



Cyberscope

# Audit Report

# **SuperWhale**

March 2024

Network    BSC\_TESTNET

Address    0x3316d45ba1f85831d056f8ddf3303da5f2d3c4aa

Audited by    © cyberscope

# Analysis

● Critical   ● Medium   ● Minor / Informative   ● Pass

Severity	Code	Description	Status
●	ST	Stops Transactions	Unresolved
●	OTUT	Transfers User's Tokens	Passed
●	ELFM	Exceeds Fees Limit	Unresolved
●	MT	Mints Tokens	Passed
●	BT	Burns Tokens	Passed
●	BC	Blacklists Addresses	Unresolved

# Diagnostics

● Critical ● Medium ● Minor / Informative

Severity	Code	Description	Status
●	ZD	Zero Division	Unresolved
●	RME	Repetitive Methods Execution	Unresolved
●	MTEE	Missing Transfer Event Emission	Unresolved
●	PMRM	Potential Mocked Router Manipulation	Unresolved
●	PTRP	Potential Transfer Revert Propagation	Unresolved
●	PVC	Price Volatility Concern	Unresolved
●	RED	Redudant Event Declaration	Unresolved
●	RSW	Redundant Storage Writes	Unresolved
●	TUU	Time Units Usage	Unresolved
●	L02	State Variables could be Declared Constant	Unresolved
●	L04	Conformance to Solidity Naming Conventions	Unresolved
●	L05	Unused State Variable	Unresolved
●	L07	Missing Events Arithmetic	Unresolved
●	L09	Dead Code Elimination	Unresolved

●	L13	Divide before Multiply Operation	Unresolved
●	L14	Uninitialized Variables in Local Scope	Unresolved
●	L16	Validate Variable Setters	Unresolved
●	L17	Usage of Solidity Assembly	Unresolved
●	L19	Stable Compiler Version	Unresolved

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## Review

Contract Name	SPW
Compiler Version	v0.8.17+commit.8df45f5f
Optimization	1 runs
Explorer	<a href="https://testnet.bscscan.com/address/0x3316d45ba1f85831d056f8ddf3303da5f2d3c4aa">https://testnet.bscscan.com/address/0x3316d45ba1f85831d056f8ddf3303da5f2d3c4aa</a>
Address	0x3316d45ba1f85831d056f8ddf3303da5f2d3c4aa
Network	BSC_TESTNET
Symbol	SPW
Decimals	9
Total Supply	100,000,000
Badge Eligibility	Must Fix Criticals

## Audit Updates

Initial Audit	09 Mar 2024
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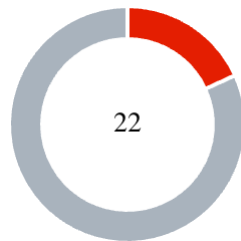
## Source Files

Filename	SHA256
<b>packages/lib/FeeType.sol</b>	d5e3cf6baf0c242335bea6323c852e1b3c3f3c87a6b9292f29c0af3e841f9578
<b>packages/lib/CurrencyTransferLib.sol</b>	023a538c07fc30e8ab53c9c82ccadbb6a64be48337f58403f6682f706500a2f9
<b>packages/infra/interface/IWETH.sol</b>	839869bd411a4e68c9a59d2a0c394a087641eeeadeda4956a255dc3179110cc3
<b>packages/infra/interface/IThirdwebContract.sol</b>	8fc9d29ddee99b052ccdc521c272ee4df8a7de0e1754bfcba397dc5cdfa18c72
<b>packages/external-deps/openzeppelin/token/ERC20/Utils/SafeERC20.sol</b>	3f614f5257a97f9a63fab94efb2d85c187fb9cc964eda956719f2b646cfc636
<b>packages/eip/interface/IERC20.sol</b>	d16bec2c3503cabd12eb803b9b9d4fbf4ceaba3ac5541d2c705564abc1ed52a1
<b>contracts/SPW.sol</b>	1794405f74eb73912e400038998e656bc742c91dfca7ca8d9bfbfd244aed286b5
<b>@openzeppelin/contracts-upgradeable/utils/StringsUpgradeable.sol</b>	e7b950eee23563e23989a3b51a1456614a1838084eef1fad04eb2be0bc280f48
<b>@openzeppelin/contracts-upgradeable/utils/ContextUpgradeable.sol</b>	5fb301961e45cb482fe4e05646d2f529aa449fe0e90c6671475d6a32356fa2d4
<b>@openzeppelin/contracts-upgradeable/utils/AddressUpgradeable.sol</b>	35fb271561f3dc72e91b3a42c6e40c2bb2e788cd8ca58014ac43f6198b8d32ca
<b>@openzeppelin/contracts-upgradeable/utils/structs/EnumerableSetUpgradeable.sol</b>	014846dc6c387e8fd6d31df636c28898eed601dc668725edbb1a0606c58d4b7e
<b>@openzeppelin/contracts-upgradeable/utils/introspection/IERC165Upgradeable.sol</b>	a39bc026ad6214e9ecd526bd4a1ddf9862d80bd4a9d0d031d9bafa4c3c147c0b



<b>@openzeppelin/contracts-upgradeable/utils/introspection/ERC165Upgradeable.sol</b>	fd84e5284eccc479268f0ef36b830019d4f7999ceb7959430d8d8d9e602dd4ef
<b>@openzeppelin/contracts-upgradeable/proxy/utils/Initializable.sol</b>	cd823c76cbf5f5b6ef1bda565d58be66c843c37707cd93eb8fb5425deebd6756
<b>@openzeppelin/contracts-upgradeable/access/IAccessControlUpgradeable.sol</b>	6d3fbd4566bc123db1ee6ba2a1b79544b572df9b9cc9be360ddb3244dd07c86b
<b>@openzeppelin/contracts-upgradeable/access/IAccessControlEnumerableUpgradeable.sol</b>	00e174801c04f08f2840ee1eed6394d06ba2b029c0b6078166255148794c1187
<b>@openzeppelin/contracts-upgradeable/access/AccessControlUpgradeable.sol</b>	86752f503f326b20940831c24fd682d21767235c88dfd5960a43a17c148c93ed
<b>@openzeppelin/contracts-upgradeable/access/AccessControlEnumerableUpgradeable.sol</b>	a55a53b215e2bb9c350bf7b86ee09b0e488522f7d8747877fd9a3a7e474c2c26
<b>@openzeppelin/contracts/utils/Address.sol</b>	8160a4242e8a7d487d940814e5279d934e81f0436689132a4e73394bab084a6d

## Findings Breakdown



Critical	4
Medium	0
Minor / Informative	18

Severity	Unresolved	Acknowledged	Resolved	Other
Critical	4	0	0	0
Medium	0	0	0	0
Minor / Informative	18	0	0	0

## ST - Stops Transactions

Criticality	Critical
Location	contracts/SPW.sol#L623,627,641,671
Status	Unresolved

### Description

The contract owner has the authority to stop the sales for all users excluding the owner. The owner may take advantage of it by setting either the `_transactionSellLimit` or `_maxHoldAmount` to zero or by setting the `_isBuyingAllowed` or `_tradingOpen` to false. As a result, the contract may operate as a honeypot. Additionally, the contract owner has the authority to stop transactions, as described in detail in sections `PMRM` , `PTRP` and `ZD` . As a result, the contract might operate as a honeypot.

```
require(
    !isPancakeSwapPair(sender) || _isBuyingAllowed,
    "Buying is not allowed before contract activation"
);
require(
    _tradingOpen ||
    sender == owner() ||
    recipient == owner() ||
    _whiteList[sender] ||
    _whiteList[recipient],
    "Not Open For Trading"
);
...
if (isSellTransferLimited(sender, recipient)) {
    require(
        amount <= _transactionSellLimit,
        "Sell amount exceeds the maximum allowed"
    );
}
...
require(
    _balances[recipient] + transferAmount <
    _maxHoldAmount,
    "Cannot hold more than Maximum hold amount"
);
```

## Recommendation

The contract could embody a check for not allowing setting the `_transactionSellLimit` or `_maxHoldAmount` less than a reasonable amount and not allowing the setting of `_isBuyingAllowed` or `_tradingOpen` to false after their activation. A suggested implementation could check that the minimum amount should be more than a fixed percentage of the total supply. 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.

### Temporary Solutions:

These measurements do not decrease the severity of the finding

- Introduce a time-locker mechanism with a reasonable delay.
- Introduce a multi-signature wallet so that many addresses will confirm the action.
- Introduce a governance model where users will vote about the actions.

### Permanent Solution:

- Renouncing the ownership, which will eliminate the threats but it is non-reversible.

## ELFM - Exceeds Fees Limit

Criticality	Critical
Status	Unresolved

### Description

The contract has set the buy fees over the allowed limit of 25% for a certain time and the owner set the `antiEnabled` variable to `true`.

```
bool antiBotFlag = onBeforeCalculateFeeRate();  
if (isPancakeSwapPair(sender) && antiBotFlag) {  
    return _highBuyFee;  
}
```

### Recommendation

The contract could embody a check for the maximum acceptable value. 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.

#### Temporary Solutions:

These measurements do not decrease the severity of the finding

- Introduce a time-locker mechanism with a reasonable delay.
- Introduce a multi-signature wallet so that many addresses will confirm the action.
- Introduce a governance model where users will vote about the actions.

#### Permanent Solution:

- Renouncing the ownership, which will eliminate the threats but it is non-reversible.

## BC - Blacklists Addresses

Criticality	Critical
Location	contracts/SPW.sol#L1017
Status	Unresolved

### Description

The contract owner has the authority to stop addresses from transactions. The owner may take advantage of it by calling the `setBlacklist` function.

```
function setBlacklist(address add_, bool blacklist_) public  
onlyOwner {  
    _blacklist[add_] = blacklist_;  
}
```

### 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.

Temporary Solutions:

These measurements do not decrease the severity of the finding

- Introduce a time-locker mechanism with a reasonable delay.
- Introduce a multi-signature wallet so that many addresses will confirm the action.
- Introduce a governance model where users will vote about the actions.

Permanent Solution:

- Renouncing the ownership, which will eliminate the threats but it is non-reversible.

## ZD - Zero Division

<b>Criticality</b>	Critical
<b>Location</b>	contracts/SPW.sol#L776
<b>Status</b>	Unresolved

### Description

The contract is using variables that may be set to zero as denominators. This can lead to unpredictable and potentially harmful results, such as a transaction revert.

```
uint256 tokensReservedForLiquidity = (amount * _liquidityFee) /  
    _poolFee;  
uint256 tokensReservedForMarketing = (amount * _marketingFee) /  
    _poolFee;  
uint256 tokensReservedForDev = (amount * _devFee) / _poolFee;
```

### Recommendation

It is important to handle division by zero appropriately in the code to avoid unintended behavior and to ensure the reliability and safety of the contract. The contract should ensure that the divisor is always non-zero before performing a division operation. It should prevent the variables to be set to zero, or should not allow the execution of the corresponding statements.

## RME - Repetitive Methods Execution

<b>Criticality</b>	Minor / Informative
<b>Location</b>	contracts/SPW.sol#L898
<b>Status</b>	Unresolved

### Description

The contract executes the `isMarketTransfer(sender, recipient)` repetitively in the smart contract code. This method is used to determine whether a transfer operation involves market transactions. Repeating the invocation of `isMarketTransfer(sender, recipient)` for each transfer operation can lead to unnecessary gas consumption and decrease the efficiency of the contract. Instead, the contract can optimize its performance by executing the method once and caching the result for subsequent use within the same transaction.

### Recommendation

To address this finding, it is recommended to refactor the contract code to execute `isMarketTransfer(sender, recipient)` once per transaction and store the result in a variable. Subsequent calls within the same transaction can then utilize the cached result rather than executing the method repeatedly. This optimization contributes to the overall optimization and gas efficiency of the smart contract.



## MTEE - Missing Transfer Event Emission

<b>Criticality</b>	Minor / Informative
<b>Location</b>	contracts/SPW.sol#L714
<b>Status</b>	Unresolved

### Description

The contract is a missing transfer event emission when fees are transferred to the contract address as part of the transfer process. This omission can lead to a lack of visibility into fee transactions and hinder the ability of decentralized applications (DApps) like blockchain explorers to accurately track and analyze these transactions.

```
// Add fees to contract
_balances[address(this)] += feeAmount;
```

### Recommendation

To address this issue, it is recommended to emit a transfer event after transferring the taxed amount to the contract address. The event should include relevant information such as the sender, recipient (contract address), and the amount transferred.

## PMRM - Potential Mocked Router Manipulation

<b>Criticality</b>	Minor / Informative
<b>Location</b>	contracts/SPW.sol#L946
<b>Status</b>	Unresolved

### Description

The contract includes a method that allows the owner to modify the router address and create a new pair. While this feature provides flexibility, it introduces a security threat. The owner could set the router address to any contract that implements the router's interface, potentially containing malicious code. In the event of a transaction triggering the swap functionality with such a malicious contract as the router, the transaction may be manipulated.

```
function setPancakeSwapRouter(address routerAddress) public
onlyOwner {
    require(
        routerAddress != address(0),
        "Cannot use the zero address as router address"
    );

    _pancakeSwapRouterAddress = routerAddress;
    _pancakeswapV2Router =
    IPancakeRouter02(_pancakeSwapRouterAddress);

    address pancakePair;

    // REC Certik : Confirm pair does not already exist
    address get_pair =
    IPancakeFactory(_pancakeswapV2Router.factory())
        .getPair(address(this),
        _pancakeswapV2Router.WETH());

    if (get_pair == address(0)) {
        pancakePair =
        IPancakeFactory(_pancakeswapV2Router.factory())
            .createPair(address(this),
        _pancakeswapV2Router.WETH());
    } else {
        pancakePair = get_pair;
    }

    _pancakeswapV2Pair = pancakePair;

    onPancakeSwapRouterUpdated();
}
```

## 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.

### Temporary Solutions:

These measurements do not decrease the severity of the finding

- Introduce a time-locker mechanism with a reasonable delay.
- Introduce a multi-signature wallet so that many addresses will confirm the action.

- Introduce a governance model where users will vote about the actions.

Permanent Solution:

- Renouncing the ownership, which will eliminate the threats but it is non-reversible.

## PTRP - Potential Transfer Revert Propagation

Criticality	Minor / Informative
Location	contracts/SPW.sol#L806,816,824
Status	Unresolved

### Description

The contract sends funds to a `marketingWallet` as part of the transfer flow. This address can either be a wallet address or a contract. If the address belongs to a contract then it may revert from incoming payment. As a result, the error will propagate to the token's contract and revert the transfer.

```
(, uint bnbAddedToLiquidity, ) =
_pancakeswapV2Router.addLiquidityETH(
    value: bnbToBeAddedToLiquidity
) {
    ...
    _autoLiquidityWallet,
    ...
};

...
(bool sent, ) = _marketingWallet.call{value:
bnbToBeSendToMarketing} (
    ""
);
require(sent, "Failed to send BNB to marketing
wallet");

...
(sent, ) = _devAddress.call{value:
bnbToBeSendToDev} ("" );
require(sent, "Failed to send BNB to dev wallet");
```

### Recommendation

The contract should tolerate the potential revert from the underlying contracts when the interaction is part of the main transfer flow. This could be achieved by not allowing set contract addresses or by sending the funds in a non-revertable way.

## PVC - Price Volatility Concern

Criticality	Minor / Informative
Location	contracts/SPW.sol#L759
Status	Unresolved

### Description

The contract accumulates tokens from the taxes to swap them for ETH. The variable `_tokenSwapThreshold` 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.

```
uint256 tokensAvailableForSwap =
balanceOf(address(this));
if (tokensAvailableForSwap >= _tokenSwapThreshold) {
    // Limit to threshold
    tokensAvailableForSwap = _tokenSwapThreshold;

    // Make sure that we are not stuck in a loop (Swap
only once)
    bool isSelling = isPancakeSwapPair(recipient);
    if (isSelling) {
        executeSwap(tokensAvailableForSwap);
    }
}
```

### 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 exchange reserves. Hence, the contract will guarantee that it cannot accumulate a huge amount of tokens in order to sell them.

## RED - Redudant Event Declaration

<b>Criticality</b>	Minor / Informative
<b>Location</b>	contracts/SPW.sol#L528
<b>Status</b>	Unresolved

### Description

The contract uses events that are not emitted within the contract's functions. As a result, these declared events are redundant and serve no purpose within the contract's current implementation.

```
event AutoBurned(uint256 bnbAmount) ;
```

### Recommendation

To optimize contract performance and efficiency, it is advisable to regularly review and refactor the codebase, removing the unused event declarations. This proactive approach not only streamlines the contract, reducing deployment and execution costs but also enhances readability and maintainability.

## RSW - Redundant Storage Writes

Criticality	Minor / Informative
Location	contracts/SPW.sol#L1134
Status	Unresolved

### Description

The contract modifies the state of the following variables without checking if their current value is the same as the one given as an argument. As a result, the contract performs redundant storage writes, when the provided parameter matches the current state of the variables, leading to unnecessary gas consumption and inefficiencies in contract execution.

```
function setSwapEnabled(bool isEnabled) public onlyOwner {
    _isSwapEnabled = isEnabled;
}

function setFeeEnabled(bool isEnabled) public onlyOwner {
    _isFeeEnabled = isEnabled;
}

function setTokenHoldEnabled(bool isEnabled) public
onlyOwner {
    _isTokenHoldEnabled = isEnabled;
}

function setExcludedFromFees(address addr, bool value)
public onlyOwner {
    _addressesExcludedFromFees[addr] = value;
}

function setExcludedFromHold(address addr, bool value)
public onlyOwner {
    _addressesExcludedFromHold[addr] = value;
}

function activateBuying(bool isEnabled) public onlyOwner {
    _isBuyingAllowed = isEnabled;
}
```



## Recommendation

The team is advised to implement additional checks within to prevent redundant storage writes when the provided argument matches the current state of the variables. By incorporating statements to compare the new values with the existing values before proceeding with any state modification, the contract can avoid unnecessary storage operations, thereby optimizing gas usage.

## TUU - Time Units Usage

Criticality	Minor / Informative
Location	contracts/SPW.sol#L1227,1275
Status	Unresolved

### Description

The contract is using arbitrary numbers to form time-related values. As a result, it decreases the readability of the codebase and prevents the compiler to optimize the source code.

```
uint256 private _rewardCyclePeriod = 43200; // The duration
of the reward cycle (e.g. can claim rewards once 12 hours)

function setRewardCyclePeriod(uint256 period) public
onlyOwner {
    require(
        period >= 3600 && period <= 86400,
        "RewardCycle must be updated to between 1 and 24
hours"
    );
    _rewardCyclePeriod = period;
}
```

### Recommendation

It is a good practice to use the time units reserved keywords like `seconds`, `minutes`, `hours`, `days` and `weeks` to process time-related calculations.

It's important to note that these time units are simply a shorthand notation for representing time in seconds, and do not have any effect on the actual passage of time or the execution of the contract. The time units are simply a convenience for expressing time in a more human-readable form.

## L02 - State Variables could be Declared Constant

<b>Criticality</b>	Minor / Informative
<b>Location</b>	contracts/SPW.sol#L1198,1201,1204
<b>Status</b>	Unresolved

### Description

State variables can be declared as constant using the constant keyword. This means that the value of the state variable cannot be changed after it has been set. Additionally, the constant variables decrease gas consumption of the corresponding transaction.

```
uint128 private platformFeeBps  
address internal platformFeeRecipient  
address public primarySaleRecipient
```

### Recommendation

Constant state variables can be useful when the contract wants to ensure that the value of a state variable cannot be changed by any function in the contract. This can be useful for storing values that are important to the contract's behavior, such as the contract's address or the maximum number of times a certain function can be called. The team is advised to add the constant keyword to state variables that never change.

## L04 - Conformance to Solidity Naming Conventions

<b>Criticality</b>	Minor / Informative
<b>Location</b>	contracts/SPW.sol#L182,186,217,230,466,478,509,513,940,1221,1250,1251,1253,1933,1937,1942
<b>Status</b>	Unresolved

### 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.

```
function __ReentrancyGuard_init() internal onlyInitializing {
    __ReentrancyGuard_init_unchained();
}

function __ReentrancyGuard_init_unchained() internal
onlyInitializing {
    _status = _NOT_ENTERED;
    ...
function WETH() external pure returns (address);
uint256 private constant _totalTokens = 1 * 10 ** 8 * 10 **
DECIMALS
uint8 public _transferFee
mapping(address => bool) public _whiteList
mapping(address => bool) public _blacklist
address _add
bool _val
    ...
}
```

## 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>.

## L05 - Unused State Variable

<b>Criticality</b>	Minor / Informative
<b>Location</b>	contracts/SPW.sol#L1183,1188,1195,1198,1201,1207
<b>Status</b>	Unresolved

### Description

An unused state variable is a state variable that is declared in the contract, but is never used in any of the contract's functions. This can happen if the state variable was originally intended to be used, but was later removed or never used.

Unused state variables can create clutter in the contract and make it more difficult to understand and maintain. They can also increase the size of the contract and the cost of deploying and interacting with it.

```
bytes32 private constant TYPEHASH =  
    keccak256(  
        "MintRequest(address to,address  
primarySaleRecipient,uint256 quantity,uint256 price,address  
currency,uint128 validityStartTimestamp,uint128  
validityEndTimestamp,bytes32 uid) "  
    )  
bytes32 internal constant MINTER_ROLE =  
    keccak256("MINTER_ROLE")  
uint128 internal constant MAX_BPS = 10_000  
uint128 private platformFeeBps  
address internal platformFeeRecipient  
mapping(bytes32 => bool) private minted
```

### Recommendation

To avoid creating unused state variables, it's important to carefully consider the state variables that are needed for the contract's functionality, and to remove any that are no longer needed. This can help improve the clarity and efficiency of the contract.

## L07 - Missing Events Arithmetic

<b>Criticality</b>	Minor / Informative
<b>Location</b>	contracts/SPW.sol#L1757,1763,1778,1786,1794,1826,1855,1864,1884,1926,1943
<b>Status</b>	Unresolved

### Description

Events are a way to record and log information about changes or actions that occur within a contract. They are often used to notify external parties or clients about events that have occurred within the contract, such as the transfer of tokens or the completion of a task.

It's important to carefully design and implement the events in a contract, and to ensure that all required events are included. It's also a good idea to test the contract to ensure that all events are being properly triggered and logged.

```
_rewardCyclePeriod = period
_rewardCycleExtensionThreshold = threshold
_maxClaimAllowed = value
_minRewardBalance = balance
_maxGasForAutoClaim = gas
_globalRewardDampeningPercentage = value
_gradualBurnMagnitude = magnitude
_gradualBurnTimespan = timespan
_mainBnbPoolSize = size
_sendWeiGasLimit = amount
antiBlockNum = _blockNum
```

### Recommendation

By including all required events in the contract and thoroughly testing the contract's functionality, the contract ensures that it performs as intended and does not have any missing events that could cause issues with its arithmetic.

## L09 - Dead Code Elimination

Criticality	Minor / Informative
Location	contracts/SPW.sol#L60,182,186
Status	Unresolved

### Description

In Solidity, dead code is code that is written in the contract, but is never executed or reached during normal contract execution. Dead code can occur for a variety of reasons, such as:

- Conditional statements that are always false.
- Functions that are never called.
- Unreachable code (e.g., code that follows a return statement).

Dead code can make a contract more difficult to understand and maintain, and can also increase the size of the contract and the cost of deploying and interacting with it.

```
function _msgDataCheck() internal view virtual returns (bytes
calldata) {
    this; // silence state mutability warning without
generating bytecode - see
https://github.com/ethereum/solidity/issues/2691
    return msg.data;
}

function __ReentrancyGuard_init() internal onlyInitializing {
    __ReentrancyGuard_init_unchained();
}

function __ReentrancyGuard_init_unchained() internal
onlyInitializing {
    _status = _NOT_ENTERED;
}
```

### Recommendation



To avoid creating dead code, it's important to carefully consider the logic and flow of the contract and to remove any code that is not needed or that is never executed. This can help improve the clarity and efficiency of the contract.

## L13 - Divide before Multiply Operation

<b>Criticality</b>	Minor / Informative
<b>Location</b>	contracts/SPW.sol#L778,780,787,797,814,822,1594,1599,1639,1648
<b>Status</b>	Unresolved

### 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 precision.

```
uint256 tokensReservedForMarketing = (amount * _marketingFee) /  
    _poolFee  
uint256 bnbToBeSendToMarketing = (bnbSwapped *  
    tokensReservedForMarketing) / tokensToSwap
```

### 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.

## L14 - Uninitialized Variables in Local Scope

<b>Criticality</b>	Minor / Informative
<b>Location</b>	contracts/SPW.sol#L1479
<b>Status</b>	Unresolved

### Description

Using an uninitialized local variable can lead to unpredictable behavior and potentially cause errors in the contract. It's important to always initialize local variables with appropriate values before using them.

```
bool sent
```

### Recommendation

By initializing local variables before using them, the contract ensures that the functions behave as expected and avoid potential issues.

## L16 - Validate Variable Setters

<b>Criticality</b>	Minor / Informative
<b>Location</b>	contracts/SPW.sol#L968
<b>Status</b>	Unresolved

### Description

The contract performs operations on variables that have been configured on user-supplied input. These variables are missing of proper check for the case where a value is zero. This can lead to problems when the contract is executed, as certain actions may not be properly handled when the value is zero.

```
_pancakeswapV2Pair = pancakePair
```

### Recommendation

By adding the proper check, the contract will not allow the variables to be configured with zero value. This will ensure that the contract can handle all possible input values and avoid unexpected behavior or errors. Hence, it can help to prevent the contract from being exploited or operating unexpectedly.

## L17 - Usage of Solidity Assembly

<b>Criticality</b>	Minor / Informative
<b>Location</b>	contracts/SPW.sol#L1716
<b>Status</b>	Unresolved

### Description

Using assembly can be useful for optimizing code, but it can also be error-prone. It's important to carefully test and debug assembly code to ensure that it is correct and does not contain any errors.

Some common types of errors that can occur when using assembly in Solidity include Syntax, Type, Out-of-bounds, Stack, and Revert.

```
assembly {  
    size := extcodesize(account)  
}
```

### Recommendation

It is recommended to use assembly sparingly and only when necessary, as it can be difficult to read and understand compared to Solidity code.

## L19 - Stable Compiler Version

Criticality	Minor / Informative
Location	contracts/SPW.sol#L11
Status	Unresolved

### Description

The `^` symbol indicates that any version of Solidity that is compatible with the specified version (i.e., any version that is a higher minor or patch version) can be used to compile the contract. The version lock is a mechanism that allows the author to specify a minimum version of the Solidity compiler that must be used to compile the contract code. This is useful because it ensures that the contract will be compiled using a version of the compiler that is known to be compatible with the code.

```
pragma solidity ^0.8.11;
```

### Recommendation

The team is advised to lock the pragma to ensure the stability of the codebase. The locked pragma version ensures that the contract will not be deployed with an unexpected version. An unexpected version may produce vulnerabilities and undiscovered bugs. The compiler should be configured to the lowest version that provides all the required functionality for the codebase. As a result, the project will be compiled in a well-tested LTS (Long Term Support) environment.

## Functions Analysis

Contract	Type	Bases		
	Function Name	Visibility	Mutability	Modifiers
FeeType	Library			
CurrencyTransferLib	Library			
	transferCurrency	Internal	✓	
	transferCurrencyWithWrapper	Internal	✓	
	safeTransferERC20	Internal	✓	
	safeTransferNativeToken	Internal	✓	
	safeTransferNativeTokenWithWrapper	Internal	✓	
SPWBase	Implementation	Context, IERC20Meta data, Ownable, ReentrancyGuardUpgradeable, AccessControlEnumerableUpgradeable		
		Public	✓	-
	activate	Public	✓	onlyOwner
	onActivated	Internal	✓	
	balanceOf	Public		-
	transfer	Public	✓	-

	transferFrom	Public	✓	-
	approve	Public	✓	-
	doTransfer	Internal	✓	
	onBeforeTransfer	Internal	✓	
	onTransfer	Internal	✓	
	updateBalances	Private	✓	
	doApprove	Private	✓	
	calculateFeeRate	Private		
	onBeforeCalculateFeeRate	Internal		
	executeSwapIfNeeded	Private	✓	
	executeSwap	Private	✓	
	swapTokensForBNB	Internal	✓	
	swapBNBForTokens	Internal	✓	
	isSellTransferLimited	Private		
	isSwapTransfer	Private		
	isMarketTransfer	Internal		
	amountUntilSwap	Public		-
	increaseAllowance	Public	✓	-
	decreaseAllowance	Public	✓	-
	addToWhiteList	Public	✓	onlyOwner
	setPancakeSwapRouter	Public	✓	onlyOwner
	onPancakeSwapRouterUpdated	Internal	✓	
	isPancakeSwapPair	Internal		



	setFees	Public	✓	onlyOwner
	setTransferFee	Public	✓	onlyOwner
	setTransactionSellLimit	Public	✓	onlyOwner
	setTrading	Public	✓	onlyOwner
	setBlacklist	Public	✓	onlyOwner
	transactionSellLimit	Public		-
	setTransactionBuyLimit	Public	✓	onlyOwner
	transactionBuyLimit	Public		-
	setHoldLimit	Public	✓	onlyOwner
	holdLimit	Public		-
	setTokenSwapThreshold	Public	✓	onlyOwner
	tokenSwapThreshold	Public		-
	name	Public		-
	symbol	Public		-
	totalSupply	Public		-
	decimals	Public		-
	allowance	Public		-
	pancakeSwapRouterAddress	Public		-
	pancakeSwapPairAddress	Public		-
	autoLiquidityWallet	Public		-
	setAutoLiquidityWallet	Public	✓	onlyOwner
	marketingWallet	Public		-
	setMarketingWallet	Public	✓	onlyOwner

	devWallet	Public		-
	setDevWallet	Public	✓	onlyOwner
	totalFeesPooled	Public		-
	totalBNBLiquidityAddedFromFees	Public		-
	isSwapEnabled	Public		-
	setSwapEnabled	Public	✓	onlyOwner
	isFeeEnabled	Public		-
	setFeeEnabled	Public	✓	onlyOwner
	isTokenHoldEnabled	Public		-
	setTokenHoldEnabled	Public	✓	onlyOwner
	isExcludedFromFees	Public		-
	setExcludedFromFees	Public	✓	onlyOwner
	isExcludedFromHold	Public		-
	setExcludedFromHold	Public	✓	onlyOwner
	activateBuying	Public	✓	onlyOwner
		External	Payable	-
<b>SPW</b>	Implementation	SPWBase		
	contractType	External		-
	contractVersion	External		-
	setContractURI	External	✓	onlyRole
		Public	✓	SPWBase
	onActivated	Internal	✓	

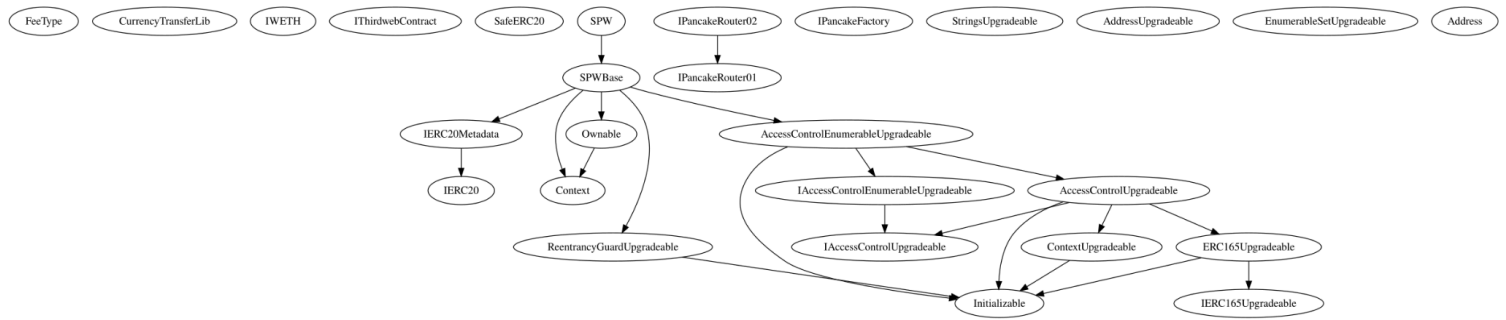
	onBeforeTransfer	Internal	✓	
	onTransfer	Internal	✓	
	processGradualBurn	Private	✓	
	updateAutoClaimQueue	Private	✓	
	claimReward	External	✓	isHuman nonReentrant
	claimReward	Public	✓	-
	doClaimReward	Private	✓	
	claimBNB	Private	✓	
	claimSPW	Private	✓	
	processRewardClaimQueue	Public	✓	-
	processRewardClaimQueueAndRefundGas	External	✓	-
	isRewardReady	Public		-
	isIncludedInRewards	Public		-
	calculateRewardCycleExtension	Public		-
	calculateClaimRewards	Public		-
	calculateBNBReward	Public		-
	onPancakeSwapRouterUpdated	Internal	✓	
	isMarketTransfer	Internal		
	isBurnTransfer	Private		
	shouldBurn	Public		-
	buyAndBurn	External	✓	onlyOwner
	doBuyAndBurn	Private	✓	
	isContract	Public		-

	totalAmountOfTokensHeld	Public		-
	bnbRewardClaimed	Public		-
	bnbRewardClaimedAsSPW	Public		-
	totalBNBClaimed	Public		-
	totalBNBClaimedAsSPW	Public		-
	rewardCyclePeriod	Public		-
	setRewardCyclePeriod	Public	✓	onlyOwner
	setRewardCycleExtensionThreshold	Public	✓	onlyOwner
	nextAvailableClaimDate	Public		-
	maxClaimAllowed	Public		-
	setMaxClaimAllowed	Public	✓	onlyOwner
	minRewardBalance	Public		-
	setMinRewardBalance	Public	✓	onlyOwner
	maxGasForAutoClaim	Public		-
	setMaxGasForAutoClaim	Public	✓	onlyOwner
	isAutoClaimEnabled	Public		-
	setAutoClaimEnabled	Public	✓	onlyOwner
	isExcludedFromRewards	Public		-
	setExcludedFromRewards	Public	✓	onlyOwner
	globalRewardDampeningPercentage	Public		-
	setGlobalRewardDampeningPercentage	Public	✓	onlyOwner
	approveClaim	Public	✓	-
	isClaimApproved	Public		-

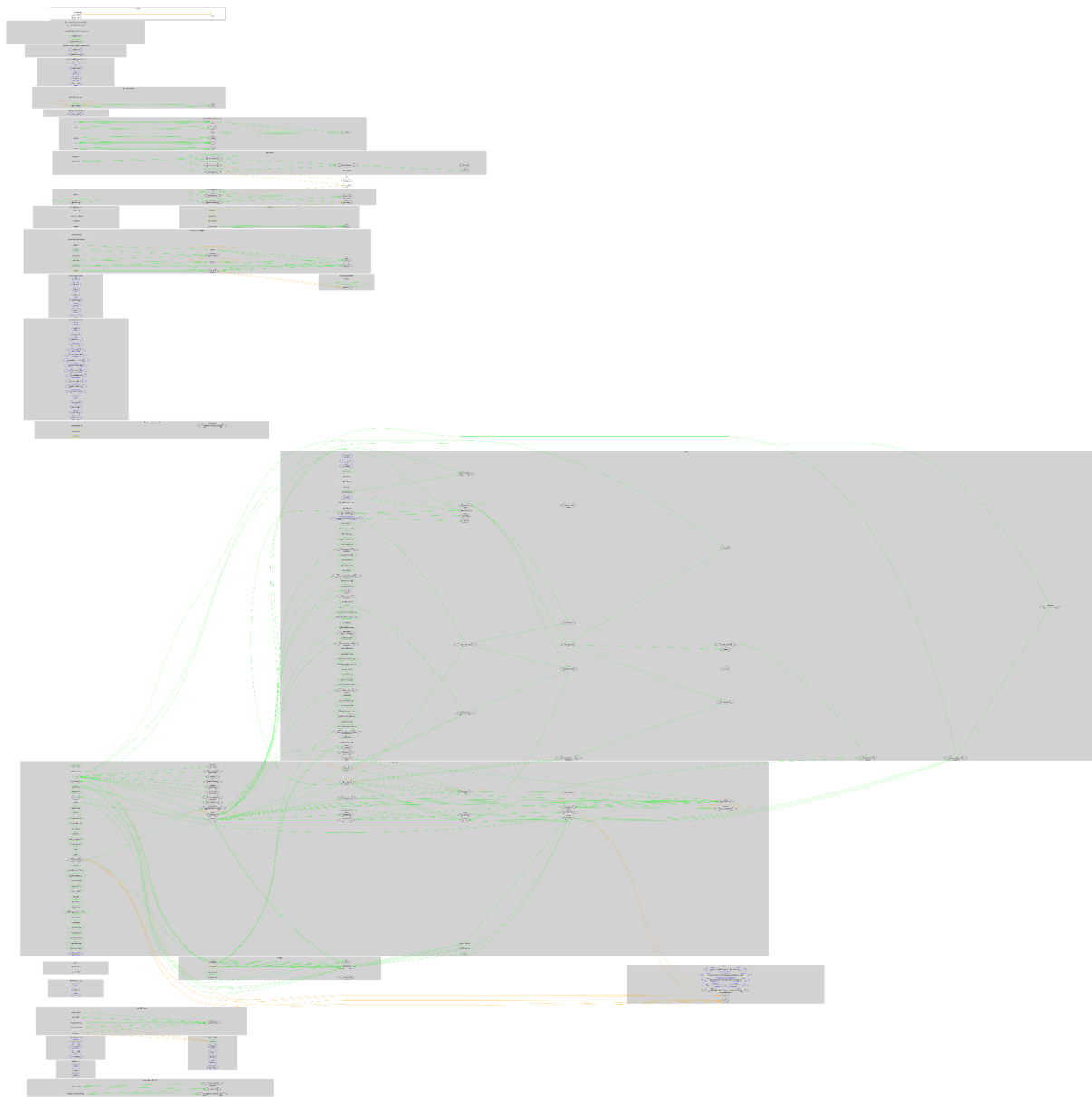
	isRewardAsTokensEnabled	Public		-
	setRewardAsTokensEnabled	Public	✓	onlyOwner
	gradualBurnMagnitude	Public		-
	setGradualBurnMagnitude	Public	✓	onlyOwner
	gradualBurnTimespan	Public		-
	setGradualBurnTimespan	Public	✓	onlyOwner
	claimRewardAsTokensPercentage	Public		-
	setClaimRewardAsTokensPercentage	Public	✓	-
	mainBnbPoolSize	Public		-
	setMainBnbPoolSize	Public	✓	onlyOwner
	isInRewardClaimQueue	Public		-
	reimburseAfterSPWClaimFailure	Public		-
	setReimburseAfterSPWClaimFailure	Public	✓	onlyOwner
	lastBurnDate	Public		-
	rewardClaimQueueLength	Public		-
	rewardClaimQueueIndex	Public		-
	isWhitelistedExternalProcessor	Public		-
	setWhitelistedExternalProcessor	Public	✓	onlyOwner
	setSendWeiGasLimit	Public	✓	onlyOwner
	setExcludeNonHumansFromRewards	Public	✓	onlyOwner
	setAntiBotEnabled	Public	✓	onlyOwner
	updateAntiBotStatus	Private	✓	
	updateBlockNum	Public	✓	onlyOwner

	onBeforeCalculateFeeRate	Internal	
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# Inheritance Graph



## Flow Graph





## Summary

SuperWhale contract implements a token mechanism. This audit investigates security issues, business logic concerns and potential improvements. There are some functions that can be abused by the owner like stop transactions, manipulate the fees and massively blacklist addresses. A multi-wallet signing pattern will provide security against potential hacks. Temporarily locking the contract or renouncing ownership will eliminate all the contract threats.

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**The Cyberscope team**

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