Aqua Audit Smart Contract Final Audit Report

Project Synopsis

Project Name	**Aqua Audit**
Platform	BSC, Solidity
Github Repo	Not Provided
Deployed Contract	Not Deployed
Total Duration	Days
Timeline of Audit	**7th July April 2021 to 10th July 2021**

Contract Details

Total Contract(s)	1
Name of Contract(s)	AqarChain
Language	Solidity
Commit Hash	**Null**

Contract Vulnerabilities Synopsis

Issues	Open Issues	Closed Issues
Critical Severity	0	3
Medium Severity	1	1
Low Severity	3	3
Information	3	0
Total Found	7	7

Detailed Results

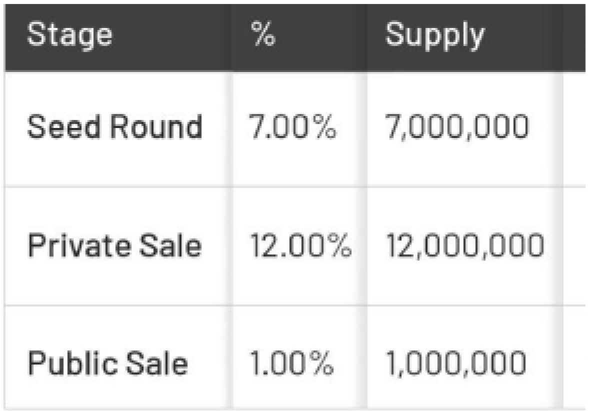
The contract has gone through several stages of the audit procedure that includes structural analysis, automated testing, manual code review etc.

All the issues have been explained and discussed in detail below. Along with the explanation of the issue found during the audit, the recommended way to overcome the issue or improve the code quality has also been mentioned.

A.Contract Name: AqarChain

Important point to NOTE from the Updated Code:

1. The **SUPPLY of SEED, PRIVATE and PUBLIC**, in the documentation provided, was as follows:



Stage	%	Supply
Seed Round	7.00%	7,000,000
Private Sale	12.00%	12,000,000
Public Sale	1.00%	1,000,000

However, in the updated smart contract, the Maximum Supply allowed for the SEED, PRIVATE and PUBLIC sale are as follows:

- ***SEED - 10000000***
- ***PRIVATE - 12200000***
- ***PUBLIC - 300000***

If this is not intended, The Code Should be updated correctly. Otherwise, the documentation should be updated with the right details in order to avoid any confusion.

Critical Severity Issues

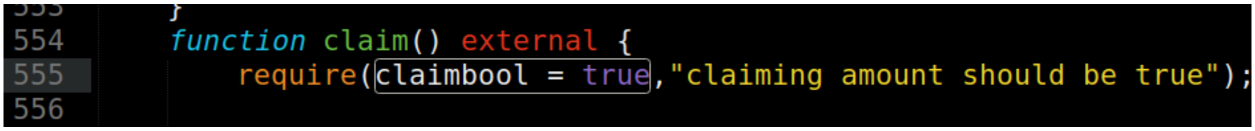
A.1 Invalid require statement doesn't restrict user's action adequately.

Line no - 443,465,481, 501, 520, 540,555

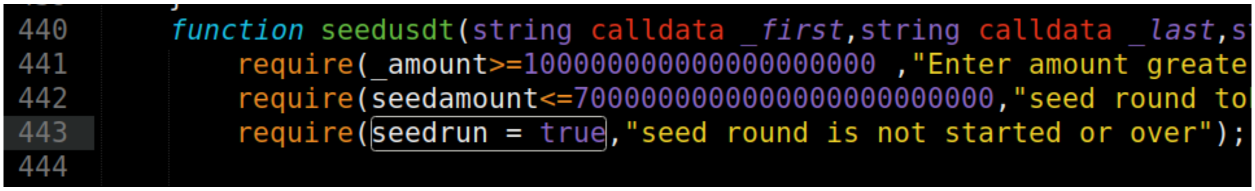
STATUS: CLOSED

Explanation:

The ***require*** statement at the above-mentioned lines involves an assignment operator(=) instead of an Equality Validation Operator(==).



```
553     }
554     function claim() external {
555         require(claimbool = true,"claiming amount should be true");
556
```



```
        }
440     function seedusdt(string calldata _first,string calldata _last,s
441         require(_amount>=100000000000000000000 ,"Enter amount greate
442         require(seedamount<=7000000000000000000000000,"seed round to
443         require(seedrun = true,"seed round is not started or over");
444
```

This leads to a completely unwanted scenario where the boolean values like ***publicrun***, ***seedrun*** etc aren't being validated for TRUE or FALSE but simply being assigned a TRUE boolean value, *every time the **require statement** is executed.*

In other words, **users can execute these functions even if the Seed round or Private Round boolean value is FALSE.**

Recommendation:

The above-mentioned require statements should use the equality operator to impose an adequate require statement validation.

For instance,

```
  require(seedrun == true,"seed round is not started or over");
or,
  require(seedrun,"seed round is not started or over");
```

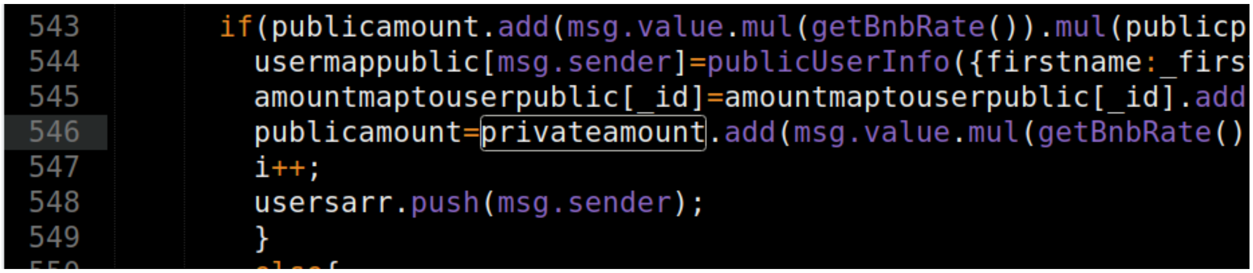
A.2 *publicbnb* function stores Invalid Data on chain.

Line no - 546

STATUS: CLOSED

Explanation:

As per the current design of the ***publicbnb*** function, it stores a wrong uint value to the publicamount state variable.



```
543        if(publicamount.add(msg.value.mul(getBnbRate()).mul(publicp
544          usermappublic[msg.sender]=publicUserInfo({firstname:_firs
545          amountmaptouserpublic[_id]=amountmaptouserpublic[_id].add
546          publicamount=privateamount.add(msg.value.mul(getBnbRate()
547          i++;
548          usersarr.push(msg.sender);
549          }
550          else{
```

The total amount of tokens being sold at the ***Public Sale Round*** is being stored in terms of the ***Private Sale round.***

In other words, the **publicamount** state variable is being wrongly updated as it stores the value of tokens sold by adding it to the **privateamount** state variable instead of the **publicamount** state variable.

This will lead to a completely unwanted scenario where the data stored on chain about the total tokens Sold in the public round will be different from the actual tokens sold in the public round.

Recommendation:

The Line no 546 in the ***publicbnb*** function should be modified as follows:

```
publicamount=privateamount.add(msg.value.mul(getBnbRate()).mul(public
price).div(1e18).div(10));
```

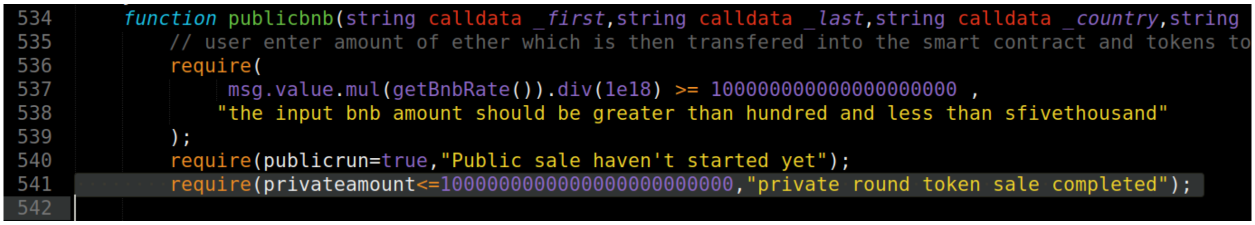
A.3 Invalid Require statement could make “*publicBnb*” function completely inaccessible.

Line no - 541

STATUS: CLOSED

Explanation:

The ***publicbnb*** function includes a require statement in the above-mentioned line which checks whether or not the State Variable ***privateamount*** is less than Public Sale supply.



```
534     function publicbnb(string calldata _first,string calldata _last,string calldata _country,string
535         // user enter amount of ether which is then transfered into the smart contract and tokens to
536         require(
537              msg.value.mul(getBnbRate()).div(1e18) >= 100000000000000000000 ,
538             "the input bnb amount should be greater than hundred and less than sfivethousand"
539         );
540         require(publicrun=true,"Public sale haven't started yet");
541         require(privateamount<=1000000000000000000000000,"private round token sale completed");
542
```

This is an inaccurate validation as the ***require*** statement checks the Public Sale Supply limit with the ***privateamount*** state variable instead of ***publicamount*** state variable.

Moreover, since the ***Private Sale*** supply(**12,000,000**)is comparatively larger than the ***Public Sale supply(1,000,000***), the ***privateamount*** state variable might be greater than the Public Sale supply limit at any instance. At that point, the ***require*** statement at line 541 shall never qualify.

This will lead to an unexpected scenario where the ***publicbnb*** function will be completely inaccessible and will never get executed.

Recommendation:

The require statement of ***publicbnb*** function at the above mentioned line should be updated as follows:

```
require(publicamount<=1000000 ether,"Public token sale completed");
```

Medium Severity Issues

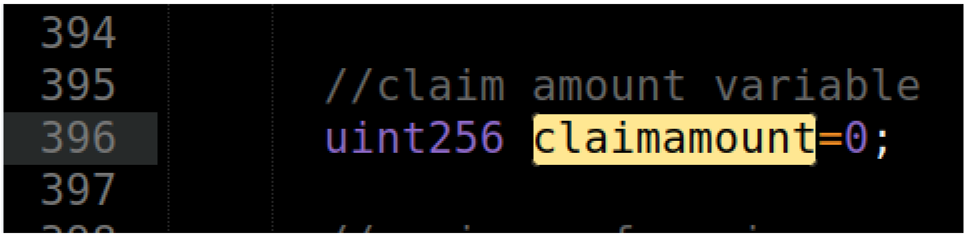
A.4 State Variable “*claimamount*” has no significant usage in the Protocol.

Line no - 396,557,562

STATUS: CLOSED

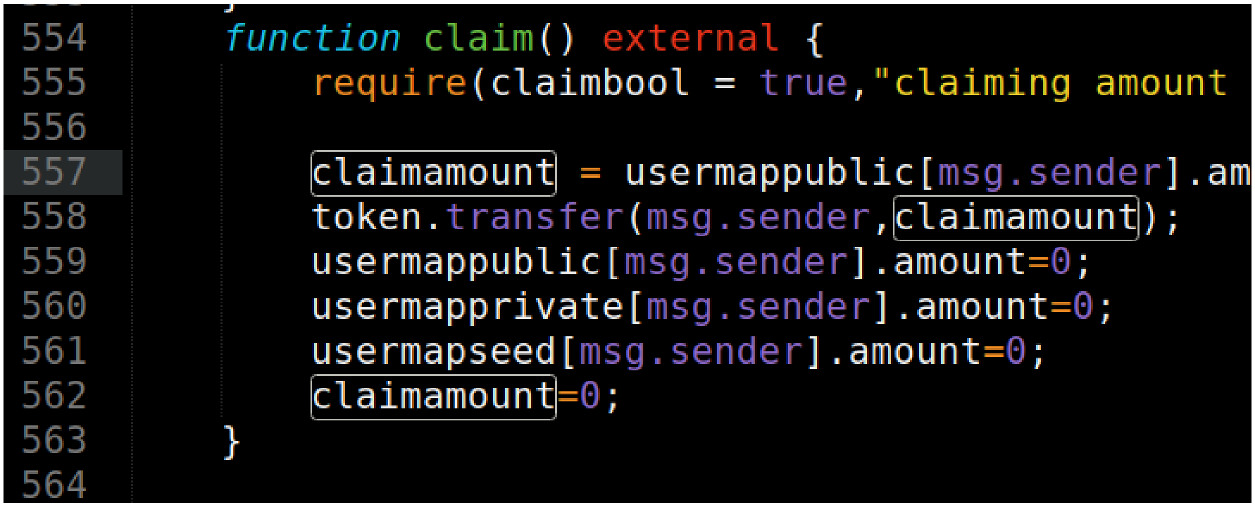
Explanation:

The State variable claim amount has no significant usage in the Contract, as per the current design of the protocol.



```
394
395        //claim amount variable
396        uint256 claimamount=0;
397
```

The variable is used to store the total claimable amount of a user which is then transferred to the user. However, once transferred, the claimable state variable is assigned a Zero Value again.



```
554    function claim() external {
555        require(claimbool = true,"claiming amount
556
557        claimamount = usermappublic[msg.sender].am
558        token.transfer(msg.sender,claimamount);
559        usermappublic[msg.sender].amount=0;
560        usermapprivate[msg.sender].amount=0;
561        usermapseed[msg.sender].amount=0;
562        claimamount=0;
563    }
564
```

In simpler terms, the ***claimamount*** state variable shall always hold a ***Zero*** Value and never symbolize any imperative state change in the protocol.

Using claimamount as a State Variable unncessarily uses extra Spaces and affects the Gas Usage in the contract.

Is the USE of claimamount as a State Variable intended?

Recommendation:

If the above-mentioned scenario is not intended, it is recommended to modify the ***claimamount*** variable as a local variable instead of a state variable.

A.5 Violation of Check Effects Interaction pattern

Explanation:

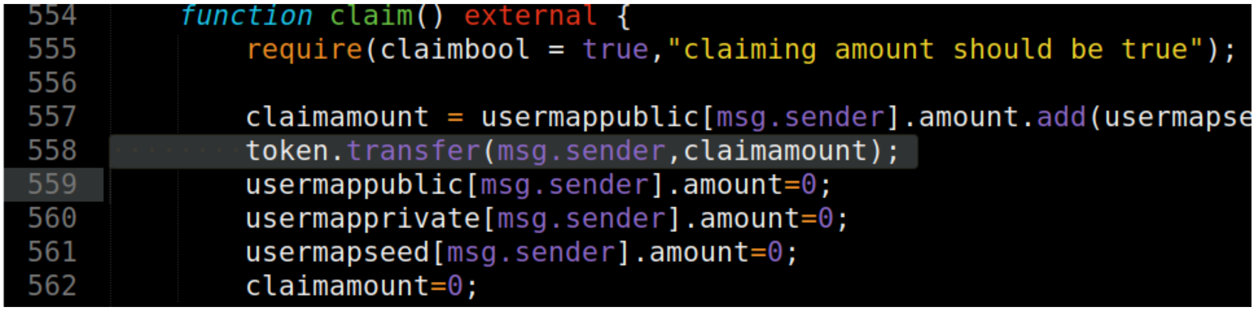
STATUS: OPEN

The **AqarChain** contract includes a few functions that update some of the very imperative state variables of the contract after the external calls are made.

An external call within a function technically shifts the control flow of the contract to another contract for a particular period of time. Therefore, as per the Solidity Guidelines, any modification of the state variables in the base contract must be performed before executing the external call.

The following functions in the contract update the state variables after making an external call at the lines mentioned below:

- ***seedusdt()** at Line **446***
- ***privateusdt()** at Line **486***
- ***publicusdt()** at Line **525***
- ***claim()** at Line **558***



```
554     function claim() external {
555         require(claimbool = true,"claiming amount should be true");
556 
557         claimamount = usermappublic[msg.sender].amount.add(usermapse
558         token.transfer(msg.sender,claimamount);
559         usermappublic[msg.sender].amount=0;
560         usermapprivate[msg.sender].amount=0;
561         usermapseed[msg.sender].amount=0;
562         claimamount=0;
```

Recommendation:

[Check Effects Interaction Pattern]() must be followed while implementing external calls in a function.

Low Severity Issues

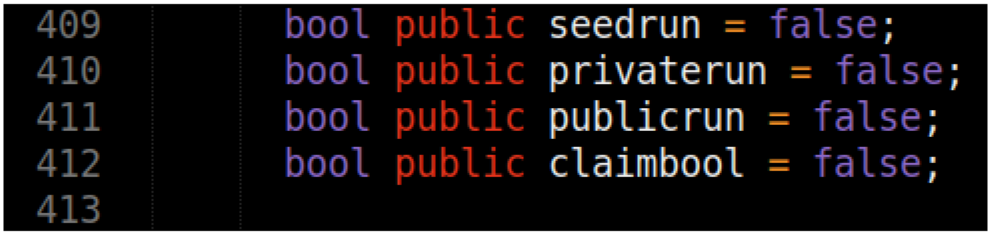
A.6 Redundant State Variable Update

Line no: 393,396,409,410,411,412

STATUS: OPEN

Explanation

The AquarChain Smart contract involves redundant updating of some of the State variables in the contract.



```
409        bool public seedrun = false;
410        bool public privaterun = false;
411        bool public publicrun = false;
412        bool public claimbool = false;
413
```

A boolean variable is by-default initialized to FALSE whereas a uint256 is initialized to ZERO. Hence, such state variables do not need to be initialized explicitly.

Recommendation:

Redundant initialization of state variables should be avoided.

A.7 Require statements can be used instead of IF and REVERT Statements

Line no - 454, 475, 492, 512, 531,551

STATUS: CLOSED

Explanation:

The function at the above-mentioned lines uses IF-REVERT statements to ensure that users do not buy tokens more than the allowed token supply for each round.

However, this is a strict validation as the users should not be able to execute the function if this IF statement fails. Therefore, it is considered a better practise in Solidity Smart Contracts, to use **require statements for such validations.**

Is this Function Design Intended?

Recommendation:

The IF-REVERT statements can be modified as follows, unless the current function design is Intended.

```
if(seedamount.add(_amount.mul(seedprice))<=7000000000000000000000000)
{
      // Logic
} else{
             revert("try reducing amount or seed round is finished")
}
```

The above-mentioned IF ELSE and Revert statement can be re-written as:

```
require(seedamount.add(_amount.mul(seedprice))<=700000000000000000000
0000,"try reducing amount or seed round is finished")
{
      // Logic
}
```

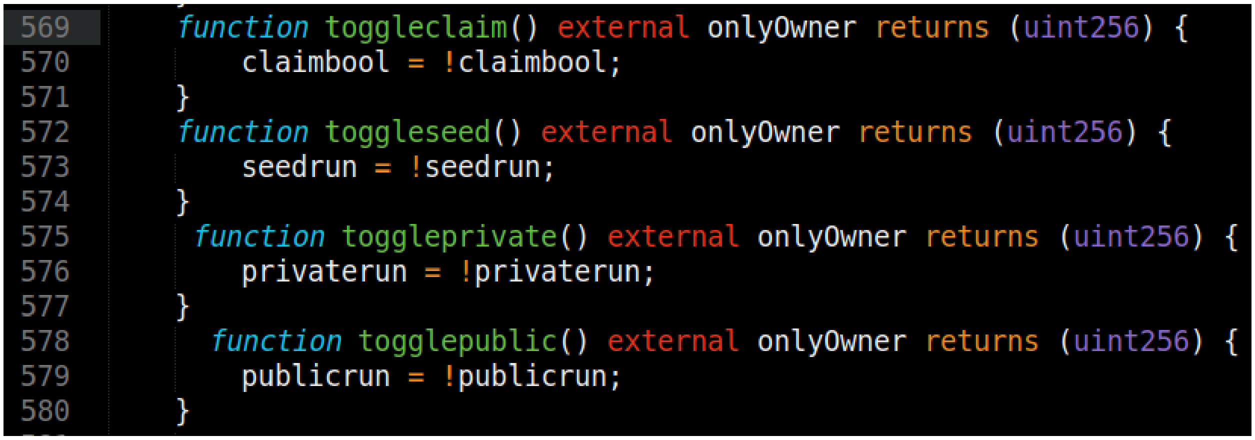
A.8 Functions promise a return Value of uint256 but do not return anything.

Line no: 569, 572, 575, 578

STATUS: CLOSED

Explanation

The functions at the above-mentioned lines indicate a uint256 return value at their function signature.



```
    function toggleclaim() external onlyOwner returns (uint256) {
        claimbool = !claimbool;
    }
    function toggleseed() external onlyOwner returns (uint256) {
        seedrun = !seedrun;
    }
     function toggleprivate() external onlyOwner returns (uint256) {
        privaterun = !privaterun;
    }
      function togglepublic() external onlyOwner returns (uint256) {
        publicrun = !publicrun;
    }
```

However, none of those functions actually return any uint256 value. If no uint value is not explicitly returned, the function will simply return a default return value for uint256, i.e., ZERO.

Recommendation:

If the above-mentioned functions are not supposed to return any uint256 value, the function signatures should be modified accordingly.

A.9 External Visibility should be preferred

STATUS: OPEN

Explanation

Those functions that are never called throughout the contract should be marked as ***external*** visibility instead of ***public*** visibility.
This will effectively result in Gas Optimization as well.

Therefore, the following function must be marked as **external** within the contract:

- ***getBnbBalance()***

Recommendation:

If the PUBLIC visibility of the above-mentioned functions is not intended, then the EXTERNAL Visibility keyword should be preferred.

A.10 Constant declaration should be preferred

Line no - 399 to 401

STATUS: OPEN

Explanation

State variables that are not supposed to change throughout the contract should be declared as **constant**.

Recommendation:
The following state variables could be declared as **constant**, unless the current contract design is intended.

- ***privateprice***
- ***publicprice***
- ***Seedprice***

A.11 Too many Digits used

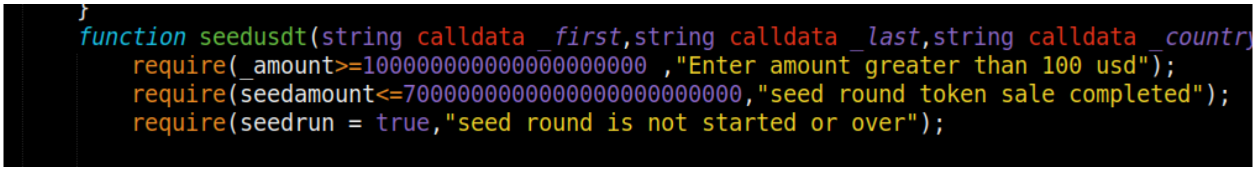
Line no - 440-456, 458-477, 478-494, 495-514, 516-533, 534-553

STATUS: CLOSED

Explanation

The above-mentioned lines have a large number of digits that makes it difficult to review and reduces the readability of the code.
The following functions in the contract have this issue:

- **seedusdt()**
- **seedbnb()**
- **privateusdt**
- **privatebnb**
- **publicusdt**
- **publicbnb**



```
    }
    function seedusdt(string calldata _first,string calldata _last,string calldata _country
        require(_amount>=100000000000000000000 ,"Enter amount greater than 100 usd");
        require(seedamount<=7000000000000000000000000,"seed round token sale completed");
        require(seedrun = true,"seed round is not started or over");
```

Recommendation:
Ether Suffix could be used to symbolize the 10^18 zeros.
For instance, the require statement at Line number 441,

```
require(_amount>=100000000000000000000 ,"Enter amount greater than
100 usd");
```

Can be written as:

```
  require(_amount>=100 ether ,"Enter amount greater than 100 usd");
```

Informational

A.12 Contract includes Hardcoded address

Line no: 418, 425, 429, 430

STATUS: Not Considered

Explanation

Keeping in mind the immutable nature of smart contracts, it is not considered a better practise to hardcode any address in the contract before deployment.

Recommendation:

Instead of including hardcoded addresses in the contract, initialize those addresses within the constructors at the time of deployment.

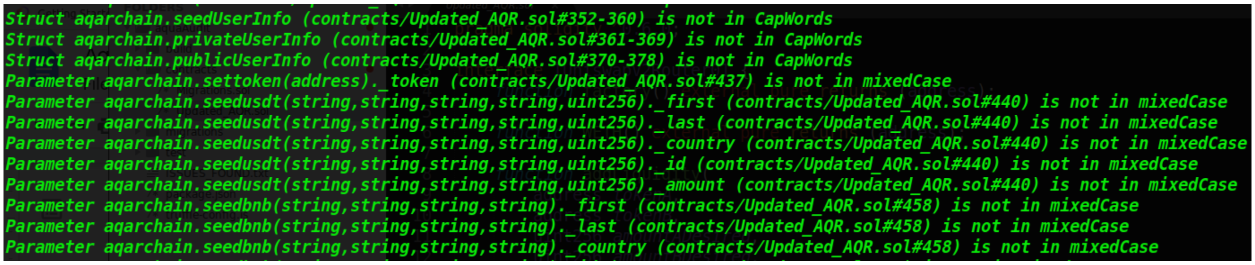
A.13 Code Style Issues

STATUS: Not Considered

Explanation

Code readability of a Smart Contract is largely influenced by the Coding Style issues and in some specific scenarios may lead to bugs in the future.

During the automated testing, it was found that the **AqarChain** contract had quite a few code style issues.



```
Struct aqarchain.seedUserInfo (contracts/Updated_AQR.sol#352-360) is not in CapWords
Struct aqarchain.privateUserInfo (contracts/Updated_AQR.sol#361-369) is not in CapWords
Struct aqarchain.publicUserInfo (contracts/Updated_AQR.sol#370-378) is not in CapWords
Parameter aqarchain.settoken(address)._token (contracts/Updated_AQR.sol#437) is not in mixedCase
Parameter aqarchain.seedusdt(string,string,string,string,uint256)._first (contracts/Updated_AQR.sol#440) is not in mixedCase
Parameter aqarchain.seedusdt(string,string,string,string,uint256)._last (contracts/Updated_AQR.sol#440) is not in mixedCase
Parameter aqarchain.seedusdt(string,string,string,string,uint256)._country (contracts/Updated_AQR.sol#440) is not in mixedCase
Parameter aqarchain.seedusdt(string,string,string,string,uint256)._id (contracts/Updated_AQR.sol#440) is not in mixedCase
Parameter aqarchain.seedusdt(string,string,string,string,uint256)._amount (contracts/Updated_AQR.sol#440) is not in mixedCase
Parameter aqarchain.seedbnb(string,string,string,string)._first (contracts/Updated_AQR.sol#458) is not in mixedCase
Parameter aqarchain.seedbnb(string,string,string,string)._last (contracts/Updated_AQR.sol#458) is not in mixedCase
Parameter aqarchain.seedbnb(string,string,string,string)._country (contracts/Updated_AQR.sol#458) is not in mixedCase
```

Recommendation:

Therefore, it is recommended to fix the issues like naming convention, indentation, and code layout issues in a smart contract.

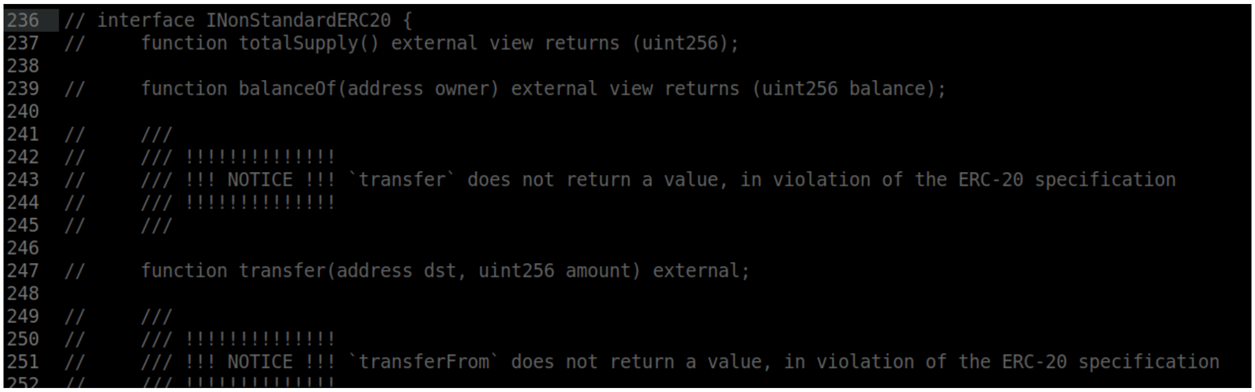
A.14 Commented codes must be wiped-out before deployment

Line no: 236-276

STATUS: Not Considered

Explanation

The AqarChain contract includes quite a few commented codes regarding a **INonStandardERC20 interface** at the above-mentioned line.



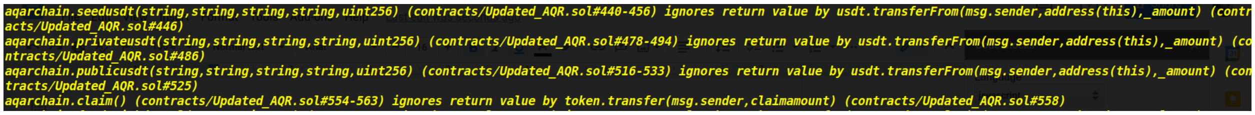
```
// interface INonStandardERC20 {
//     function totalSupply() external view returns (uint256);

//     function balanceOf(address owner) external view returns (uint256 balance);

//     ///
//     /// !!!!!!!!!!!!!!
//     /// !!! NOTICE !!! `transfer` does not return a value, in violation of the ERC-20 specification
//     /// !!!!!!!!!!!!!!
//     ///

//     function transfer(address dst, uint256 amount) external;

//     ///
//     /// !!!!!!!!!!!!!!
//     /// !!! NOTICE !!! `transferFrom` does not return a value, in violation of the ERC-20 specification
//     /// !!!!!!!!!!!!!!
```

This badly affects the readability of the code.

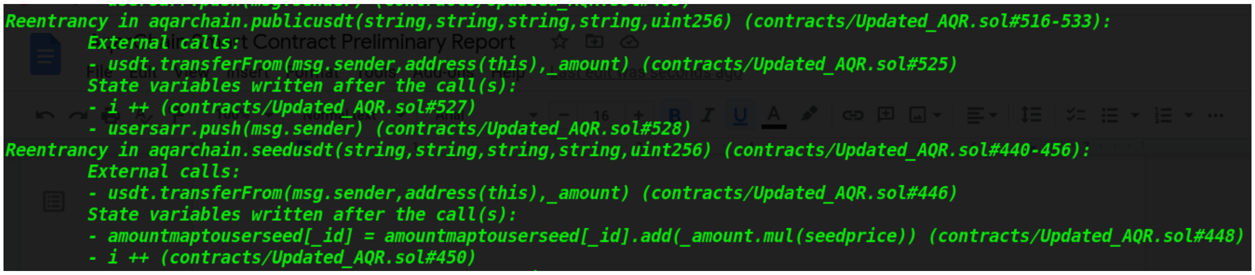
Recommendation:

Therefore, it is recommended to fix the issues like naming convention, indentation, and code layout issues in a smart contract.

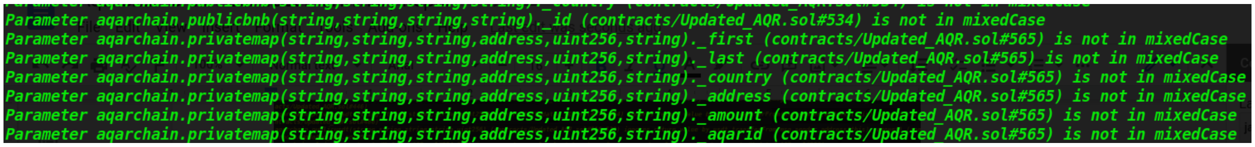
Automated Test Results



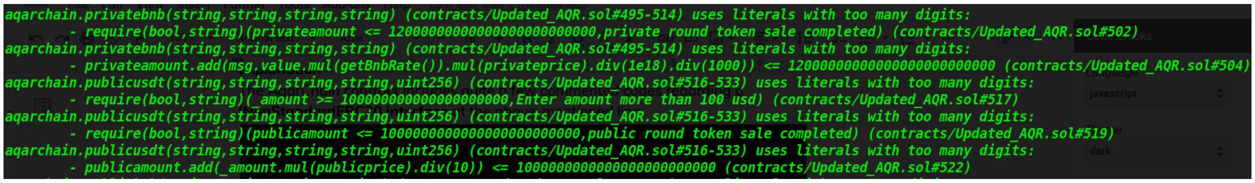
```
aqarchain.seedusdt(string,string,string,string,uint256) (contracts/Updated_AQR.sol#440-456) ignores return value by usdt.transferFrom(msg.sender,address(this),_amount) (contr
acts/Updated_AQR.sol#446)
aqarchain.privateusdt(string,string,string,string,uint256) (contracts/Updated_AQR.sol#478-494) ignores return value by usdt.transferFrom(msg.sender,address(this),_amount) (co
ntracts/Updated_AQR.sol#486)
aqarchain.publicusdt(string,string,string,string,uint256) (contracts/Updated_AQR.sol#516-533) ignores return value by usdt.transferFrom(msg.sender,address(this),_amount) (con
tracts/Updated_AQR.sol#525)
aqarchain.claim() (contracts/Updated_AQR.sol#554-563) ignores return value by token.transfer(msg.sender,claimamount) (contracts/Updated_AQR.sol#558)
```



```
Reentrancy in aqarchain.publicusdt(string,string,string,string,uint256) (contracts/Updated_AQR.sol#516-533):
        External calls:
        - usdt.transferFrom(msg.sender,address(this),_amount) (contracts/Updated_AQR.sol#525)
        State variables written after the call(s):
        - i ++ (contracts/Updated_AQR.sol#527)
        - usersarr.push(msg.sender) (contracts/Updated_AQR.sol#528)
Reentrancy in aqarchain.seedusdt(string,string,string,string,uint256) (contracts/Updated_AQR.sol#440-456):
        External calls:
        - usdt.transferFrom(msg.sender,address(this),_amount) (contracts/Updated_AQR.sol#446)
        State variables written after the call(s):
        - amountmaptouserseed[_id] = amountmaptouserseed[_id].add(_amount.mul(seedprice)) (contracts/Updated_AQR.sol#448)
        - i ++ (contracts/Updated_AQR.sol#450)
```



```
Parameter aqarchain.publicbnb(string,string,string,string)._id (contracts/Updated_AQR.sol#534) is not in mixedCase
Parameter aqarchain.privatemap(string,string,string,address,uint256,string)._first (contracts/Updated_AQR.sol#565) is not in mixedCase
Parameter aqarchain.privatemap(string,string,string,address,uint256,string)._last (contracts/Updated_AQR.sol#565) is not in mixedCase
Parameter aqarchain.privatemap(string,string,string,address,uint256,string)._country (contracts/Updated_AQR.sol#565) is not in mixedCase
Parameter aqarchain.privatemap(string,string,string,address,uint256,string)._address (contracts/Updated_AQR.sol#565) is not in mixedCase
Parameter aqarchain.privatemap(string,string,string,address,uint256,string)._amount (contracts/Updated_AQR.sol#565) is not in mixedCase
Parameter aqarchain.privatemap(string,string,string,address,uint256,string)._aqarid (contracts/Updated_AQR.sol#565) is not in mixedCase
```



```
aqarchain.privatebnb(string,string,string,string) (contracts/Updated_AQR.sol#495-514) uses literals with too many digits:
        - require(bool,string)(privateamount <= 12000000000000000000000000,private round token sale completed) (contracts/Updated_AQR.sol#502)
aqarchain.privatebnb(string,string,string,string) (contracts/Updated_AQR.sol#495-514) uses literals with too many digits:
        - privateamount.add(msg.value.mul(getBnbRate()).mul(privateprice).div(1e18).div(1000)) <= 12000000000000000000000000 (contracts/Updated_AQR.sol#504)
aqarchain.publicusdt(string,string,string,string,uint256) (contracts/Updated_AQR.sol#516-533) uses literals with too many digits:
        - require(bool,string)(_amount >= 100000000000000000000,Enter amount more than 100 usd) (contracts/Updated_AQR.sol#517)
aqarchain.publicusdt(string,string,string,string,uint256) (contracts/Updated_AQR.sol#516-533) uses literals with too many digits:
        - require(bool,string)(publicamount <= 1000000000000000000000000,public round token sale completed) (contracts/Updated_AQR.sol#519)
aqarchain.publicusdt(string,string,string,string,uint256) (contracts/Updated_AQR.sol#516-533) uses literals with too many digits:
        - publicamount.add(_amount.mul(publicprice).div(10)) <= 1000000000000000000000000 (contracts/Updated_AQR.sol#522)
```