



Sakai Vault Smart Contract Audit Report

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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 don't 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 grieving 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

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] = getUSDAddress();
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] = getUSDAddress();
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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