgSender()];
uint256 percent = (myBalance * 10000) / total;
uint256 amount = (_balances[worldPoolWallet] * percent) / 10000;
```

Recommendation

The team is advised to avoid repeating the same code in multiple places, which can make the contract easier to read and maintain. The authors could try to reuse code wherever possible, as this can help reduce the complexity and size of the contract. For instance, the contract could reuse the common code segments in an internal function in order to avoid repeating the same code in multiple places.

RCS - Redundant Conditional Statement

Criticality	Minor / Informative
Location	contracts/WorldToken.sol#L239,245,595
Status	Unresolved

Description

There are code segments that could be optimized. A segment may be optimized so that it becomes a smaller size, consumes less memory, executes more rapidly, or performs fewer operations.

The `findIndex(_msgSender(), claimList)` is checked twice in the `claim` function. As a result, the following code segments are redundant.

```
int256 index = findIndex(_msgSender(), claimList);
require(index >= 0 && uint256(index) < claimList.length, "Invalid index");
```

Recommendation

The team is advised to take these segments into consideration and rewrite them so the runtime will be more performant. That way it will improve the efficiency and performance of the source code and reduce the cost of executing it.

RSK - Redundant Storage Keyword

Criticality	Minor / Informative
Location	contracts/WorldToken.sol#L352
Status	Unresolved

Description

The contract uses the `storage` keyword in a view function. The `storage` keyword is used to persist data on the contract's storage. View functions are functions that do not modify the state of the contract and do not perform any actions that cost gas (such as sending a transaction). As a result, the use of the `storage` keyword in view functions is redundant.

```
Transaction storage transaction
```

Recommendation

It is generally considered good practice to avoid using the `storage` keyword in view functions because it is unnecessary and can make the code less readable.

IDI - Immutable Declaration Improvement

Criticality	Minor / Informative
Location	contracts/WorldToken.sol#L200
Status	Unresolved

Description

The contract declares state variables that their value is initialized once in the constructor and are not modified afterwards. The `immutable` is a special declaration for this kind of state variables that saves gas when it is defined.

```
_totalSupply
```

Recommendation

By declaring a variable as immutable, the Solidity compiler is able to make certain optimizations. This can reduce the amount of storage and computation required by the contract, and make it more gas-efficient.

L04 - Conformance to Solidity Naming Conventions

Criticality	Minor / Informative
Location	contracts/WorldToken.sol#L161,163,164,176,177,257,265,287,298,319,340,846,857
Status	Unresolved

Description

The Solidity style guide is a set of guidelines for writing clean and consistent Solidity code. Adhering to a style guide can help improve the readability and maintainability of the Solidity code, making it easier for others to understand and work with.

The followings are a few key points from the Solidity style guide:

1. Use camelCase for function and variable names, with the first letter in lowercase (e.g., myVariable, updateCounter).
2. Use PascalCase for contract, struct, and enum names, with the first letter in uppercase (e.g., MyContract, UserStruct, ErrorEnum).
3. Use uppercase for constant variables and enums (e.g., MAX_VALUE, ERROR_CODE).
4. Use indentation to improve readability and structure.
5. Use spaces between operators and after commas.
6. Use comments to explain the purpose and behavior of the code.
7. Keep lines short (around 120 characters) to improve readability.

```
uint8 constant private _decimals = 4
string constant private _symbol = "WORLD"
string constant private _name = "WORLD"
event allowListTransferTaxEvent(address addr);
event addToDexAddressListEvent(address addr);
uint256 _required
bytes memory _data
uint _txIndex
...
```

Recommendation

By following the Solidity naming convention guidelines, the codebase increased the readability, maintainability, and makes it easier to work with.
Find more information on the Solidity documentation https://docs.soliditylang.org/en/v0.8.17/style-guide.html#naming-convention.

L13 - Divide before Multiply Operation

Criticality	Minor / Informative
Location	contracts/WorldToken.sol#L589,590,614,615,628,629,633,634,638,639,643,644,648,649,654,655,656,660,661,662,666,667,668,672,673,674,680,681,682,686,687,688,692,693,694,698,699,700,704,705,706,716,717,718,722,723,724
Status	Unresolved

Description

It is important to be aware of the order of operations when performing arithmetic calculations. This is especially important when working with large numbers, as the order of operations can affect the final result of the calculation. Performing divisions before multiplications may cause loss of prediction.

```
uint256 percent = (myBalance * 10000) / total;
uint256 amount = (_balances[worldPoolWallet] * percent) / 10000;
uint256 percent = 7250 * (tax * 100) / 10000;
uint256 convertWorldAmount = percent * amount / 10000;
...
```

Recommendation

To avoid this issue, it is recommended to carefully consider the order of operations when performing arithmetic calculations in Solidity. It's generally a good idea to use parentheses to specify the order of operations. The basic rule is that the multiplications should be prior to the divisions.

L16 - Validate Variable Setters

Criticality	Minor / Informative
Location	contracts/WorldToken.sol#L196
Status	Unresolved

Description

The contract performs operations on variables that have been configured on user-supplied input. These variables are missing of proper check for the case where a value is zero. This can lead to problems when the contract is executed, as certain actions may not be properly handled when the value is zero.

```
_owner = msgSender
```

Recommendation

By adding the proper check, the contract will not allow the variables to be configured with zero value. This will ensure that the contract can handle all possible input values and avoid unexpected behavior or errors. Hence, it can help to prevent the contract from being exploited or operating unexpectedly.

Functions Analysis

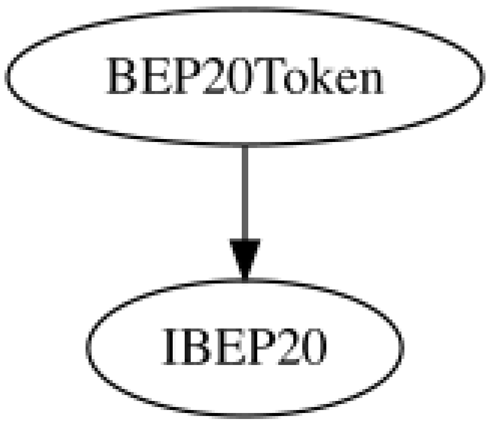
Contract	Type	Bases		
	Function Name	**Visibility**	**Mutability**	**Modifiers**
IBEP20	Interface			
	totalSupply	External		-
	decimals	External		-
	symbol	External		-
	name	External		-
	getOwner	External		-
	balanceOf	External		-
	transfer	External	✓	-
	allowance	External		-
	approve	External	✓	-
	transferFrom	External	✓	-
BEP20Token	Implementation	IBEP20		
		Public	✓	-
		External	Payable	-
	_msgSender	Internal		
	_msgData	Internal		
	isOwner	Public		-

	getOwner	External		-
	addOwner	Public	✓	onlyOwner
	removeOwner	Public	✓	onlyOwner
	changeRequirement	Public	✓	onlyOwner
	submitTransaction	Public	✓	onlyOwner
	confirmTransaction	Public	✓	onlyOwner txExists notExecuted notConfirmed
	executeTransaction	Internal	✓	onlyOwner txExists notExecuted
	revokeConfirmation	Public	✓	onlyOwner txExists notExecuted
	getOwners	Public		-
	getTransactionCount	Public		-
	getTransaction	Public		-
	contractChangeTax	Public	✓	onlyContract
	changeTax	Public	✓	onlyOwner
	contractChangeBuyTax	Public	✓	onlyContract
	changeBuyTax	Public	✓	onlyOwner
	contractChangeTransferTax	Public	✓	onlyContract
	changeTransferTax	Public	✓	onlyOwner
	contractSetTaxFree	Public	✓	onlyContract
	setTaxFree	Public	✓	onlyOwner
	contractChangeApy	Public	✓	onlyContract
	changeApy	Public	✓	onlyOwner

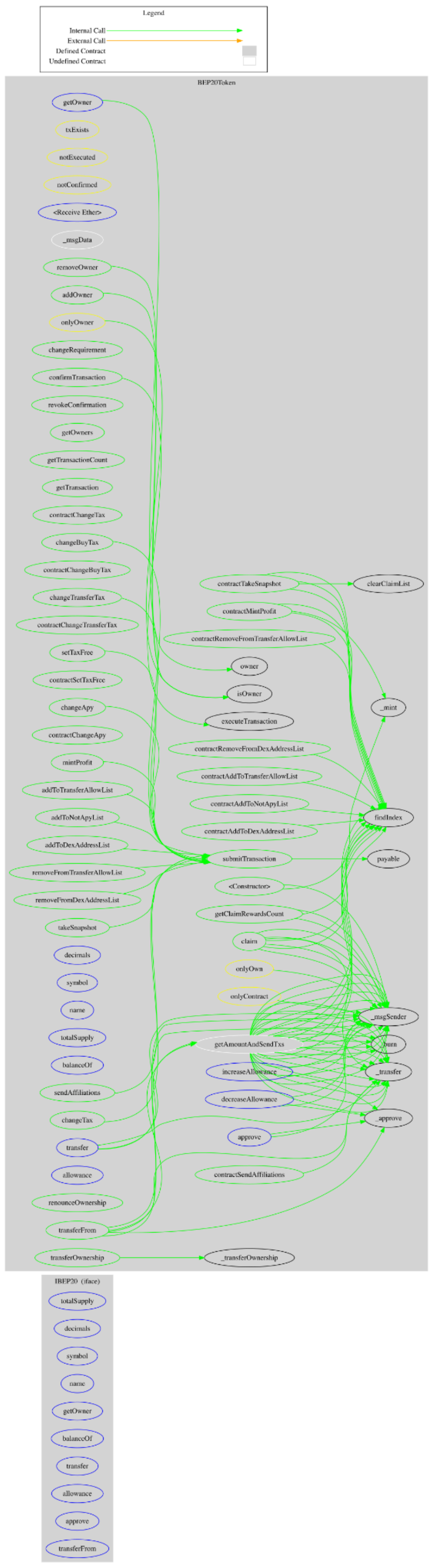
	contractMintProfit	Public	✓	onlyContract
	mintProfit	Public	✓	onlyOwner
	contractAddToTransferAllowList	Public	✓	onlyContract
	addToTransferAllowList	Public	✓	onlyOwner
	contractAddToNotApyList	Public	✓	onlyContract
	addToNotApyList	Public	✓	onlyOwner
	contractAddToDexAddressList	Public	✓	onlyContract
	addToDexAddressList	Public	✓	onlyOwner
	findIndex	Internal		
	contractRemoveFromTransferAllowList	Public	✓	onlyContract
	removeFromTransferAllowList	Public	✓	onlyOwner
	contractRemoveFromDexAddressList	Public	✓	onlyContract
	removeFromDexAddressList	Public	✓	onlyOwner
	decimals	External		-
	symbol	External		-
	name	External		-
	totalSupply	External		-
	balanceOf	External		-
	clearClaimList	Internal	✓	
	contractTakeSnapshot	Public	✓	onlyContract
	takeSnapshot	Public	✓	onlyOwner
	claim	Public	✓	-
	getClaimRewardsCount	Public		-

	getAmountAndSendTxs	Internal	✓	
	transfer	External	✓	-
	transferFrom	Public	✓	onlyOwner
	allowance	External		-
	increaseAllowance	External	✓	-
	decreaseAllowance	External	✓	-
	_transfer	Internal	✓	
	_mint	Internal	✓	
	_burn	Internal	✓	
	approve	External	✓	-
	_approve	Internal	✓	
	owner	Public		-
	renounceOwnership	Public	✓	onlyOwn
	transferOwnership	Public	✓	onlyOwn
	_transferOwnership	Internal	✓	
	contractSendAffiliations	Public	✓	onlyContract
	sendAffiliations	Public	✓	onlyOwner

Inheritance Graph



Flow Graph


Legend
Internal Call
External Call
Defined Contract
Undefined Contract
BEP20Token
getOwner
txExists
notExecuted
notConfirmed
<Receive Ether>
_msgData
removeOwner
addOwner
onlyOwner
changeRequirement
confirmTransaction
revokeConfirmation
getOwners
getTransactionCount
getTransaction
contractChangeTax
changeBuyTax
contractChangeBuyTax
changeTransferTax
contractChangeTransferTax
setTaxFree
contractSetTaxFree
changeApy
contractChangeApy
mintProfit
addToTransferAllowList
addToNotApyList
addToDexAddressList
removeFromTransferAllowList
removeFromDexAddressList
takeSnapshot
decimals
symbol
name
totalSupply
balanceOf
sendAffiliations
changeTax
transfer
allowance
renounceOwnership
transferFrom
transferOwnership
contractTakeSnapshot
contractMintProfit
contractRemoveFromTransferAllowList
owner
isOwner
executeTransaction
contractRemoveFromDexAddressList
contractAddToTransferAllowList
contractAddToNotApyList
contractAddToDexAddressList
submitTransaction
<Constructor>
getClaimRewardsCount
claim
onlyOwn
onlyContract
getAmountAndSendTxs
increaseAllowance
decreaseAllowance
approve
contractSendAffiliations
_transferOwnership
clearClaimList
_mint
findIndex
payable
_msgSender
_burn
_transfer
_approve
IBEP20 (iface)
totalSupply
decimals
symbol
name
getOwner
balanceOf
transfer
allowance
approve
transferFrom

Summary

The Worldwide Token contract implements a token mechanism. This audit investigates security issues, business logic concerns, and potential improvements. There are some functions that can be abused by the owner like mint tokens. If the contract owner abuses the mint functionality, then the contract will be highly inflated. A multi-wallet signing pattern will provide security against potential hacks. Temporarily locking the contract or renouncing ownership will eliminate all the contract threats. There is also a limit of max 15% sell, 10% buy, and 5% transfer fees.

Team Update

The team implemented a custom multi-sig wallet functionality, where the authorized addresses can confirm or revoke an admin transaction. At the time of this audit, the minimum required signatures for a transaction to be executed is one. However, as described in detail in the MM section, the implementation needs to be reviewed and rewritten to work as expected.

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Cyberscope is one of the leading smart contract audit firms in the crypto space and has built a high-profile network of clients and partners.

The Cyberscope team

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