Cyberscope

Audit Report

OpenGames

February 2023

Commit 670f48222bc71c2829db29f0b87999a40255f4e1

Audited by © cyberscope

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Review

Repository	https://github.com/ammagtech/OGB-ICO-SmartContract
Commit	670f48222bc71c2829db29f0b87999a40255f4e1

Audit Updates

Initial Audit	13 Feb 2023

Source Files

Filename	SHA256
Console.sol	1982f3779eeec3143b12365735adb0021 8c417603b7c22870a8ec749d225abb8
DevContract.sol	54a933da8b206c020a824371fda1db8d7 d5a45d50170adb34bbaa5b6756289a8
INV_Round1.sol	47514cf13b128c684e9b272d2805b1d66 13dbdbf2af25f99703adae443f13862
INV_Round2.sol	ba672130a9ae7525ecd7674b56a37006f 32044d2d79b2f9fde24277b869b166d
INV_Seed.sol	43cca8b6264a43aefafdc45e800f86380cf b8923eec220da68ca4d88001d7b9c
LaunchContract.sol	f8f512429bbfa319ca70def64c57359a220 0480d1e9be584d8298c9ab602f459
SeedReplica.sol	b3b305e7959cabb4187c6ca7d1bb8f3fd 019e705288b681dfe8a2ad7380749f7
USDToken.sol	56e2439c286ac369377192a9668759e86 9241c5d718fa8e321cbd20e483345f7

Introduction

The Open Games Builders (OGB) ecosystem consists of 9 smart contracts.

1. **OGBToken** - An ERC20 token.
2. **USDToken** - An ERC20 token.
3. **LaunchContract** - A utility contract to launch the INV_Seed and INV_Round1 contracts.
4. **DevContract** - A vesting contract.
5. **INV_Seed** - A vesting contract.
6. **INV_Round1** - A vesting contract.
7. **INV_Round2** - A vesting contract.
8. **SeedReplica** - A vesting contract for users that have prepaid.
9. **Console** - A library that handles logging.

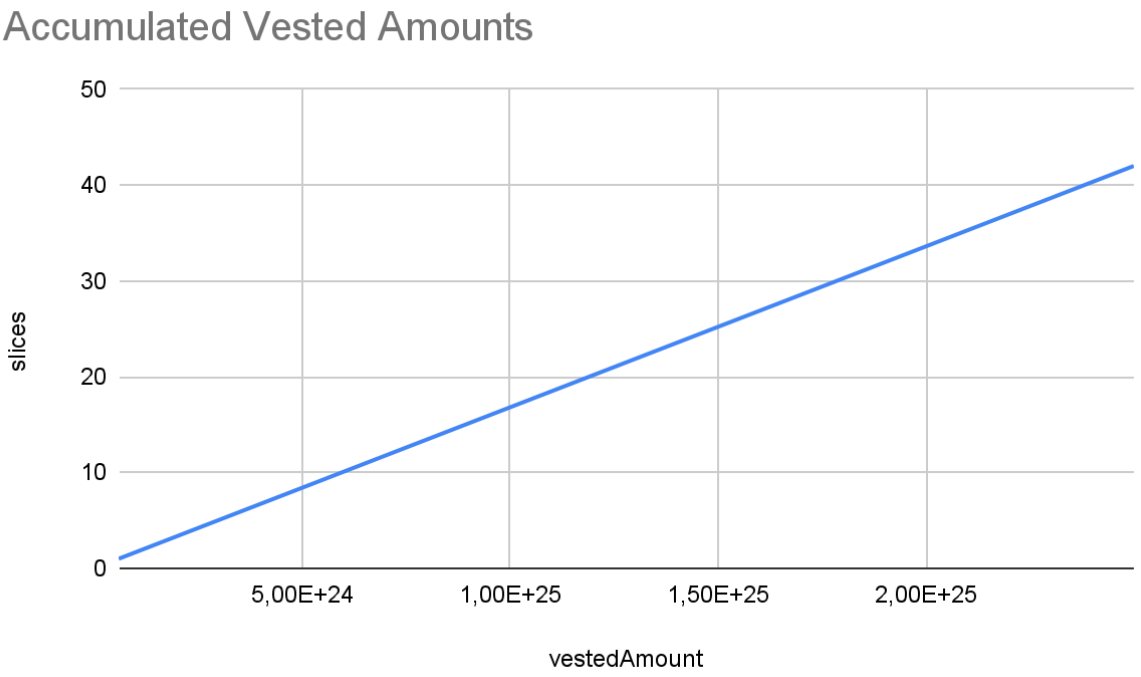
The purpose of the ecosystem is to handle token sales separated into rounds, where investors can deposit USDT and receive OGB tokens in return. The contracts keep track of how much USDT each investor has deposited, how many OGB tokens they have received, and how many tokens they are entitled to after a vesting period. The contracts also include functionality for controlling the start and stop of the ICO (Initial Coin Offering), setting the USDT to OGB rate, and various other parameters.

It should be noted that all of the vesting contracts inherit the functionality of the `UUPSUpgradable` contract. This allows the creation of an upgradeable smart contract that can be updated with bug fixes, security patches, or new features without having to deploy a completely new contract and update the addresses in every application that interacts with it. This makes the upgrade process much easier, cheaper, and more efficient for the project and its users. You can read more about it at https://docs.openzeppelin.com/contracts/4.x/api/proxy#UUPSUpgradeable.

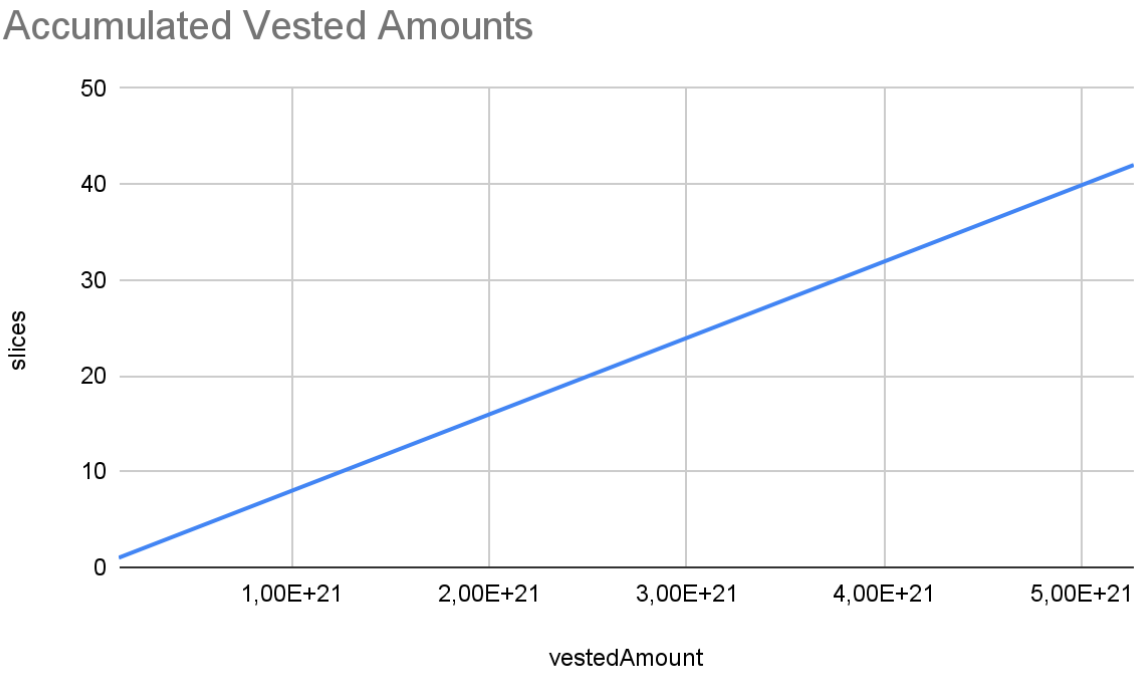
Vesting Formula

The vesting amount calculation follows a linear distribution from the first slice until the last one (the number of slices is different for each contract). The vesting amount sheet contains the details about the calculations. The X-Axis depicts the accumulative amount. Each user that participated in one or more of the ecosystem's contracts, receives a proportional amount.

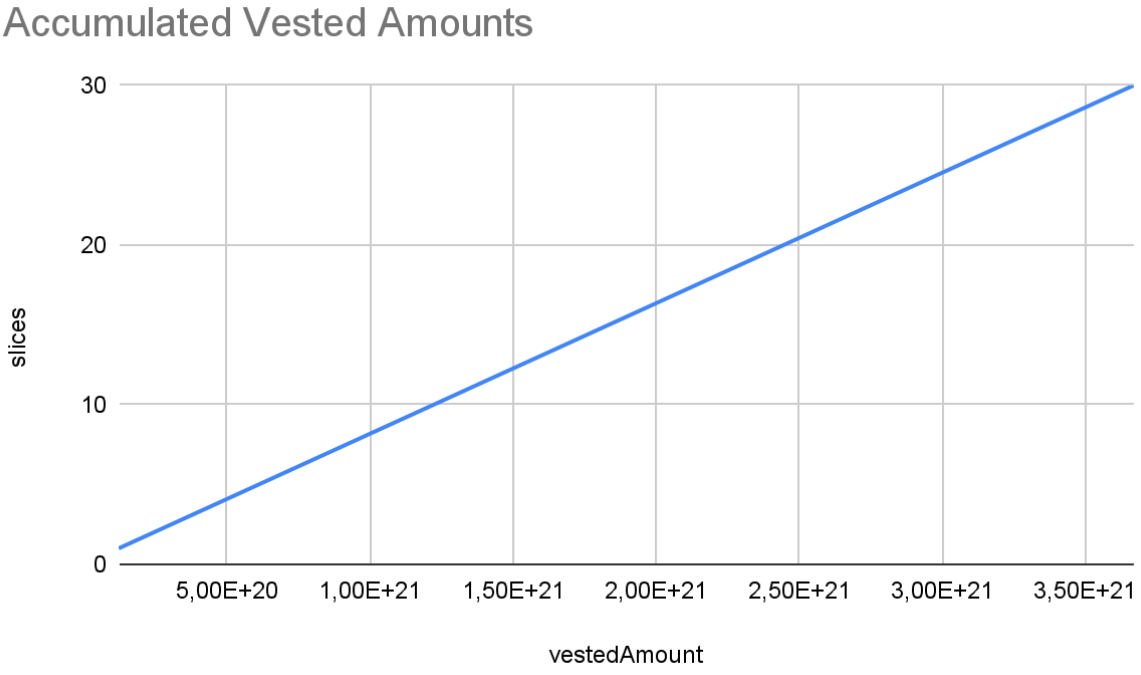
DevContract



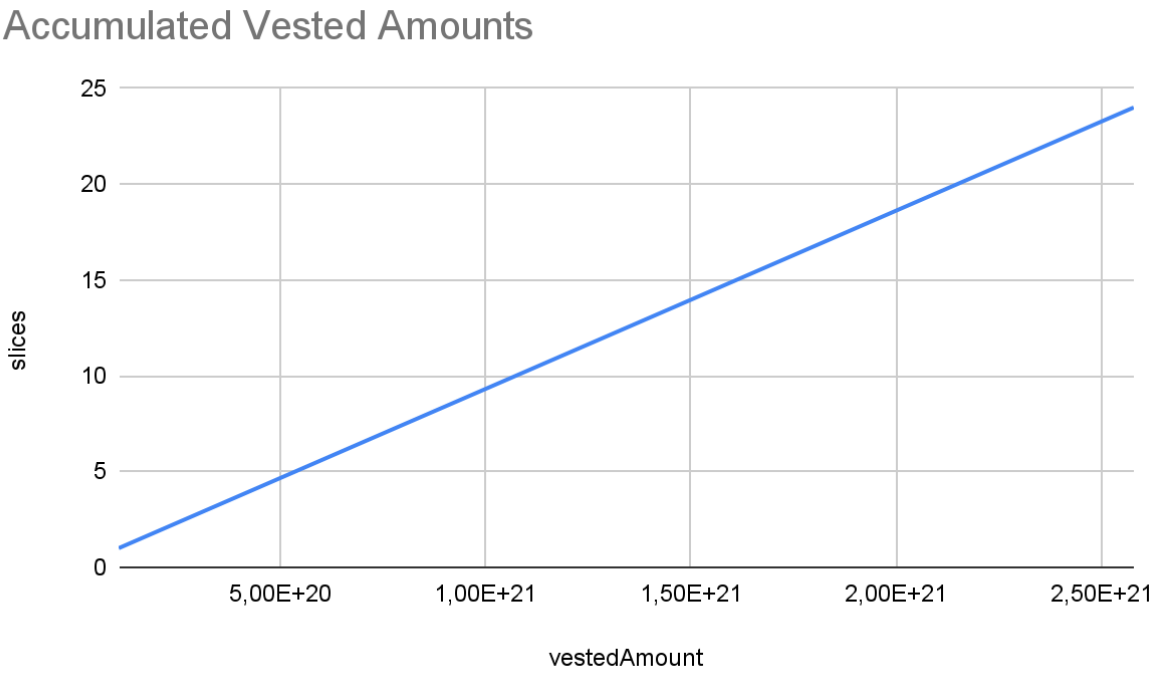
INV_Seed



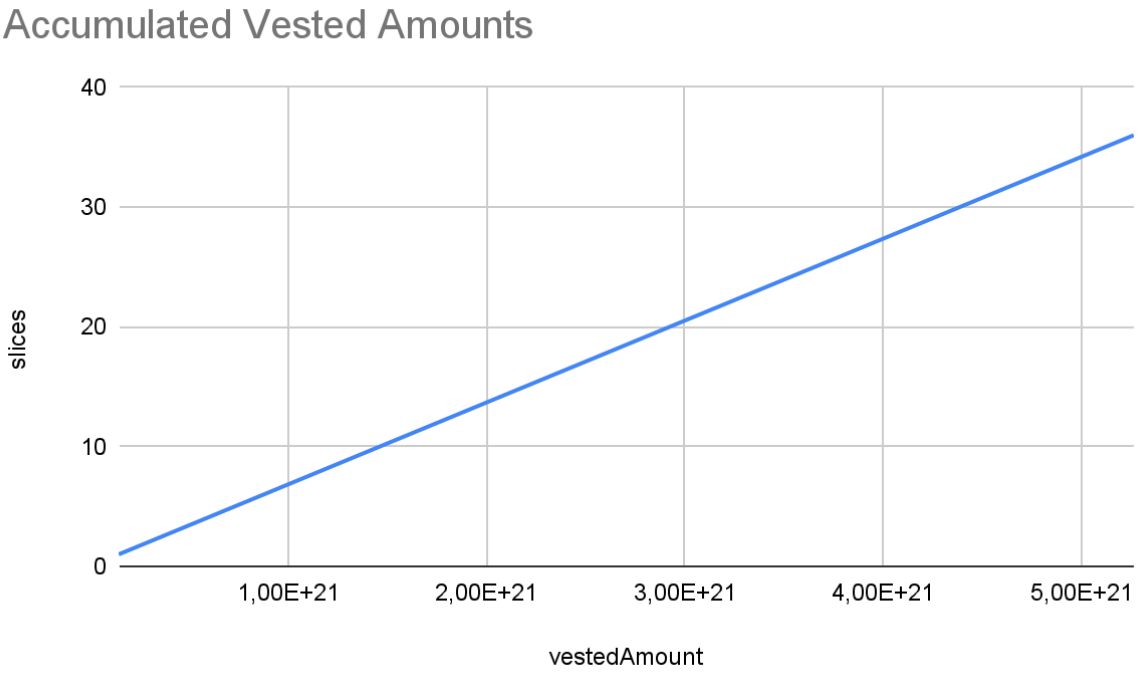
INV_Round1



INV_Round2



SeedReplica



Roles

Owner

The owner has the authority to

- Set a new address for the OGBToken and USDToken.
- Add/remove an address from the `Operator` role.
- Change the time period to release each slice of the vested amount.
- Change the max amount each user can vest.

Operator

The operator has the authority to

- Start/stop the ICO process (Initial Coin Offering).

User

The user has the authority to

- Deposit an amount in USDT and get OGBToken in return through the vesting process.
- Release the vested amount and get OGB tokens in slices.

Diagnostics

Critical Medium Minor / Informative

Severity	Code	Description	Status
●	CSC	Contract State Configuration	Unresolved
●	SOIL	Stable Operations in Loop	Unresolved
●	GCC	Gas Consuming Calculations	Unresolved
●	MC	Missing Check	Unresolved
●	CR	Calculation Repetition	Unresolved
●	PTAI	Potential Transfer Amount Inconsistency	Unresolved
●	RSML	Redundant SafeMath Library	Unresolved
●	OCTD	Transfers Contract's Tokens	Unresolved
●	UVF	Unused Variables And Functions	Unresolved
●	UF	Unimplemented Function	Unresolved
●	CR	Code Repetition	Unresolved
●	ZD	Zero Division	Unresolved
●	CO	Code Optimization	Unresolved

●	RVA	Redundant Variable Assignment	Unresolved
●	DPI	Decimals Precision Inconsistency	Unresolved
●	TUU	Time Units Usage	Unresolved
●	AAO	Accumulated Amount Overflow	Unresolved
●	L02	State Variables could be Declared Constant	Unresolved
●	L04	Conformance to Solidity Naming Conventions	Unresolved
●	L05	Unused State Variable	Unresolved
●	L07	Missing Events Arithmetic	Unresolved
●	L09	Dead Code Elimination	Unresolved
●	L12	Using Variables before Declaration	Unresolved
●	L13	Divide before Multiply Operation	Unresolved
●	L14	Uninitialized Variables in Local Scope	Unresolved
●	L16	Validate Variable Setters	Unresolved
●	L17	Usage of Solidity Assembly	Unresolved
●	L19	Stable Compiler Version	Unresolved
●	L20	Succeeded Transfer Check	Unresolved

CSC - Contract State Configuration

Criticality	Minor / Informative
Status	Unresolved

Description

The contract calculations are heavily dependent on the configuration of the state. For instance, the combination of `sliceTime` and `noOfSlices` produced the `computedAmount`. This amount is added to the `lastWithdrawAmount` when the user claims the corresponding tokens. If the contract owner increases the `sliceTime` or `noOfSlices` then the calculation will yield a lower number than the previous calculations. As a result, the expression `computedAmount.sub(lastWithdrawAmount[_benifierAddress]);` will underflow.

Recommendation

The team is advised to add sanity checks in the state setter methods in order to prevent the contract from resulting in an odd state.

SOIL - Stable Operations in Loop

Criticality	Minor / Informative
Location	SeedReplica.sol#L1284
Status	Unresolved

Description

The contract contains some checks inside the loop that do not change by the loop. As a result, the expression is executed N times but will always yield the same result.

```
for(uint256 x=0; x < _clientDetailarr.length; x++){
    require(!isICOLaunch, "Token launched, cannot deposit");
    ...
```

Recommendation

The team is advised to move the stable checks before the loop execution.

GCC - Gas Consuming Calculations

Criticality	Minor / Informative
Status	Unresolved

Description

The contract provides a different result if the last digit of the number is greater than four. The contract divides, then multiplies, and then subtracts in order to calculate the result. This process increases the gas consumption and complexity in the source code.

```
uint256 step1 = OGBToken/10; //5879
uint256 step2 = step1 * 10;//58790
uint256 step3 = OGBToken - step2;
if(step3 >4){
    console.log(step3);
    _result = ((OGBToken.add(10)).mul(tokenGenPercentage))/10**20;
}
else{
    _result = (OGBToken.mul(tokenGenPercentage))/10**20;
}
```

Recommendation

If the modulo 10 is applied to a decimal number, it will yield the last digit number. Thus, the algorithm could be simplified on one expression `OGBToken % 10 >4`.

MC - Missing Check

Criticality	Minor / Informative
Status	Unresolved

Description

The contract is processing variables that have not been properly sanitized and checking that they form the proper shape. These variables may produce vulnerability issues.

The variable `devFee` calculates the fee that will be transferred to the dev wallet. The `devFee` is divided by `10**18` as a result, if the owner sets a value greater than this, the contract will revert to the expression `uint256 _remaingAmount = _amount - _devAmount;`

The variable `tokenGenPercentage` represents a percentage. This variable is dividend by the number `10**20`, if the owner sets a value greater than `10**20`, then the percentage will be more than 100%.

Recommendation

The team is advised to properly check the variables according to the required specifications.

- The `devFee` should not be greater than `10**18`
- The `tokenGenPercentage` should not be greater than `10**20`

CR - Calculation Repetition

Criticality	Minor / Informative
Location	INV_Round1.sol#L127 INV_Round2.sol#L132 SeedReplica.sol#L125 INV_Seed.sol#L125
Status	Unresolved

Description

The contract calculates the `((_amount.mul(10**18)).div(USDT_To_OGB_Rate))` expression twice. As a result, it increases the gas consumption and creates unessecary complexity in the contract.

```
   function getAccurateResult(uint256 _amount) private view returns(uint256
_result) {

        uint256 OGBToken = ((_amount.mul(10**18)).div(USDT_To_OGB_Rate));
        console.log(OGBToken);
        uint256 step1 = OGBToken/10; //5879
        uint256 step2 = step1 * 10;//58790
        uint256 step3 = OGBToken - step2;
        console.log(step3);
        if(step3 >4){

            _result =
(((_amount.mul(10**2).add(1)).mul(10**18)).div(USDT_To_OGB_Rate))/10**2;

        }
        else{
            _result = ((_amount.mul(10**18)).div(USDT_To_OGB_Rate));
        }
    }
```

Recommendation

The team is adviced to resuse the initial calculation rather that re-calculating the same expression.

PTAI - Potential Transfer Amount Inconsistency

Criticality	Minor / Informative
Location	INV_Round1.sol#L118,119,264,266 INV_Round2.sol#L121,122,267,269 INV_Seed.sol#L116,117,262,264 SeedReplica.sol#L1383,1385
Status	Unresolved

Description

The `transfer()` and `transferFrom()` functions are used to transfer a specified amount of tokens to an address. The fee or tax is an amount that is charged to the sender of an ERC20 token when tokens are transferred to another address. According to the specification, the transferred amount could potentially be less than the expected amount. This may produce inconsistency between the expected and the actual behavior.

The following example depicts the diversion between the expected and actual amount.

Tax	Amount	Expected	Actual
No Tax	100	100	100
10% Tax	100	100	90

The contract transfers funds to either a specific wallet address or a user's address upon releasing the vested amount. The USDT or OGB token contracts could potentially charge fees during transactions. As a result, the actual transferred amount may differ than the expected one.

```
IERC20(USDTAddress).transferFrom(msg.sender, devWallet, _devAmount);
IERC20(USDTAddress).transferFrom(msg.sender, OwnerWallet, _remaingAmount);
...
if(_beforeVestingAmount > 0 ){
    IERC20(OGBAddress).transfer(_benifierAddress, _beforeVestingAmount);
}
IERC20(OGBAddress).transfer(_benifierAddress, vestedAmount);
```

Recommendation

The team is advised to take into consideration the actual amount that has been transferred instead of the expected.

It is important to note that an ERC20 transfer tax is not a standard feature of the ERC20 specification, and it is not universally implemented by all ERC20 contracts. Therefore, the contract could produce the actual amount by calculating the difference between the transfer call.

```
Actual Transferred Amount = Balance After Transfer - Balance Before Transfer
```

RSML - Redundant SafeMath Library

Criticality	Minor / Informative
Location	DevContract.sol#L5 INV_Round1.sol#L5 INV_Round2.sol#L5 INV_Seed.sol#L5 LaunchContract.sol#L5 SeedReplica.sol#L96
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 on 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 unnecessarily the gas consumption.

```
import "@openzeppelin/contracts/utils/math/SafeMath.sol";
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.

OCTD - Transfers Contract's Tokens

Criticality	Minor / Informative
Location	DevContract.sol#L194 INV_Round1.sol#L333 INV_Round2.sol#L336 INV_Seed.sol#L331 LaunchContract.sol#L50 SeedReplica.sol#L1490
Status	Unresolved

Description

The contract owner has the authority to claim all the balance of the contract. The owner may take advantage of it by calling the `emergencyWithdrawToken` function.

```
function emergencyWithdrawToken(address token, address destination) public
onlyOwner returns (bool sent){
    IERC20(token).transfer(destination,
IERC20(token).balanceOf(address(this)));
    return true;
}
```

Recommendation

The team should carefully manage the private keys of the owner’s account. We strongly recommend a powerful security mechanism that will prevent a single user from accessing the contract admin functions. That risk can be prevented by temporarily locking the contract or renouncing ownership.

UVF - Unused Variables And Functions

Criticality	Minor / Informative
Location	DevContract.sol#L209
Status	Unresolved

Description

An unused variable/function is a variable/function that is declared in the contract, but is never used in any of the contract's functions. This can happen if the variable/function was originally intended to be used, but was later removed or never used.

Unused variables/functions can create clutter in the contract and make it more difficult to understand and maintain. They can also increase the size of the contract and the cost of deploying and interacting with it. The contract declares the variable `USDTAddress` and its value is being assigned by the `setUSDTAddress` function, but it is not being used anywhere else in the contract.

```
address public USDTAddress;
...
function setUSDTAddress(address _USDTAddress) public onlyOwner{
    USDTAddress = _USDTAddress;
}
```

Recommendation

To avoid creating unused state variables, it's important to carefully consider the state variables that are needed for the contract's functionality, and to remove any that are no longer needed. This can help improve the clarity and efficiency of the contract.

UF - Unimplemented Function

Criticality	Minor / Informative
Location	SeedReplica.sol#L1501
Status	Unresolved

Description

A function with no code is a function that has been declared in a contract or interface but has no actual code that executes when the function is called. This could happen if a developer forgets to write the code for the function or intentionally leaves the function empty.

While a function with no code won't cause any syntax errors, it will prevent the contract from operating as intended since the function will not execute any actions. When calling a function with no code, the transaction will simply return without doing anything.

```
function getRate(uint256 _amount) public view returns(uint256 OGBAmount){}
```

Recommendation

The team is advised to ensure that the function has the necessary code to execute the desired actions when called. If the function is intentionally left empty, it is important to document why it is empty to avoid confusion for other people who may work on the contract or interact with it in the future.

CR - Code Repetition

Criticality	Minor / Informative
Location	DevContract.sol#L59,
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 contract can assign or modify a new value to the `OGBAddress` variable in two different functions. As a result, the same functionality is duplicated.

```
function setTokenAddress(address _OGBAddress) public onlyOwner{
    OGBAddress = _OGBAddress;
}
...
function setOGBTAddress(address _OGBAddress) public onlyOwner{
    OGBAddress = _OGBAddress;
}
```

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 to 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.

ZD - Zero Division

Criticality	Critical
Location	DevContract.sol#L129,174 INV_Seed.sol#L127,158,291,318 INV_Round1.sol#L129,160,293,320 INV_Round2.sol#L132,163,296,323 SeedReplica.sol#L1305,1336,1412,1439
Status	Unresolved

Description

The contract is using variables that may be set to zero as denominators. This can lead to unpredictable and potentially harmful results, such as a transaction revert. Overall, the following variables can be set to zero or there can be a scenario where they haven't been initialized with a value:

- `sliceTime`
- `USDT_To_OGB_Rate`
- `noOfSlices`

Regarding the `sliceTime` variable, it will be zero in the following scenario:

1. `initialize()` function isn't called after contracts deployment, so `sliceTime` value remains zero.
2. `deposit()` function is called.
3. `release()` is called, lastly, resulting in a division by zero.

```
uint256 NumberOfSlicesPassed = timePassed.div(sliceTime);
...
uint256 OGBToken = ((_amount.mul(10**18)).div(USDT_To_OGB_Rate));
...
_perSliceTokens = (_totalOGBTokens).div(noOfSlices);
uint256 amountPerSlice = (_amountToHold).div(noOfSlices);
uint256 perSliceTime = (endTime - startTime).div(noOfSlices);
```

Recommendation

It is important to handle division by zero appropriately in the code to avoid unintended behavior and to ensure the reliability and safety of the contract. The contract should ensure that the divisor is always non-zero before performing a division operation. It should prevent the variables to be set to zero or should not allow executing of the corresponding statements.

CO - Code Optimization

Criticality	Minor / Informative
Location	INV_Seed.sol#L268 INV_Round1.sol#L270 INV_Round2.sol#L273 SeedReplica.sol#L1389
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 contract performs the same operation at the `if` block and the `else-if` block while checking the same condition. As a result, the code is being repeated and makes it more difficult to undestand.

```
else if(_beforeVestingAmount > 0){
    IERC20(OGBAddress).transfer(_benifierAddress, _beforeVestingAmount);
    beforeVestingTokens[_benifierAddress] = 0;
}
```

Recommendation

The team is advised to take into consideration these segments 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.

RVA - Redundant Variable Assignment

Criticality	Minor / Informative
Location	SeedReplica.sol#L1285
Status	Unresolved

Description

The contract assigns the `_clientDetail` array to a new variable and stored in memory. This new variable is not being manipulated in any way, instead it is only used for reading. This can become a problem in situations where memory usage is a concern, such as when working with large data sets since gas fees are based on the amount of memory used.

```
ClientDetail[] memory _clientDetailarr = _clientDetail;
```

Recommendation

The team is advised to remove the array's reassignment completely, since it is redundant and may produce additional gas fees. In general, it is recommended to assign a value to a single variable and then use that variable in subsequent operations.

DPI - Decimals Precision Inconsistency

Criticality	Medium
Location	INV_Seed.sol#L261 DevContract.sol#L104 INV_Round1.sol#L263 INV_Round2.sol#L266 SeedReplica.sol#L1382
Status	Unresolved

Description

The decimals field of a contract's ERC20 token can be used to specify the number of decimal places that the token uses. For example, if decimals is set to `8`, it means that the smallest unit of the token is `0.00000001`, and if decimals are set to `18`, it means that the smallest unit of the token is `0.000000000000000001`.

However, there is an inconsistency in the way that the decimals field is handled in some ERC20 contracts. The ERC20 specification does not specify how the decimals field should be implemented, and as a result, some contracts use different precision numbers.

This inconsistency can cause problems when interacting with these contracts, as it is not always clear how the decimals field should be interpreted. For example, if a contract expects the decimals field to be 18 digits, but the contract being interacted with uses 8 digits, the result of the interaction may not be what was expected.

The contract engages with two distinct contracts, transferring funds to them, and each contract may anticipate a different number of decimal places compared to the original contract. As a result, this can lead to inconsistencies in the transferred amounts.

```
if(_beforeVestingAmount > 0 ){
    IERC20(OGBAddress).transfer(_benifierAddress, _beforeVestingAmount);
}
IERC20(OGBAddress).transfer(_benifierAddress, vestedAmount);
```

Recommendation

To avoid these issues, it is important to carefully review the implementation of the decimals field of the underlying tokens. The team is advised to normalize each decimal to one single source of truth. A recommended way is to scale all the decimals to the greatest token's decimal. Hence, the contract will not lose precision in the calculations.

The following example depicts 3 tokens with different decimals precision.

ERC20	Decimals
Token 1	6
Token 2	9
Token 3	18

All the decimals could be normalized to 18 since it represents the ERC20 token with the greatest digits.

TUU - Time Units Usage

Criticality	Minor / Informative
Location	DevContract.sol#L52,53,55 INV_Seed.sol#L66,69 INV_Round1.sol#L68,71 INV_Round2.sol#L71,74 SeedReplica.sol#L1244,1247
Status	Unresolved

Description

The contract is using arbitrary numbers to form time-related values. As a result, it decreases the readability of the codebase and prevents the compiler to optimize the source code.

```
timePeriod = 12600;
sliceTime = 300;
cliff = block.timestamp + 360;
...
```

Recommendation

It is a good practice to use the time units reserved keywords like `seconds`, `minutes`, `hours`, `days`, `weeks` and `years` to process time-related calculations.

It's important to note that these time units are simply a shorthand notation for representing time in seconds, and do not have any effect on the actual passage of time or the execution of the contract. The time units are simply a convenience for expressing time in a more human-readable form.

AAO - Accumulated Amount Overflow

Criticality	Minor / Informative
Location	INV_Seed.sol#L114 INV_Round1.sol#L116 INV_Round2.sol#L119
Status	Unresolved

Description

The contract is using variables to accumulate values. The contract could lead to an overflow when the total value of a variable exceeds the maximum value that can be stored in that variable's data type. This can happen when an accumulated value is updated repeatedly over time, and the value grows beyond the maximum value that can be represented by the data type.

The value of `bookedTokens` variable is increased each time the `deposit()` function is called. The value that is added to the `bookedTokens` is dependent on the deposited amount and, most importantly, the `USDT_To_OGB_Rate` variable. The lower the `USDT_To_OGB_Rate` value is, the higher the amount that is added to the `bookedTokens` will be. As a result, the accumulated amount may potentially lead to an overflow.

```
bookedTokens += accurateOGBToken;
```

Recommendation

The team is advised to carefully investigate the usage of the variables that accumulate value. A suggestion is to add checks to the code to ensure that the value of a variable does not exceed the maximum value that can be stored in its data type.

L02 - State Variables could be Declared Constant

Criticality	Minor / Informative
Location	LaunchContract.sol#L23 DevContract.sol#L26,27
Status	Unresolved

Description

State variables can be declared as constant using the constant keyword. This means that the value of the state variable cannot be changed after it has been set. Additionally, the constant variables decrease gas consumption of the corresponding transaction.

```
address public round2Address
uint256 public perSlicePercentage
uint256 public devFee
```

Recommendation

Constant state variables can be useful when the contract wants to ensure that the value of a state variable cannot be changed by any function in the contract. This can be useful for storing values that are important to the contract's behavior, such as the contract's address or the maximum number of times a certain function can be called. The team is advised to add the constant keyword to state variables that never change.

L04 - Conformance to Solidity Naming Conventions

Criticality	Minor / Informative
Location	SeedReplica.sol#L649,652,667,692,696,757,889,892,1079,1097,1100,1103,1181,1189,1190,1200,1205,1207,1210,1225,1231,1253,1257,1261,1267,1273,1279,1303,1320,1333,1339,1343,1351,1356,1360,1371,1418,1448 LaunchContract.sol#L12,33,39 INV_Seed.sol#L10,14,15,24,25,27,30,45,51,72,76,80,86,92,98,103,125,142,155,161,165,173,236,240,251,297,327,342 INV_Round2.sol#L11,15,16,25,26,28,31,50,56,77,81,85,91,97,103,108,130,147,160,166,170,178,241,245,256,302,332 INV_Round1.sol#L11,15,16,25,26,28,32,47,53,74,78,82,88,94,100,105,127,144,157,163,167,175,238,242,253,299,329 DevContract.sol#L11,21,22,39,59,66,155,190,205,209
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.

```
function __Context_init() internal onlyInitializing {
    }

function __Context_init_unchained() internal onlyInitializing {
    }
uint256[50] private __gap
...
function __Ownable_init_unchained() internal onlyInitializing {
        _transferOwnership(_msgSender());
    }
uint256[49] private __gap

function __ERC1967Upgrade_init() internal onlyInitializing {
    }

...
```

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.

L05 - Unused State Variable

Criticality	Minor / Informative
Location	SeedReplica.sol#L1181
Status	Unresolved

Description

An unused state variable is a state variable that is declared in the contract, but is never used in any of the contract's functions. This can happen if the state variable was originally intended to be used, but was later removed or never used.

Unused state variables can create clutter in the contract and make it more difficult to understand and maintain. They can also increase the size of the contract and the cost of deploying and interacting with it.

```
uint256[50] private __gap
```

Recommendation

To avoid creating unused state variables, it's important to carefully consider the state variables that are needed for the contract's functionality and to remove any that are no longer needed. This can help improve the clarity and efficiency of the contract.

L07 - Missing Events Arithmetic

Criticality	Minor / Informative
Location	SeedReplica.sol#L1254,1280,1357 INV_Seed.sol#L73,77,99,237 INV_Round2.sol#L78,82,104,242 INV_Round1.sol#L75,79,101,239
Status	Unresolved

Description

Events are a way to record and log information about changes or actions that occur within a contract. They are often used to notify external parties or clients about events that have occurred within the contract, such as the transfer of tokens or the completion of a task.

It's important to carefully design and implement the events in a contract, and to ensure that all required events are included. It's also a good idea to test the contract to ensure that all events are being properly triggered and logged.

```
sliceTime = _timeSeconds
USDT_To_OGB_Rate = _rate
noOfSlices = _slices
usdtLimit = _amount
```

Recommendation

By including all required events in the contract and thoroughly testing the contract's functionality, the contract ensures that it performs as intended and does not have any missing events that could cause issues with its arithmetic.

L09 - Dead Code Elimination

Criticality	Minor / Informative
Location	SeedReplica.sol#L365,390,400,419,433,452,462,649,652,860,870,889,892,990,997,1007,1026,1033,1048,1100
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 sendValue(address payable recipient, uint256 amount) internal {
        require(address(this).balance >= amount, "Address: insufficient
balance");

        (bool success, ) = recipient.call{value: amount}("");
        require(success, "Address: unable to send value, recipient may have
reverted");
    }

function functionCall(address target, bytes memory data) internal returns
(bytes memory) {
        return functionCall(target, data, "Address: low-level call failed");
    }

...
```

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.

L12 - Using Variables before Declaration

Criticality	Minor / Informative
Location	SeedReplica.sol#L966
Status	Unresolved

Description

The contract is using a variable before the declaration. This is usually happening either if it has not been declared yet or if the variable has been declared in a different scope. It is not a good practice to use a local variable before it has been declared.

```
bytes32 slot
```

Recommendation

By declaring local variables before using them, contract ensures that it operates correctly. It's important to be aware of this rule when working with local variables, as using a variable before it has been declared can lead to unexpected behavior and can be difficult to debug.

L13 - Divide before Multiply Operation

Criticality	Minor / Informative
Location	SeedReplica.sol#L1307,1308,1322,1323,1410,1412,1414,1439,1441 INV_Seed.sol#L129,130,144,145,289,291,293,318,320 INV_Round2.sol#L134,135,149,150,294,296,298,323,325 INV_Round1.sol#L131,132,146,147,291,293,295,320,322 DevContract.sol#L129,139,141
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 step1 = OGBToken/10
uint256 step2 = step1 * 10

uint256 NumberOfSlicesPassed = timePassed.div(sliceTime)
uint256 amountPerSlice = (_amountToHold).div(noOfSlices)
return (amountPerSlice.mul(NumberOfSlicesPassed), NumberOfSlicesPassed)

uint256 NumberOfSlicesPassed = timePassed.div(sliceTime)
uint256 amountPerSlice = (_amountToHold).div(noOfSlices)
_amount = amountPerSlice.mul(NumberOfSlicesPassed)
```

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.

L14 - Uninitialized Variables in Local Scope

Criticality	Minor / Informative
Location	SeedReplica.sol#L966
Status	Unresolved

Description

Using an uninitialized local variable can lead to unpredictable behavior and potentially cause errors in the contract. It's important to always initialize local variables with appropriate values before using them.

```
bytes32 slot
```

Recommendation

By initializing local variables before using them, the contract ensures that the functions behave as expected and avoid potential issues.

L16 - Validate Variable Setters

Criticality	Minor / Informative
Location	SeedReplica.sol#L1234,1235,1262,1497 LaunchContract.sol#L34,35,57 INV_Seed.sol#L54,55,56,81,338,343 INV_Round2.sol#L59,60,61,86,343 INV_Round1.sol#L56,57,58,83,340 DevContract.sol#L60,67,201,206,210
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.

```
OGBAddress = _OGBAddress
launchContract = _launchContract
OwnerWallet = _ownerAddress
payable(destination).transfer(address(this).balance)
seedAddress = _seedContract
round1Address = _round1
USDTAddress = _USDTAddress
```

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.

L17 - Usage of Solidity Assembly

Criticality	Minor / Informative
Location	SeedReplica.sol#L491,842,852,862,872
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 {
                    let returndata_size := mload(returndata)
                    revert(add(32, returndata), returndata_size)
                }

assembly {
            r.slot := slot
        }
```

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	SeedReplica.sol#L2 LaunchContract.sol#L2 INV_Seed.sol#L2 INV_Round2.sol#L2 INV_Round1.sol#L2 DevContract.sol#L2
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 ^0.8.7;
```

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.

L20 - Succeeded Transfer Check

Criticality	Minor / Informative
Location	SeedReplica.sol#L1383,1385,1390,1491 LaunchContract.sol#L51 INV_Seed.sol#L116,117,262,264,269,332 INV_Round2.sol#L121,122,267,269,274,337 INV_Round1.sol#L118,119,264,266,271,334 DevContract.sol#L70,104,195
Status	Unresolved

Description

According to the ERC20 specification, the transfer methods should be checked if the result is successful. Otherwise, the contract may wrongly assume that the transfer has been established.

```
IERC20(OGBAddress).transfer(_benifierAddress, _beforeVestingAmount)
IERC20(OGBAddress).transfer(_benifierAddress, vestedAmount)
IERC20(token).transfer(destination, IERC20(token).balanceOf(address(this)))
IERC20(USDTAddress).transferFrom(msg.sender, devWallet, _devAmount)
IERC20(USDTAddress).transferFrom(msg.sender, OwnerWallet, _remaingAmount)
IERC20(OGBAddress).transferFrom(OGBAddress, address(this), _amount)
IERC20(OGBAddress).transfer(msg.sender, vestedAmount)
```

Recommendation

The contract should check if the result of the transfer methods is successful. The team is advised to check the SafeERC20 library from the Openzeppelin library.

Functions Analysis

Contract	Type	Bases		
	Function Name	**Visibility**	**Mutability**	**Modifiers**
devContract	Implementation	Initializable, OwnableUpgradeable, UUPSUpgradeable		
		Public	✓	-
	initialize	Public	✓	initializer
	setTokenAddress	Public	✓	onlyOwner
	_authorizeUpgrade	Internal	✓	onlyOwner
	deposit	Public	✓	-
	getVestedAmount	Public		-
	release	Public	✓	onlyOwner
	_computeReleasableAmount	Private		
	V_GetRemaingTime	Public		-
	getTokenBalance	Public		-
	emergencyWithdrawToken	Public	✓	onlyOwner
	emergencyWithdrawCurrency	Public	✓	onlyOwner
	setOGBTAddress	Public	✓	onlyOwner
	setUSDTAddress	Public	✓	onlyOwner
		External	Payable	-
		External	Payable	-
INV_Round1	Implementation	Initializable, OwnableUpgradeable, UUPSUpgradeable		
		Public	✓	-
	initialize	Public	✓	initializer

	setSliceTime	Public	✓	onlyOwner
	setUSDTLimit	Public	✓	onlyOwner
	setOwnerWallet	Public	✓	onlyOwner
	_authorizeUpgrade	Internal	✓	onlyOwner
	StartICO	Public	✓	-
	StopICO	Public	✓	-
	setUSDT_OBG_Rate	Public	✓	onlyOwner
	deposit	Public	✓	-
	getAccurateResult	Private		
	getAccurateResult2	Private		
	getUserAmounts	Public		-
	setTimePeriod	Public	✓	onlyOwner
	Launch	Public	✓	-
	setOperator	Public	✓	onlyOwner
	setNumberOfSlices	Public	✓	onlyOwner
	getVestedAmount	Public		-
	release	Public	✓	-
	_computeReleasableAmount	Private		
	V_GetRemaingTime	Public		-
	getTokenBalance	Public		-
	emergencyWithdrawToken	Public	✓	onlyOwner
	emergencyWithdrawCurrency	Public	✓	onlyOwner
		External	Payable	-
		External	Payable	-
INV_Round2	Implementation	Initializable, OwnableUpgradeable, UUPSUpgradeable		
		Public	✓	-

	initialize	Public	✓	initializer
	setSliceTime	Public	✓	onlyOwner
	setUSDTLimit	Public	✓	onlyOwner
	setOwnerWallet	Public	✓	onlyOwner
	_authorizeUpgrade	Internal	✓	onlyOwner
	StartICO	Public	✓	-
	StopICO	Public	✓	-
	setUSDT_OBG_Rate	Public	✓	onlyOwner
	deposit	Public	✓	-
	getAccurateResult	Private		
	getAccurateResult2	Private		
	getUserAmounts	Public		-
	setTimePeriod	Public	✓	onlyOwner
	Launch	Public	✓	-
	setOperator	Public	✓	onlyOwner
	setNumberOfSlices	Public	✓	onlyOwner
	getVestedAmount	Public		-
	release	Public	✓	-
	_computeReleasableAmount	Private		
	V_GetRemaingTime	Public		-
	getTokenBalance	Public		-
	emergencyWithdrawToken	Public	✓	onlyOwner
	emergencyWithdrawCurrency	Public	✓	onlyOwner
		External	Payable	-
		External	Payable	-
INV_Seed	Implementation	Initializable, OwnableUpgradeable, UUPSUpgradeable		

		Public	✓	-
	initialize	Public	✓	initializer
	setSliceTime	Public	✓	onlyOwner
	setUSDTLimit	Public	✓	onlyOwner
	setOwnerWallet	Public	✓	onlyOwner
	_authorizeUpgrade	Internal	✓	onlyOwner
	StartICO	Public	✓	-
	StopICO	Public	✓	-
	setUSDT_OBG_Rate	Public	✓	onlyOwner
	deposit	Public	✓	-
	getAccurateResult	Private		
	getAccurateResult2	Private		
	getUserAmounts	Public		-
	setTimePeriod	Public	✓	onlyOwner
	Launch	Public	✓	-
	setOperator	Public	✓	onlyOwner
	setNumberOfSlices	Public	✓	onlyOwner
	getVestedAmount	Public		-
	release	Public	✓	-
	_computeReleasableAmount	Private		
	V_GetRemaingTime	Public		-
	getTokenBalance	Public		-
	emergencyWithdrawToken	Public	✓	onlyOwner
	emergencyWithdrawCurrency	Public	✓	onlyOwner
	setOGBToken	Public	✓	onlyOwner
		External	Payable	-
		External	Payable	-
ILaunch	Interface			

	Launch	External	✓	-
LaunchContract	Implementation	Initializable, OwnableUpgradeable, UUPSUpgradeable		
		Public	✓	-
	initialize	Public	✓	initializer
	_authorizeUpgrade	Internal	✓	onlyOwner
	setContractAddresses	Public	✓	onlyOwner
	LaunchToken	Public	✓	onlyOwner
	chkLaunch	Public		-
	emergencyWithdrawToken	Public	✓	onlyOwner
	emergencyWithdrawCurrency	Public	✓	onlyOwner
		External	Payable	-
		External	Payable	-
IERC20	Interface			
	totalSupply	External		-
	balanceOf	External		-
	transfer	External	✓	-
	allowance	External		-
	approve	External	✓	-
	transferFrom	External	✓	-
SafeMath	Library			
	tryAdd	Internal		
	trySub	Internal		
	tryMul	Internal		
	tryDiv	Internal		

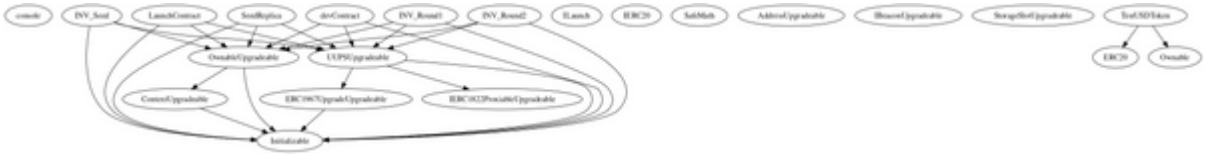
	tryMod	Internal		
	add	Internal		
	sub	Internal		
	mul	Internal		
	div	Internal		
	mod	Internal		
	sub	Internal		
	div	Internal		
	mod	Internal		
AddressUpgradeable	Library			
	isContract	Internal		
	sendValue	Internal	✓	
	functionCall	Internal	✓	
	functionCall	Internal	✓	
	functionCallWithValue	Internal	✓	
	functionCallWithValue	Internal	✓	
	functionStaticCall	Internal		
	functionStaticCall	Internal		
	verifyCallResult	Internal		
Initializable	Implementation			
	_disableInitializers	Internal	✓	
ContextUpgradeable	Implementation	Initializable		
	__Context_init	Internal	✓	onlyInitializing
	__Context_init_unchained	Internal	✓	onlyInitializing
	_msgSender	Internal		
	_msgData	Internal		

OwnableUpgradeable	Implementation	Initializable, ContextUpgradeable		
	__Ownable_init	Internal	✓	onlyInitializing
	__Ownable_init_unchained	Internal	✓	onlyInitializing
	owner	Public		-
	_checkOwner	Internal		
	renounceOwnership	Public	✓	onlyOwner
	transferOwnership	Public	✓	onlyOwner
	_transferOwnership	Internal	✓	
IERC1822ProxiableUpgradeable	Interface			
	proxiableUUID	External		-
IBeaconUpgradeable	Interface			
	implementation	External		-
StorageSlotUpgradeable	Library			
	getAddressSlot	Internal		
	getBooleanSlot	Internal		
	getBytes32Slot	Internal		
	getUint256Slot	Internal		
ERC1967UpgradeUpgradeable	Implementation	Initializable		
	__ERC1967Upgrade_init	Internal	✓	onlyInitializing
	__ERC1967Upgrade_init_unchained	Internal	✓	onlyInitializing
	_getImplementation	Internal		

	_setImplementation	Private	✓	
	_upgradeTo	Internal	✓	
	_upgradeToAndCall	Internal	✓	
	_upgradeToAndCallUUPS	Internal	✓	
	_getAdmin	Internal		
	_setAdmin	Private	✓	
	_changeAdmin	Internal	✓	
	_getBeacon	Internal		
	_setBeacon	Private	✓	
	_upgradeBeaconToAndCall	Internal	✓	
	_functionDelegateCall	Private	✓	
UUPSUpgradeable	Implementation	Initializable, IERC1822ProxiableUpgradeable, ERC1967UpgradeUpgradeable		
	__UUPSUpgradeable_init	Internal	✓	onlyInitializing
	__UUPSUpgradeable_init_unchained	Internal	✓	onlyInitializing
	proxiableUUID	External		notDelegated
	upgradeTo	External	✓	onlyProxy
	upgradeToAndCall	External	Payable	onlyProxy
	_authorizeUpgrade	Internal	✓	
SeedReplica	Implementation	Initializable, OwnableUpgradeable, UUPSUpgradeable		
		Public	✓	-
	initialize	Public	✓	initializer
	setSliceTime	Public	✓	onlyOwner

	setUSDTLimit	Public	✓	onlyOwner
	setOwnerWallet	Public	✓	onlyOwner
	_authorizeUpgrade	Internal	✓	onlyOwner
	StartICO	Public	✓	-
	StopICO	Public	✓	-
	setUSDT_OBG_Rate	Public	✓	onlyOwner
	depositPrePaid	Public	✓	onlyOwner
	getAccurateRate	Private		
	getBeforeVestingToken	Private		
	getUserAmounts	Public		-
	setTimePeriod	Public	✓	onlyOwner
	Launch	Public	✓	-
	setOperator	Public	✓	onlyOwner
	setNumberOfSlices	Public	✓	onlyOwner
	getVestedAmount	Public		-
	release	Public	✓	-
	_computeReleasableAmount	Private		
	V_GetRemaingTime	Public		-
	getTokenBalance	Public		-
	getClientRecord	Private	✓	
	showClientData	Public		-
	emergencyWithdrawToken	Public	✓	onlyOwner
	emergencyWithdrawCurrency	Public	✓	onlyOwner
	getRate	Public		-
		External	Payable	-
		External	Payable	-
TestUSDToken	Implementation	ERC20, Ownable		
		Public	✓	ERC20

Inheritance Graph



Flow Graph

Summary

OpenGames contract implements a financial, staking, and utility mechanism. This audit investigates security issues, business logic concerns, and potential improvements.

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