Cyberscope

Audit Report

CloudBTC

February 2024

SHA256 f3667e99eb380a9c7b8f3764903f446197209d691bdc8641c6009553a9edeb48

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Review

Testing Deploy	https://goerli.etherscan.io/address/0xa2932aebe9d43c0354fa2d1206062e1e28d0ed57

Audit Updates

Initial Audit	12 Feb 2024

Source Files

Filename	SHA256
contracts/Presale.sol	f3667e99eb380a9c7b8f3764903f446197209d691bdc8641c6009553a9edeb48
@openzeppelin/contracts/utils/Context.sol	9c1cc43aa4a2bde5c7dea0d4830cd42c54813ff883e55c8d8f12e6189bf7f10a
@openzeppelin/contracts/utils/math/SafeMath.sol	6f78c3ed573a960297585ff30b926477aa2ac81297ecae48727de5102c9f7742
@openzeppelin/contracts/token/ERC20/IERC20.sol	6f2faae462e286e24e091d7718575179644dc60e79936ef0c92e2d1ab3ca3cee
@openzeppelin/contracts/security/ReentrancyGuard.sol	265194fe7821f95d4c3cf2c6c8ad3a86313a2df90e8ee3385e454abbb8c233f6
@openzeppelin/contracts/security/Pausable.sol	5a5498e08dcbab736f3399f8115629eb818b6a7171d83430aef3bc146630d16b
@openzeppelin/contracts/access/Ownable.sol	38578bd71c0a909840e67202db527cc6b4e6b437e0f39f0c909da32c1e30cb81
@chainlink/contracts/src/v0.8/interfaces/AggregatorV3Interface.sol	62d0c0c753b724d3450723960ca4d256a16613a8c50ca42755610a951b772c7d

Overview

The contract facilitates a presale event for a specific token, allowing participants to purchase tokens using either Ethereum (ETH) or Tether (USDT) as payment methods. The presale is divided into 9 stages, each with a predefined token supply and price, ensuring a gradual and strategic token distribution. As the presale progresses through these stages, the contract adjusts the token price and supply available for purchase, automatically transitioning to the next stage once the current stage's token allocation is fully sold. This design aims to incentivize early participation and manage the distribution pace effectively.

buyWithETH functionality

The `buyWithETH` functionality within the contract allows participants to purchase tokens using Ethereum (ETH) during a presale event, subject to minimum and maximum investment limits of 0.001 and 1 Ether. Upon sending ETH to the contract, a portion may be allocated as a referral reward if a valid referral is provided. The remaining ETH, after deducting the referral reward, is distributed among predefined wallets. The contract converts the ETH sent into its USDT equivalent based on the current ETH price, then calculates the number of tokens the participant can purchase at the current stage's price. If the purchase exceeds the available token supply for the current stage, the contract automatically advances to the next stage to fulfill the remaining order, ensuring a seamless transition and accurate token distribution. Finally, the `presaleToken` is transferred to the user, completing the purchase process.

buyWithUSDT functionality

The `buyWithUSDT` functionality enables participants to use Tether (USDT) for purchasing tokens during the presale event, adhering to set minimum and maximum transaction limits of 10 and 2500 USDT. Initially, the contract verifies that the sender has granted sufficient USDT allowance to the contract for the transaction. A portion of the USDT amount may be allocated as a referral reward if a valid referral is provided, fostering the growth of the presale's network. The remaining USDT, after subtracting the referral reward, is divided and sent to designated receiver addresses. The contract calculates the number of tokens purchasable based on the current stage's USDT price, ensuring participants receive the correct token amount for their USDT. Should the desired purchase exceed the available supply for the current stage, the contract automatically progresses to the next stage, adjusting the token price accordingly to complete the transaction. This mechanism ensures a fair and orderly distribution of tokens across different presale stages, ultimately increasing the total USDT raised and the total tokens sold. Finally, the `presaleToken` is transferred to the participant, finalizing the purchase.

Roles

Owner

The owner can interact with the following functions:

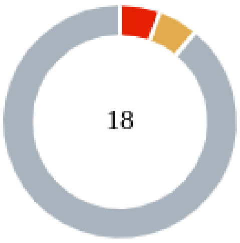
- function setPresaleStage(PresaleStage stage)
- function withdrawETH()
- function withdrawUSDT()
- function pausePresale()
- function unpausePresale()
- function updateReferralPercentage(uint256 val)
- function distributeTokens(address[] calldata userAddresses, uint256[] calldata tokenAmounts)

Users

The users can interact with the following functions:

- function buyWithETH(address referral)
- function buyWithUSDT
- function getLatestETHPrice()

Findings Breakdown



Critical 1

Medium 1

Minor / Informative 16

Severity	Unresolved	Acknowledged	Resolved	Other
Critical	1	0	0	0
Medium	1	0	0	0
Minor / Informative	16	0	0	0

Diagnostics

Critical · Medium · Minor / Informative

Severity	Code	Description	Status
Critical	IDU	Incorrect Decimals Usage	Unresolved
Medium	IVC	Inconsistent Value Calculation	Unresolved
Minor / Informative	ALU	Array Length Usage	Unresolved
Minor / Informative	CCR	Contract Centralization Risk	Unresolved
Minor / Informative	DDP	Decimal Division Precision	Unresolved
Minor / Informative	DPI	Decimals Precision Inconsistency	Unresolved
Minor / Informative	IDI	Immutable Declaration Improvement	Unresolved
Minor / Informative	MPR	Misleading Price Representation	Unresolved
Minor / Informative	ODM	Oracle Decimal Mismatch	Unresolved
Minor / Informative	PBV	Percentage Boundaries Validation	Unresolved
Minor / Informative	PTRP	Potential Transfer Revert Propagation	Unresolved
Minor / Informative	RSML	Redundant SafeMath Library	Unresolved
Minor / Informative	SPM	Stage Price Mismatch	Unresolved
Minor / Informative	TSI	Tokens Sufficiency Insurance	Unresolved

●	USS	Unvalidated Stage Setting	Unresolved
●	L13	Divide before Multiply Operation	Unresolved
●	L19	Stable Compiler Version	Unresolved
●	L20	Succeeded Transfer Check	Unresolved

IDU - Incorrect Decimals Usage

Criticality	Critical
Location	contracts/Presale.sol#L113
Status	Unresolved

Description

The contract contains the `buyWithUSDT` function designed to handle purchases with USDT, calculating various amounts based on the `usdtAmount` parameter. However, the function incorrectly multiplies `usdtAmount` by a hardcoded `baseDecimals` value of `18`. This approach fails to account for the actual decimal count of the USDT token, which may differ from `18`, leading to inaccurate calculations. For instance, the `referralReward` is calculated using this incorrect multiplier, resulting in rewards and token distributions that are significantly higher than intended. This discrepancy can cause an unintended depletion of the contract's token supply and distort the intended economics of the token sale.

```
    function buyWithUSDT(uint256 usdtAmount, address referral) public
nonReentrant whenNotPaused {
        ...

        // Calculate referral reward if referral is valid
        uint256 referralReward = 0;
        if (referral != address(0) && referral != msg.sender) {
            referralReward = (usdtAmount *
baseDecimals).mul(referralPercentage).div(100); // 5% referral reward
in USDT

            usdtToken.transferFrom(msg.sender, referral,
referralReward);
            referralRewardsUSDT[referral] += referralReward;
            totalReferrals[referral] += 1;
        }

        uint256 remainingUSDT = (usdtAmount *
baseDecimals).sub(referralReward);
        ...
        uint256 tokensToBuy = ((usdtAmount * baseDecimals) /
currentPriceInUSDT) * baseDecimals; // Direct division for token
amount calculation

        ...
    }
```

Recommendation

It is recommended to revise the code implementation concerning the handling of decimals. Instead of using a hardcoded value, the contract should dynamically retrieve the decimals value from the USDT contract address. This can be achieved by calling the decimals() function on the USDT token contract, ensuring that calculations within the `buyWithUSDT` function accurately reflect the token's actual decimal structure. Adopting this approach will correct the calculation of variables such as `referralReward`, aligning token distributions with the intended logic and preserving the contract's economic integrity.

IVC - Inconsistent Value Calculation

Criticality	Medium
Location	contracts/Presale.sol#L107,139,167
Status	Unresolved

Description

The contract is designed to handle token purchases through its `processPurchase` function, which accepts the `value` parameter representing the amount paid by the user. The `value` parameter can originate from two different sources, either as `msg.value` for ETH transactions or as `usdtAmount` for USDT transactions. Consequently, this leads to a scenario where the `value` parameter can represent two fundamentally different quantities, each with its own decimal precision. Despite this variance, the contract uniformly applies `baseDecimals` multiplication to the value parameter, disregarding the inherent difference in decimal places between ETH (typically 18 decimals) and USDT. This uniform treatment can result in inaccurate calculations of the `remainingValue`, potentially affecting the fairness and accuracy of token distribution and financial accounting within the contract.

```
processPurchase(tokensToBuy, msg.value, "ETH");
...
processPurchase(tokensToBuy, usdtAmount, "USDT");
...
    function processPurchase(uint256 tokensToBuy, uint256 value,
string memory currency) private {
        ...
            uint256 remainingValue = ((value * baseDecimals) >
stageValue) ? (value  * baseDecimals) - stageValue : 0;
          ...
    }
```

Recommendation

It is recommended to revise the code implementation to ensure that the calculation of financial values within the `processPurchase` function accurately reflects the decimal precision of the currency being used. This could involve differentiating between the handling of ETH and USDT transactions, applying the appropriate decimal adjustments based on the currency type. One approach could be to introduce separate processing paths within the function for ETH and USDT, each tailored to the specific decimal characteristics of the currency. Alternatively, dynamically determining the multiplication factor based on the currency's actual decimal places could unify the handling of different currencies while preserving accuracy. This adjustment will help ensure that the contract's financial calculations are precise and consistent, regardless of the payment method used.

ALU - Array Length Usage

Criticality	Minor / Informative
Location	contracts/Presale.sol#L95,131,202,210
Status	Unresolved

Description

The contract is designed to distribute a balance among addresses stored in the `ethReceivers` and `usdtReceivers` arrays, which both are intended to contain three addresses. The distribution logic calculates each recipient's `share` by dividing the total value by a hardcoded value of 3. This division approach does not account for the actual length of the `ethReceivers` and `usdtReceivers` arrays. This oversight can result in either an excess or shortage of distributed funds, depending on the current length of the array, potentially causing financial discrepancies and undermining the fairness and reliability of the distribution mechanism.

```
uint256 share = remainingETH.div(3);
for (uint i = 0; i < ethReceivers.length; i++) {

...

uint256 share = remainingUSDT.div(3);
for (uint i = 0; i < usdtReceivers.length; i++) {
```

Recommendation

It is recommended to dynamically calculate the share amount by using the length of the `ethReceivers` and `usdtReceivers` arrays instead of a hardcoded value. This can be achieved by modifying the share calculation to `uint256 share = balance.div(ethReceivers.length);`. By adopting this approach, the contract ensures that the total balance is always evenly divided among the current number of addresses in the arrays, regardless of the length. This adjustment enhances the contract's flexibility and accuracy in fund distribution, aligning it with the principle of dynamic array handling in smart contract development.

CCR - Contract Centralization Risk

Criticality	Minor / Informative
Location	contracts/Presale.sol#L189,216,224,229
Status	Unresolved

Description

The contract's functionality and behavior are heavily dependent on external parameters or configurations. While external configuration can offer flexibility, it also poses several centralization risks that warrant attention. Centralization risks arising from the dependence on external configuration include Single Point of Control, Vulnerability to Attacks, Operational Delays, Trust Dependencies, and Decentralization Erosion.

Specifically, the owner has the ability to set the Presale Stage, pause and unpause the presale functionality, update the referral percentage reward, and distribute tokens to specific addresses. This concentration of power in the hands of a single entity introduces a significant centralization risk, potentially undermining the trust and security principles typically associated with decentralized systems. Such centralization may lead to scenarios where the contract owner could unilaterally make changes that affect all stakeholders, without consensus or oversight, potentially impacting the fairness and transparency of the presale and token distribution processes.

```
    function setPresaleStage(PresaleStage stage) public
onlyOwner {
        currentStage = stage;
        emit StageChanged(stage);
    }

    function pausePresale() public onlyOwner {
        _pause();
    }

    function unpausePresale() public onlyOwner {
        _unpause();
    }

    function updateReferralPercentage(uint256 val) public
onlyOwner {
        referralPercentage = val;
    }

    function distributeTokens(address[] calldata userAddresses,
uint256[] calldata tokenAmounts) external onlyOwner
nonReentrant whenNotPaused {
    ...
    }
```

Recommendation

To address this finding and mitigate centralization risks, it is recommended to evaluate the feasibility of migrating critical configurations and functionality into the contract's codebase itself. This approach would reduce external dependencies and enhance the contract's self-sufficiency. It is essential to carefully weigh the trade-offs between external configuration flexibility and the risks associated with centralization.

DDP - Decimal Division Precision

Criticality	Minor / Informative
Location	contracts/Presale.sol#L95,131,202,210
Status	Unresolved

Description

Division of decimal (fixed point) numbers can result in rounding errors due to the way that division is implemented in Solidity. Thus, it may produce issues with precise calculations with decimal numbers.

Solidity represents decimal numbers as integers, with the decimal point implied by the number of decimal places specified in the type (e.g. decimal with 18 decimal places). When a division is performed with decimal numbers, the result is also represented as an integer, with the decimal point implied by the number of decimal places in the type. This can lead to rounding errors, as the result may not be able to be accurately represented as an integer with the specified number of decimal places.

Hence, the splitted shares will not have the exact precision and some funds may not be calculated as expected.

```
        uint256 share = remainingETH.div(3);
         for (uint i = 0; i < ethReceivers.length; i++) {
             ethReceivers[i].transfer(share);
         }
    ...

    uint256 share = remainingUSDT.div(3);
         for (uint i = 0; i < usdtReceivers.length; i++) {
             usdtToken.transferFrom(msg.sender,
usdtReceivers[i], share);
         }

    ...
    function withdrawETH() external onlyOwner {
         uint256 balance = address(this).balance;
         uint256 share = balance.div(3);
         for (uint i = 0; i < ethReceivers.length; i++) {
             ethReceivers[i].transfer(share);
         }
    }
```

Recommendation

The team is advised to take into consideration the rounding results that are produced from the solidity calculations. The contract could calculate the subtraction of the divided funds in the last calculation in order to avoid the division rounding issue.

DPI - Decimals Precision Inconsistency

Criticality	Minor / Informative
Location	contracts/Presale.sol#L104,137,160,167
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 are 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.

```
uint256 usdtAmount = (msg.value * ethPriceInUSDT * (10 ** 10));
...
uint256 tokensToBuy = ((usdtAmount * baseDecimals) /
currentPriceInUSDT) * baseDecimals; // Direct division for token
amount calculation
...
uint256 stageValue = availableTokens * stagePrices[currentStage] /
baseDecimals;
presaleToken.transfer(msg.sender, availableTokens);
...
uint256 remainingValue = ((value * baseDecimals) > stageValue) ?
(value  * baseDecimals) - stageValue : 0;
```

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.

IDI - Immutable Declaration Improvement

Criticality	Minor / Informative
Location	contracts/Presale.sol#L50
Status	Unresolved

Description

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

```
baseDecimals
```

Recommendation

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

MPR - Misleading Price Representation

Criticality	Minor / Informative
Location	contracts/Presale.sol#L104,136
Status	Unresolved

Description

The contract declares the `currentPriceInUSDT` variable, which, by its naming, suggests it stores the price of tokens in USDT. However, the `stagePrices` for each presale stage, which are used to set `currentPriceInUSDT`, are denominated in ether (ETH) rather than USDT. This discrepancy between the variable's name and the unit of currency used for the price values is misleading. It could cause confusion leading to incorrect assumptions about the contract's pricing mechanism and potentially impacting the contract's integration with external systems or its overall functionality.

```
        uint256 currentPriceInUSDT = stagePrices[currentStage];
// Price per token in USDT for current stage
```

Recommendation

It is recommended to ensure consistent and clear naming conventions and units of measurement throughout the contract. If `currentPriceInUSDT` is intended to represent prices in USDT, the stagePrices should be set in USDT units, not in ether. Alternatively, if the contract's logic is to remain as is, renaming `currentPriceInUSDT` to reflect that it is denominated in ether would help clarify the actual functionality.

ODM - Oracle Decimal Mismatch

Criticality	Minor / Informative
Location	contracts/Presale.sol#L194
Status	Unresolved

Description

The contract relies on data retrieved from an external Oracle to make critical calculations. However, the contract does not include a verification step to align the decimal precision of the retrieved data with the precision expected by the contract's internal calculations. This mismatch in decimal precision can introduce substantial errors in calculations involving decimal values.

```
    function getLatestETHPrice() public view returns (uint256) {
        (,int price,,,) = ethPriceFeed.latestRoundData();
        require(price > 0, "Invalid ETH price");
        return uint256(price);
    }
```

Recommendation

The team is advised to retrieve the decimals precision from the Oracle API in order to proceed with the appropriate adjustments to the internal decimals representation.

PBV - Percentage Boundaries Validation

Criticality	Minor / Informative
Location	contracts/Presale.sol#L87,123,244
Status	Unresolved

Description

The contract is using the `referralReward` variable for calculations. However, this variable is used in multiplication operations and if `referralReward` is set to a value greater than `100`, it could lead to incorrect calculations, potentially causing unintended behavior or financial discrepancies within the contract's operations.

```
referralReward = msg.value.mul(referralPercentage).div(100); //
5% referral reward
...
referralReward = (usdtAmount *
baseDecimals).mul(referralPercentage).div(100); // 5% referral
reward in USDT
...
    function updateReferralPercentage(uint256 val) public
onlyOwner {
        referralPercentage = val;
    }
```

Recommendation

It is recommended to ensure that the values of `claimPer` and `tgePer` cannot exceed `100`. This can be achieved by adding checks whenever these variables are set.

PTRP - Potential Transfer Revert Propagation

Criticality	Minor / Informative
Location	contracts/Presale.sol#L88
Status	Unresolved

Description

The contract sends funds to a `referral` address as part of the transfer flow. This address can either be a wallet address or a contract. If the address belongs to a contract then it may revert from incoming payment. As a result, the error will propagate to the token's contract and revert the transfer.

```
payable(referral).transfer(referralReward);
```

Recommendation

The contract should tolerate the potential revert from the underlying contracts when the interaction is part of the main transfer flow. This could be achieved by not allowing set contract addresses or by sending the funds in a non-revertable way.

RSML - Redundant SafeMath Library

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

Description

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

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

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

Recommendation

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

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

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

SPM - Stage Price Mismatch

Criticality	Minor / Informative
Location	contracts/Presale.sol#L146,177
Status	Unresolved

Description

The contract contains the `processPurchase` function designed to handle the purchase of tokens. This function checks if the available tokens in the current stage are sufficient for the purchase. If not, it advances to the next stage using the `checkAndAdvanceStage` function. However, a critical oversight is observed where tokens from the next stage are sold at the price of the previous stage. This discrepancy allows users to purchase tokens at a lower price than intended for the new stage, potentially leading to financial discrepancies and undermining the presale's pricing structure. As a result, depending on the ETH price at the current time of buying the tokens, the user could buy tokens from the next round with the price of the previous round.

```
    function processPurchase(uint256 tokensToBuy, uint256 value,
string memory currency) private {
        uint256 availableTokens =
(stageTokenSupplies[currentStage] * baseDecimals) -
tokensSold[currentStage];

        if (tokensToBuy <= availableTokens) {
            // Purchase can be fulfilled within the current
stage
            tokensSold[currentStage] += tokensToBuy;
            presaleToken.transfer(msg.sender, tokensToBuy);
            emit TokensPurchased(msg.sender, tokensToBuy,
value, currency);
        } else {
            // Purchase spans to the next stage
            require(currentStage < PresaleStage.Stage9, "Not
enough tokens available");

            // Fulfill part of the purchase with the current
stage's remaining tokens
            tokensSold[currentStage] =
stageTokenSupplies[currentStage] * baseDecimals;
            uint256 stageValue = availableTokens *
stagePrices[currentStage] / baseDecimals;
            presaleToken.transfer(msg.sender, availableTokens);
            emit TokensPurchased(msg.sender, availableTokens,
stageValue, currency);

            // Move to the next stage and fulfill the remaining
part of the purchase
            checkAndAdvanceStage();
            uint256 remainingTokensToBuy = tokensToBuy -
availableTokens;
            uint256 remainingValue = ((value * baseDecimals) >
stageValue) ? (value  * baseDecimals) - stageValue : 0;
            tokensSold[currentStage] += remainingTokensToBuy;
            presaleToken.transfer(msg.sender,
remainingTokensToBuy);
            emit TokensPurchased(msg.sender,
remainingTokensToBuy, remainingValue, currency);
        }

        // Check and advance stage after processing the
purchase
        checkAndAdvanceStage();
    }

    function checkAndAdvanceStage() private {
        if (tokensSold[currentStage] >=
stageTokenSupplies[currentStage] * baseDecimals) {
```

```
            if (currentStage == PresaleStage.Stage9) {
                _pause();
                emit PresaleEnded();
            } else {
                currentStage =
PresaleStage(uint256(currentStage) + 1);
                emit PresaleAdvanced(currentStage);
            }
        }
    }
```

`

Recommendation

It is recommended to revise the `processPurchase` function to ensure that when advancing to the next stage, the remaining tokens are sold at the correct price of the new stage. This could involve recalculating the `remainingValue` based on the `stagePrices` of the newly advanced stage before proceeding with the sale of additional tokens. Implementing this change will align the token sale process with the intended pricing strategy across different stages, ensuring fairness and maintaining the integrity of the presale event.

TSI - Tokens Sufficiency Insurance

Criticality	Minor / Informative
Location	contracts/Presale.sol#L43
Status	Unresolved

Description

The tokens are not held within the contract itself. Instead, the contract is designed to provide the tokens from an external administrator. While external administration can provide flexibility, it introduces a dependency on the administrator's actions, which can lead to various issues and centralization risks.

```
    constructor(address _presaleTokenAddress, address
_usdtTokenAddress, address _ethPriceFeedAddress)
Ownable(msg.sender) {
        presaleToken = IERC20(_presaleTokenAddress);
    ...
    }
```

Recommendation

It is recommended to consider implementing a more decentralized and automated approach for handling the contract tokens. One possible solution is to hold the presale tokens within the contract itself. If the contract guarantees the process it can enhance its reliability, security, and participant trust, ultimately leading to a more successful and efficient process.

USS - Unvalidated Stage Setting

Criticality	Minor / Informative
Location	contracts/Presale.sol#L57,189
Status	Unresolved

Description

The contract contains the `setPresaleStage` function that allows the owner to set the current presale stage. However, this function lacks validation to ensure the stage value passed as a parameter is within accepted limits. Consequently, it is possible for an undefined or unintended presale stage to be set, potentially leading to unpredictable behavior or misuse of the contract functionality. This oversight introduces a risk to the contract's integrity and could affect the presale process's fairness and transparency.

```
    function initializeStageData() private {
        // Initialize stage prices and token supplies
        stagePrices[PresaleStage.Stage1] = 0.0001 ether;
        stagePrices[PresaleStage.Stage2] = 0.0002 ether;
        stagePrices[PresaleStage.Stage3] = 0.000968 ether;
        stagePrices[PresaleStage.Stage4] = 0.001065 ether;
        stagePrices[PresaleStage.Stage5] = 0.001171 ether;
        stagePrices[PresaleStage.Stage6] = 0.001288 ether;
        stagePrices[PresaleStage.Stage7] = 0.003 ether;
        stagePrices[PresaleStage.Stage8] = 0.004 ether;
        stagePrices[PresaleStage.Stage9] = 0.05 ether;
        ...

     function setPresaleStage(PresaleStage stage) public onlyOwner
{
        currentStage = stage;
        emit StageChanged(stage);
     }
```

Recommendation

It is recommended to add an additional check within the `setPresaleStage` function to verify the state value before setting the new stage. This could involve explicitly checking that the passed `stage` parameter is within the range of defined `PresaleStage` enum values. Implementing such validation ensures that only valid stages can be set, preventing any unintended contract states and enhancing the contract's security and reliability. This approach will safeguard the presale process against potential manipulation or errors stemming from invalid stage settings.

L13 - Divide before Multiply Operation

Criticality	Minor / Informative
Location	contracts/Presale.sol#L137
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 tokensToBuy = ((usdtAmount * baseDecimals) /
currentPriceInUSDT) * baseDecimals
```

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.

L19 - Stable Compiler Version

Criticality	Minor / Informative
Location	contracts/Presale.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 ^0.8.20;
```

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	contracts/Presale.sol#L125,133,152,161,169,212,242
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.

```
usdtToken.transferFrom(msg.sender, referral, referralReward)
usdtToken.transferFrom(msg.sender, usdtReceivers[i], share)
presaleToken.transfer(msg.sender, tokensToBuy)
presaleToken.transfer(msg.sender, availableTokens)
presaleToken.transfer(msg.sender, remainingTokensToBuy)
usdtToken.transfer(usdtReceivers[i], share)
presaleToken.transfer(userAddress, tokensToBuy)
```

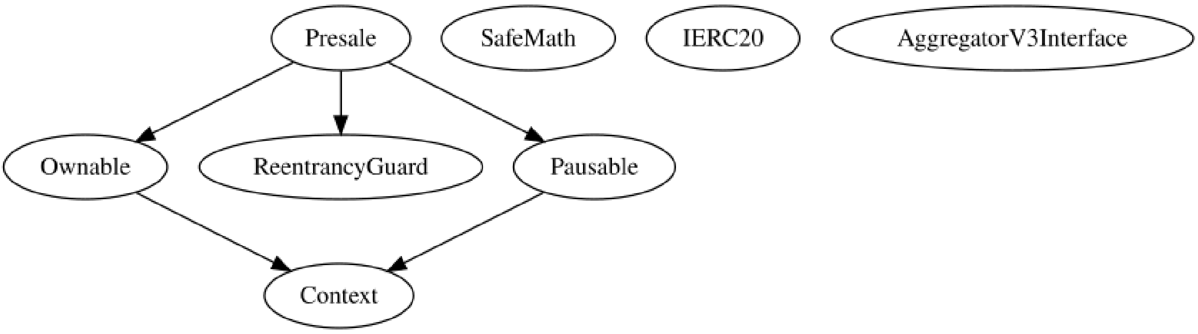
Recommendation

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.

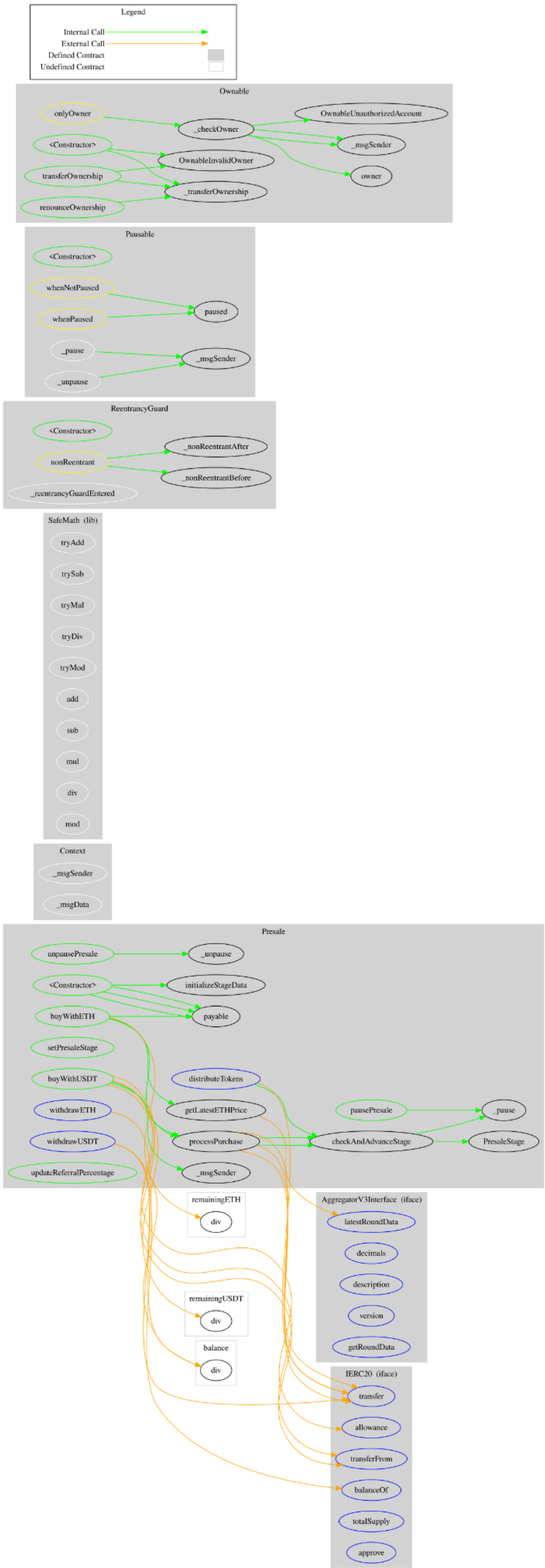
Functions Analysis

Contract	Type	Bases		
	Function Name	**Visibility**	**Mutability**	**Modifiers**
Presale	Implementation	Ownable, ReentrancyGuard, Pausable		
		Public	✓	Ownable
	initializeStageData	Private	✓	
	buyWithETH	Public	Payable	nonReentrant whenNotPaused
	buyWithUSDT	Public	✓	nonReentrant whenNotPaused
	processPurchase	Private	✓	
	checkAndAdvanceStage	Private	✓	
	setPresaleStage	Public	✓	onlyOwner
	getLatestETHPrice	Public		-
	withdrawETH	External	✓	onlyOwner
	withdrawUSDT	External	✓	onlyOwner
	pausePresale	Public	✓	onlyOwner
	unpausePresale	Public	✓	onlyOwner
	updateReferralPercentage	Public	✓	onlyOwner

Inheritance Graph



Flow Graph


Legend
Internal Call
External Call
Defined Contract
Undefined Contract
Ownable
onlyOwner
_checkOwner
OwnableUnauthorizedAccount
<Constructor>
_msgSender
OwnableInvalidOwner
owner
transferOwnership
_transferOwnership
renounceOwnership
Pausable
<Constructor>
whenNotPaused
paused
whenPaused
_pause
_msgSender
_unpause
ReentrancyGuard
<Constructor>
_nonReentrantAfter
nonReentrant
_nonReentrantBefore
_reentrancyGuardEntered
SafeMath (lib)
tryAdd
trySub
tryMul
tryDiv
tryMod
add
sub
mul
div
mod
Context
_msgSender
_msgData
Presale
unpausePresale
_unpause
<Constructor>
initializeStageData
buyWithETH
payable
setPresaleStage
buyWithUSDT
distributeTokens
withdrawETH
getLatestETHPrice
pausePresale
_pause
withdrawUSDT
processPurchase
checkAndAdvanceStage
PresaleStage
updateReferralPercentage
_msgSender
remainingETH
div
AggregatorV3Interface (iface)
latestRoundData
decimals
description
version
remainingUSDT
div
balance
div
getRoundData
IERC20 (iface)
transfer
allowance
transferFrom
balanceOf
totalSupply
approve

Summary

CloudBTC contract implements a presale mechanism allowing participants to purchase tokens using either Ethereum (ETH) or Tether (USDT). This audit investigates security issues, business logic concerns and potential improvements.

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

The Cyberscope team

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