Aqar Chain
Smart Contract Audit Report

IMMUNE BYTES
Audits

AQAR CHAIN

June 30, 2021

Introduction

1. About Aqar Chain

Aqarchain is a blockchain (tezos) powered real estate investing platform whose aim is to create a decentralized ecosystem where investment in real estate is as easy as investing in shares on the stock market.

Aqarchain is the flagship product of the Smart Chain Information Technology Consultancy Ltd. The purpose of this product is to provide the following financial services: “Operating a Crowdfunding Platform.”

- The Aqarchain Platform will facilitate selling of Properties between various Sellers and Investors.
- The Platform will cater to Retail Clients as well as Professional Clients and potentially Market Counterparties.
- The Platform will offer an additional level of smart contracts security by tokenizing the shares in the Properties.
- The Platform is developed on the Tezos Blockchain.

Visit https://aqarchain.io/ to know more about.

2. About ImmuneBytes

ImmuneBytes is a security start-up to provide professional services in the blockchain space. The team has hands-on experience in conducting smart contract audits, penetration testing, and security consulting. ImmuneBytes’s security auditors have worked on various A-league projects and have a great understanding of DeFi projects like AAVE, Compound, 0x Protocol, Uniswap, dydx.

The team has been able to secure 15+ blockchain projects by providing security services on different frameworks. ImmuneBytes team helps start-up with a detailed analysis of the system ensuring security and managing the overall project.

Visit http://immunebytes.com/ to know more about the services.

Documentation Details

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Audit Process & Methodology

ImmuneBytes team has performed thorough testing of the project starting with analyzing the code design patterns in which we reviewed the smart contract architecture to ensure it is structured and safe use of third-party smart contracts and libraries.

Our team then performed a formal line-by-line inspection of the Smart Contract in order to find any potential issues like Signature Replay Attacks, Unchecked External Calls, External Contract Referencing, Variable Shadowing, Race conditions, Transaction-ordering dependence, timestamp dependence, DoS attacks, and others.

In the Unit testing phase, we run unit tests written by the developer in order to verify the functions work as intended. In Automated Testing, we tested the Smart Contract with our in-house developed tools to identify vulnerabilities and security flaws.

The code was audited by a team of independent auditors which includes -

1. Testing the functionality of the Smart Contract to determine proper logic has been followed throughout.
2. Analyzing the complexity of the code by thorough, manual review of the code, line-by-line.
3. Deploying the code on testnet using multiple clients to run live tests.
4. Analyzing failure preparations to check how the Smart Contract performs in case of bugs and vulnerabilities.
5. Checking whether all the libraries used in the code are on the latest version.
6. Analyzing the security of the on-chain data.

Audit Details

- Project Name:Aqar Chain
- Languages: Solidity(Smart contract)
- Github commit hash for audit: f23bf2375ad6c45ba8509ead0ade36720ae625d9
- Platforms and Tools: Remix IDE, Truffle, Truffle Team, Ganache, Solhint, VScode, Contract Library, Slither, SmartCheck

Audit Goals

The focus of the audit was to verify that the smart contract system is secure, resilient, and working according to its specifications. The audit activities can be grouped into the following three categories:

1. Security: Identifying security-related issues within each contract and within the system of contracts.
2. Sound Architecture: Evaluation of the architecture of this system through the lens of established smart contract best practices and general software best practices.
3. Code Correctness and Quality: A full review of the contract source code. The primary areas of focus include:
    a. Correctness
    b. Readability
    c. Sections of code with high complexity
    d. Quantity and quality of test coverage

Security Level References

Every issue in this report was assigned a severity level from the following:

High severity issues will bring problems and should be fixed.

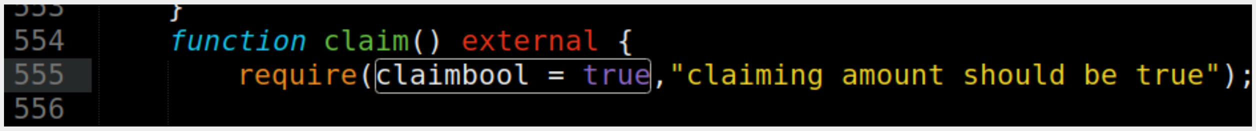
Medium severity issues could potentially bring problems and should eventually be fixed.

Low severity issues are minor details and warnings that can remain unfixed but would be better fixed at some point in the future.

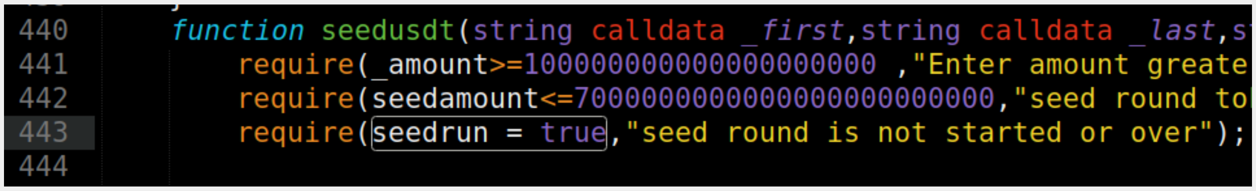
Issues	High	Medium	Low
Open	3	2	6
Closed	-	-	-

High severity issues

1. **Invalid require statement doesn't restrict user's action adequately.**
   Line no - 443,465,481, 501, 520, 540,555
   Explanation:
   The **require** statement at the above-mentioned lines involves an assignment operator(=) instead of an Equality Validation Operator(==).



```
     }
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>=1000000000000000000000 ,"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.

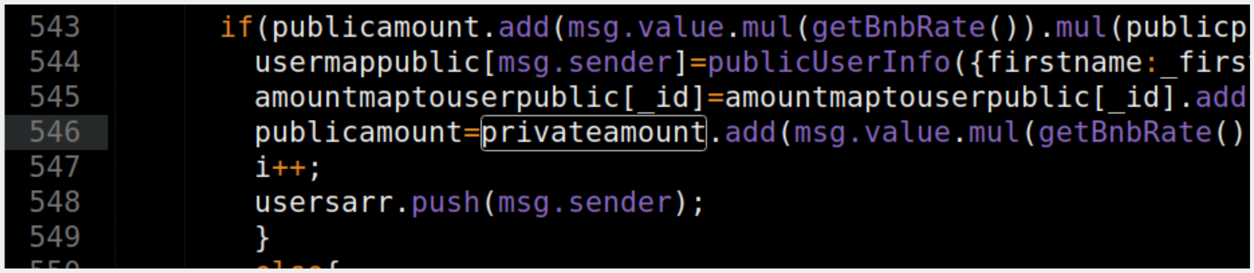
In other words, **users can execute these functions even if the Seed round or Private Round boolean value is FALSE.**

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");
```

2. **publicbnb function stores Invalid Data on chain.**
   Line no - 546
   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           }
```

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

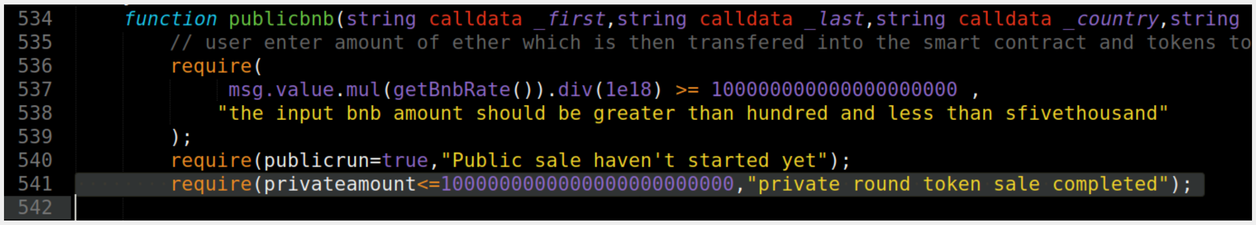
In other words, the **publicamount** state variable is being wrongly updated as it stores the value of tokens sold by adding it to the **privateamount** state varible instead of the **publicamount** state variable.

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(publicprice)
.div(1e18).div(10));
```

3. **Invalid Require statement could make “publicBnb” function completely inaccessible.**
   Line no - 541
   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.

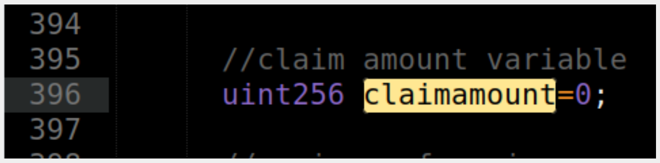
Moreover, since the **Private Sale** supply(**12,000,000**)is comparatively larger than the **Public Sale supply(1,000,000)**, the **privateamount** state variable might be greater than the Public Sale supply limit at any instance. At that point, the **require** statement at line 541 shall never qualify.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

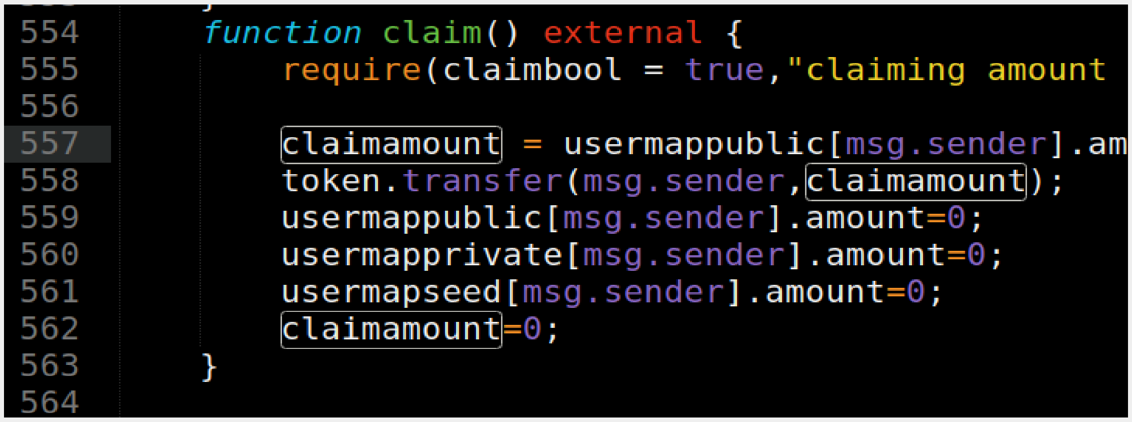
Medium severity issues

1. **State Variable “claimamount” has no significant usage in the Protocol.**
   Line no - 396,557,562
   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.

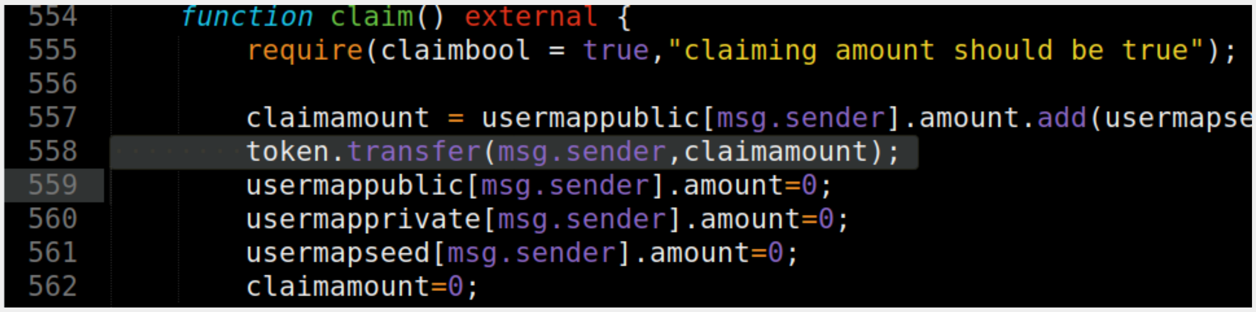
Is the USE of claimamount as a State Variable intended?

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.

2. **Violation of Check Effects Interaction pattern**
   Explanation:
   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**

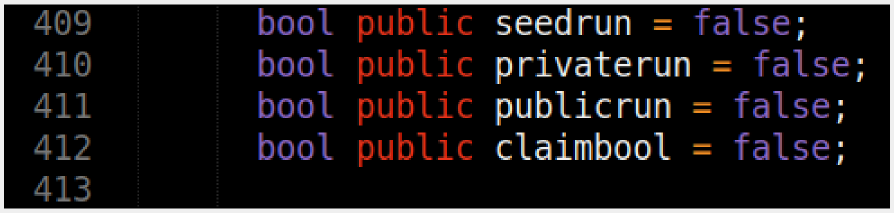


```
554      function claim() external {
555          require(claimbool = true,"claiming amount should be true");
556
557          claimamount = usermappublic[msg.sender].amount.add(usermapse
558          token.transfer(msg.sender,claimamount);
559          usermappublic[msg.sender].amount=0;
560   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

1. **Redundant State Variable Update**
   Line no: 393,396,409,410,411,412
   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.

2. **Require statements can be used instead of IF and REVERT Statements**
   Line no - 454, 475, 492, 512, 531,551
   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{
```

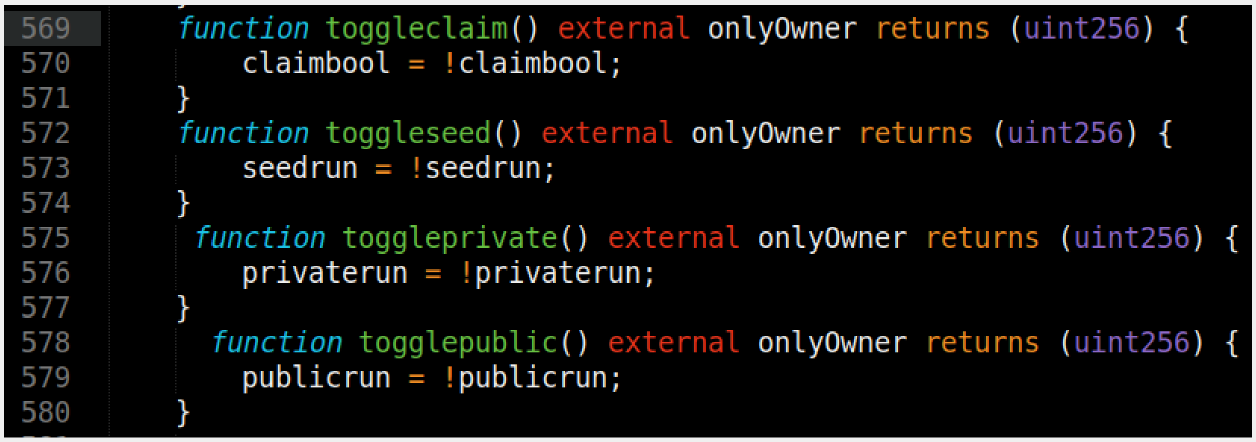
```
            revert("try reducing amount or seed round is finished")
}
```

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

```

require(seedamount.add(_amount.mul(seedprice))<=70000000000000000000000
0,"try reducing amount or seed round is finished")
{
      // Logic
}
```

3. **Functions promise a return Value of uint256 but do not return anything.**
   Line no: 569, 572, 575, 578
   Explanation
   The functions at the above-mentioned lines indicate a uint256 return value at their function signature.



```
569     function toggleclaim() external onlyOwner returns (uint256) {
570         claimbool = !claimbool;
571     }
572     function toggleseed() external onlyOwner returns (uint256) {
573         seedrun = !seedrun;
574     }
575      function toggleprivate() external onlyOwner returns (uint256) {
576         privaterun = !privaterun;
577     }
578       function togglepublic() external onlyOwner returns (uint256) {
579         publicrun = !publicrun;
580     }
```

   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.

4. **External Visibility should be preferred**
   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.

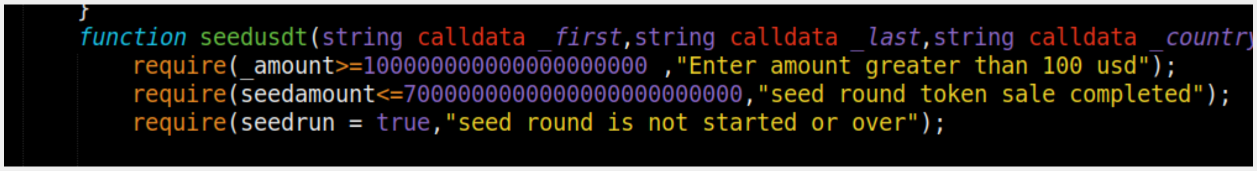
   Therefore, the following function must be marked as **external** within the contract:
   - **getBnbBalance()**

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

5. **Constant declaration should be preferred**
   Line no - 399 to 401
   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**

6. **Too many Digits used**
   Line no - 440-456, 458-477, 478-494, 495-514, 516-533, 534-553
   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");
```

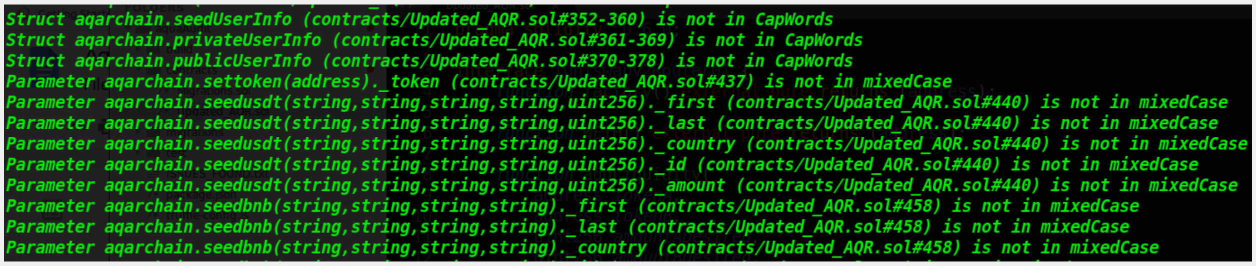
Recommendations

1. **Contract includes Hardcoded address**
   Line no: 418, 425, 429, 430
   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.

2. **Code Style Issues**
   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.

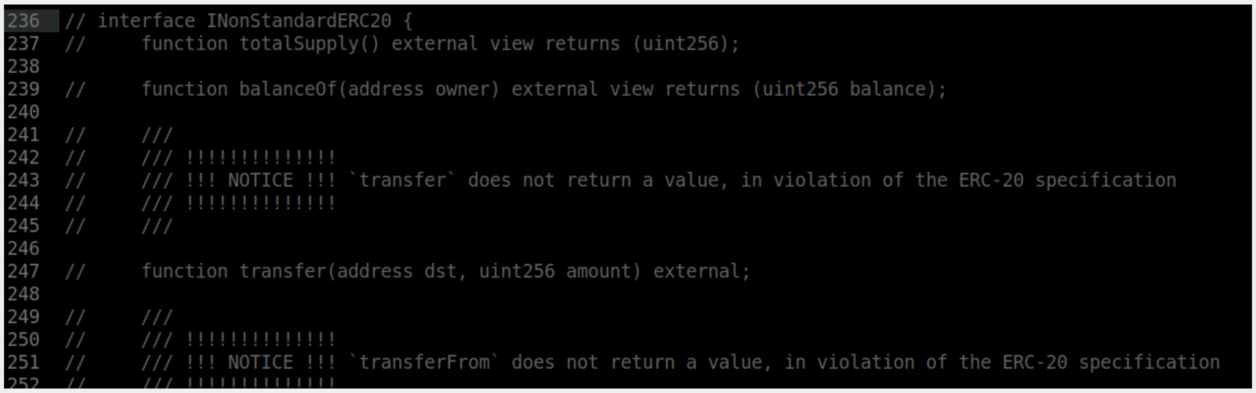
   During the automated testing, it was found that the **AqarChain** contract had quite a few code style issues.



```
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.

3. **Commented codes must be wiped-out before deployment**
   Line no: 236-276
   Explanation
   The AqarChain contract includes quite a few commented codes regarding a **INonStandardERC20 interface** at the above-mentioned line.

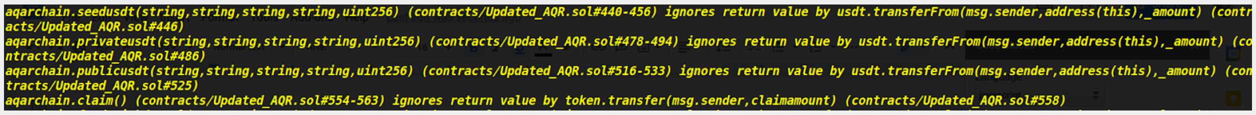


```
236  // interface INonStandardERC20 {
237  //     function totalSupply() external view returns (uint256);
238
239  //     function balanceOf(address owner) external view returns (uint256 balance);
240
241  //     ///
242  //     /// !!!!!!!!!!!!!!
243  //     /// !!! NOTICE !!! `transfer` does not return a value, in violation of the ERC-20 specification
244  //     /// !!!!!!!!!!!!!!
245  //     ///
246
247  //     function transfer(address dst, uint256 amount) external;
248
249  //     ///
250  //     /// !!!!!!!!!!!!!!
251  //     /// !!! NOTICE !!! `transferFrom` does not return a value, in violation of the ERC-20 specification
```

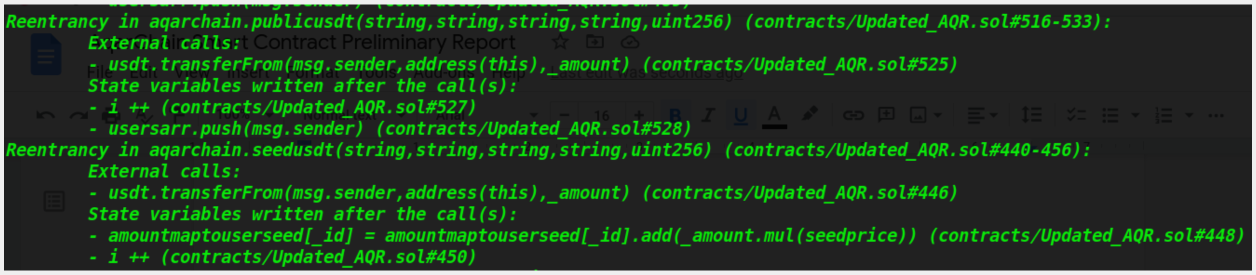
This badly affects the readability of the code.

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

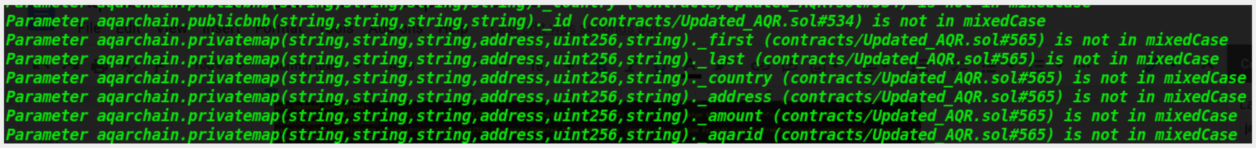
Automated Audit Result



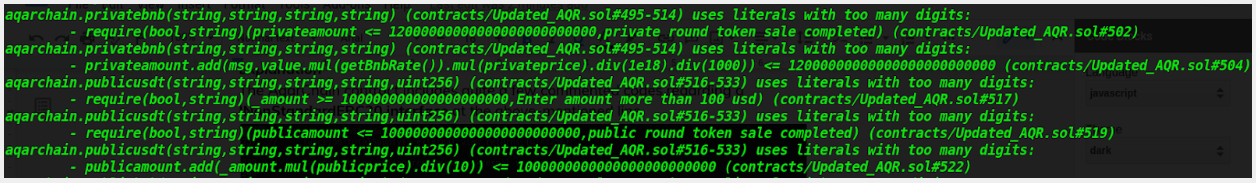
```
aqarchain.seedusdt(string,string,string,string,uint256) (contracts/Updated_AQR.sol#440-456) ignores return value by usdt.transferFrom(msg.sender,address(this),_amount) (contr
acts/Updated_AQR.sol#446)
aqarchain.privateusdt(string,string,string,string,uint256) (contracts/Updated_AQR.sol#478-494) ignores 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)
```

This audit does not provide a security or correctness guarantee of the audited smart contract. Securing smart contracts is a multistep process, therefore running a bug bounty program as a complement to this audit is strongly recommended.

Concluding Remarks

While conducting the audit of the Aqar Chain smart contract, it was observed that the contracts contain High, Medium, and Low severity issues, along with several areas of recommendations.

Our auditors suggest that High, Medium, Low severity issues should be resolved by the developers. Resolving the areas of recommendations are up to the team's discretion. The recommendations given will improve the operations of the smart contract.

Disclaimer

ImmuneBytes's audit does not provide a security or correctness guarantee of the audited smart contract. Securing smart contracts is a multistep process, therefore running a bug bounty program as a complement to this audit is strongly recommended.

Our team does not endorse the Aqar Chain platform or its product nor this audit is investment advice.
Notes:

- Please make sure contracts deployed on the mainnet are the ones audited.
- Check for the code refactor by the team on critical issues.

ImmuneBytes Pvt Ltd.