Sakai Vault

Smart Contract Audit Report

SYSFIXED

20 Feb 2023

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AUDITED DETAILS

Audited Project

Project name	Token ticker	Blockchain
Sakai Vault	SAKAI	Binance Smart Chain

Addresses

Contract address	0x43b35e89d15b91162dea1c51133c4c93bdd1c4af
Contract deployer address	0x9c362E823D4ebf885333A2DaD4689d4BEF9AE480

Project Website

https://t.me/SakaiVault

Codebase

https://bscscan.com/address/0x43b35e89d15b91162dea1c51133c4c93bdd1c4af#code

SUMMARY

Sakai Vault is a decentralized spot and perpetual exchange that supports low swap fees and zero-price impact trades. Trading is supported by a unique multi-asset pool that earns liquidity providers fees from market making, swap, and leverage trading.

Contract Summary

Documentation Quality

Sakai Vault provides a very good documentation with standard of solidity base code.

- The technical description is provided clearly and structured and also dont have any high risk issue.

Code Quality

The Overall quality of the basecode is standard.

- Standard solidity basecode and rules are already followed by Sakai Vault with the discovery of several low issues.

Test Coverage

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

Audit Findings Summary

- SWC-101 | It is recommended to use vetted safe math libraries for arithmetic operations consistently on lines 621, 643, 669, 920, 950, 986, 989, 1011, 1014, 1040, 1042, 1095, 1412, 1412, 1425, 1522, 1614, 1614, 1618, 1619, 1619, 1620, 1632, 1632 and 1633.
- 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 1636, 1637, 1648, 1649 and 1650.

CONCLUSION

We have audited the Sakai Vault project released on January 2023 to discover issues and identify potential security vulnerabilities in Sakai Vault Project. This process is used to find technical issues and security loopholes which might be found in the smart contract.

The security audit report provides satisfactory results with low-risk issues.

The issues found in the Sakai Vault smart contract code do not pose a considerable risk. The writing of the contract is close to the standard of writing contracts in general. The low-risk issues found are some arithmetic operation issues and out-of-bounds array access. The index access expression can cause an exception in case of an invalid array index value.

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.	ISSUE FOUND
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.	PASS
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.	PASS
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.	PASS
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	Sunday Feb 19 2023 18:50:20 GMT+0000 (Coordinated Universal Time)
Finished	Monday Feb 20 2023 15:13:37 GMT+0000 (Coordinated Universal Time)
Mode	Standard
Main Source File	SAKAI.sol

Detected Issues

ID	Title	Severity	Status
SWC-101	ARITHMETIC OPERATION "+" DISCOVERED	low	acknowledged
SWC-101	ARITHMETIC OPERATION "-" DISCOVERED	low	acknowledged
SWC-101	ARITHMETIC OPERATION "+" DISCOVERED	low	acknowledged
SWC-101	ARITHMETIC OPERATION "+" DISCOVERED	low	acknowledged
SWC-101	ARITHMETIC OPERATION "-" DISCOVERED	low	acknowledged
SWC-101	ARITHMETIC OPERATION "-" DISCOVERED	low	acknowledged
SWC-101	ARITHMETIC OPERATION "+=" DISCOVERED	low	acknowledged
SWC-101	ARITHMETIC OPERATION "+=" DISCOVERED	low	acknowledged
SWC-101	ARITHMETIC OPERATION "+=" DISCOVERED	low	acknowledged
SWC-101	ARITHMETIC OPERATION "-" DISCOVERED	low	acknowledged
SWC-101	ARITHMETIC OPERATION "-=" DISCOVERED	low	acknowledged
SWC-101	ARITHMETIC OPERATION "-" DISCOVERED	low	acknowledged
SWC-101	ARITHMETIC OPERATION "*" DISCOVERED	low	acknowledged
SWC-101	ARITHMETIC OPERATION "**" DISCOVERED	low	acknowledged

SWC-101	ARITHMETIC OPERATION "/" DISCOVERED	low	acknowledged
SWC-101	ARITHMETIC OPERATION "/" DISCOVERED	low	acknowledged
SWC-101	ARITHMETIC OPERATION "/" DISCOVERED	low	acknowledged
SWC-101	ARITHMETIC OPERATION "*" DISCOVERED	low	acknowledged
SWC-101	ARITHMETIC OPERATION "-=" DISCOVERED	low	acknowledged
SWC-101	ARITHMETIC OPERATION "/" DISCOVERED	low	acknowledged
SWC-101	ARITHMETIC OPERATION "*" DISCOVERED	low	acknowledged
SWC-101	ARITHMETIC OPERATION "-" DISCOVERED	low	acknowledged
SWC-101	ARITHMETIC OPERATION "/" DISCOVERED	low	acknowledged
SWC-101	ARITHMETIC OPERATION "*" DISCOVERED	low	acknowledged
SWC-101	ARITHMETIC OPERATION "-" DISCOVERED	low	acknowledged
SWC-110	OUT OF BOUNDS ARRAY ACCESS	low	acknowledged
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SWC-110	OUT OF BOUNDS ARRAY ACCESS	low	acknowledged
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SWC-101 | ARITHMETIC OPERATION "+" DISCOVERED

LINE 621

low SEVERITY

This plugin produces issues to support false positive discovery within mythril.

Source File

- SAKAI.sol

Locations

```
620   ) internal {
621   uint256 newAllowance = token.allowance(address(this), spender) + value;
622   _callOptionalReturn(
623   token,
624   abi.encodeWithSelector(
625
```

SWC-101 | ARITHMETIC OPERATION "-" DISCOVERED

LINE 643

low SEVERITY

This plugin produces issues to support false positive discovery within mythril.

Source File

- SAKAI.sol

Locations

```
642   );
643   uint256 newAllowance = oldAllowance - value;
644   _callOptionalReturn(
645   token,
646   abi.encodeWithSelector(
647
```

SWC-101 | ARITHMETIC OPERATION "+" DISCOVERED

LINE 669

low SEVERITY

This plugin produces issues to support false positive discovery within mythril.

Source File

- SAKAI.sol

Locations

```
668   require(
669   nonceAfter == nonceBefore + 1,
670   "SafeERC20: permit did not succeed"
671   );
672   }
673
```

SWC-101 | ARITHMETIC OPERATION "+" DISCOVERED

LINE 920

low SEVERITY

This plugin produces issues to support false positive discovery within mythril.

Source File

- SAKAI.sol

Locations

```
919   address owner = _msgSender();
920   _approve(owner, spender, allowance(owner, spender) + addedValue);
921   return true;
922   }
923
924
```

SWC-101 | ARITHMETIC OPERATION "-" DISCOVERED

LINE 950

low SEVERITY

This plugin produces issues to support false positive discovery within mythril.

Source File

- SAKAI.sol

Locations

```
949   unchecked {
950   _approve(owner, spender, currentAllowance - subtractedValue);
951   }
952
953   return true;
954
```

SWC-101 | ARITHMETIC OPERATION "-" DISCOVERED

LINE 986

low SEVERITY

This plugin produces issues to support false positive discovery within mythril.

Source File

- SAKAI.sol

Locations

```
985   unchecked {
986   _balances[from] = fromBalance - amount;
987   // Overflow not possible: the sum of all balances is capped by totalSupply, and the
sum is preserved by
988   // decrementing then incrementing.
989   _balances[to] += amount;
990
```

SWC-101 | ARITHMETIC OPERATION "+=" DISCOVERED

LINE 989

low SEVERITY

This plugin produces issues to support false positive discovery within mythril.

Source File

- SAKAI.sol

Locations

```
988   // decrementing then incrementing.
989   _balances[to] += amount;
990   }
991
992   emit Transfer(from, to, amount);
993
```

SWC-101 | ARITHMETIC OPERATION "+=" DISCOVERED

LINE 1011

low SEVERITY

This plugin produces issues to support false positive discovery within mythril.

Source File

- SAKAI.sol

Locations

```
1010
1011   _totalSupply += amount;
1012   unchecked {
1013   // Overflow not possible: balance + amount is at most totalSupply + amount, which
is checked above.
1014   _balances[account] += amount;
1015
```

SWC-101 | ARITHMETIC OPERATION "+=" DISCOVERED

LINE 1014

low SEVERITY

This plugin produces issues to support false positive discovery within mythril.

Source File

- SAKAI.sol

Locations

```
1013   // Overflow not possible: balance + amount is at most totalSupply + amount, which
is checked above.
1014   _balances[account] += amount;
1015   }
1016   emit Transfer(address(0), account, amount);
1017
1018
```

SWC-101 | ARITHMETIC OPERATION "-" DISCOVERED

LINE 1040

low SEVERITY

This plugin produces issues to support false positive discovery within mythril.

Source File

- SAKAI.sol

Locations

```
1039   unchecked {
1040   _balances[account] = accountBalance - amount;
1041   // Overflow not possible: amount <= accountBalance <= totalSupply.
1042   _totalSupply -= amount;
1043   }
1044
```

SWC-101 | ARITHMETIC OPERATION "-=" DISCOVERED

LINE 1042

low SEVERITY

This plugin produces issues to support false positive discovery within mythril.

Source File

- SAKAI.sol

Locations

```
1041   // Overflow not possible: amount <= accountBalance <= totalSupply.
1042   _totalSupply -= amount;
1043   }
1044
1045   emit Transfer(account, address(0), amount);
1046
```

SWC-101 | ARITHMETIC OPERATION "-" DISCOVERED

LINE 1095

low SEVERITY

This plugin produces issues to support false positive discovery within mythril.

Source File

- SAKAI.sol

Locations

```
1094   unchecked {
1095   _approve(owner, spender, currentAllowance - amount);
1096   }
1097   }
1098   }
1099
```

SWC-101 | ARITHMETIC OPERATION "*" DISCOVERED

LINE 1412

low SEVERITY

This plugin produces issues to support false positive discovery within mythril.

Source File

- SAKAI.sol

Locations

```
1411   constructor() ERC20("Sakai Vault", "SAKAI") {
1412   _mint(owner(), 8_000_000 * 10**18);
1413
1414   swapTax = 300;
1415   denominator = 10_000;
1416
```

SWC-101 | ARITHMETIC OPERATION "**" DISCOVERED

LINE 1412

low SEVERITY

This plugin produces issues to support false positive discovery within mythril.

Source File

- SAKAI.sol

Locations

```
1411   constructor() ERC20("Sakai Vault", "SAKAI") {
1412   _mint(owner(), 8_000_000 * 10**18);
1413
1414   swapTax = 300;
1415   denominator = 10_000;
1416
```

SWC-101 | ARITHMETIC OPERATION "/" DISCOVERED

LINE 1425

low SEVERITY

This plugin produces issues to support false positive discovery within mythril.

Source File

- SAKAI.sol

Locations

```
1424
1425   swapTokensAtAmount = totalSupply() / 5_000;
1426   isSwapBackEnabled = true;
1427
1428   _approve(address(this), address(uniswapV2Router), type(uint256).max);
1429
```

SWC-101 | ARITHMETIC OPERATION "/" DISCOVERED

LINE 1522

low SEVERITY

This plugin produces issues to support false positive discovery within mythril.

Source File

- SAKAI.sol

Locations

```
1521   require(
1522   amount >= 1 && amount <= totalSupply() / 1000,
1523   "Amount must be beetween 1 wei and 0.1% of totalSupply"
1524   );
1525
1526
```

SWC-101 | ARITHMETIC OPERATION "/" DISCOVERED

LINE 1614

low SEVERITY

This plugin produces issues to support false positive discovery within mythril.

Source File

- SAKAI.sol

Locations

```
1613   ) {
1614   fees = (amount * swapTax) / denominator;
1615   }
1616
1617   if (fees > 0) {
1618
```

SWC-101 | ARITHMETIC OPERATION "*" DISCOVERED

LINE 1614

low SEVERITY

This plugin produces issues to support false positive discovery within mythril.

Source File

- SAKAI.sol

Locations

```
1613   ) {
1614   fees = (amount * swapTax) / denominator;
1615   }
1616
1617   if (fees > 0) {
1618
```

SWC-101 | ARITHMETIC OPERATION "-=" DISCOVERED

LINE 1618

low SEVERITY

This plugin produces issues to support false positive discovery within mythril.

Source File

- SAKAI.sol

Locations

```
1617   if (fees > 0) {
1618   amount -= fees;
1619   uint256 swapbackTax = (fees * 5) / 6;
1620   uint256 rewardTax = fees - swapbackTax;
1621   super._transfer(from, address(this), swapbackTax);
1622
```

SWC-101 | ARITHMETIC OPERATION "/" DISCOVERED

LINE 1619

low SEVERITY

This plugin produces issues to support false positive discovery within mythril.

Source File

- SAKAI.sol

Locations

```
1618   amount -= fees;
1619   uint256 swapbackTax = (fees * 5) / 6;
1620   uint256 rewardTax = fees - swapbackTax;
1621   super._transfer(from, address(this), swapbackTax);
1622   super._transfer(from, address(stakingContract), rewardTax);
1623
```

SWC-101 | ARITHMETIC OPERATION "*" DISCOVERED

LINE 1619

low SEVERITY

This plugin produces issues to support false positive discovery within mythril.

Source File

- SAKAI.sol

Locations

```
1618   amount -= fees;
1619   uint256 swapbackTax = (fees * 5) / 6;
1620   uint256 rewardTax = fees - swapbackTax;
1621   super._transfer(from, address(this), swapbackTax);
1622   super._transfer(from, address(stakingContract), rewardTax);
1623
```

SWC-101 | ARITHMETIC OPERATION "-" DISCOVERED

LINE 1620

low SEVERITY

This plugin produces issues to support false positive discovery within mythril.

Source File

- SAKAI.sol

Locations

```
1619   uint256 swapbackTax = (fees * 5) / 6;
1620   uint256 rewardTax = fees - swapbackTax;
1621   super._transfer(from, address(this), swapbackTax);
1622   super._transfer(from, address(stakingContract), rewardTax);
1623   }
1624
```

SWC-101 | ARITHMETIC OPERATION "/" DISCOVERED

LINE 1632

low SEVERITY

This plugin produces issues to support false positive discovery within mythril.

Source File

- SAKAI.sol

Locations

```
1631
1632   uint256 treasuryAmount = (contractTokenBalance * 4) / 5;
1633   uint256 gasAmount = contractTokenBalance - treasuryAmount;
1634
1635   address[] memory path = new address[](2);
1636
```

SWC-101 | ARITHMETIC OPERATION "*" DISCOVERED

LINE 1632

low SEVERITY

This plugin produces issues to support false positive discovery within mythril.

Source File

- SAKAI.sol

Locations

```
1631
1632   uint256 treasuryAmount = (contractTokenBalance * 4) / 5;
1633   uint256 gasAmount = contractTokenBalance - treasuryAmount;
1634
1635   address[] memory path = new address[](2);
1636
```

SWC-101 | ARITHMETIC OPERATION "-" DISCOVERED

LINE 1633

low SEVERITY

This plugin produces issues to support false positive discovery within mythril.

Source File

- SAKAI.sol

Locations

```
1632   uint256 treasuryAmount = (contractTokenBalance * 4) / 5;
1633   uint256 gasAmount = contractTokenBalance - treasuryAmount;
1634
1635   address[] memory path = new address[](2);
1636   path[0] = address(this);
1637
```

SWC-110 | OUT OF BOUNDS ARRAY ACCESS

LINE 1636

low SEVERITY

The index access expression can cause an exception in case of use of invalid array index value.

Source File

- SAKAI.sol

Locations

```
1635   address[] memory path = new address[](2);
1636   path[0] = address(this);
1637   path[1] = getUSDTAddress();
1638
1639   uniswapV2Router.swapExactTokensForTokensSupportingFeeOnTransferTokens(
1640
```

SWC-110 | OUT OF BOUNDS ARRAY ACCESS

LINE 1637

low SEVERITY

The index access expression can cause an exception in case of use of invalid array index value.

Source File

- SAKAI.sol

Locations

```
1636   path[0] = address(this);
1637   path[1] = getUSDTAddress();
1638
1639   uniswapV2Router.swapExactTokensForTokensSupportingFeeOnTransferTokens(
1640   treasuryAmount,
1641
```

SWC-110 | OUT OF BOUNDS ARRAY ACCESS

LINE 1648

low SEVERITY

The index access expression can cause an exception in case of use of invalid array index value.

Source File

- SAKAI.sol

Locations

```
1647   address[] memory WETHpath = new address[](3);
1648   WETHpath[0] = address(this);
1649   WETHpath[1] = getUSDTAddress();
1650   WETHpath[2] = uniswapV2Router.WETH();
1651
1652
```

SWC-110 | OUT OF BOUNDS ARRAY ACCESS

LINE 1649

low SEVERITY

The index access expression can cause an exception in case of use of invalid array index value.

Source File

- SAKAI.sol

Locations

```
1648   WETHpath[0] = address(this);
1649   WETHpath[1] = getUSDTAddress();
1650   WETHpath[2] = uniswapV2Router.WETH();
1651
1652   uniswapV2Router.swapExactTokensForETHSupportingFeeOnTransferTokens(
1653
```

SWC-110 | OUT OF BOUNDS ARRAY ACCESS

LINE 1650

low SEVERITY

The index access expression can cause an exception in case of use of invalid array index value.

Source File

- SAKAI.sol

Locations

```
1649   WETHpath[1] = getUSDTAddress();
1650   WETHpath[2] = uniswapV2Router.WETH();
1651
1652   uniswapV2Router.swapExactTokensForETHSupportingFeeOnTransferTokens(
1653   gasAmount,
1654
```

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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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