Tender.fi

Smart Contract Audit Report

SYSFIXED

06 Jan 2023

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AUDITED DETAILS

Audited Project

Project name	Token ticker	Blockchain
Tender.fi	TND	Arbitrum

Addresses

Contract address	0xc47d9753f3b32aa9548a7c3f30b6aec3b2d2798c
Contract deployer address	0x5BffD59217c3c1De7D422Ce4f0D87Ce97DF8395c

Project Website

https://www.tender.fi/

Codebase

https://arbiscan.io/address/0xc47d9753f3b32aa9548a7c3f30b6aec3b2d2798c#code

SUMMARY

Tender.fi is a decentralized open-source protocol for borrowing and lending that is leading the way in innovation. It aims to provide support for autocompounding and collateralization for popular DeFi assets, starting with GMX and GLP. This is a unique and important aspect of the protocol, as it allows for the collateralization of long-tail assets. Tender.fi's approach to borrowing and lending is what sets it apart from other DeFi protocols.

Contract Summary

Documentation Quality

Tender.fi provides a very poor documentation with standard of solidity base code.

- The technical description is provided unclear and disorganized.

Code Quality

The Overall quality of the basecode is poor.

- Solidity basecode and rules are unclear and disorganized by Tender.fi.

Test Coverage

Test coverage of the project is 100% (Through Codebase)

Audit Findings Summary

- SWC-103 | Pragma statements can be allowed to float when a contract is intended on lines 49.
- SWC-107 | It is recommended to use a reentrancy lock, reentrancy weaknesses detected on lines 776, 777, 753, 753, 754, 754, 756, 759 and 165.
- SWC-110 SWC-123 | It is recommended to use of revert(), assert(), and require() in Solidity, and the new REVERT opcode in the EVM on lines 165.
- SWC-113 SWC-128 | It is recommended to implement the contract logic to handle failed calls and block gas limit on lines 778.

CONCLUSION

We have audited the Tender.fi project released in January 2023 to find issues and identify potential security vulnerabilities in the Tender.fi project. This process is used to find the technical problems and security loopholes that may be found in smart contracts.

The security audit report gave unsatisfactory results with the discovery of medium-risk issues and several other low-risk issues.

Writing a contract that does not follow the Solidity style guide can pose a significant risk. The medium-risk and low problems we found in the smart contract are multiple calls are executed in the same transaction, a floating pragma is set, read of persistent state following the external call, a call to a user-supplied address is executed, and requirement violation. This call is executed following another call within the same transaction. It is possible that the call never gets executed if a prior call fails permanently. This might be caused intentionally by a malicious callee. If possible, refactor the code such that each transaction only executes one external call or make sure that all callees can be trusted (i.e. they're part of your own codebase). A requirement was violated in a nested call and the call was reverted as a result. Make sure valid inputs are provided to the nested call (for instance, via passed arguments).

AUDIT RESULT

Article	Category	Description	Result
Default Visibility	SWC-100 SWC-108	Functions and state variables visibility should be set explicitly. Visibility levels should be specified consciously.	PASS
Integer Overflow and Underflow	SWC-101	If unchecked math is used, all math operations should be safe from overflows and underflows.	PASS
Outdated Compiler Version	SWC-102	It is recommended to use a recent version of the Solidity compiler.	PASS
Floating Pragma	SWC-103	Contracts should be deployed with the same compiler version and flags that they have been tested thoroughly.	ISSUE FOUND
Unchecked Call Return Value	SWC-104	The return value of a message call should be checked.	PASS
Unprotected Ether Withdrawal	SWC-105	Due to missing or insufficient access controls, malicious parties can withdraw from the contract.	PASS
SELFDESTRUCT Instruction	SWC-106	The contract should not be self-destructible while it has funds belonging to users.	PASS
Reentrancy	SWC-107	Check effect interaction pattern should be followed if the code performs recursive call.	ISSUE FOUND
Uninitialized Storage Pointer	SWC-109	Uninitialized local storage variables can point to unexpected storage locations in the contract.	PASS
Assert Violation	SWC-110 SWC-123	Properly functioning code should never reach a failing assert statement.	ISSUE FOUND
Deprecated Solidity Functions	SWC-111	Deprecated built-in functions should never be used.	PASS
Delegate call to Untrusted Callee	SWC-112	Delegatecalls should only be allowed to trusted addresses.	PASS

DoS (Denial of Service)	SWC-113 SWC-128	Execution of the code should never be blocked by a specific contract state unless required.	ISSUE FOUND
Race Conditions	SWC-114	Race Conditions and Transactions Order Dependency should not be possible.	PASS
Authorization through tx.origin	SWC-115	tx.origin should not be used for authorization.	PASS
Block values as a proxy for time	SWC-116	Block numbers should not be used for time calculations.	PASS
Signature Unique ID	SWC-117 SWC-121 SWC-122	Signed messages should always have a unique id. A transaction hash should not be used as a unique id.	PASS
Incorrect Constructor Name	SWC-118	Constructors are special functions that are called only once during the contract creation.	PASS
Shadowing State Variable	SWC-119	State variables should not be shadowed.	PASS
Weak Sources of Randomness	SWC-120	Random values should never be generated from Chain Attributes or be predictable.	PASS
Write to Arbitrary Storage Location	SWC-124	The contract is responsible for ensuring that only authorized user or contract accounts may write to sensitive storage locations.	PASS
Incorrect Inheritance Order	SWC-125	When inheriting multiple contracts, especially if they have identical functions, a developer should carefully specify inheritance in the correct order. The rule of thumb is to inherit contracts from more /general/ to more /specific/.	PASS
Insufficient Gas Griefing	SWC-126	Insufficient gas griefing attacks can be performed on contracts which accept data and use it in a sub-call on another contract.	PASS
Arbitrary Jump Function	SWC-127	As Solidity doesnt support pointer arithmetics, it is impossible to change such variable to an arbitrary value.	PASS

Typographical Error	SWC-129	A typographical error can occur for example when the intent of a defined operation is to sum a number to a variable.	PASS
Override control character	SWC-130	Malicious actors can use the Right-To-Left-Override unicode character to force RTL text rendering and confuse users as to the real intent of a contract.	PASS
Unused variables	SWC-131 SWC-135	Unused variables are allowed in Solidity and they do not pose a direct security issue.	PASS
Unexpected Ether balance	SWC-132	Contracts can behave erroneously when they strictly assume a specific Ether balance.	PASS
Hash Collisions Variable	SWC-133	Using abi.encodePacked() with multiple variable length arguments can, in certain situations, lead to a hash collision.	PASS
Hardcoded gas amount	SWC-134	The transfer() and send() functions forward a fixed amount of 2300 gas.	PASS
Unencrypted Private Data	SWC-136	It is a common misconception that private type variables cannot be read.	PASS

SMART CONTRACT ANALYSIS

Started	Thursday Jan 05 2023 05:37:45 GMT+0000 (Coordinated Universal Time)
Finished	Friday Jan 06 2023 02:58:48 GMT+0000 (Coordinated Universal Time)
Mode	Standard
Main Source File	TND.sol

Detected Issues

ID	Title	Severity	Status
SWC-113	MULTIPLE CALLS ARE EXECUTED IN THE SAME TRANSACTION.	medium	acknowledged
SWC-103	A FLOATING PRAGMA IS SET.	low	acknowledged
SWC-107	READ OF PERSISTENT STATE FOLLOWING EXTERNAL CALL.	low	acknowledged
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SWC-107	WRITE TO PERSISTENT STATE FOLLOWING EXTERNAL CALL.	low	acknowledged
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SWC-107	READ OF PERSISTENT STATE FOLLOWING EXTERNAL CALL.	low	acknowledged
SWC-107	A CALL TO A USER-SUPPLIED ADDRESS IS EXECUTED.	low	acknowledged
SWC-123	REQUIREMENT VIOLATION.	low	acknowledged

SWC-113 | MULTIPLE CALLS ARE EXECUTED IN THE SAME TRANSACTION.

LINE 778

medium SEVERITY

This call is executed following another call within the same transaction. It is possible that the call never gets executed if a prior call fails permanently. This might be caused intentionally by a malicious callee. If possible, refactor the code such that each transaction only executes one external call or make sure that all callees can be trusted (i.e. they're part of your own codebase).

Source File

- TND.sol

Locations

```
777   address yieldTracker = yieldTrackers[i];
778   IYieldTracker(yieldTracker).updateRewards(_account);
779   }
780   }
781   }
782
```

SWC-103 | A FLOATING PRAGMA IS SET.

LINE 49

low SEVERITY

The current pragma Solidity directive is ""^0.6.2"". It is recommended to specify a fixed compiler version to ensure that the bytecode produced does not vary between builds. This is especially important if you rely on bytecode-level verification of the code.

Source File

- TND.sol

Locations

```
48
49   pragma solidity ^0.6.2;
50
51   /**
52   * @dev Collection of functions related to the address type
53
```

SWC-107 | READ OF PERSISTENT STATE FOLLOWING EXTERNAL CALL.

LINE 776

low SEVERITY

The contract account state is accessed after an external call. To prevent reentrancy issues, consider accessing the state only before the call, especially if the callee is untrusted. Alternatively, a reentrancy lock can be used to prevent untrusted callees from re-entering the contract in an intermediate state.

Source File

- TND.sol

Locations

```
775   function _updateRewards(address _account) private {
776   for (uint256 i = 0; i < yieldTrackers.length; i++) {
777   address yieldTracker = yieldTrackers[i];
778   IYieldTracker(yieldTracker).updateRewards(_account);
779   }
780
```

SWC-107 | READ OF PERSISTENT STATE FOLLOWING EXTERNAL CALL.

LINE 777

low SEVERITY

The contract account state is accessed after an external call. To prevent reentrancy issues, consider accessing the state only before the call, especially if the callee is untrusted. Alternatively, a reentrancy lock can be used to prevent untrusted callees from re-entering the contract in an intermediate state.

Source File

- TND.sol

Locations

```
776   for (uint256 i = 0; i < yieldTrackers.length; i++) {
777   address yieldTracker = yieldTrackers[i];
778   IYieldTracker(yieldTracker).updateRewards(_account);
779   }
780   }
781
```

SWC-107 | READ OF PERSISTENT STATE FOLLOWING EXTERNAL CALL.

LINE 753

low SEVERITY

The contract account state is accessed after an external call. To prevent reentrancy issues, consider accessing the state only before the call, especially if the callee is untrusted. Alternatively, a reentrancy lock can be used to prevent untrusted callees from re-entering the contract in an intermediate state.

Source File

- TND.sol

Locations

```
752
753   balances[_sender] = balances[_sender].sub(_amount, "BaseToken: transfer amount
exceeds balance");
754   balances[_recipient] = balances[_recipient].add(_amount);
755
756   if (nonStakingAccounts[_sender]) {
757
```

SWC-107 | WRITE TO PERSISTENT STATE FOLLOWING EXTERNAL CALL.

LINE 753

low SEVERITY

The contract account state is accessed after an external call. To prevent reentrancy issues, consider accessing the state only before the call, especially if the callee is untrusted. Alternatively, a reentrancy lock can be used to prevent untrusted callees from re-entering the contract in an intermediate state.

Source File

- TND.sol

Locations

```
752
753   balances[_sender] = balances[_sender].sub(_amount, "BaseToken: transfer amount
exceeds balance");
754   balances[_recipient] = balances[_recipient].add(_amount);
755
756   if (nonStakingAccounts[_sender]) {
757
```

SWC-107 | READ OF PERSISTENT STATE FOLLOWING EXTERNAL CALL.

LINE 754

low SEVERITY

The contract account state is accessed after an external call. To prevent reentrancy issues, consider accessing the state only before the call, especially if the callee is untrusted. Alternatively, a reentrancy lock can be used to prevent untrusted callees from re-entering the contract in an intermediate state.

Source File

- TND.sol

Locations

```
753   balances[_sender] = balances[_sender].sub(_amount, "BaseToken: transfer amount
exceeds balance");
754   balances[_recipient] = balances[_recipient].add(_amount);
755
756   if (nonStakingAccounts[_sender]) {
757   nonStakingSupply = nonStakingSupply.sub(_amount);
758
```

SWC-107 | WRITE TO PERSISTENT STATE FOLLOWING EXTERNAL CALL.

LINE 754

low SEVERITY

The contract account state is accessed after an external call. To prevent reentrancy issues, consider accessing the state only before the call, especially if the callee is untrusted. Alternatively, a reentrancy lock can be used to prevent untrusted callees from re-entering the contract in an intermediate state.

Source File

- TND.sol

Locations

```
753   balances[_sender] = balances[_sender].sub(_amount, "BaseToken: transfer amount
exceeds balance");
754   balances[_recipient] = balances[_recipient].add(_amount);
755
756   if (nonStakingAccounts[_sender]) {
757   nonStakingSupply = nonStakingSupply.sub(_amount);
758
```

SWC-107 | READ OF PERSISTENT STATE FOLLOWING EXTERNAL CALL.

LINE 756

low SEVERITY

The contract account state is accessed after an external call. To prevent reentrancy issues, consider accessing the state only before the call, especially if the callee is untrusted. Alternatively, a reentrancy lock can be used to prevent untrusted callees from re-entering the contract in an intermediate state.

Source File

- TND.sol

Locations

```
755
756   if (nonStakingAccounts[_sender]) {
757   nonStakingSupply = nonStakingSupply.sub(_amount);
758   }
759   if (nonStakingAccounts[_recipient]) {
760
```

SWC-107 | READ OF PERSISTENT STATE FOLLOWING EXTERNAL CALL.

LINE 759

low SEVERITY

The contract account state is accessed after an external call. To prevent reentrancy issues, consider accessing the state only before the call, especially if the callee is untrusted. Alternatively, a reentrancy lock can be used to prevent untrusted callees from re-entering the contract in an intermediate state.

Source File

- TND.sol

Locations

```
758   }
759   if (nonStakingAccounts[_recipient]) {
760   nonStakingSupply = nonStakingSupply.add(_amount);
761   }
762
763
```

SWC-107 | A CALL TO A USER-SUPPLIED ADDRESS IS EXECUTED.

LINE 165

low SEVERITY

An external message call to an address specified by the caller is executed. Note that the callee account might contain arbitrary code and could re-enter any function within this contract. Reentering the contract in an intermediate state may lead to unexpected behaviour. Make sure that no state modifications are executed after this call and/or reentrancy guards are in place.

Source File

- TND.sol

Locations

```
164   // solhint-disable-next-line avoid-low-level-calls
165   (bool success, bytes memory returndata) = target.call{ value: value }(data);
166   return _verifyCallResult(success, returndata, errorMessage);
167   }
168
169
```

SWC-123 | REQUIREMENT VIOLATION.

LINE 165

low SEVERITY

A requirement was violated in a nested call and the call was reverted as a result. Make sure valid inputs are provided to the nested call (for instance, via passed arguments).

Source File

- TND.sol

Locations

```
164   // solhint-disable-next-line avoid-low-level-calls
165   (bool success, bytes memory returndata) = target.call{ value: value }(data);
166   return _verifyCallResult(success, returndata, errorMessage);
167   }
168
169
```

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This is a limited report on our findings based on our analysis, in accordance with good industry practice as of the date of this report, in relation to cybersecurity vulnerabilities and issues in the framework and algorithms based on smart contracts, the details of which are set out in this report. In order to get a full view of our analysis, it is crucial for you to read the full report. While we have done our best in conducting our analysis and producing this report, it is important to note that you should not rely on this report and cannot claim against us on the basis of what it says or doesn't say, or how we produced it, and it is important for you to conduct your own independent investigations before making any decisions. We go into more detail on this in the below disclaimer below – please make sure to read it in full.

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