SAULIDITY

Staxe

# 2023 | SMART CONTRACT SECURITY ANALYSIS

**PREPARED BY**

Saulidity

**PRESENTED TO**

Staxe.io

2023

SAULIDITY

# SECURITY REPORT

Smart Contract Audit

saulidity.com

Saulidity

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# Saulidity

Saulidity is a renowned cybersecurity firm specializing in the analysis and development of Smart contracts. Saulidity, as a full-service security organization, can help with a variety of audits and project development.

In a market where confidence and trust are key, a genuine project may simply increase its user base enormously with an official audit performed by Saulidity.

# Introduction

For a thorough understanding of the audit, please read the entire document.

The goal of the audit was to find any potential smart contract security problems and vulnerabilities.
The information in this report should be used to understand the smart contract's risk exposure and as a guide to improving the smart contract's security posture by addressing the concerns that were discovered.

During our audit, we conducted a thorough inquiry using automated analysis and manual review approaches.

The security specialists did a complete study independently of one another in order to uncover any security issues in the contracts as comprehensively as feasible. For optimum security and professionalism, all of our audits are undertaken by at least two independent auditors.

The project's website, logic, or tokenomics have not been vetted by the Saulidity team.

# Scope

We analyze smart contracts for both well-known and more specific vulnerabilities.

Here are some of the most well-known vulnerabilities that are taken into account but not limited to:

- Reentrancy
- Timestamp Dependence
- Gas Limit and Loops
- DoS with (Unexpected) Throw
- DoS with Block Gas Limit
- Transaction-Ordering Dependence
- Style guide violation
- Transfer forwards all gas
- API violation
- Compiler version not fixed
- Unchecked external call - Unchecked math
- Unsafe type inference
- Implicit visibility level

# Appendix

Vulnerabilities can be divided into four threat levels: Critical, High, Medium and Low. The classification is mainly based on the impact, likelihood of utilization and other factors.

Critical flaws can result in the loss of assets or the alteration of data and are often simple to exploit.

High-level vulnerabilities are challenging to exploit, but they can have a big influence on how smart contracts are executed, such as giving the public access to key features.

Although medium-level vulnerabilities should be fixed, they generally cannot result in the loss of assets or the manipulation of data.

Low-level flaws are typically caused by code fragments that are out-of-date, useless, etc. and cannot significantly affect execution.

# SC Weakness Registry

| ITEM | DESCRIPTION |
|---|---|
| Default Visibility | Functions and state variables visibility should be set explicitly. Visibility levels should be specified consciously. |
| Integer Overflow and Underflow | If unchecked math is used, all math operations should be safe from overflows and underflows. |
| Outdated Compiler Version | It is recommended to use a recent version of the Solidity compiler. |
| Floating Pragma | Contracts should be deployed with the same compiler version and flags that they have been tested thoroughly. |
| Unchecked Call Return Value | The return value of a message call should be checked. |
| Access Control & Authorization | Ownership takeover should not bepossible. All crucial functions should be protected. Users could not affect data that belongs to other users. |
| Selfdestruct | The contract should not be destroyed until it has funds belonging to users. |
| Check-Effect-Interaction | CEI pattern should be followed if the code performs any external call. |

# SC Weakness Registry

| ITEM | DESCRIPTION |
|---|---|
| Uninitialized Storage Pointer | Storage type should be set explicitly if the compiler version is < 0.5.0. |
| Assert Violation | Properly functioning code should never reach a failing assert statement. |
| Deprecated Solidity Functions | Deprecated built-in functions should never be used. |
| Delegatecall to Untrusted Callee | Delegatecalls should only be allowed to trusted addresses. |
| Denial of Service | Execution of the code should never be blocked by a specific contract state unless it is required. |
| Race Conditions | Race Conditions and Transactions Order Dependency should not be possible. |
| Authorization through tx.origin | tx.origin should not be used for authorization. |
| Block values as a proxy for time | Block numbers should not be used for time calculations. |

# SC Weakness Registry

| ITEM | DESCRIPTION |
|---|---|
| Signature Unique Id | Signed messages should always have a unique id. A transaction hash should not be used as a unique id. |
| Shadowing State Variable | State variables should not be shadowed. |
| Weak Sources of Randomness | Random values should never be generated from Chain Attributes. |
| Incorrect Inheritance Order | When inheriting multiple contracts, especially if they have identical functions, a developer should carefully specify inheritance in the correct order. |
| Calls Only to Trusted Addresses | All external calls should be performed only to trusted addresses. |
| Presence of unused variables | The code should not contain unused variables if this is not justified by design. |

# Audit & Project Information

| | |
|---|---|
| Project Name | Staxe |
| Contract Information | https://github.com/staxeio/staxe-contracts/tree/main/contracts/v3 |
| Report ID | stSAUL001 1.1 |
| Website | https://staxe.io/ |
| Contact | Luis Martinez |
| Contact Information | luis@staxe.io |
| Code language | Solidity |

# Summary Table

| SEVERITY | FOUND |
| --- | --- |
| Critical | 0 |
| High | 0 |
| Medium | 0 |
| Low | 3 |
| Lowest / Code Style / Optimized Practice | 3 |

# Executive Summary

ACCORDING TO THE ANALYSIS, **THERE ARE NO CRITICAL SEVERITY SECURITY VULNERABILITIES. IT SHOULD BE NOTED THAT ALL FINDINGS HAVE BEEN ACKNOWLEDGED AND/OR MITIGATED BY THE CLIENT.**

ALL ISSUES FOUND DURING ANALYSIS WERE REVIEWED, AND FALSE POSITIVES WERE ELIMINATED. THE FINDINGS ARE PRESENTED IN THE ANALYSIS SECTION OF THE REPORT.

# Inheritance

**Issue**: Inheritance

**Severity**: -

**Location**: General

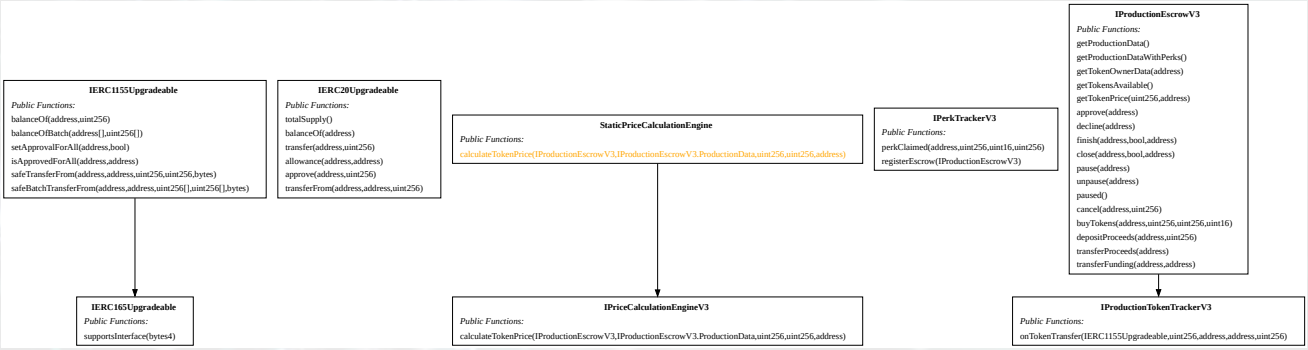
**Description**: Inheritance is a fundamental concept in object-oriented programming (OOP) that allows a class (referred to as a child or derived class) to inherit characteristics and functionalities from another class (known as a parent or base class).

In the context of smart contracts in Solidity, inheritance is used to establish relationships between contracts, enabling code reuse, responsibility separation, and promoting modularity.

In a smart contract, we can observe inheritance among the different contracts:

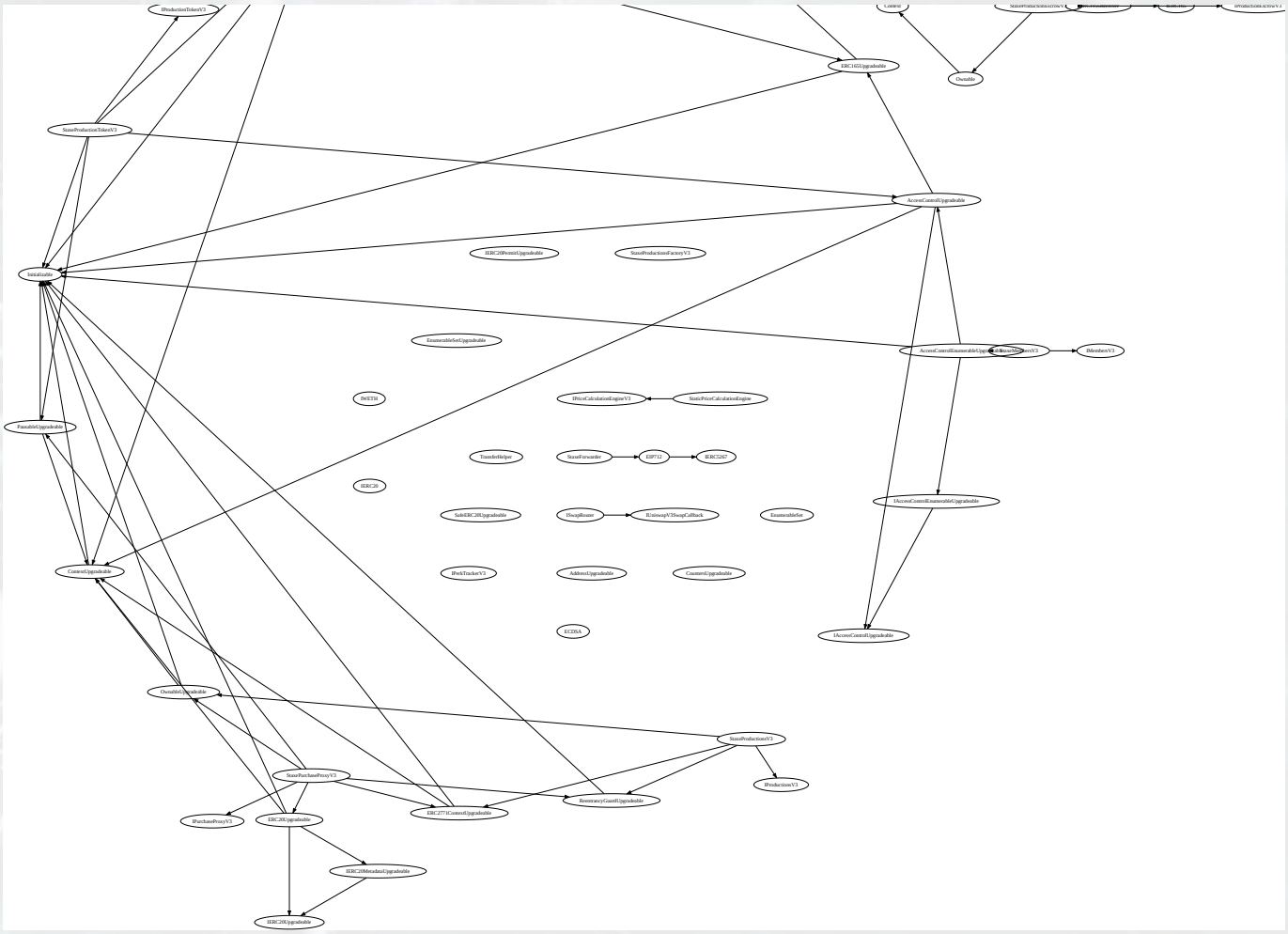
# Inheritance

## StaticPriceCalculationEngine.sol



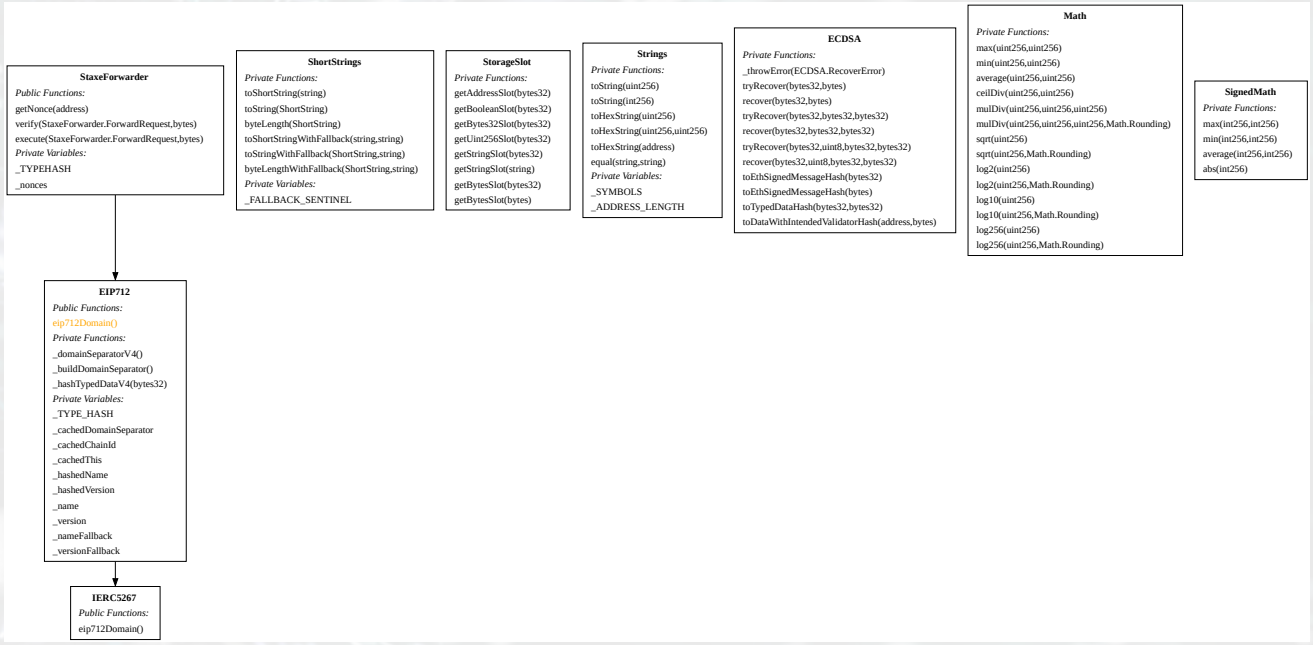
# Inheritance

## StaxeProductionsV3.sol



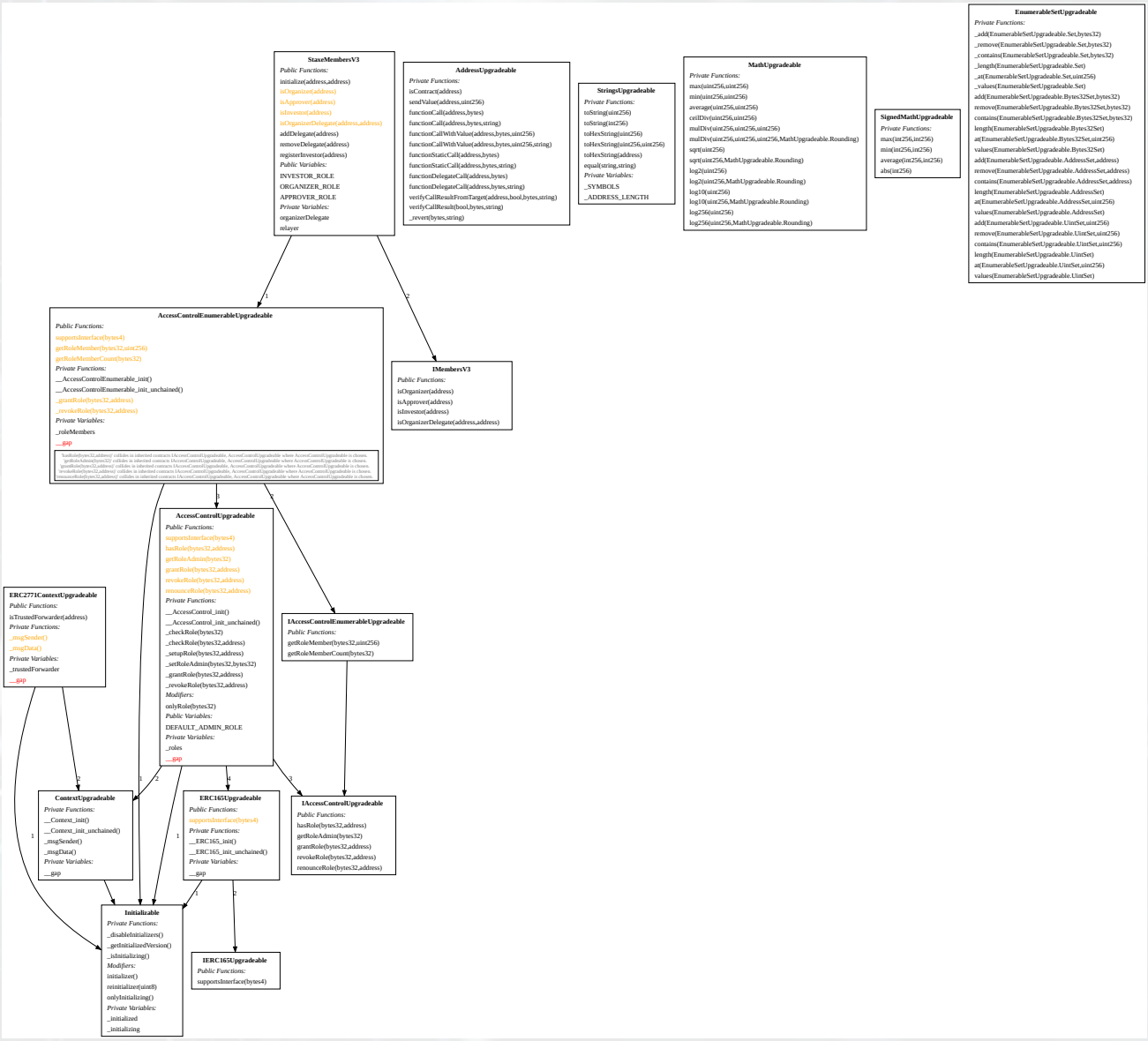
# Inheritance

## StaxeForwarder.sol



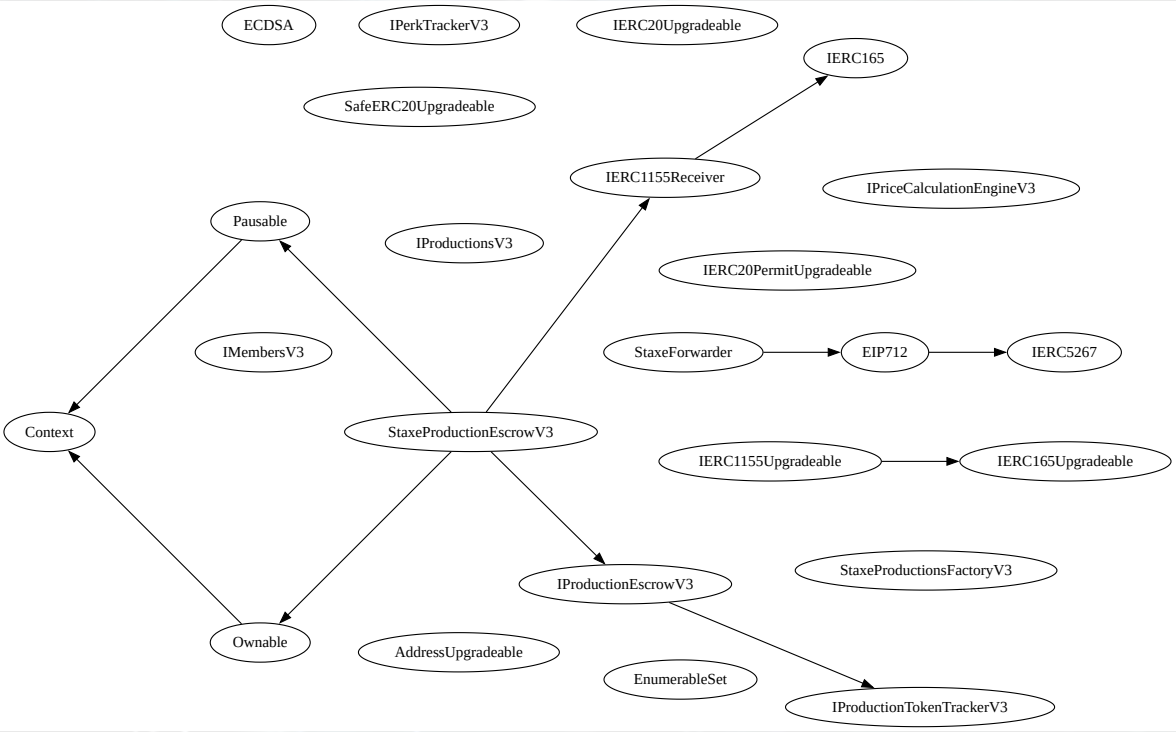
# Inheritance

## StaxeMembersV3.sol



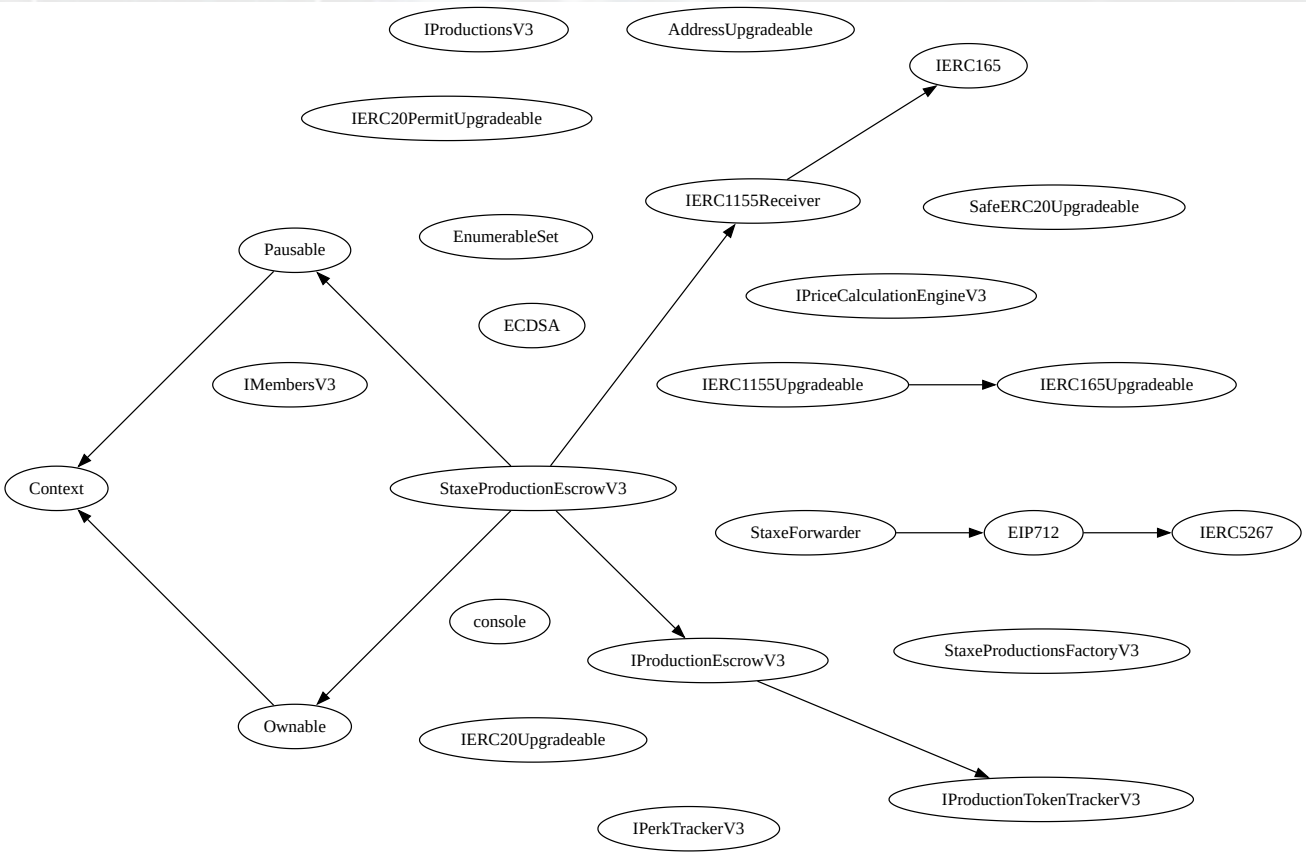
# Inheritance

## StaxeProductionsEscrowV3.sol



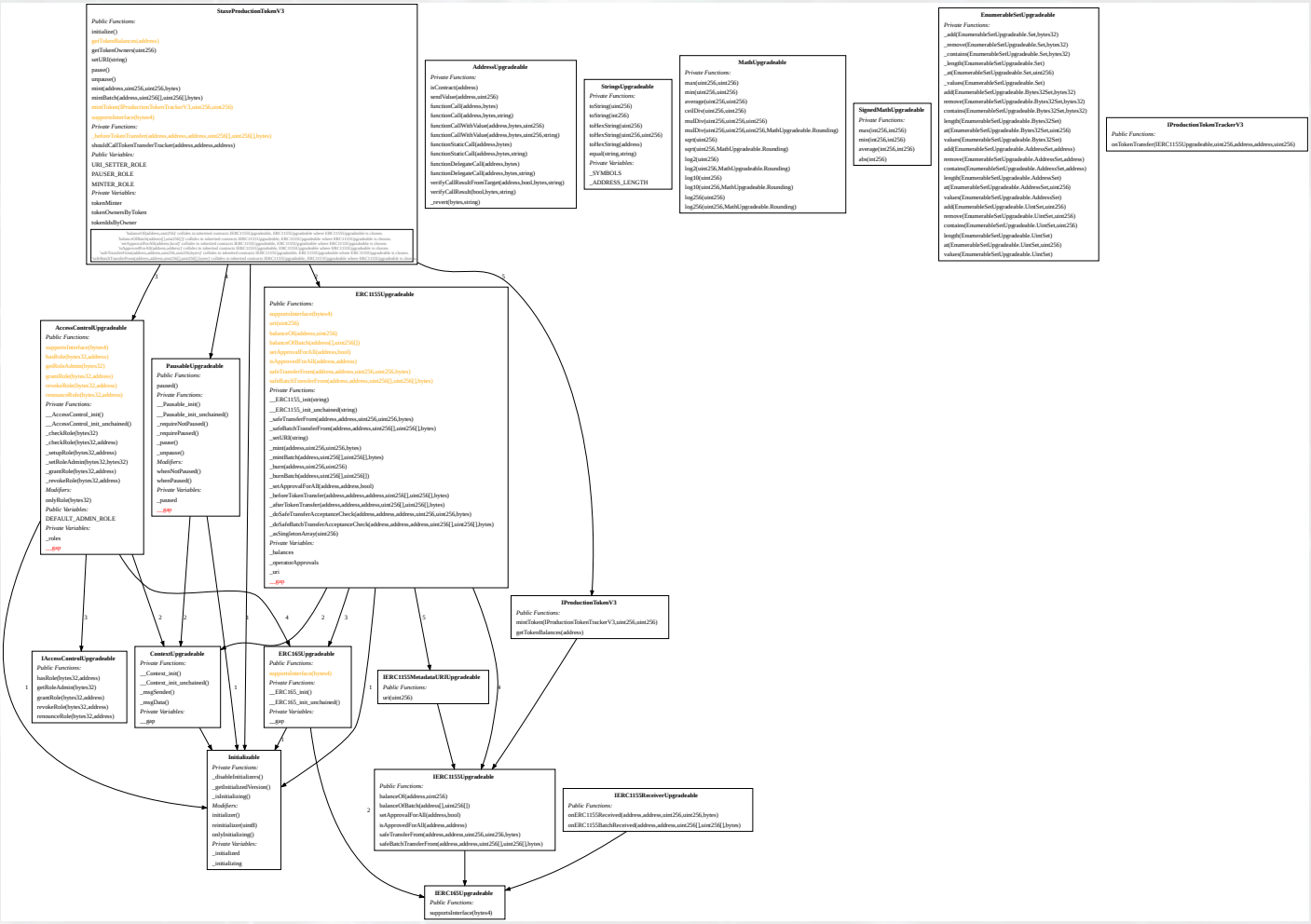
# Inheritance

## StaxeProductionsFactoryV3.sol



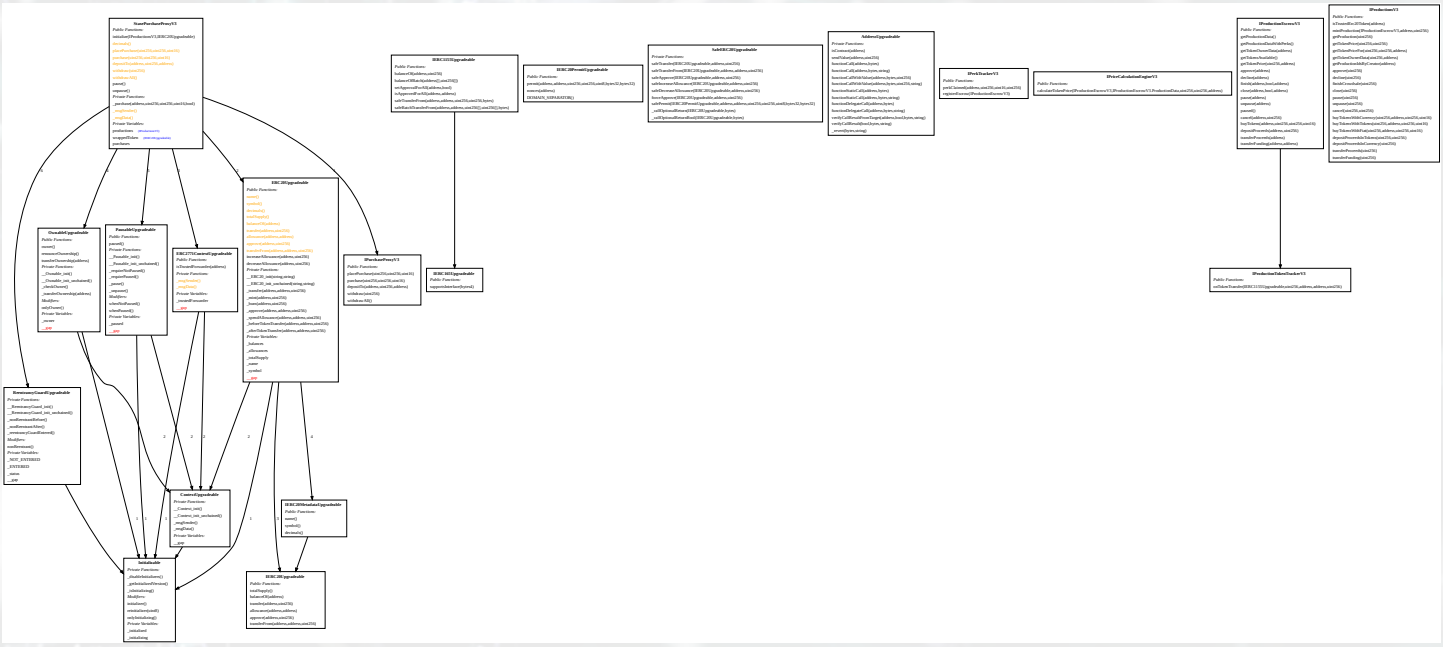
# Inheritance

## StaxeProductionToken.sol



# Inheritance

## StaxePurchaseProxyV3.sol



# Call Graph

**Issue**: Call Graph

**Severity**: -

**Location**: General

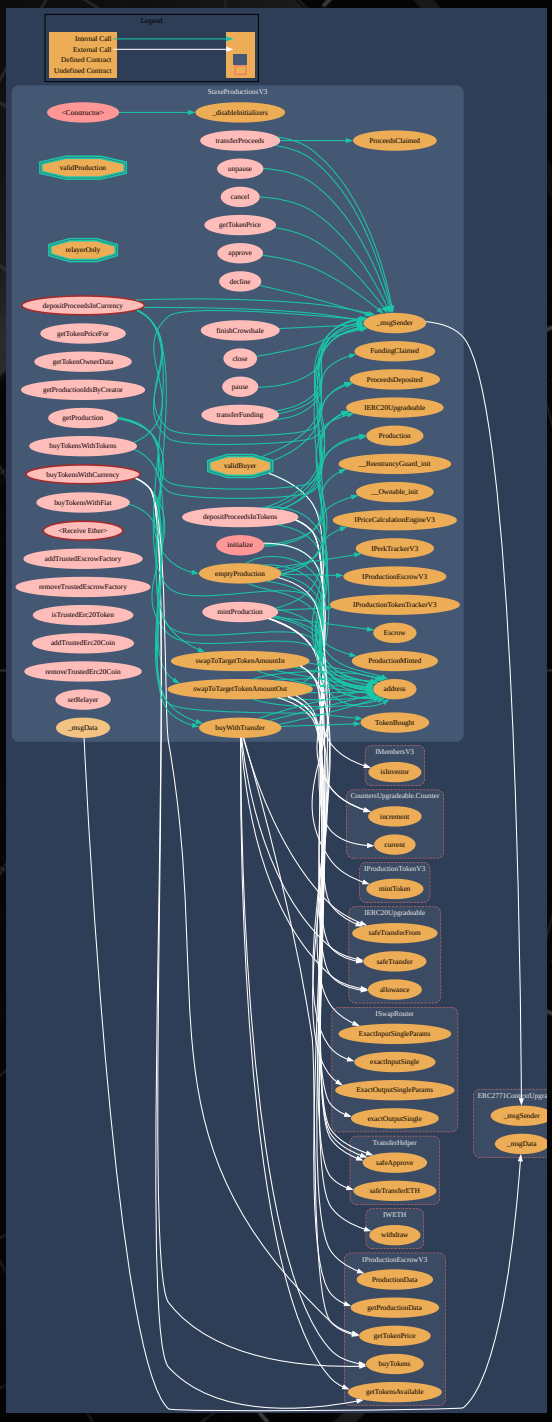
**Description**: A call graph of a smart contract provides a visual representation of the function calls and dependencies within the contract. It illustrates the flow of execution and the relationships between functions.

The call graph displays nodes representing individual functions and edges representing the calls made between them.The call graph allows for a comprehensive view of the contract's function hierarchy, enabling the identification of critical functions, entry points, and external dependencies.

It highlights the paths of execution, including any loops or recursive calls, which can be crucial for understanding the contract's behavior and potential risks.

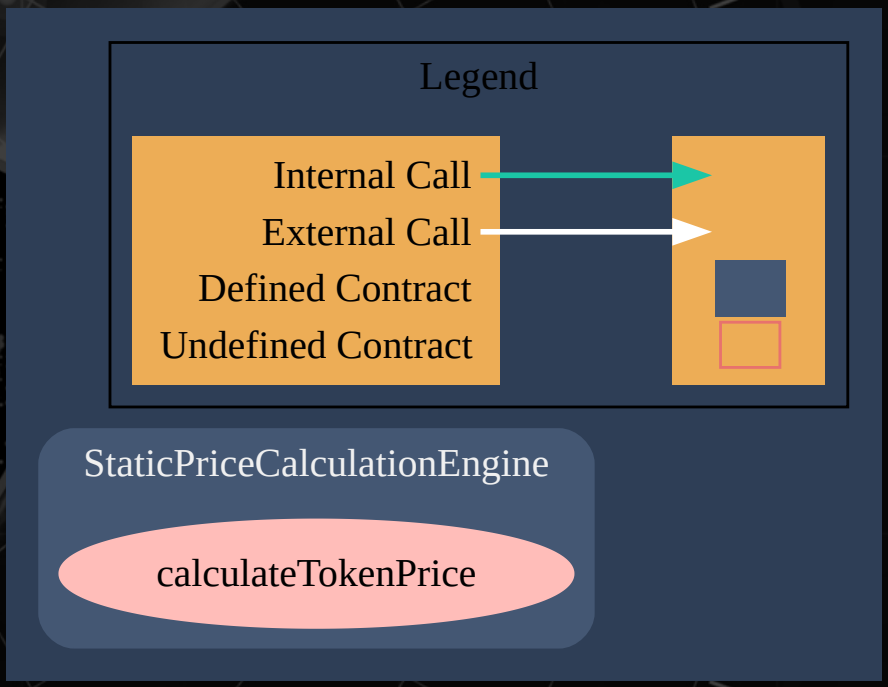
# Call Graph

## StaxeProductionsV3.sol



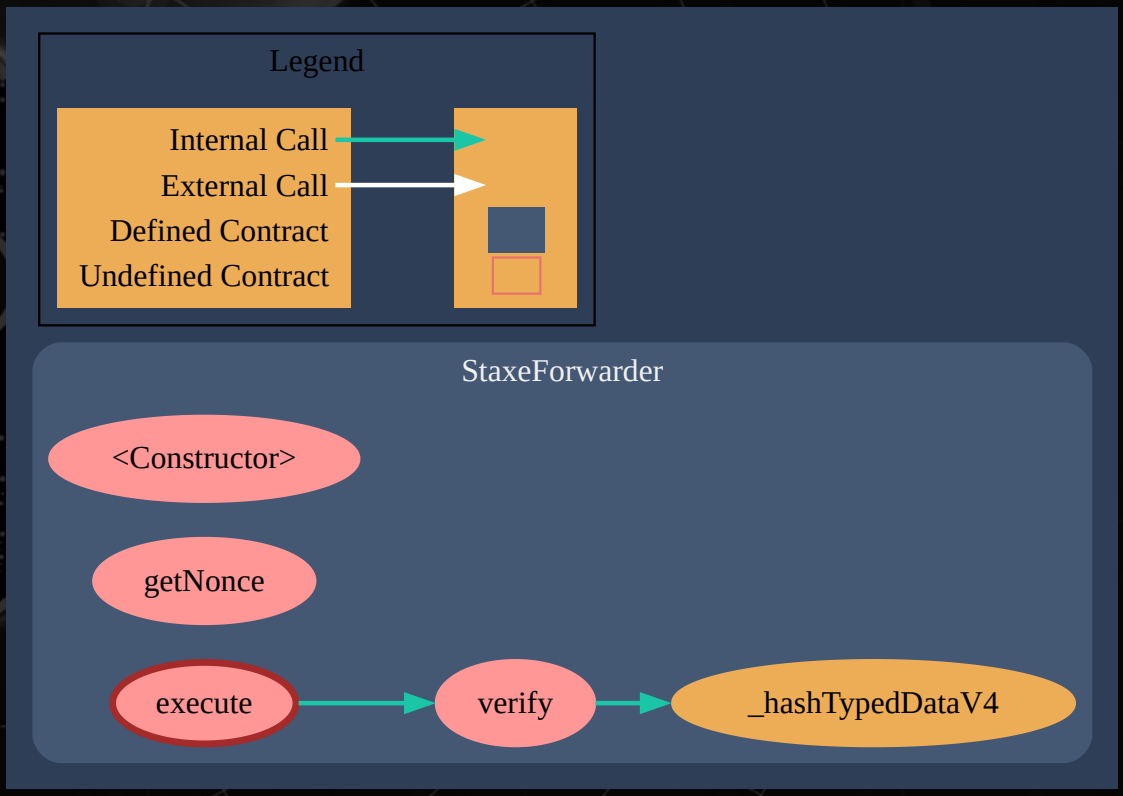
# Call Graph

**StaticPriceCalculationEngine.sol**



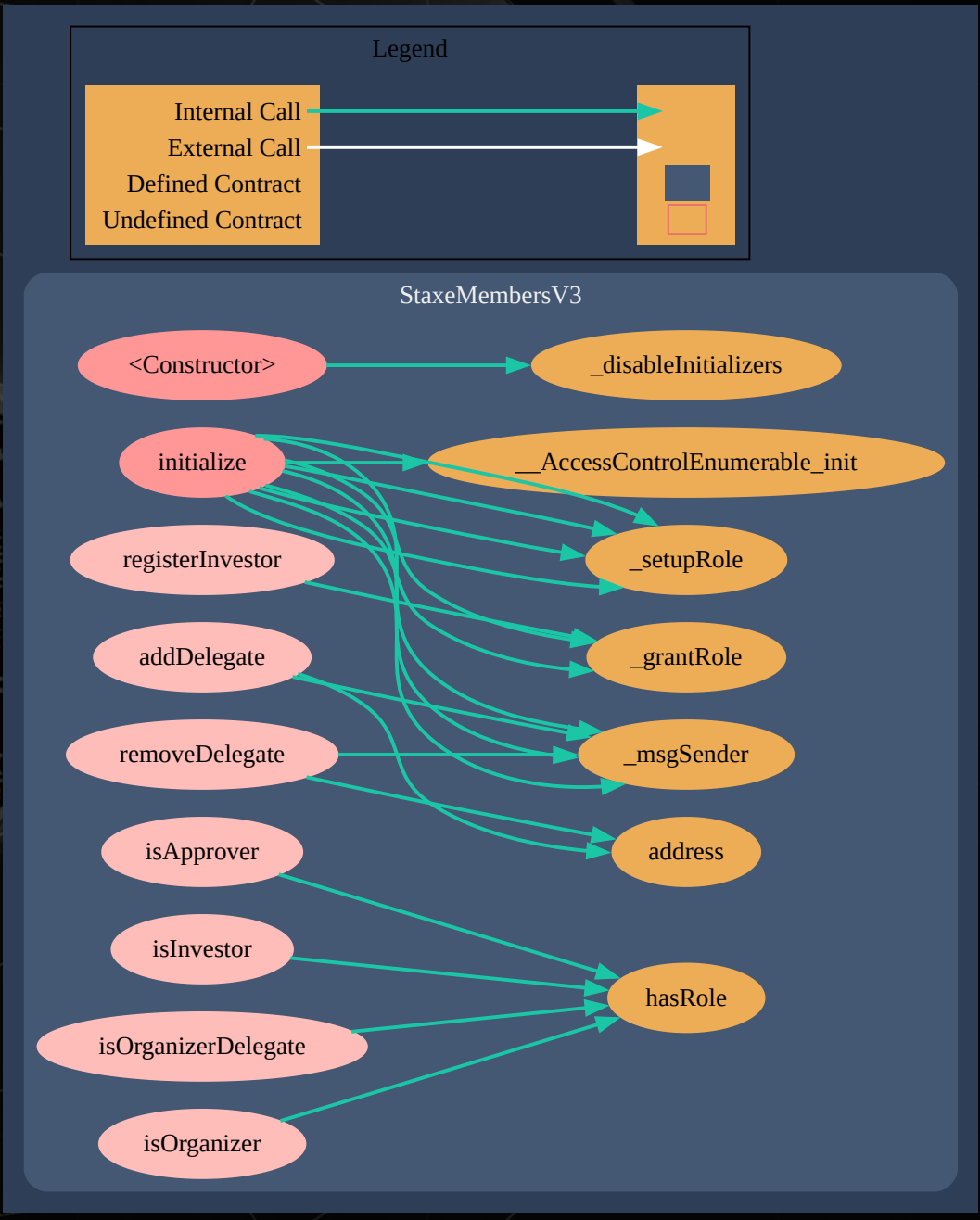
# Call Graph

## StaxeForwarder.sol



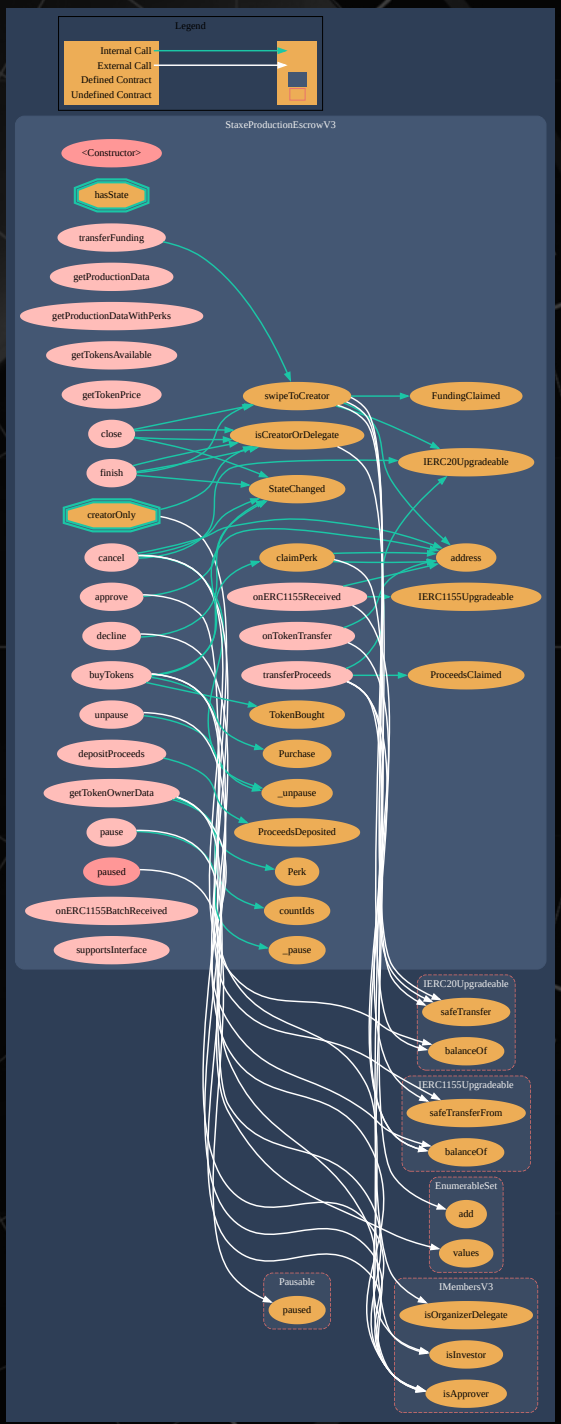
# Call Graph

## StaxeMembersV3.sol



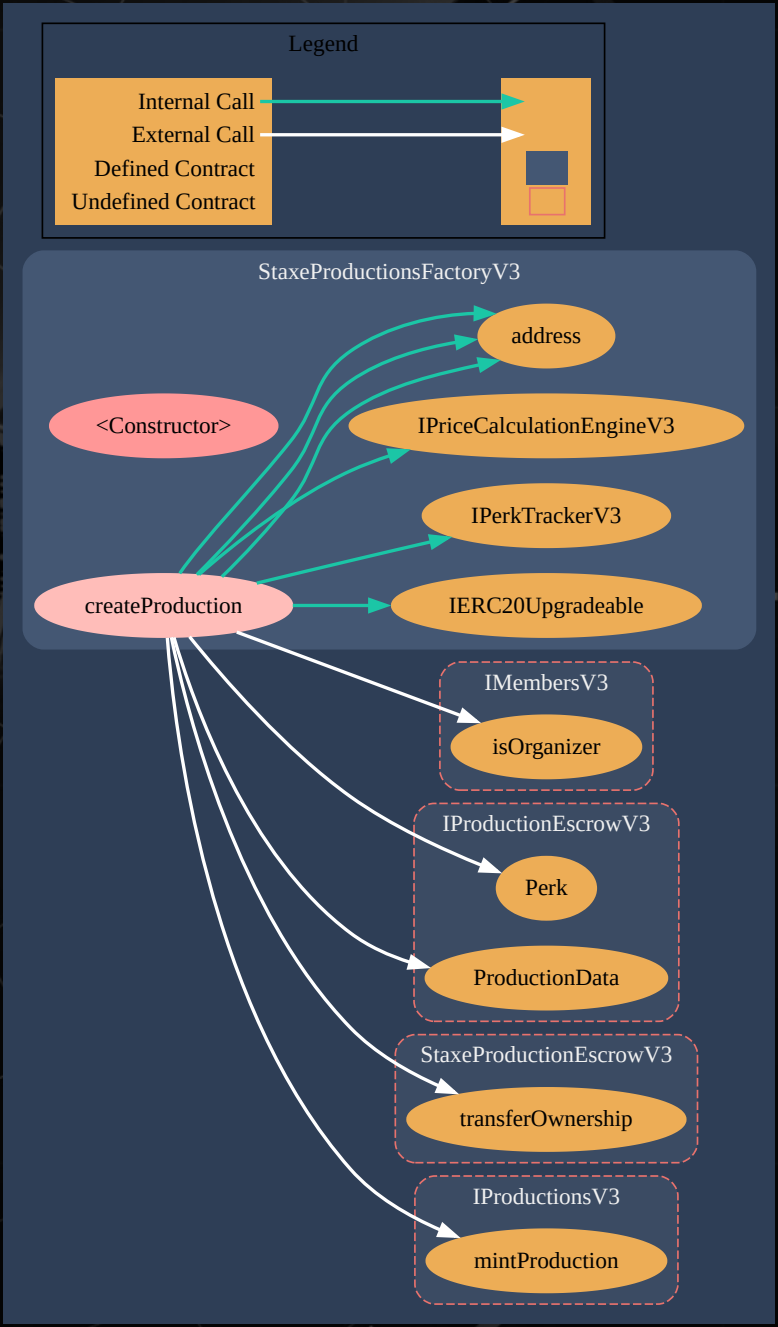
# Call Graph

## StaxeProductionsEscrowV3.sol



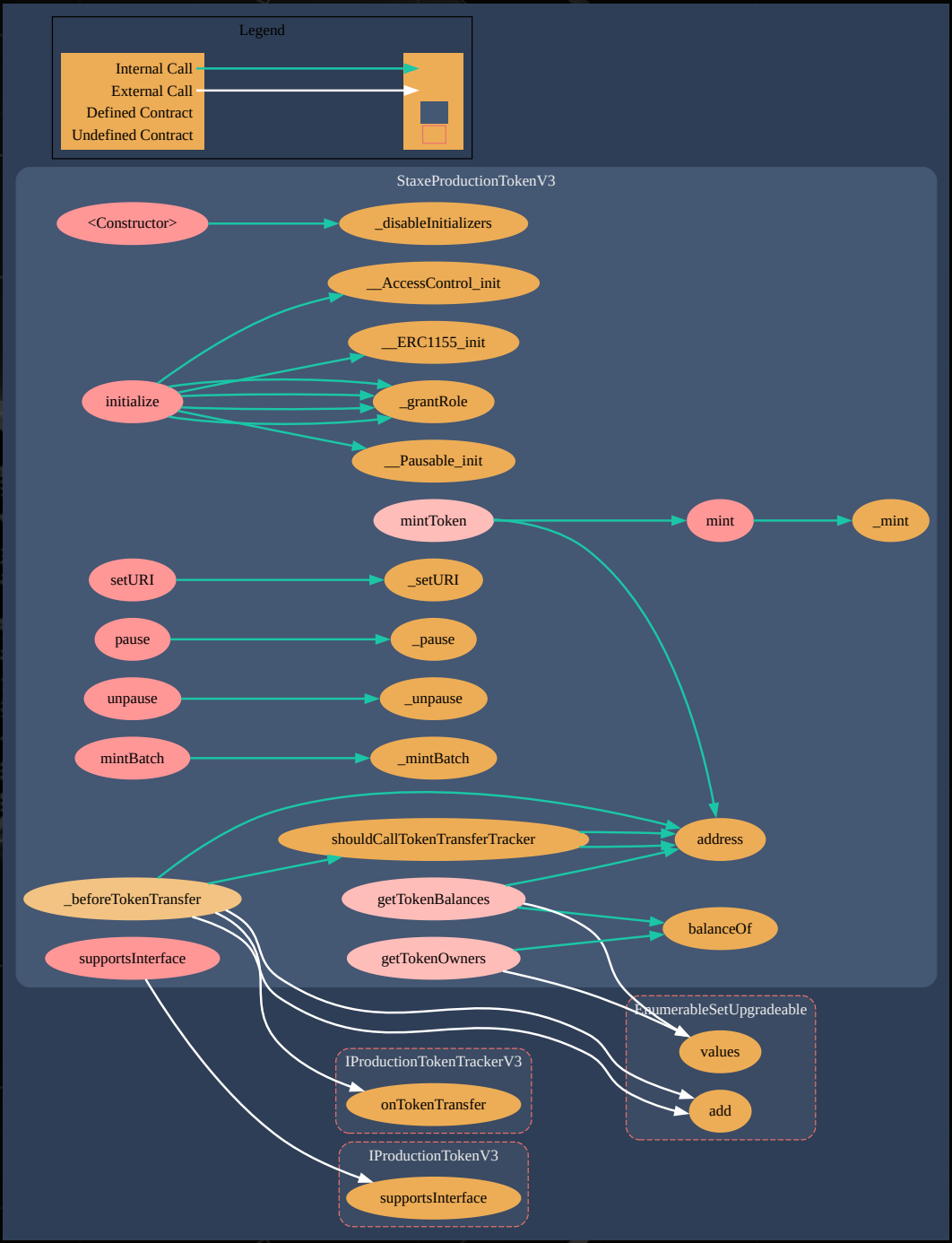
# Call Graph

## StaxeProductionsFactoryV3.sol



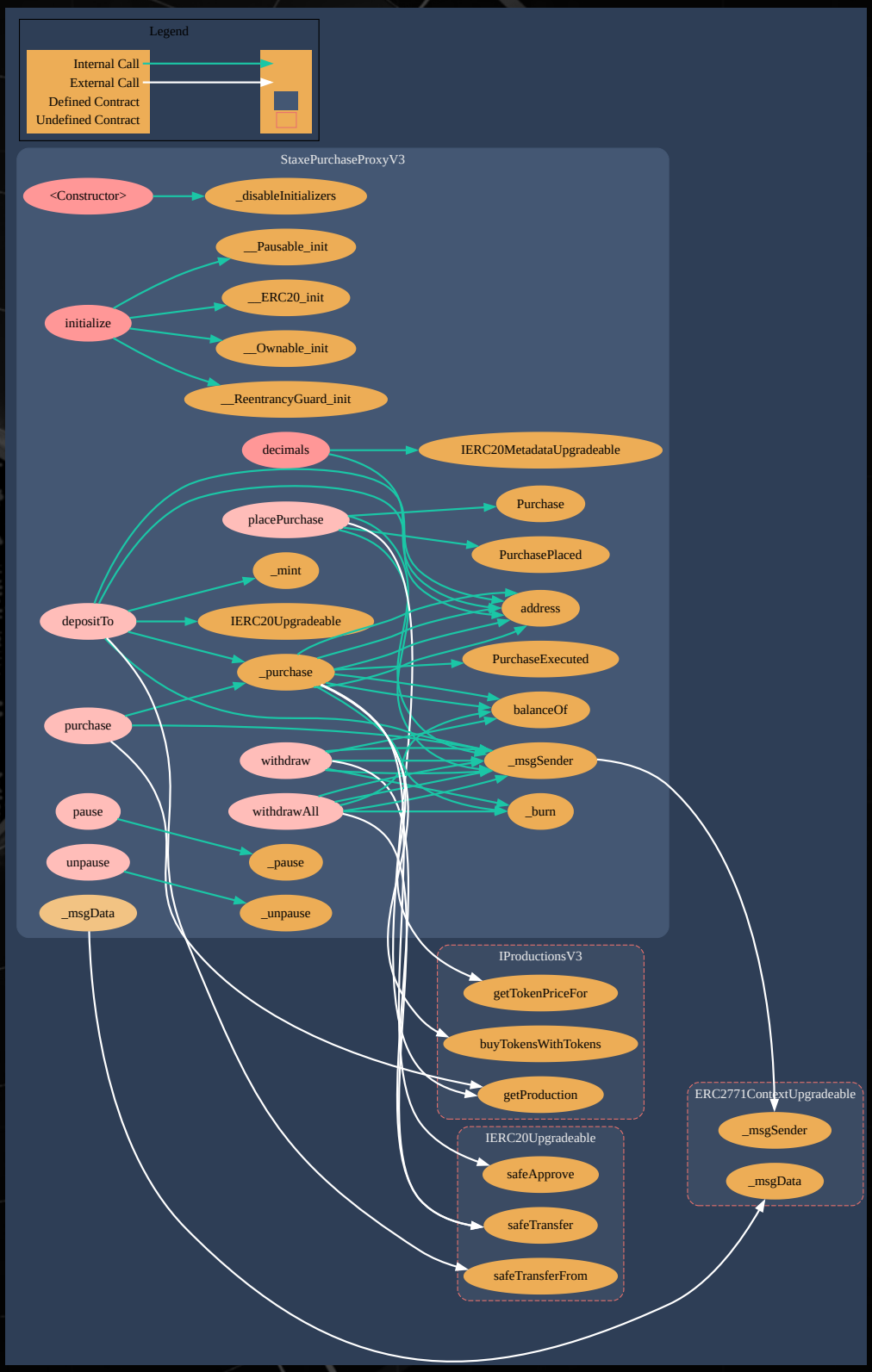
# Call Graph

## StaxeProductionToken.sol



# Call Graph

## StaxePurchaseProxyV3.sol



# Contract Interaction

**Issue**: Contract Interaction

**Severity**: -

**Location**: General

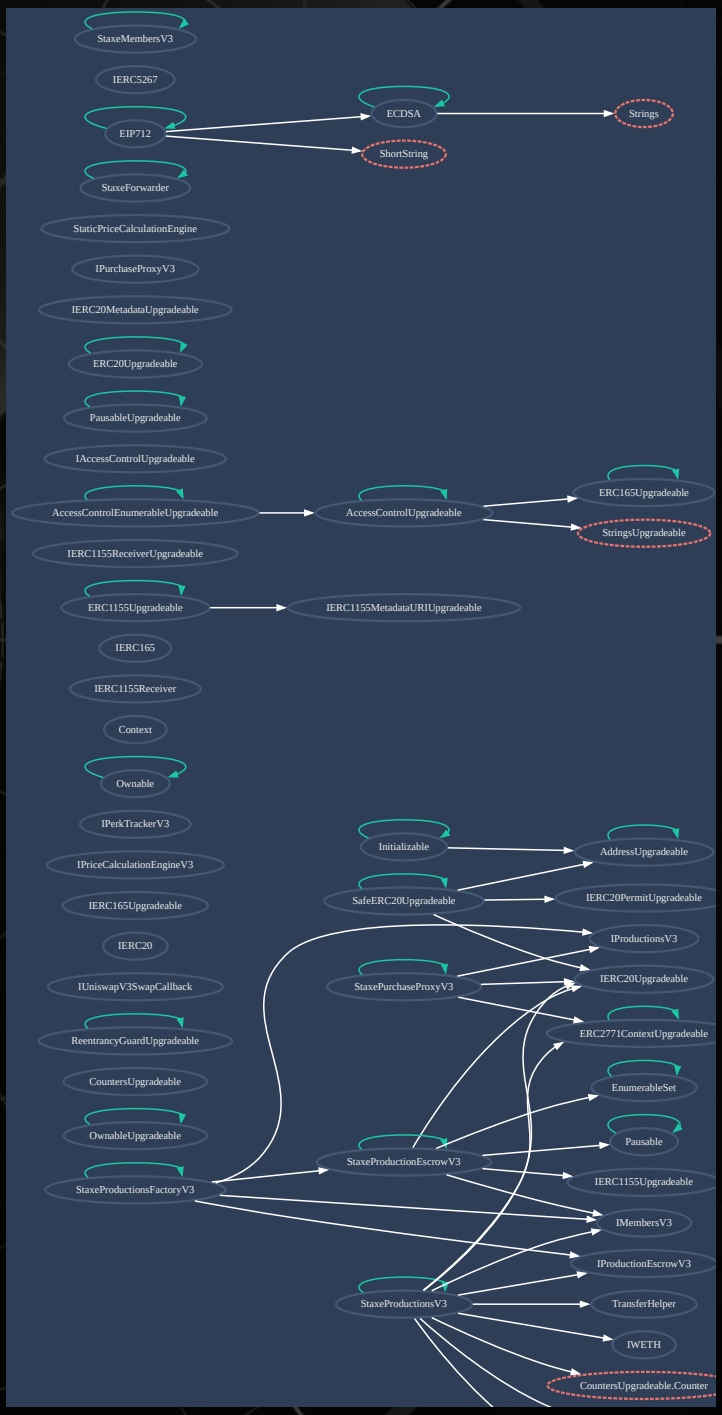
**Description**: A contract interaction graph provides a visual representation of the relationships and interactions between different smart contracts within an ecosystem. It shows how contracts interact with each other through function calls, events, and state variables.

Readers can visualize the relationships and dependencies between contracts, ensuring a comprehensive analysis of the smart contract ecosystem.

The graph can be used to highlight potential security risks, communication challenges, or optimization opportunities arising from the contract interactions.

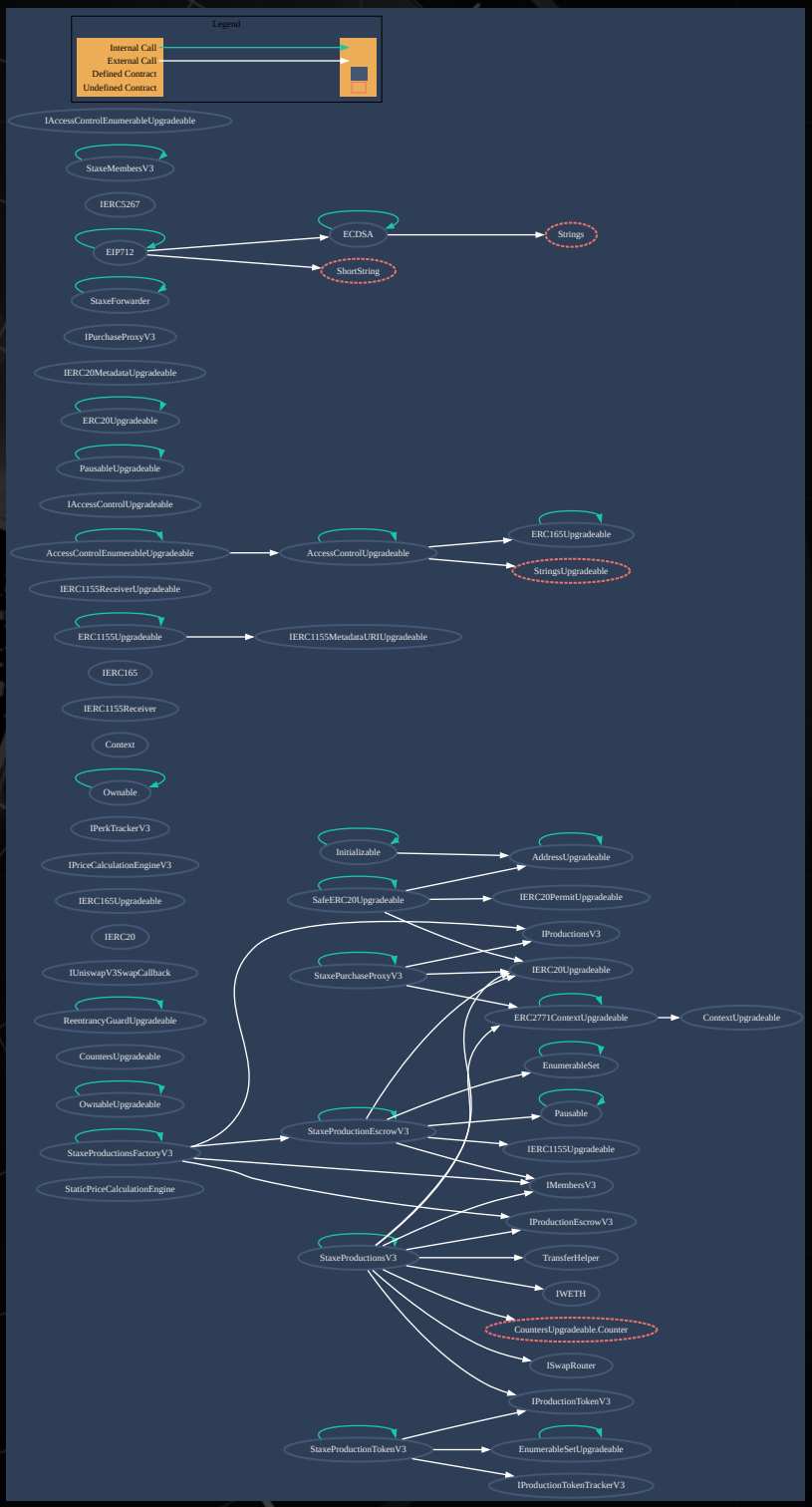
# Contract Interaction

## StaxeProductionsV3.sol



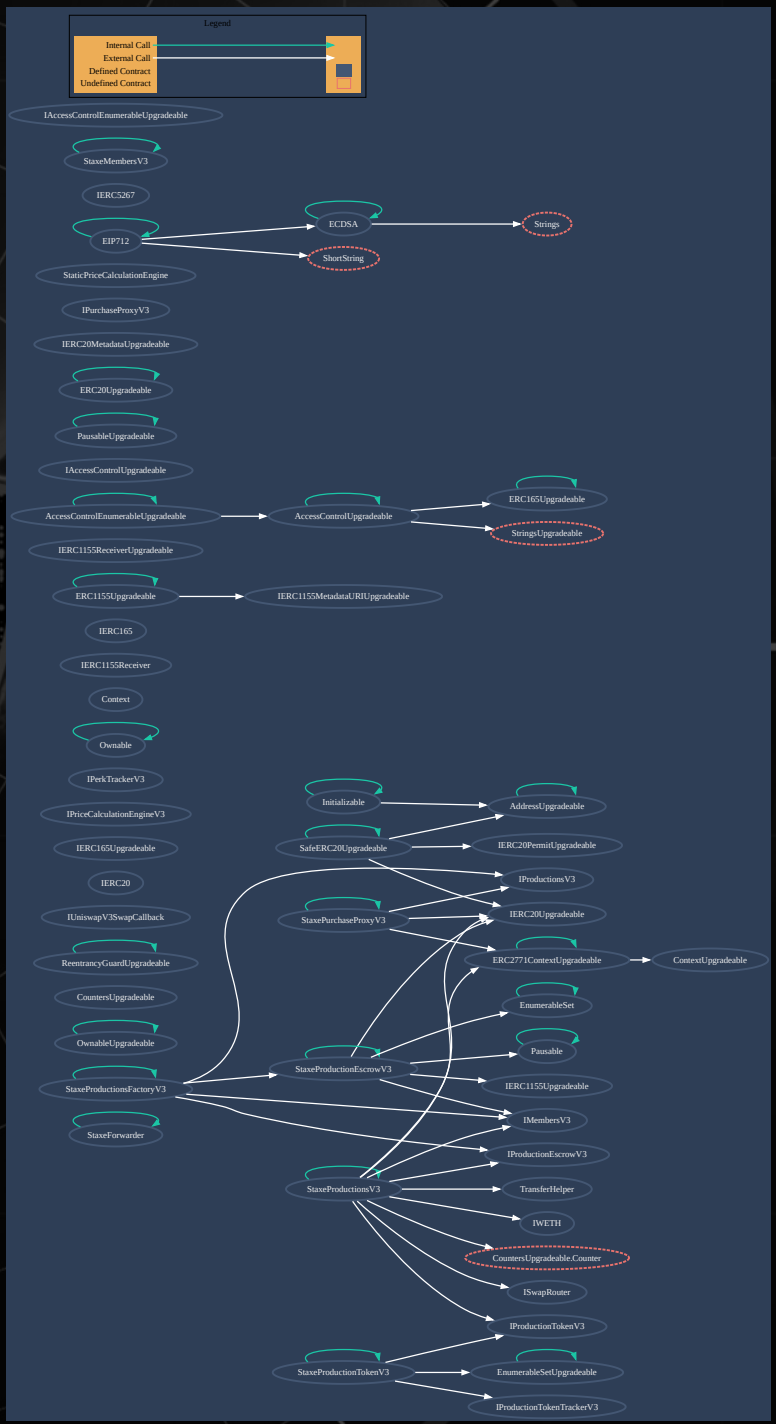
# Contract Interaction

## StaticPriceCalculationEngine.sol



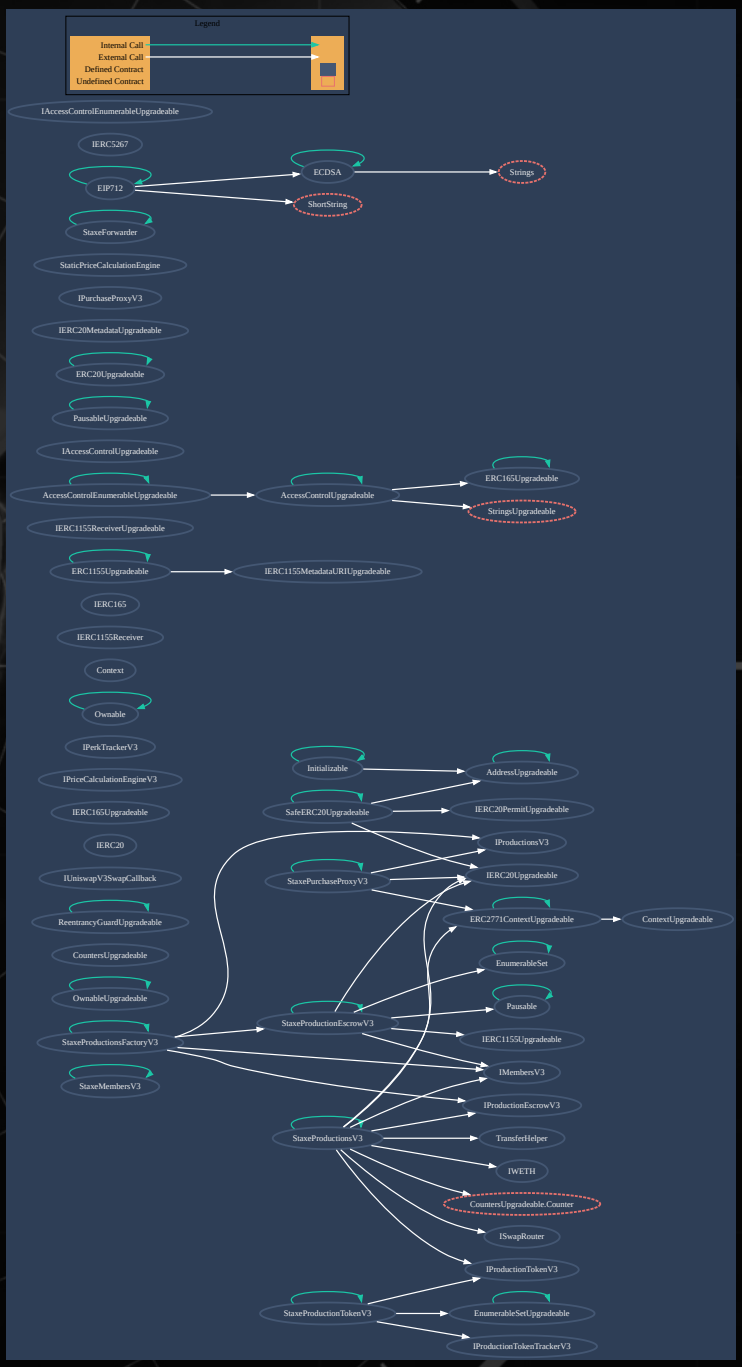
# Contract Interaction

## StaxeForwarder.sol



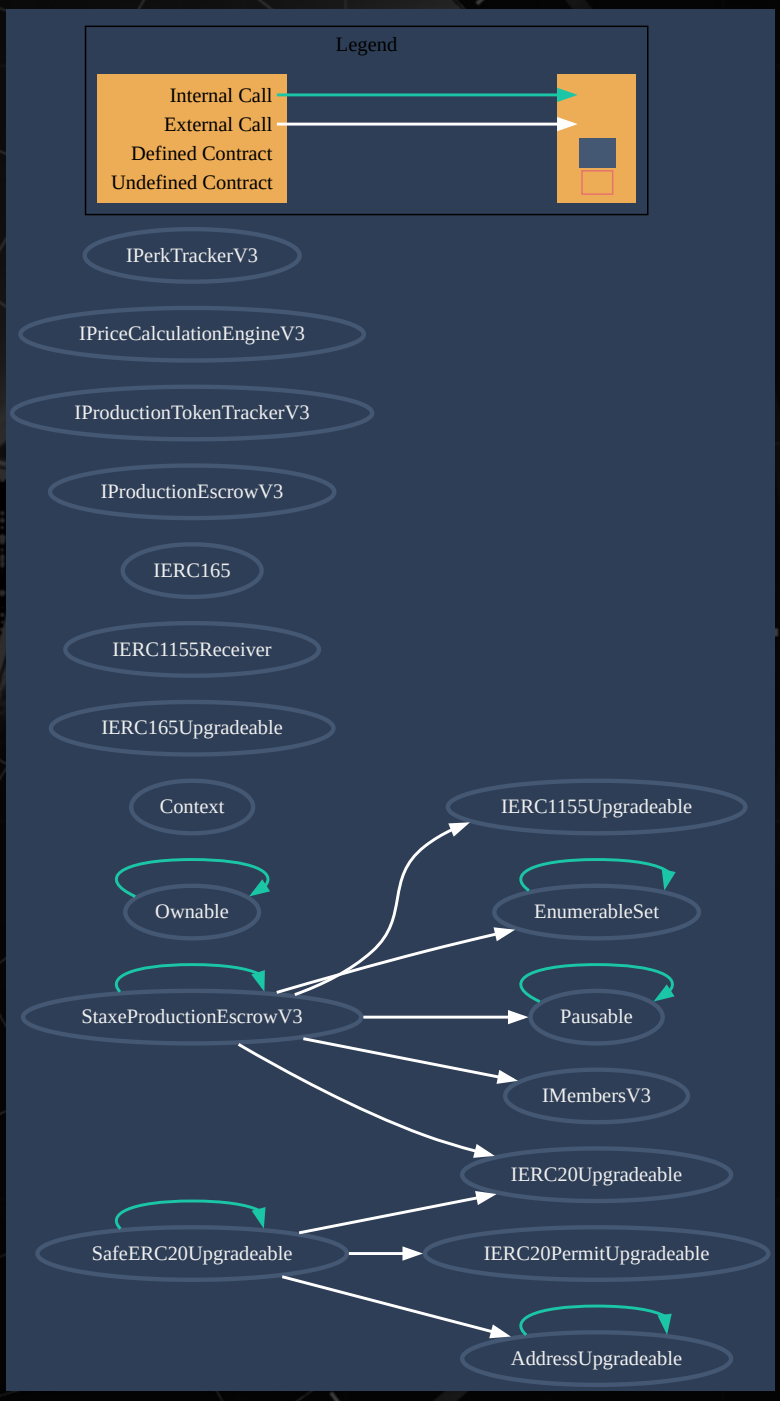
# Contract Interaction

## StaxeMembersV3.sol



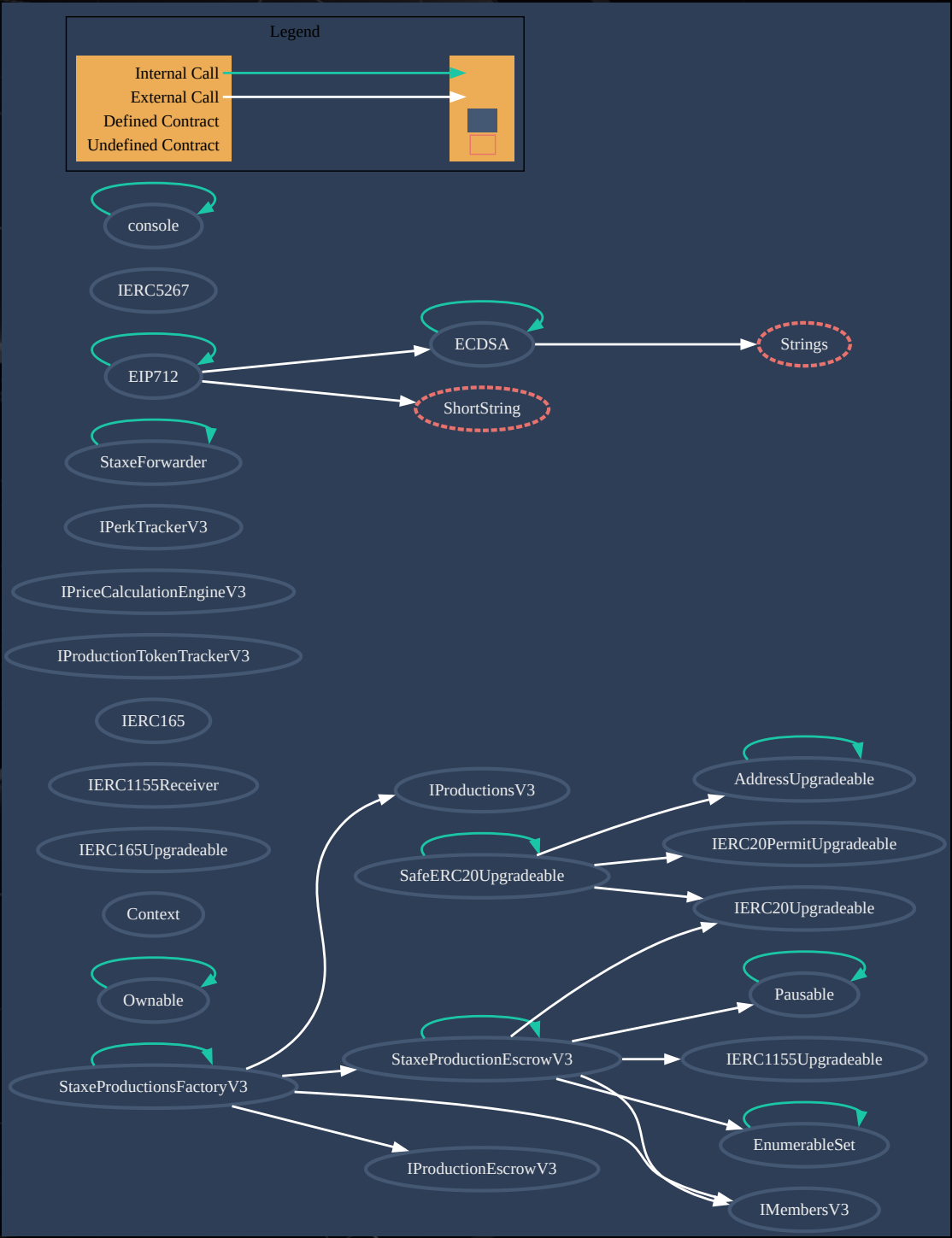
# Contract Interaction

## StaxeProductionsEscrowV3.sol



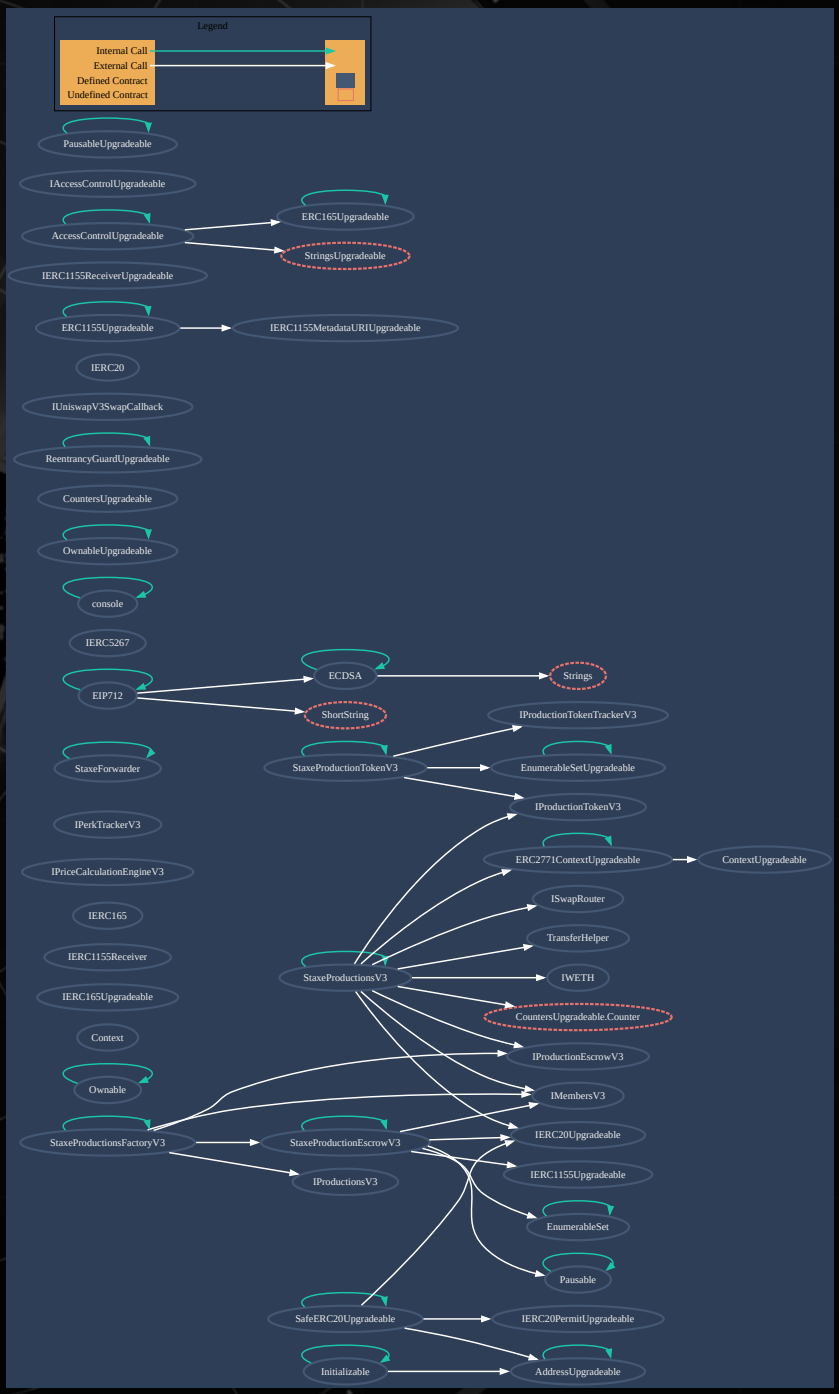
# Contract Interaction

## StaxeProductionsFactoryV3.sol



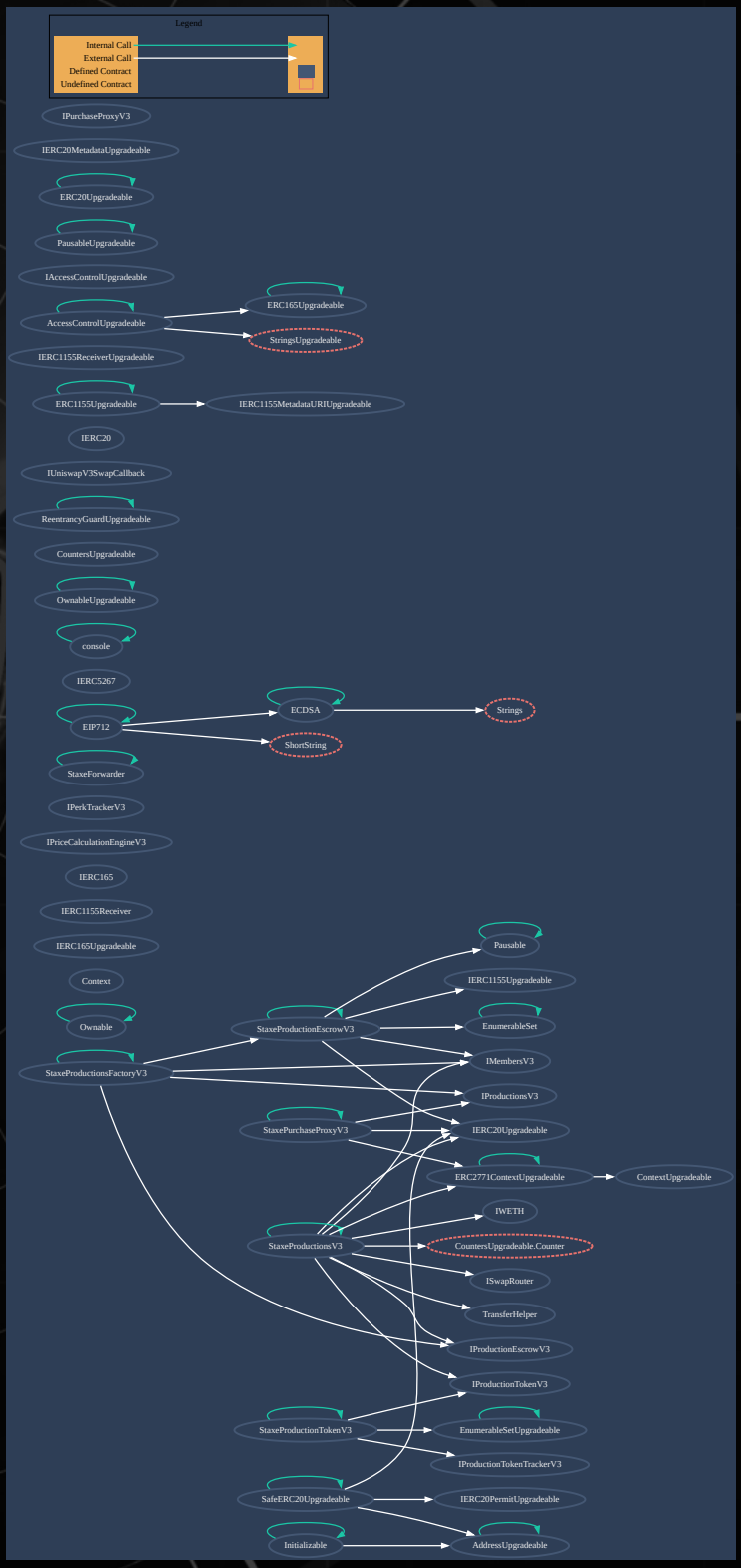
# Contract Interaction

## StaxeProductionToken.sol



# Contract Interaction

## StaxePurchaseProxyV3.sol



# Analysis

**Issue**: Cyclomatic Complexity

**Severity**: -

**Location**: General

**Description**: In the scope of this audit, after analyzing the cyclomatic complexity of the functions present in the contract, we can see that the majority of the functions have a complexity of 1 to 3.

This indicates that the functions in the contract are relatively simple and easy to understand. A cyclomatic complexity of 1 to 3 suggests a limited number of decision points and loops, which helps reduce the overall complexity of the contract.This facilitates contract maintenance and decreases the risk of errors related to excessive complexity.

However, it is important to note that cyclomatic complexity alone does not guarantee absolute security of the contract.

# Analysis

**Issue**: Upgradeable Contact(s)

**Severity**: -

**Location**: General

**Description**: Any upgradable smart contract carries a certain degree of risk as the process of upgrading the contract can introduce new vulnerabilities or flaws that were not present in the original code.

# Analysis

**Issue**: Contract Owner Privileges

**Severity**: -

**Location**: General

**Description**: The owner has control over these functions:

**StaxeProductionEscrowV3.sol**

| Function | Modifiers |
|---|---|
| _requireNotPaused | ['onlyOwner'] |
| _requirePaused | ['onlyOwner'] |
| renounceOwnership | ['onlyOwner'] |
| transferOwnership | ['onlyOwner'] |
| _pause | ['onlyOwner', 'whenNotPaused'] |
| _unpause | ['onlyOwner', 'whenPaused'] |
| approve | ['hasState', 'onlyOwner'] |
| decline | ['hasState', 'onlyOwner'] |
| finish | ['hasState', 'onlyOwner', 'whenNotPaused'] |
| close | ['hasState', 'onlyOwner'] |
| pause | ['hasState', 'onlyOwner', 'whenNotPaused'] |
| unpause | ['hasState', 'onlyOwner', 'whenPaused'] |
| paused | ['onlyOwner'] |
| cancel | ['hasState', 'onlyOwner', 'whenPaused'] |
| buyTokens | ['hasState', 'onlyOwner', 'whenNotPaused'] |
| depositProceeds | ['creatorOnly', 'hasState', 'onlyOwner'] |
| transferProceeds | ['hasState', 'onlyOwner'] |
| transferFunding | ['creatorOnly', 'hasState', 'onlyOwner', 'whenNotPaused'] |

# Analysis

**StaxeProductionsV3.sol**

| Function | Modifiers |
|---|---|
| renounceOwnership | ['onlyOwner'] |
| transferOwnership | ['onlyOwner'] |
| addTrustedEscrowFactory | ['onlyOwner'] |
| removeTrustedEscrowFactory | ['onlyOwner'] |
| addTrustedErc20Coin | ['onlyOwner'] |
| removeTrustedErc20Coin | ['onlyOwner'] |
| setRelayer | ['onlyOwner'] |

**StaxePurchaseProxyV3.sol**

| Function | Modifiers |
|---|---|
| renounceOwnership | ['onlyOwner'] |
| transferOwnership | ['onlyOwner'] |
| pause | ['onlyOwner', 'whenNotPaused'] |
| unpause | ['onlyOwner', 'whenPaused'] |

**Comment**: An onlyOwner function is a type of function in a smart contract that has an access control modifier restricting its execution to the owner of the contract. This security measure ensures that only the contract's owner can invoke certain sensitive functions,thereby enhancing the contract's security and integrity.

# Analysis

**Issue**: Solidity Naming Convention

**Severity**: Lowest / Code Style / Optimization

**Location**: General

**Status**: Acknowledged

**Description**: Solidity defines a naming convention that should be followed. When widely embraced and utilized, naming conventions may be quite effective. Different conventions can be used to express crucial meta information that would otherwise be unavailable.

**Comment:** The naming standard defined by Solidity should be followed. In a Solidity file, the following naming rules should be followed:

Contracts should be in CapWords.
Functions and parameters should be in mixedCase.
Constants should be in UPPER_CASE_WITH_UNDERSCORES

# Analysis

## StaxeProductionsV3.sol

**Issue:** Contract Size

**Severity:** Lowest / Code Style / Optimized Practice

**Location:** General

**Status:** Acknowledged

**Description:** Contract code size exceeds 24576 bytes (a limit introduced in Spurious Dragon). This contract may not be deployable on mainnet.

**Comment:** Consider enabling the optimizer (with a low "runs" value!), turning off revert strings, removing abundant code or using libraries.

# Analysis

## StaxeProductionsV3.sol

**Issue**: Missing Zero Address Validation

**Severity**: Low

**Location**: L82-100, L303-305

**Status**: Acknowledged

**Description**: Lack of zero address validation. Checking for the zero-address can help to prevent errors and vulnerabilities that may arise from passing an invalid address to a function. For example, if a function transfers funds to an invalid address, the funds will be irretrievably lost.

```
function setRelayer(address _relayer) external onlyOwner {
  relayer = _relayer;
}
```

**Comment**: It is generally recommended to include a zero-address check in functions that expect an Ethereum address as a parameter. Therefore, we recommend making sure that the address is not zero by adding checks.

# Analysis

## StaxeProductionsV3.sol

**Issue**: Missing Event for Access Control

**Severity**: Low

**Location**: L82-100, L303-305

**Status**: Acknowledged

**Description**: Events that are missing for critical access control parameters.

```
function setRelayer(address _relayer) external onlyOwner {
    relayer = _relayer;
}
```

**Comment**: It is recommended emitting events for the sensitive functions that are controlled by centralization roles.

# Analysis

## StaxeForwarder.sol

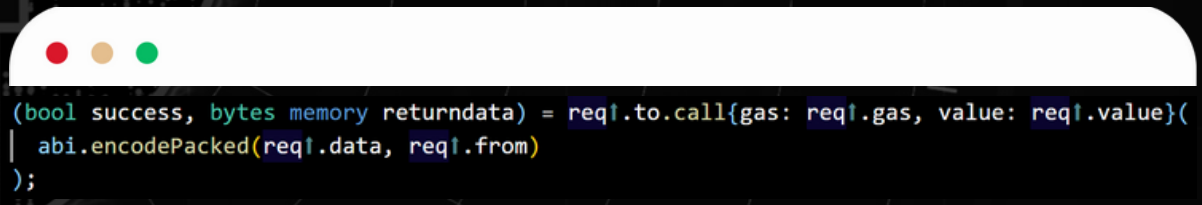
**Issue**: Usage of Low-level Calls

**Severity**: Lowest / Code Style / Optimization

**Location**: L54-56

**Status**: Acknowledged

**Description**: Failing to check the return value of a low-level message call could lead to unexpected consequences.



```
(bool success, bytes memory returndata) = req↑.to.call{gas: req↑.gas, value: req↑.value}(
  abi.encodePacked(req↑.data, req↑.from)
);
```

**Comment**: Whenever possible, it is recommended to avoid the use of low level calls.

# Analysis

## StaxeMembersV3.sol

**Issue**: Missing Zero Address Validation

**Severity**: Low

**Location**: L31-40

**Status**: Acknowledged

**Description**: Lack of zero address validation. Checking for the zero-address can help to prevent errors and vulnerabilities that may arise from passing an invalid address to a function. For example, if a function transfers funds to an invalid address, the funds will be irretrievably lost.

```
function initialize(address treasury↑, address _relayer↑) public initializer {
    __AccessControlEnumerable_init();
    relayer = _relayer↑;
    _setupRole(AccessControlUpgradeable.DEFAULT_ADMIN_ROLE, msg.sender);
    _setupRole(INVESTOR_ROLE, _msgSender());
    _setupRole(ORGANIZER_ROLE, _msgSender());
    _setupRole(APPROVER_ROLE, _msgSender());
    _grantRole(AccessControlUpgradeable.DEFAULT_ADMIN_ROLE, relayer);
    _grantRole(AccessControlUpgradeable.DEFAULT_ADMIN_ROLE, treasury↑);
}
```

# Testing Standards

The goal of the audit was to find any potential smart contract security problems and vulnerabilities. The information in this report should be used to understand the smart contract's risk exposure and as a guide to improving the smart contract's security posture by addressing the concerns that were discovered.

The blockchain platform is used to deploy and execute smart contracts. The platform, its programming language, and other smart contract-related applications all have vulnerabilities that may be exploited. As a result, the audit cannot ensure the audited smart contract(s) explicit security.Audits can't make statements or warranties on security of the code.It also cannot be deemed an adequate assessment of the code's utility and safety, bug-free status, or any statements of the smart contract.While we did our best in completing the study and publishing this report, it is crucial to emphasize that you should not rely only on it; we advocate all projects doing many independent audits and participating in a public bug bounty program to assure smart contract security.

# Testing Standards

1. Gather all relevant data.

2. Perform a preliminary visual examination of all documents and contracts.

3. Find security holes with specialist tools & manual review with independent experts.

4. Create and distribute a report.

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