



# Cyberscope

## Audit Report **Digits DAO**

January 2022

SHA256

fdfccf30288fdf5527f32938f29e169ed19b2d0e66a55a8dff94028f777b915a  
9230c91afa6cf6f758ea9bf11dfb8c501051ecf4c7dfe19cafe9c9d96cffba4e  
aa94928f4e13a74889384b358c501a94220e8269ecbed8933d0d06619ee75742

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## Contract Review

<b>Contract Names</b>	Testing Deploy
<b>Digits</b>	<a href="https://testnet.bscscan.com/address/0x09f24E590ed2F3a187403b66947eFcB67DA895E3">https://testnet.bscscan.com/address/0x09f24E590ed2F3a187403b66947eFcB67DA895E3</a>
<b>DividendTracker</b>	<a href="https://testnet.bscscan.com/address/0xb0D00B13A1e960a2BEf5D33b027f8AbcAd1D0EB2">https://testnet.bscscan.com/address/0xb0D00B13A1e960a2BEf5D33b027f8AbcAd1D0EB2</a>
<b>TokenStorage</b>	<a href="https://testnet.bscscan.com/address/0x8420B4596ca6B4bA9a61B9aF8F506F451c26dE17">https://testnet.bscscan.com/address/0x8420B4596ca6B4bA9a61B9aF8F506F451c26dE17</a>

## Audit Updates

<b>Initial Audit</b>	19 Dec 2022 <a href="https://github.com/cyberscope-io/audits/blob/main/digits-dao/v1/audit.pdf">https://github.com/cyberscope-io/audits/blob/main/digits-dao/v1/audit.pdf</a>
<b>Corrected Phase 2</b>	30 Dec 2022 <a href="https://github.com/cyberscope-io/audits/blob/main/digits-dao/v2/audit.pdf">https://github.com/cyberscope-io/audits/blob/main/digits-dao/v2/audit.pdf</a>
<b>Corrected Phase 3</b>	04 Jan 2023

# Source Files

Filename	SHA256
Digits.sol	fdfccf30288fdf5527f32938f29e169ed19b2d0e66a55a8dff94028f777b915a
DividendTracker.sol	9230c91afa6cf6f758ea9bf11dfb8c501051ecf4c7dfe19cafe9c9d96cffba4e
helpers/WrapERC20.sol	0193f63e41ce717dc360cd3bb68219ac4b3c02527631d7213d8cdf0c33c8c46d
interfaces/IDigits.sol	7520933d39e6bce99940059a9090c1aa8c9541a92a6b34e882053a0a92275702
interfaces/IDividendTracker.sol	3909c145c50b27f918081d262633b64180ede76a41177b7a571d0ce6b957f30f
interfaces/ITokenStorage.sol	6ae3a83e47496d5ecedc057359f2a989f4f92b2c1f4a4b6e549ab39ac07e4458
TokenStorage.sol	aa94928f4e13a74889384b358c501a94220e8269ecbed8933d0d06619ee75742

# Introduction

Digits DAO consists of four contracts:

- Digits
- DividendTracker
- TokenStorage
- MultiRewards

This audit report is referring to the first three contracts. The audit report for the `MultiRewards` contract can be found at <https://github.com/cyberscope-io/audits/tree/main/digits-dao/MultiRewards.pdf>.

## Roles

### Digits

The Digits contract has two roles, the **USER** role and the **OWNER** role.

The **OWNER** role has the authority to

- Include/Exclude an address from fees.
- Include/Exclude an address from the max tx amount.
- Include/Exclude an address from the max wallet amount
- Set fees up to 24% combined.
- Enable/Disable fees.
- Claim all the balance of the contract.
- Renounce/Transfer ownership.

The **USER** role has the authority to

- Make transactions.
- Claim dividends distributed as DAI tokens.

### DividendTracker

The DividendTracker contract has two roles, the **USER** role, and the **OWNER** role.

The **OWNER** role has the authority to

- Renounce/Transfer ownership.
- Set the balance of an account.
- Include/Exclude an account from dividends.
- Transfer an account's dividends to that account.

The **USER** role has the authority to

- Transfer dividends to the contract.

### TokenStorage

The DividendTracker contract has two roles, the **MANAGER** role, and the **OWNER** role.

The **OWNER** role has the authority to

- Renounce/Transfer ownership.
- Add/Remove managers.

The **MANAGER** role has the authority to

- Transfer DAI to an address.
- Swap tokens for DAI.
- Distribute dividends.

# Contract Diagnostics

● Critical   ● Medium   ● Minor / Informative

Severity	Code	Description	Status
●	OCTD	Transfers Contract's Tokens	Acknowledged
●	PVC	Price Volatility Concern	Acknowledged
●	US	Untrusted Source	Acknowledged
●	L04	Conformance to Solidity Naming Conventions	Acknowledged
●	L13	Divide before Multiply Operation	Acknowledged



## OCTD - Transfers Contract's Tokens

Criticality	Minor / Informative
Location	Digits.sol#L662
Status	Acknowledged

### Description

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

```
function rescueToken(address _token, uint256 _amount) external onlyOwner {  
    IERC20(_token).transfer(msg.sender, _amount);  
}
```

### Recommendation

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

### Team Update

*"Owner will likely be a multisig, also we don't expect ERC20 tokens to be sent to Digits contract per se."*

## PVC - Price Volatility Concern

<b>Criticality</b>	Minor / Informative
<b>Location</b>	Digits.sol#L602
<b>Status</b>	Acknowledged

### Description

The contract accumulates tokens from the taxes to swap them for ETH. The variable `swapTokensAtAmount` sets a threshold where the contract will trigger the swap functionality. If the variable is set to a big number, then the contract will swap a huge amount of tokens for ETH. It is important to note that the price of the token representing it, can be highly volatile. This means that the value of a price volatility swap involving Ether could fluctuate significantly at the triggered point, potentially leading to significant price volatility for the parties involved.

```
function updateDividendSettings(bool _swapEnabled, uint256 _swapTokensAtAmount, bool
_swapAllToken) external onlyOwner {
    swapEnabled = _swapEnabled;
    swapTokensAtAmount = _swapTokensAtAmount;
    swapAllToken = _swapAllToken;

    emit UpdateDividendSettings(_swapEnabled, _swapTokensAtAmount, _swapAllToken);
}
```

### Recommendation

The contract could ensure that it will not sell more than a reasonable amount of tokens in a single transaction. A suggested implementation could check that the maximum amount should be less than a fixed percentage of the total supply. Hence, the contract will guarantee that it cannot accumulate a huge amount of tokens in order to sell them.

## Team Update

*“We are fine with this, it’s unlikely that token swap will trigger with great token amount, as each transfer that fees reach threshold they are swapped and we control the threshold.”*

## US - Untrusted Source

<b>Criticality</b>	Minor / Informative
<b>Location</b>	Digits.sol#L117,440
<b>Status</b>	Acknowledged

### Description

The contract uses an external contract in order to determine the transaction's flow. The external contract is untrusted. As a result, it may produce security issues and harm the transactions.

```
dividendTracker = new DividendTracker(dai, address(this), uniswapRouter);  
...  
function setTokenStorage(address _tokenStorage) external onlyOwner {  
    ...  
    tokenStorage = ITokenStorage(_tokenStorage);  
}
```

### Recommendation

The contract should use a trusted external source. A trusted source could be either a commonly recognized or an audited contract. The pointing addresses should not be able to change after the initialization.

### Team Update

*“DividendTracker contract is created by the Digits contract on deployment and is part of this audit. TokenStorage contract is settable only once.”*

## L04 - Conformance to Solidity Naming Conventions

<b>Criticality</b>	Minor / Informative
<b>Location</b>	TokenStorage.sol#L55,60,129 DividendTracker.sol#L17,18,19,20 Digits.sol#L22,23,411,482,487,501,521,522,523,538,543,548,573,574,575,619,623
<b>Status</b>	Acknowledged

### Description

The Solidity style guide is a set of guidelines for writing clean and consistent Solidity code. Adhering to a style guide can help improve the readability and maintainability of the Solidity code, making it easier for others to understand and work with.

The followings are a few key points from the Solidity style guide:

1. Use camelCase for function and variable names, with the first letter in lowercase (e.g., myVariable, updateCounter).
2. Use PascalCase for contract, struct, and enum names, with the first letter in uppercase (e.g., MyContract, UserStruct, ErrorEnum).
3. Use uppercase for constant variables and enums (e.g., MAX\_VALUE, ERROR\_CODE).
4. Use indentation to improve readability and structure.
5. Use spaces between operators and after commas.
6. Use comments to explain the purpose and behavior of the code.
7. Keep lines short (around 120 characters) to improve readability.

```
address _address
address _liquidityWallet
string private constant _name = "Digits_DividendTracker"
string private constant _symbol = "Digits_DividendTracker"
uint256 private constant minTokenBalanceForDividends = 10000 * (10**18)
uint256 private constant magnitude = 2**128
string private constant _name = "Digits"
string private constant _symbol = "DIGITS"
address[] memory _users
address _multiRewards
address _tokenStorage
address _marketingWallet
uint256 _treasuryFee
uint256 _liquidityFee

...
```

## Recommendation

By following the Solidity naming convention guidelines, the codebase increased the readability, maintainability, and makes it easier to work with.

Find more information on the Solidity documentation

<https://docs.soliditylang.org/en/v0.8.17/style-guide.html#naming-convention>.

## Team Update

*“Code was just repurposed, we didn’t want to make too many changes to working code, so we will leave these as is.”*

## L13 - Divide before Multiply Operation

Criticality	Minor / Informative
Location	Digits.sol#L424,429,446,448
Status	Acknowledged

### 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.

```
swapTokensDividends = (tokens * dividendFeeBPS) / totalFeeBPS
uint256 daiDividends = (daiSwapped * swapTokensDividends) /
swapTokensTotal
```

### 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.

### Team Update

*"Here we first calculate amount of tokens that are fees, and then we construct divisor as a sum of these different token fees, so we maintain precision that way."*

# Functions Analysis

Contract	Type	Bases		
	Function Name	Visibility	Mutability	Modifiers
Digits	Implementation	Ownable, IERC20, IDigits		
		Public	✓	-
	name	External		-
	symbol	External		-
	decimals	External		-
	totalSupply	Public		-
	balanceOf	Public		-
	allowance	External		-
	approve	External	✓	-
	withdrawableDividendOf	External		-
	isExcludedFromDividends	External		-
	isExcludedFromFees	External		-
	isExcludedFromMaxTx	External		-
	isExcludedFromMaxWallet	External		-
	increaseAllowance	External	✓	-
	decreaseAllowance	External	✓	-



	triggerDividendDistribution	External	✓	-
	transfer	External	✓	-
	transferFrom	External	✓	-
	claim	External	✓	-
	compound	External	✓	-
	_transfer	Internal	✓	
	_executeTransfer	Private	✓	
	_approve	Private	✓	
	_mint	Private	✓	
	includeToWhiteList	Private	✓	
	_executeSwap	Private	✓	
	_setAutomatedMarketMakerPair	Private	✓	
	setMultiRewardsAddress	External	✓	onlyOwner
	setTokenStorage	External	✓	onlyOwner
	setWallet	External	✓	onlyOwner
	setAutomatedMarketMakerPair	External	✓	onlyOwner
	setFee	External	✓	onlyOwner
	setSwapEnabled	External	✓	onlyOwner
	setTaxEnabled	External	✓	onlyOwner
	setCompoundingEnabled	External	✓	onlyOwner
	setMaxTxBPS	External	✓	onlyOwner
	setMaxWalletBPS	External	✓	onlyOwner

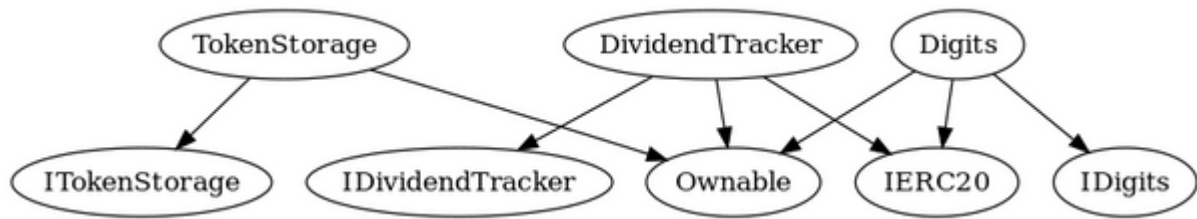
	openTrading	External	✓	onlyOwner
	updateDividendSettings	External	✓	onlyOwner
	excludeFromFees	Public	✓	onlyOwner
	excludeFromDividends	External	✓	onlyOwner
	excludeFromMaxTx	Public	✓	onlyOwner
	excludeFromMaxWallet	Public	✓	onlyOwner
	rescueToken	External	✓	onlyOwner
	rescueETH	External	✓	onlyOwner
<b>DividendTracker</b>	Implementation	Ownable, IERC20, IDividendTracker		
		Public	✓	-
	distributeDividends	External	✓	-
	setBalance	External	✓	onlyOwner
	excludeFromDividends	External	✓	onlyOwner
	processAccount	External	✓	onlyOwner
	compoundAccount	External	✓	onlyOwner
	isExcludedFromDividends	External		-
	withdrawableDividendOf	Public		-
	withdrawnDividendOf	Public		-
	accumulativeDividendOf	Public		-
	getAccountInfo	External		-

	getLastClaimTime	External		-
	name	External		-
	symbol	External		-
	decimals	External		-
	totalSupply	Public		-
	balanceOf	Public		-
	transfer	Public		-
	allowance	Public		-
	approve	Public		-
	transferFrom	Public		-
	_setBalance	Internal	✓	
	_mint	Private	✓	
	_burn	Private	✓	
	_withdrawDividendOfUser	Private	✓	
	_compoundDividendOfUser	Private	✓	
<b>IDigits</b>	Interface			
	claim	External	✓	-
	triggerDividendDistribution	External	✓	-
<b>IDividendTracker</b>	Interface			

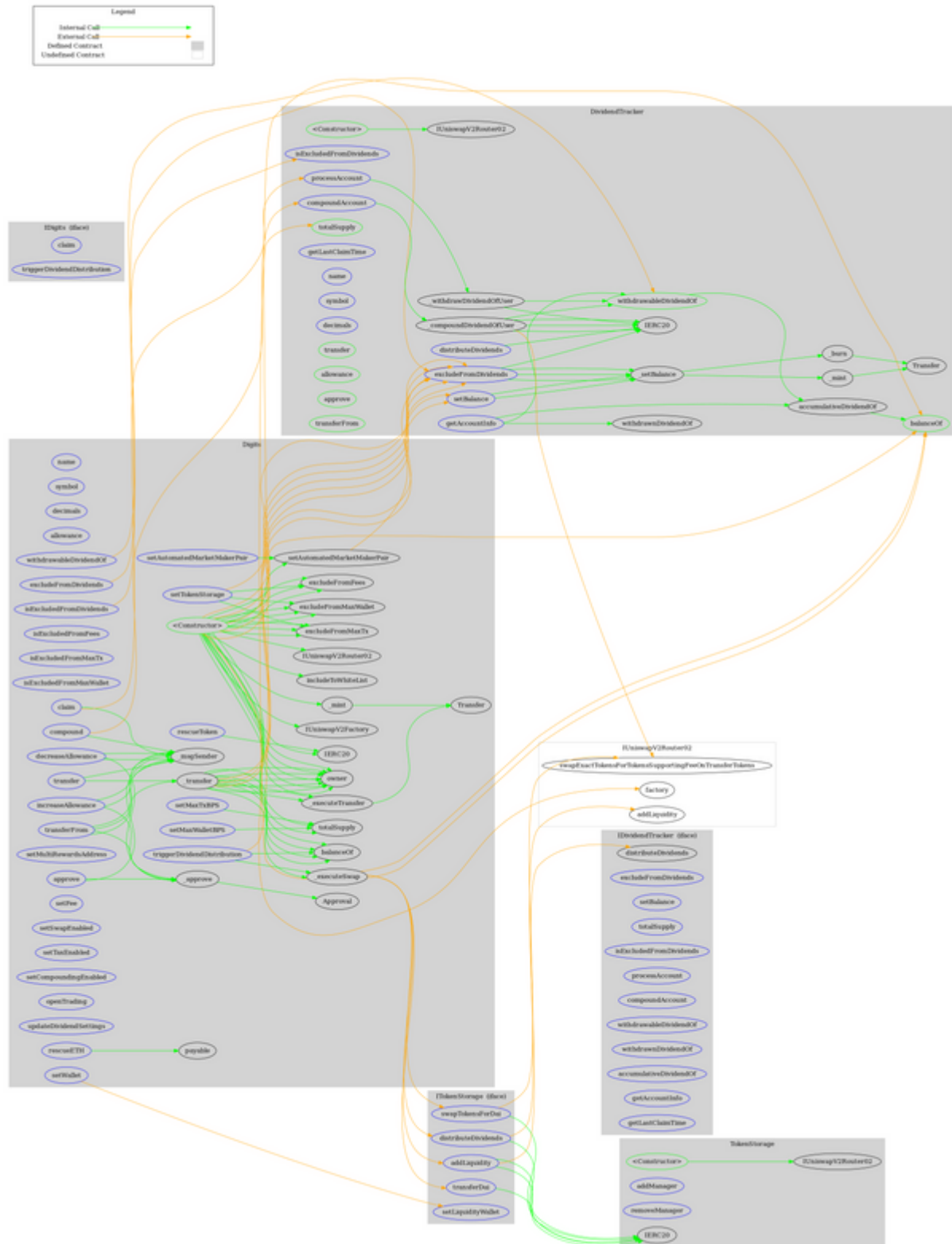
	distributeDividends	External	✓	-
	excludeFromDividends	External	✓	-
	setBalance	External	✓	-
	totalSupply	External		-
	isExcludedFromDividends	External		-
	processAccount	External	✓	-
	compoundAccount	External	✓	-
	withdrawableDividendOf	External		-
	withdrawnDividendOf	External		-
	accumulativeDividendOf	External		-
	getAccountInfo	External		-
	getLastClaimTime	External		-
<b>ITokenStorage</b>	Interface			
	swapTokensForDai	External	✓	-
	transferDai	External	✓	-
	addLiquidity	External	✓	-
	distributeDividends	External	✓	-
	setLiquidityWallet	External	✓	-
<b>TokenStorage</b>	Implementation	Ownable, ITokenStorage		

		Public	✓	-
	addManager	External	✓	onlyOwner
	removeManager	External	✓	onlyOwner
	transferDai	External	✓	-
	swapTokensForDai	External	✓	-
	addLiquidity	External	✓	-
	distributeDividends	External	✓	-
	setLiquidityWallet	External	✓	-

# Inheritance Graph



# Flow Graph



# Summary

Digits DAO contracts implement a token mechanism. This audit investigates security issues, business logic concerns, and potential improvements.



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Cyberscope is a blockchain cybersecurity company that was founded with the vision to make web3.0 a safer place for investors and developers. Since its launch, it has worked with thousands of projects and is estimated to have secured tens of millions of investors' funds.

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

<https://www.cyberscope.io>