Cyberscope

Audit Report

OpenGames

September 2023

Network	BSC
Address	0x0da87c6180d5609B5D0D5B8094f27cB5231499a3
Audited by	© cyberscope

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	Passed
●	BT	Burns Tokens	Passed
●	BC	Blacklists Addresses	Passed

Diagnostics

● Critical ● Medium ● Minor / Informative

Severity	Code	Description	Status
●	RPF	Redundant Pausable Functionality	Unresolved
●	RFD	Redundant Function Declarations	Unresolved
●	UM	Unused Modifier	Unresolved
●	CO	Contract Optimization	Unresolved
●	MNF	Misleading NFT Functionality	Unresolved
●	MU	Modifiers Usage	Unresolved
●	RSML	Redundant SafeMath Library	Unresolved
●	L09	Dead Code Elimination	Unresolved
●	L17	Usage of Solidity Assembly	Unresolved
●	L19	Stable Compiler Version	Unresolved

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Review

Contract Name	OpenGamesBuildersToken
Compiler Version	v0.8.1+commit.df193b15
Optimization	200 runs
Explorer	https://bscscan.com/address/0x0da87c6180d5609b5d0d5b8094f27cb5231499a3
Address	0x0da87c6180d5609b5d0d5b8094f27cb5231499a3
Network	BSC
Symbol	OGBX
Decimals	18
Total Supply	1,000,000,000

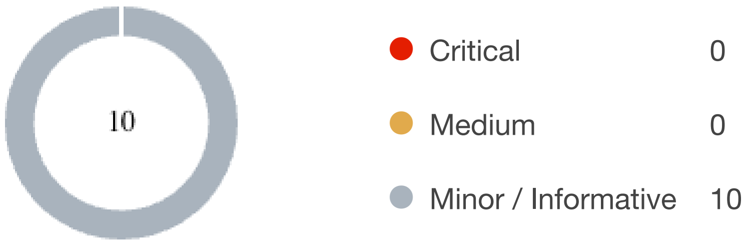
Audit Updates

Initial Audit	10 Feb 2023 https://github.com/cyberscope-io/audits/blob/main/opengames/v1/audit.pdf
Corrected Phase 2	13 Feb 2023 https://github.com/cyberscope-io/audits/blob/main/opengames/v2/audit.pdf
Corrected Phase 3	14 Sep 2023

Source Files

Filename	SHA256
OpenGamesBuildersToken.sol	3bc93089a05d4fbd1bbbd39ddf7996ec4d d843f3be7097c6eac276ae1f816815

Findings Breakdown



Severity	Unresolved	Acknowledged	Resolved	Other
● Critical	0	0	0	0
● Medium	0	0	0	0
● Minor / Informative	10	0	0	0

RPF - Redundant Pausable Functionality

Criticality	Minor / Informative
Location	contracts/OGBToken.sol#L957,962
Status	Unresolved

Description

The contract inherits functionality from the Pausable contract, which provides features for pausing and unpausing the contract's operations. However, none of the contract's functions make use of the `whenNotPaused` and `whenPaused` modifiers inherited from Pausable. Consequently, these modifiers remain unused and redundant within the contract.

```
// Function to pause contract operations
function pause() external onlyOwner {
    _pause();
}

// Function to resume contract operations
function unpause() external onlyOwner {
    _unpause();
}
```

Recommendation

To optimize the contract code and eliminate redundancy, it is advisable to either remove the inheritance from the Pausable contract if pausing and unpausing functionality is not needed, or to consider integrating these modifiers into the contract's functions where appropriate. If pausing functionality is indeed required, ensure that the `whenNotPaused` and `whenPaused` modifiers are applied to relevant functions to enable the contract's pausing mechanism effectively. This way, the contract remains more coherent and efficient in its operation.

RFD - Redundant Function Declarations

Criticality	Minor / Informative
Location	contracts/OGBToken.sol#L967,979,988,997,1008,1017
Status	Unresolved

Description

The contract contains a set of custom transfer functions (`inGameTransaction` , `upgradeItems` , `payMarketplaceFees` , `buyNFT` , and `sellNFT`) that essentially replicate the functionality of the standard ERC20 transfer function with additional validation. These custom functions share a common pattern and differ primarily in their names and validation checks. As a result, declaring all these functions is redundant.

```
// Function for in-game transactions
    function inGameTransaction(address to, uint256 amount) external {
    // This function allows users to perform in-game transactions by transferring tokens to another address.
    // The "to" parameter is the recipient's address, and "amount" is the number of tokens to transfer.
    require(amount > 0, "Amount must be greater than 0");
    require(to != address(0), "Invalid recipient address");
    // The require statement checks that the transfer amount is positive.
    // If it's not, the function will revert with the provided error message.
    _transfer(msg.sender, to, amount);
    // The _transfer function, inherited from ERC20, is used to transfer tokens from the sender to the recipient.
}
...
```

Recommendation

To streamline the contract code and adhere to best practices, it is recommended to leverage the standard ERC20 transfer function and implement custom logic using the `_beforeTokenTransfer` function provided by the OpenZeppelin ERC20 contract (or similar functionality). By centralizing the transfer logic in a single place, you can reduce redundancy, improve code maintainability, and ensure consistent validation checks across all transfer operations. Custom behavior, such as additional validation or functionality, can be implemented within `_beforeTokenTransfer` as needed, allowing for more modular and efficient code while retaining flexibility for customization.

UM - Unused Modifier

Criticality	Minor / Informative
Location	contracts/OGBToken.sol#L951,1001,1012,1021
Status	Unresolved

Description

The contract defines a `hasMinimumBalance` modifier intended to ensure that the caller has a minimum balance of tokens before executing certain functions. However, instead of consistently applying this modifier where needed, the contract redundantly contains direct `require` statements within the functions, performing the same balance check as the modifier.

```
// Modifier to ensure that the caller has a minimum balance of tokens
modifier hasMinimumBalance(uint256 amount) {
    require(balanceOf(msg.sender) >= amount, "Insufficient balance");
    _;
}

require(balanceOf(msg.sender) >= nftPrice, "Insufficient balance");
```

Recommendation

To promote code consistency, readability, and maintenance, it is recommended to use the `hasMinimumBalance` modifier consistently where balance checks are required. By doing so, you can eliminate redundancy, reduce the likelihood of errors, and make the codebase more coherent. Review and update all instances where direct `require` statements for balance checks exist within functions, replacing them with the `hasMinimumBalance` modifier. This ensures that the balance check logic remains centralized within the modifier, enhancing code quality and reducing duplication.

CO - Contract Optimization

Criticality	Minor / Informative
Location	OpenGamesBuildersToken.sol#L1052
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 `balanceOfUser` function is redundant. Users can utilize the already defined `balanceOf` function.

```
// Function to retrieve user's token balance
function balanceOfUser(address user) external view returns (uint256) {
    return balanceOf(user);
}
```

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.

MNF - Misleading NFT Functionality

Criticality	Minor / Informative
Location	contracts/OGBToken.sol#L997,1008,1017
Status	Unresolved

Description

Several functions within the contract have names that imply they facilitate the buying, selling, or renting of NFTs (`buyNFT` , `sellNFT` , `rentNFT`). However, upon closer examination of their implementations, it becomes apparent that these functions are primarily used for transferring tokens rather than handling actual NFTs. This discrepancy between function names and their actual behavior can lead to confusion and misinterpretation.

```
// Function for buying NFTs
function buyNFT(address nftOwner, uint256 nftPrice) external {
    // This function enables users to buy NFTs from the specified owner.
    // The "nftOwner" parameter is the owner's address, and "nftPrice" is
the NFT's price in tokens.
    require(nftPrice > 0, "NFT price must be greater than 0");
    require(balanceOf(msg.sender) >= nftPrice, "Insufficient balance");
    // The require statement checks if the buyer has enough tokens to make
the purchase.
    // If not, the function reverts with an error message.
    _transfer(msg.sender, nftOwner, nftPrice);
}
...
```

Recommendation

To improve code clarity and ensure that function names accurately represent their behavior, it is recommended to consider renaming these functions to more accurately describe their token transfer functionality. By providing descriptive and accurate function names, you can enhance the readability and understanding of the contract code, reducing the potential for misinterpretation and confusion among developers and users.

MU - Modifiers Usage

Criticality	Minor / Informative
Location	contracts/OGBToken.sol#L970,982,991,1000,1011,1020
Status	Unresolved

Description

The contract uses repetitive statements on some methods to validate some preconditions. In Solidity, the form of preconditions is usually represented by the modifiers. Modifiers allow you to define a piece of code that can be reused across multiple functions within a contract. This can be particularly useful when you have several functions that require the same checks to be performed before executing the logic within the function.

```
require(amount > 0, "Amount must be greater than 0");
```

Recommendation

The team is advised to use modifiers since it is a useful tool for reducing code duplication and improving the readability of smart contracts. By using modifiers to perform these checks, it reduces the amount of code that is needed to write, which can make the smart contract more efficient and easier to maintain.

RSML - Redundant SafeMath Library

Criticality	Minor / Informative
Location	contracts/OGBToken.sol
Status	Unresolved

Description

SafeMath is a popular Solidity library that provides a set of functions for performing common arithmetic operations in a way that is resistant to integer overflows and underflows.

Starting with Solidity versions that are greater than or equal to 0.8.0, the arithmetic operations revert to underflow and overflow. As a result, the native functionality of the Solidity operations replaces the SafeMath library. Hence, the usage of the SafeMath library adds complexity, overhead and increases gas consumption unnecessarily.

```
library SafeMath {...}
```

Recommendation

The team is advised to remove the SafeMath library. Since the version of the contract is greater than `0.8.0` then the pure Solidity arithmetic operations produce the same result.

If the previous functionality is required, then the contract could exploit the `unchecked { ... }` statement.

Read more about the breaking change on https://docs.soliditylang.org/en/v0.8.16/080-breaking-changes.html#solidity-v0-8-0-breaking-changes.

L09 - Dead Code Elimination

Criticality	Minor / Informative
Location	OpenGamesBuildersToken.sol#L827
Status	Unresolved

Description

In Solidity, dead code is code that is written in the contract, but is never executed or reached during normal contract execution. Dead code can occur for a variety of reasons, such as:

- Conditional statements that are always false.
- Functions that are never called.
- Unreachable code (e.g., code that follows a return statement).

Dead code can make a contract more difficult to understand and maintain, and can also increase the size of the contract and the cost of deploying and interacting with it.

```
function _burn(address account, uint256 amount) internal virtual {
        require(account != address(0), "ERC20: burn from the zero address");

        _beforeTokenTransfer(account, address(0), amount);

        uint256 accountBalance = _balances[account];
...
            _totalSupply -= amount;
        }

        emit Transfer(account, address(0), amount);

        _afterTokenTransfer(account, address(0), amount);
    }
```

Recommendation

To avoid creating dead code, it's important to carefully consider the logic and flow of the contract and to remove any code that is not needed or that is never executed. This can help improve the clarity and efficiency of the contract.

L17 - Usage of Solidity Assembly

Criticality	Minor / Informative
Location	OpenGamesBuildersToken.sol#L1040
Status	Unresolved

Description

Using assembly can be useful for optimizing code, but it can also be error-prone. It's important to carefully test and debug assembly code to ensure that it is correct and does not contain any errors.

Some common types of errors that can occur when using assembly in Solidity include Syntax, Type, Out-of-bounds, Stack, and Revert.

```
assembly {
            size := extcodesize(addr)
        }
```

Recommendation

It is recommended to use assembly sparingly and only when necessary, as it can be difficult to read and understand compared to Solidity code.

L19 - Stable Compiler Version

Criticality	Minor / Informative
Location	OpenGamesBuildersToken.sol#L7,225,252,359,444,525,555,922
Status	Unresolved

Description

The `^` symbol indicates that any version of Solidity that is compatible with the specified version (i.e., any version that is a higher minor or patch version) can be used to compile the contract. The version lock is a mechanism that allows the author to specify a minimum version of the Solidity compiler that must be used to compile the contract code. This is useful because it ensures that the contract will be compiled using a version of the compiler that is known to be compatible with the code.

```
pragma solidity ^0.8.0;
```

Recommendation

The team is advised to lock the pragma to ensure the stability of the codebase. The locked pragma version ensures that the contract will not be deployed with an unexpected version. An unexpected version may produce vulnerabilities and undiscovered bugs. The compiler should be configured to the lowest version that provides all the required functionality for the codebase. As a result, the project will be compiled in a well-tested LTS (Long Term Support) environment.

Functions Analysis

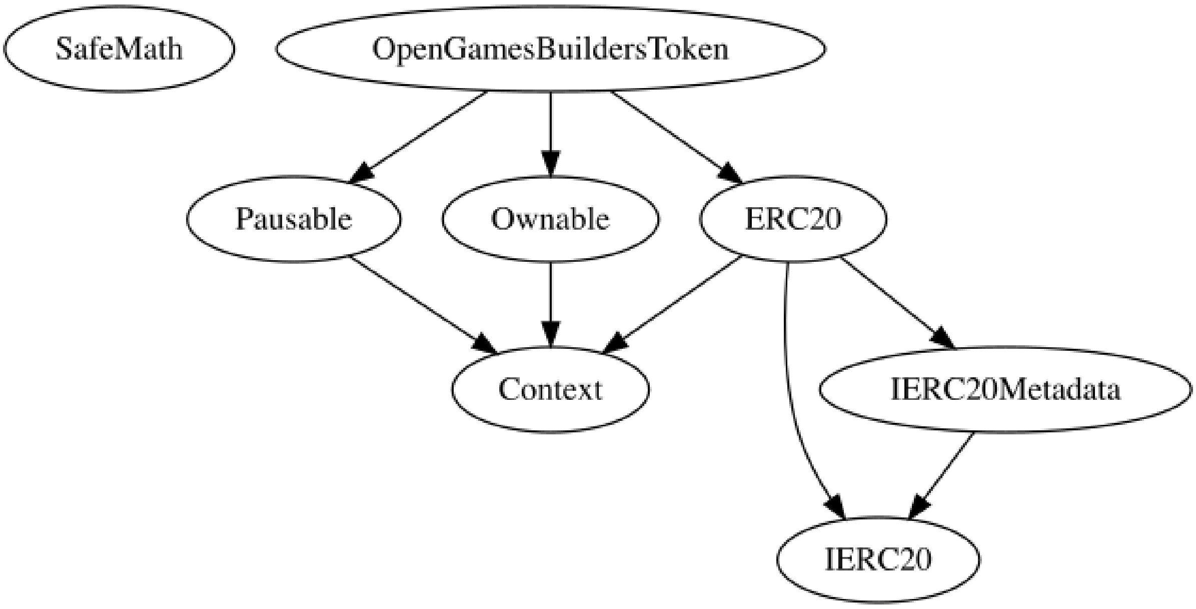
Contract	Type	Bases		
	Function Name	**Visibility**	**Mutability**	**Modifiers**
SafeMath	Library			
	tryAdd	Internal		
	trySub	Internal		
	tryMul	Internal		
	tryDiv	Internal		
	tryMod	Internal		
	add	Internal		
	sub	Internal		
	mul	Internal		
	div	Internal		
	mod	Internal		
	sub	Internal		
	div	Internal		
	mod	Internal		
Context	Implementation			
	_msgSender	Internal		
	_msgData	Internal		

Pausable	Implementation	Context		
		Public	✓	-
	paused	Public		-
	_requireNotPaused	Internal		
	_requirePaused	Internal		
	_pause	Internal	✓	whenNotPaused
	_unpause	Internal	✓	whenPaused
Ownable	Implementation	Context		
		Public	✓	-
	owner	Public		-
	_checkOwner	Internal		
	renounceOwnership	Public	✓	onlyOwner
	transferOwnership	Public	✓	onlyOwner
	_transferOwnership	Internal	✓	
IERC20	Interface			
	totalSupply	External		-
	balanceOf	External		-
	transfer	External	✓	-
	allowance	External		-
	approve	External	✓	-

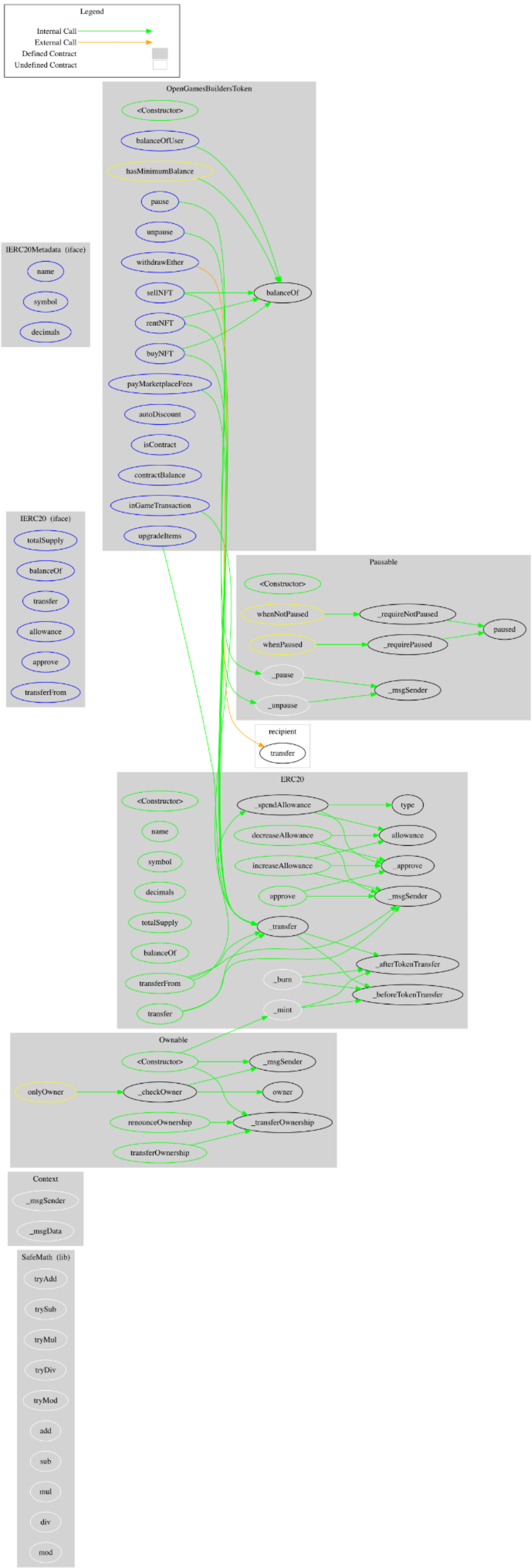
	transferFrom	External	✓	-
IERC20Metadata	Interface	IERC20		
	name	External		-
	symbol	External		-
	decimals	External		-
ERC20	Implementation	Context, IERC20, IERC20Metadata		
		Public	✓	-
	name	Public		-
	symbol	Public		-
	decimals	Public		-
	totalSupply	Public		-
	balanceOf	Public		-
	transfer	Public	✓	-
	allowance	Public		-
	approve	Public	✓	-
	transferFrom	Public	✓	-
	increaseAllowance	Public	✓	-
	decreaseAllowance	Public	✓	-
	_transfer	Internal	✓	
	_mint	Internal	✓	

	_burn	Internal	✓	
	_approve	Internal	✓	
	_spendAllowance	Internal	✓	
	_beforeTokenTransfer	Internal	✓	
	_afterTokenTransfer	Internal	✓	
OpenGamesBuildersToken	Implementation	ERC20, Ownable, Pausable		
		Public	✓	ERC20
	pause	External	✓	onlyOwner
	unpause	External	✓	onlyOwner
	inGameTransaction	External	✓	-
	upgradeItems	External	✓	-
	payMarketplaceFees	External	✓	-
	buyNFT	External	✓	-
	sellNFT	External	✓	-
	rentNFT	External	✓	-
	autoDiscount	External		-
	isContract	External		-
	contractBalance	External		-
	balanceOfUser	External		-
	withdrawEther	External	✓	onlyOwner

Inheritance Graph



Flow Graph


Legend
Internal Call
External Call
Defined Contract
Undefined Contract
OpenGamesBuildersToken
<Constructor>
balanceOfUser
hasMinimumBalance
pause
unpause
withdrawEther
sellNFT
rentNFT
buyNFT
payMarketplaceFees
autoDiscount
isContract
contractBalance
inGameTransaction
upgradeItems
balanceOf
IERC20Metadata (iface)
name
symbol
decimals
IERC20 (iface)
totalSupply
balanceOf
transfer
allowance
approve
transferFrom
Pausable
<Constructor>
whenNotPaused
_requireNotPaused
paused
whenPaused
_requirePaused
_pause
_msgSender
_unpause
recipient
transfer
ERC20
<Constructor>
_spendAllowance
type
name
decreaseAllowance
allowance
symbol
increaseAllowance
approve
decimals
approve
_msgSender
totalSupply
_transfer
balanceOf
_afterTokenTransfer
transferFrom
_burn
_beforeTokenTransfer
transfer
_mint
Ownable
<Constructor>
_msgSender
onlyOwner
_checkOwner
owner
renounceOwnership
_transferOwnership
transferOwnership
Context
_msgSender
_msgData
SafeMath (lib)
tryAdd
trySub
tryMul
tryDiv
tryMod
add
sub
mul
div
mod

Summary

OpenGames contract implements a token mechanism. This audit investigates security issues, business logic concerns, and potential improvements. OpenGames is an interesting project that has a friendly and growing community. The Smart Contract analysis reported no compiler error or critical issues. The contract Owner can access some admin functions that can not be used in a malicious way to disturb the users' transactions.

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Blockchain technology and cryptographic assets present a high level of ongoing risk Cyberscope's position is that each company and individual are responsible for their own due diligence and continuous security Cyberscope's goal is to help reduce the attack vectors and the high level of variance associated with utilizing new and consistently changing technologies and in no way claims any guarantee of security or functionality of the technology we agree to analyze. The assessment services provided by Cyberscope are subject to dependencies and are under continuing development. 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 Cryptographic tokens are emergent technologies and carry with them high levels of technical risk and uncertainty. The assessment reports could include false positives false negatives and other unpredictable results. The services may access and depend upon multiple layers of third parties.

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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

https://www.cyberscope.io