



Cyberscope

# Audit Report

## **payMe Vesting**

October 2022

Github <https://github.com/payMeQuiz/payMe-Project>

Commit [6c603956be4963a53f2b78af0eaed73dba9bee9d](#)

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## Contract Review

<b>Contract Name</b>	PaymeTokenVesting
<b>Compiler Version</b>	v0.8.9+commit.e5eed63a
<b>Github</b>	<a href="https://github.com/payMeQuiz/payMe-Project">https://github.com/payMeQuiz/payMe-Project</a>
<b>Commit</b>	6ae40ccfae93ee9b1b5fd8d90051790048d4279f
<b>Testing Deploy</b>	<a href="https://testnet.bscscan.com/token/0x2172122e8EAd8e85a2cdA49b0e91b5569Fc192A0">https://testnet.bscscan.com/token/0x2172122e8EAd8e85a2cdA49b0e91b5569Fc192A0</a>
<b>Domain</b>	<a href="https://payme.games">https://payme.games</a>

## Audit Updates

<b>Initial Audit</b>	17th October 2022
<b>Corrected</b>	

## Source Files

Filename	SHA256
@openzeppelin/contracts-upgradeable/access/OwnableUpgradeable.sol	da66c17044345dc892d85bd7ddc9745d25df0b3dacfba8f84eb87c60d6e40fe3
@openzeppelin/contracts-upgradeable/proxy/utils/Initializable.sol	cd823c76cbf5f5b6ef1bda565d58be66c843c37707cd93eb8fb5425deebd6756
@openzeppelin/contracts-upgradeable/security/ReentrancyGuardUpgradeable.sol	b6adbe9bc075b15cfb4b90f1ae020da4c78e3feada056a4c75b875350285c915
@openzeppelin/contracts-upgradeable/token/ERC20/extensions/draft-IERC20PermitUpgradeable.sol	b97515a88e75c313eacf0a27c9439ef371d86d4c2730d3b13076640942f813df
@openzeppelin/contracts-upgradeable/token/ERC20/IERC20Upgradeable.sol	4e09a7479aa3e7c313f8fc141c4c8fc04e0abfeb8754615ef7d78ec94c298b07
@openzeppelin/contracts-upgradeable/token/ERC20/utils/SafeERC20Upgradeable.sol	b7410d275fc7d26e36b0851541d6ff290593ba72d64b5c906978124b123915c1

<b>@openzeppelin/contracts-upgradeable/utils/AddressUpgradeable.sol</b>	35fb271561f3dc72e91b3a42c6e40c2bb2e788cd8ca58014ac43f6198b8d32ca
<b>@openzeppelin/contracts-upgradeable/utils/ContextUpgradeable.sol</b>	5fb301961e45cb482fe4e05646d2f529aa449fe0e90c6671475d6a32356fa2d4
<b>@openzeppelin/contracts-upgradeable/utils/math/MathUpgradeable.sol</b>	43127075ebfd67044ac7cbee0734c30911e435f58a42d8cf20a86d9fe963ae80
<b>@openzeppelin/contracts-upgradeable/utils/math/SafeMathUpgradeable.sol</b>	4039686a509394aed475619c4e0b3a2df1df34fe59e90b9add8669de371eb731
<b>contracts/PaymeTokenVesting.sol</b>	56c1b1a507294cdb229deab7b7646ada1ed2266a017ebb09bc21b82855fee681

# Introductions

The PaymeTokenVesting contract implements a vesting contract as an upgradable proxy. The contract is responsible for creating and configuring vesting schedules for a beneficiary.

Each beneficiary can have multiple vesting schedules. In addition, the contract monitors the vesting schedules by keeping track of the beneficiaries and how many times its beneficiary has vested.

## Roles

The contract has an owner role and a beneficiary role. The beneficiary is any user that vests on the contract. The owner has the authority to withdraw a specific amount from the contract if possible. Additionally, the owner and any user that is beneficiary have the authority:

1. Revoke all the vested amount if the vesting period is elapsed or the proportional amount in relation to the vested period.
2. Release tokens for TGE If the TGE opening time has elapsed.
3. Release a specific amount of vested tokens if it is possible.

# Contract Diagnostics

● Critical ● Medium ● Minor / Informative

Severity	Code	Description	Status
●	VTAI	Vesting Total Amount Inconsistency	Unresolved
●	VTI	Vesting Token Issues	Unresolved
●	CO	Code Optimization	Unresolved
●	MC	Missing Check	Unresolved
●	L04	Conformance to Solidity Naming Conventions	Unresolved
●	L05	Unused State Variable	Unresolved
●	L11	Unnecessary Boolean equality	Unresolved
●	L13	Divide before Multiply Operation	Unresolved



## VTAI - Vesting Total Amount Inconsistency

<b>Criticality</b>	medium
<b>Location</b>	contract.sol#L271
<b>Status</b>	Unresolved

### Description

The contract is using a variable "vestingSchedulesTotalAmount" to aggregate the total vested amount. The variable is aggregating the total vested amount but it is not taking into account the TGE amount. When the TGE amount is claimed by the investors, it is creating an inconsistency between the actual total amount and the calculated vested ("vestingSchedulesTotalAmount") amount.

```
function releaseTokenForTGE(bytes32 vestingScheduleId)
    public
    nonReentrant
    {
        //..
        uint256 currentTime = getCurrentTime();
        require(currentTime >= TGEOpeningTime, "TGE: time not reached!");
        require(TGETokenParticipates[vestingScheduleId] == 0, "TGE: Token
Already claimed");
        uint256 TGEReleaseAmount =
        vestingSchedule.amountTotal.mul(TGEPercent).div(100);
        vestingSchedule.released =
        vestingSchedule.released.add(TGEReleaseAmount);
        TGETokenParticipates[vestingScheduleId] = TGEReleaseAmount;
        //..
    }
```

### Recommendation

It is recommended to sum up all the potential releasable amounts in the total vesting amount.

## VTI - Vesting Token Issues

<b>Criticality</b>	minor / informative
<b>Location</b>	contract.sol#L271,415
<b>Status</b>	Unresolved

### Description

The vesting functionality may produce some vulnerabilities during the claiming period.

#### TGE vs Normal Claim

A user is able to claim the whole vested amount and then claim the TGE amount as well. The opposite cannot happen. If a user claims the TGE, then he will not be able to claim the vested amount.

#### Early TGE claim

If a user claims the TGE amount at the beginning of the vesting period, then the `_computeReleasableAmount` method will revert. This will happen because the `vestingSchedule.released` will be greater than the releasable amount.

```
function releaseTokenForTGE(bytes32 vestingScheduleId) public nonReentrant
{
    //..
    vestingSchedule.released = vestingSchedule.released.add(TGEReleaseAmount);
    //..
}

function _computeReleasableAmount(VestingSchedule memory vestingSchedule) internal view
returns(uint256){
    //..
    vestedAmount = vestedAmount.sub(vestingSchedule.released);
    //..
}
```

## Recommendation

The team is advised to carefully check if the implementation follows the expected business logic.

## MC - Missing Check

<b>Criticality</b>	minor / informative
<b>Location</b>	contract.sol#L1
<b>Status</b>	Unresolved

### Description

The contract is processing variables that have not been properly sanitized and checked that they form the proper shape. These variables may produce vulnerability issues. To be more specific, the variables `TGEOpeningTime` and `TGEPercents` are not properly sanitized.

```
function initialize(IERC20Upgradeable token_,uint256 TGEPercents_,uint256 TGEOpeningTime_)
public initializer {
    require(address(token_) != address(0));
    __Ownable__init_unchained();
    __ReentrancyGuard__init_unchained();

    _token = token_;

    TGEOpeningTime = TGEOpeningTime_;
    TGEPercents = TGEPercents_;
}
```

### Recommendation

The contract should properly check the variables according to the required specifications.

- `TGEOpeningTime` should be greater than the current timestamp.
- `TGEPercents` should be greater than zero and lower than 100 percent.

## L04 - Conformance to Solidity Naming Conventions

<b>Criticality</b>	minor / informative
<b>Location</b>	contracts/PaymeTokenVesting.sol#L108,173,47,203,130,57,59,48,205,199,202,206,204,201,200
<b>Status</b>	Unresolved

### Description

Solidity defines a naming convention that should be followed. Rule exceptions:

- Allow constant variable name/symbol/decimals to be lowercase.
- Allow `_` at the beginning of the mixed\_case match for private variables and unused parameters.

```
TGEOpeningTime_  
_crowdsales_address  
TGEPPercent  
_slicePeriodSeconds  
_beneficiary  
TGETokenParticipates  
crowdsales_address  
TGEOpeningTime  
_amount  
...
```

### Recommendation

Follow the Solidity naming convention.

<https://docs.soliditylang.org/en/v0.4.25/style-guide.html#naming-conventions>.

## L05 - Unused State Variable

<b>Criticality</b>	minor / informative
<b>Location</b>	contracts/PaymeTokenVesting.sol#L18
<b>Status</b>	Unresolved

### Description

There are segments that contain unused state variables.

PaymeTokenVesting

### Recommendation

Remove unused state variables.

## L11 - Unnecessary Boolean equality

<b>Criticality</b>	minor / informative
<b>Location</b>	contracts/PaymeTokenVesting.sol#L415,244,70,78,271
<b>Status</b>	Unresolved

### Description

The comparison to boolean constants is redundant. Boolean constants can be used directly and do not need to be compared to true or false.

```
(currentTime < vestingSchedule.cliff) || vestingSchedule.revoked == true  
require(bool,string)(vestingSchedule.revocable == true,TokenVesting: vesting is not revocable)  
require(bool)(vestingSchedules[vestingScheduleId].initialized == true)  
require(bool,string)(vestingSchedule.releaseAtTGE == true,ReleaseTokenAtTGE: only investors  
can claim token at TGE)  
require(bool)(vestingSchedules[vestingScheduleId].revoked == false)
```

### Recommendation

Remove the equality to the boolean constant.

## L13 - Divide before Multiply Operation

<b>Criticality</b>	minor / informative
<b>Location</b>	contracts/PaymeTokenVesting.sol#L415
<b>Status</b>	Unresolved

### Description

Performing divisions before multiplications may cause lose of prediction.

```
vestedSlicePeriods = timeFromStart.div(secondsPerSlice)
```

### Recommendation

The multiplications should be prior to the divisions.



# Contract Functions

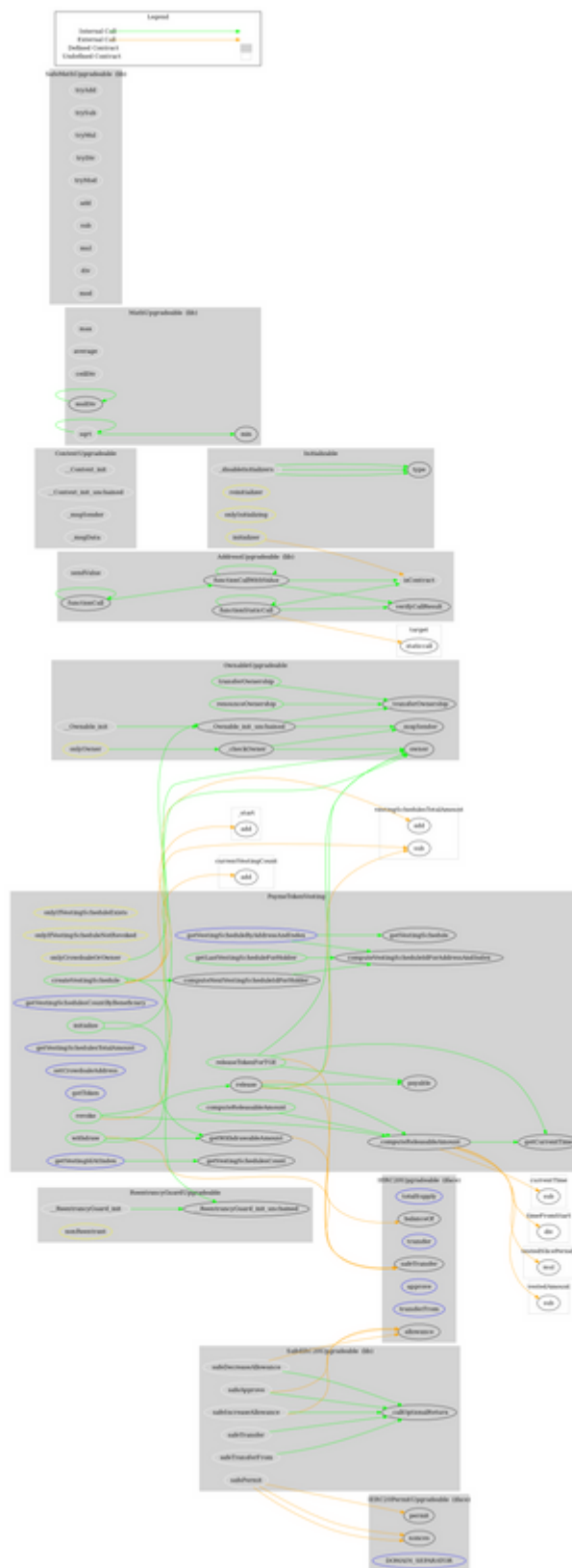
Contract	Type	Bases		
	Function Name	Visibility	Mutability	Modifiers
<b>OwnableUpgradeable</b>	Implementation	Initializable, ContextUpgradeable		
	__Ownable_init	Internal	✓	onlyInitializing
	__Ownable_init_unchained	Internal	✓	onlyInitializing
	owner	Public		-
	_checkOwner	Internal		
	renounceOwnership	Public	✓	onlyOwner
	transferOwnership	Public	✓	onlyOwner
	_transferOwnership	Internal	✓	
<b>Initializable</b>	Implementation			
	_disableInitializers	Internal	✓	
<b>ReentrancyGuardUpgradeable</b>	Implementation	Initializable		
	__ReentrancyGuard_init	Internal	✓	onlyInitializing
	__ReentrancyGuard_init_unchained	Internal	✓	onlyInitializing
<b>IERC20PermitUpgradeable</b>	Interface			
	permit	External	✓	-
	nonces	External		-
	DOMAIN_SEPARATOR	External		-
<b>IERC20Upgradeable</b>	Interface			
	totalSupply	External		-
	balanceOf	External		-

	transfer	External	✓	-
	allowance	External		-
	approve	External	✓	-
	transferFrom	External	✓	-
<b>SafeERC20Upgradeable</b>	Library			
	safeTransfer	Internal	✓	
	safeTransferFrom	Internal	✓	
	safeApprove	Internal	✓	
	safeIncreaseAllowance	Internal	✓	
	safeDecreaseAllowance	Internal	✓	
	safePermit	Internal	✓	
	_callOptionalReturn	Private	✓	
<b>AddressUpgradeable</b>	Library			
	isContract	Internal		
	sendValue	Internal	✓	
	functionCall	Internal	✓	
	functionCall	Internal	✓	
	functionCallWithValue	Internal	✓	
	functionCallWithValue	Internal	✓	
	functionStaticCall	Internal		
	functionStaticCall	Internal		
	verifyCallResult	Internal		
<b>ContextUpgradeable</b>	Implementation	Initializable		
	__Context_init	Internal	✓	onlyInitializing
	__Context_init_unchained	Internal	✓	onlyInitializing
	_msgSender	Internal		
	_msgData	Internal		
<b>MathUpgradeable</b>	Library			

	max	Internal		
	min	Internal		
	average	Internal		
	ceilDiv	Internal		
	mulDiv	Internal		
	mulDiv	Internal		
	sqrt	Internal		
	sqrt	Internal		
<b>SafeMathUpgradable</b>	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		
<b>PaymeTokenVesting</b>	Implementation	OwnableUpgradable, ReentrancyGuardUpgradable		
	initialize	Public	✓	initializer
	getVestingSchedulesCountByBeneficiary	External		-
	getVestingIdAtIndex	External		-
	getVestingScheduleByAddressAndIndex	External		-
	getVestingSchedulesTotalAmount	External		-
	setCrowdsaleAddress	External	✓	-

	getToken	External		-
	createVestingSchedule	Public	✓	onlyCrowdsale OrOwner
	revoke	Public	✓	onlyOwner onlyIfVestingS cheduleNotRe voked
	withdraw	Public	✓	nonReentrant onlyOwner
	releaseTokenForTGE	Public	✓	nonReentrant
	release	Public	✓	nonReentrant onlyIfVestingS cheduleNotRe voked
	getVestingSchedulesCount	Public		-
	computeReleasableAmount	Public		onlyIfVestingS cheduleNotRe voked
	getVestingSchedule	Public		-
	getWithdrawableAmount	Public		-
	computeNextVestingScheduleIdForHolder	Public		-
	getLastVestingScheduleForHolder	Public		-
	computeVestingScheduleIdForAddressAndIndex	Public		-
	_computeReleasableAmount	Internal		
	getCurrentTime	Internal		

# Contract Flow



## Domain Info

<b>Domain Name</b>	payme.games
<b>Registry Domain ID</b>	29f4ee9286e043058b41ccc27375747f-DONUTS
<b>Creation Date</b>	2021-01-06T13:00:37Z
<b>Updated Date</b>	2022-08-05T11:31:27Z
<b>Registry Expiry Date</b>	2023-01-06T13:00:37Z
<b>Registrar WHOIS Server</b>	whois.namecheap.com
<b>Registrar URL</b>	<a href="https://www.namecheap.com/">https://www.namecheap.com/</a>
<b>Registrar</b>	NameCheap, Inc.
<b>Registrar IANA ID</b>	1068

The domain was created almost 2 years before the creation of the audit. It will expire in 3 months.

There is no public billing information, the creator is protected by the privacy settings.

# Summary

The PaymeTokenVesting contract is responsible for generating vesting schedules. This audit investigates security issues and mentions business logic concerns and potential improvements.

## Disclaimer

All the content provided in this document is for general information only and should not be used as financial advice or a reason to buy any investment.

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The Cyberscope team disclaims any liability for the resulting losses.



# About Cyberscope

Coinscope audit and K.Y.C. service has been rebranded to Cyberscope.

Coinscope is the leading early coin listing, voting and auditing authority firm. The audit process is analyzing and monitoring many aspects of the project. That way, it gives the community a good sense of security using an informative report and a generic score.

Cyberscope and Coinscope are aiming to make crypto discoverable and efficient globally. They provide all the essential tools to assist users draw their own conclusions.



The Cyberscope team

<https://www.cyberscope.io>