



# SOLIDProof

*Bring trust into your projects*

**Blockchain Security | Smart Contract Audits | KYC  
Development | Marketing**

MADE IN GERMANY

# Ball Exchange

# AUDIT

SECURITY ASSESSMENT

**18. August, 2023**

FOR



**SolidProof\_io**



**@solidproof\_io**

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## Introduction

[SolidProof.io](#) is a brand of the officially registered company MAKE Network GmbH, based in Germany. We're mainly focused on Blockchain Security such as Smart Contract Audits and KYC verification for project teams.

Solidproof.io assess potential security issues in the smart contracts implementations, review for potential inconsistencies between the code base and the whitepaper/documentation, and provide suggestions for improvement.

## Disclaimer

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SolidProof.io Reports represent an extensive auditing process intending to help our customers increase the quality of their code while reducing the high level of risk presented by cryptographic tokens and blockchain technology. Blockchain technology and cryptographic assets present a high level of ongoing risk. SolidProof's position is that each company and individual are responsible for their own due diligence and continuous security. SolidProof in no way claims any guarantee of the security or functionality of the technology we agree to analyze.

# Project Overview

## Summary

Project Name	Ball Exchange
Website	<a href="https://ball.exchange/">https://ball.exchange/</a>
About the project	Ball Exchange is an innovative and highly flexible DEX built to support the Shibarium ecosystem
Chain	Shibarium
Language	Solidity
Codebase Link	<a href="https://github.com/ballExchange/BallExchange-SmartContracts">https://github.com/ballExchange/BallExchange-SmartContracts</a>
Commit	7f3423b
Unit Tests	Not Provided

## Social Medias

Telegram	<a href="https://t.me/BallExchange">https://t.me/BallExchange</a>
Twitter	<a href="https://twitter.com/BallShibarium">https://twitter.com/BallShibarium</a>
Facebook	N/A
Instagram	N/A
Github	<a href="https://github.com/ballExchange/">https://github.com/ballExchange/</a>
Reddit	N/A
Medium	N/A
Discord	<a href="https://discord.gg/ballexchange">https://discord.gg/ballexchange</a>
Youtube	N/A
TikTok	N/A
LinkedIn	N/A

## Audit Summary

Version	Delivery Date	Changelog
v1.0	17. August 2023	<ul style="list-style-type: none"> <li>• Layout Project</li> <li>• Automated- /Manual-Security Testing</li> <li>• Summary</li> </ul>
v1.1	18. August 2023	<ul style="list-style-type: none"> <li>• Reaudit</li> </ul>

**Note** - The following audit report presents a comprehensive security analysis of the smart contract utilized in the project. This analysis did not include functional testing (or unit testing) of the contract/s logic. We cannot guarantee 100% logical correctness of the contract as it was not functionally tested by us.



## File Overview

The Team provided us with the files that should be tested in the security assessment. This audit covered the following files listed below with an SHA-1 Hash. Moreover, other files associated with the project are not audited by our team and we cannot comment on its security

File Name	SHA-1 Hash
contracts/MasterChef.sol	48ce548ebeede265ce141381b1d374ec5a9e1a8d
contracts/BallRouter.sol	4af87e818aad56e573503c1c2bf160069d7cac66
contracts/BallExchange.sol	b7ce92c05f7bcd0257ae4b0eeabe0d1003e29df9
contracts/BallFactory.sol	6364c2ab7f9297e4758e37dcdc0662043c6e38bb

*Please note: Files with a different hash value than in this table have been modified after the security check, either intentionally or unintentionally. A different hash value may (but need not) be an indication of a changed state or potential vulnerability that was not the subject of this scan.*

## Imported packages

*Used code from other Frameworks/Smart Contracts (direct imports).*

Dependency / Import Path	Count
@openzeppelin/contracts/access/Ownable.sol	1
@openzeppelin/contracts/math/SafeMath.sol	1
@openzeppelin/contracts/utils/ReentrancyGuard.sol	1

**Note for Investors:** We only audited contracts mentioned in the scope above. All contracts related to the project apart from that are not a part of the audit, and we cannot comment on its security and are not responsible for it in any way



## Audit Information

### Vulnerability & Risk Level

Risk represents the probability that a certain source threat will exploit vulnerability and the impact of that event on the organization or system. The risk Level is computed based on CVSS version 3.0.

Level	Value	Vulnerability	Risk (Required Action)
<b>Critical</b>	9 - 10	A vulnerability that can disrupt the contract functioning in a number of scenarios, or creates a risk that the contract may be broken.	Immediate action to reduce risk level.
<b>High</b>	7 - 8.9	A vulnerability that affects the desired outcome when using a contract, or provides the opportunity to use a contract in an unintended way.	Implementation of corrective actions as soon as possible.
<b>Medium</b>	4 - 6.9	A vulnerability that could affect the desired outcome of executing the contract in a specific scenario.	Implementation of corrective actions in a certain period.
<b>Low</b>	2 - 3.9	A vulnerability that does not have a significant impact on possible scenarios for the use of the contract and is probably subjective.	Implementation of certain corrective actions or accepting the risk.
<b>Informational</b>	0 - 1.9	A vulnerability that have informational character but is not effecting any of the code.	An observation that does not determine a level of risk



## Auditing Strategy and Techniques Applied

Throughout the review process, care was taken to check the repository for security-related issues, code quality, and compliance with specifications and best practices. To this end, our team of experienced pen-testers and smart contract developers reviewed the code line by line and documented any issues discovered.

We check every file manually. We use automated tools only so that they help us achieve faster and better results.

## Methodology

The auditing process follows a routine series of steps:

1. Code review that includes the following:
  - a. Reviewing the specifications, sources, and instructions provided to SolidProof to ensure we understand the size, scope, and functionality of the smart contract.
  - b. Manual review of the code, i.e., reading the source code line by line to identify potential vulnerabilities.
  - c. Comparison to the specification, i.e., verifying that the code does what is described in the specifications, sources, and instructions provided to SolidProof.
2. Testing and automated analysis that includes the following:
  - a. Test coverage analysis determines whether test cases cover code and how much code is executed when those test cases are executed.
  - b. Symbolic execution, which is analysing a program to determine what inputs cause each part of a program to execute.
3. Review best practices, i.e., review smart contracts to improve efficiency, effectiveness, clarity, maintainability, security, and control based on best practices, recommendations, and research from industry and academia.
4. Concrete, itemized and actionable recommendations to help you secure your smart contracts.



## Overall Security

### Upgradeability

**Contract is not an upgradeable**



**Deployer cannot update the contract with new functionalities**

Description

The contract is not an upgradeable contract. The deployer is not able to change or add any functionalities to the contract after deploying.

Comment

N/A



## Ownership

**The ownership is not renounced**

**✗ The owner is not renounce**

Description

The owner has not renounced the ownership that means that the owner retains control over the contract's operations, including the ability to execute functions that may impact the contract's users or stakeholders. This can lead to several potential issues, including:

- Centralizations
- The owner has significant control over contract's operations

Comment

The contracts are 1:1 forked from Pancake Swap v2 with only minor name changes.

**Note** - If the contract is not deployed then we would consider the ownership to be not renounced. Moreover, if there are no ownership functionalities then the ownership is automatically considered renounced.



## Ownership Privileges

*These functions can be dangerous. Please note that abuse can lead to financial loss. We have a guide where you can learn more about these Functions.*

### Minting tokens

*Minting tokens refer to the process of creating new tokens in a cryptocurrency or blockchain network. This process is typically performed by the project's owner or designated authority, who has the ability to add new tokens to the network's total supply.*

#### Contract owner cannot mint new tokens

 **The owner cannot mint new tokens**

Description	The owner is not able to mint new tokens once the contract is deployed.
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Comment	N/A
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## Burning tokens

*Burning tokens is the process of permanently destroying a certain number of tokens, reducing the total supply of a cryptocurrency or token. This is usually done to increase the value of the remaining tokens, as the reduced supply can create scarcity and potentially drive up demand.*

Contract owner cannot burn tokens		 The owner cannot burn tokens
Description	The owner is not able burn tokens without any allowances.	
Comment	N/A	



## Blacklist addresses

*Blacklisting addresses in smart contracts is the process of adding a certain address to a blacklist, effectively preventing them from accessing or participating in certain functionalities or transactions within the contract. This can be useful in preventing fraudulent or malicious activities, such as hacking attempts or money laundering.*

**Contract owner cannot blacklist addresses**



**The owner cannot blacklist addresses**

Description	The owner is not able blacklist addresses to lock funds.
Comment	N/A





## Fees and Tax

*In some smart contracts, the owner or creator of the contract can set fees for certain actions or operations within the contract. These fees can be used to cover the cost of running the contract, such as paying for gas fees or compensating the contract's owner for their time and effort in developing and maintaining the contract.*

**Contract owner cannot set fees more than 25%**



**The owner cannot levy unfair taxes**

Description

The owner is not able to set the fees above 25%

Comment

N/A





## Lock User Funds

*In a smart contract, locking refers to the process of restricting access to certain tokens or assets for a specified period of time. When tokens or assets are locked in a smart contract, they cannot be transferred or used until the lock-up period has expired or certain conditions have been met.*

### Owner cannot lock the contract



**The owner cannot lock the contract**

Description

The owner is not able to lock the contract by any functions or updating any variables.

Comment

N/A

## External/Public functions

External/public functions are functions that can be called from outside of a contract, i.e., they can be accessed by other contracts or external accounts on the blockchain. These functions are specified using the function declaration's external or public visibility modifier.

## State variables

State variables are variables that are stored on the blockchain as part of the contract's state. They are declared at the contract level and can be accessed and modified by any function within the contract. State variables can be defined with a visibility modifier, such as public, private, or internal, which determines the access level of the variable.

## Components

 <b>Contracts</b>	 <b>Libraries</b>	 <b>Interfaces</b>	 <b>Abstract</b>
7	6	13	2


## Exposed Functions

This section lists functions that are explicitly declared public or payable. Please note that getter methods for public stateVars are not included.

 <b>Public</b>	 <b>Payable</b>
217	10

External	Internal	Private	Pure	View
179	175	5	37	81

## StateVariables

<b>Total</b>	 <b>Public</b>
60	48

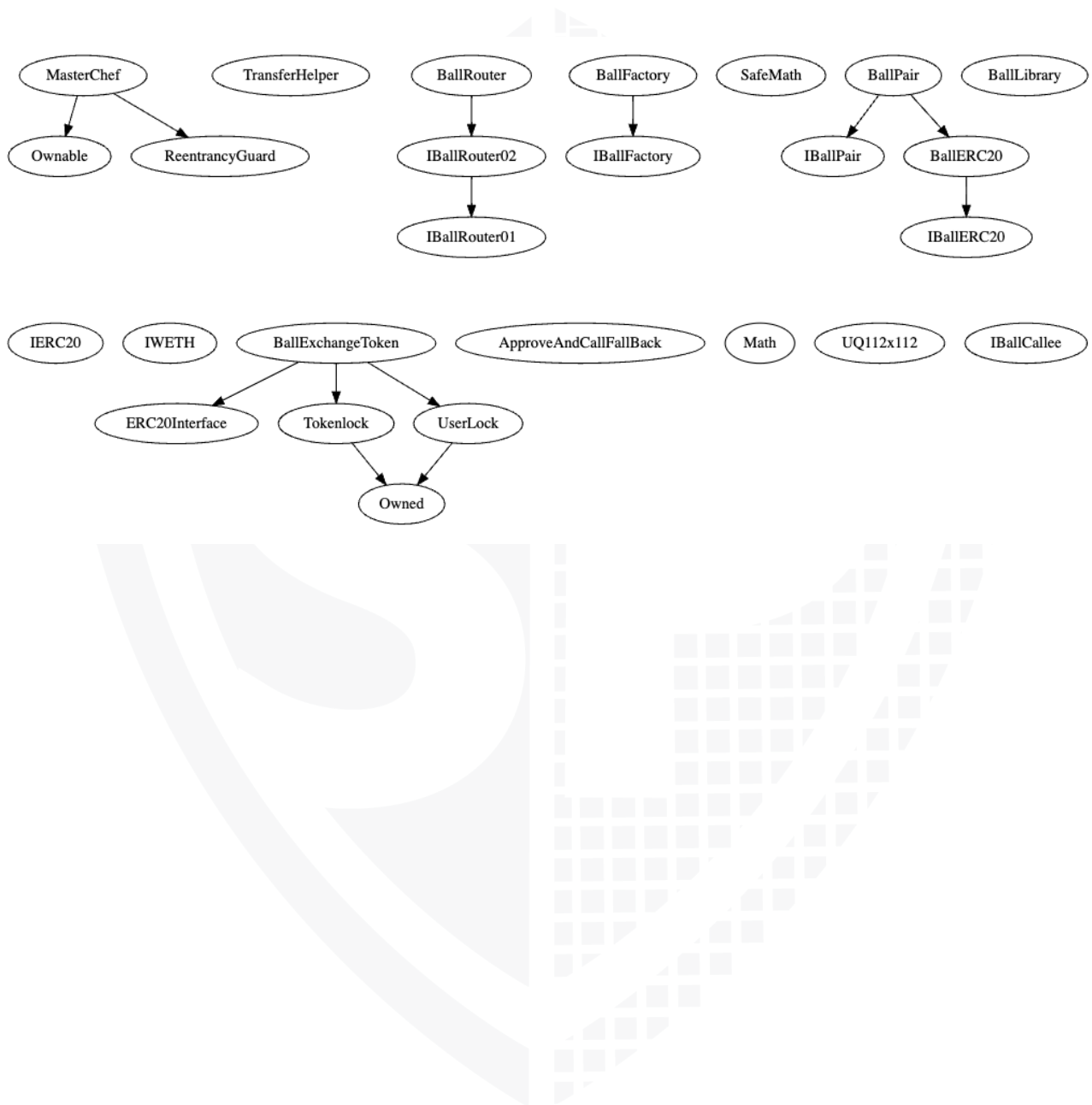


## Capabilities

Solidity Versions observed	 Transfers ETH	 Can Receive Funds	 Uses Hash Functions	 ECRecover
0.6.12 $\geq 0.6.0$ $\geq 0.6.2$ $\geq 0.5.0$ $= 0.6.6$ $\wedge 0.8.19$ $\wedge 0.8.0$ $\wedge 0.8.9$ $= 0.5.16$	Yes	Yes	Yes	Yes

## Inheritance Graph

An inheritance graph is a graphical representation of the inheritance hierarchy among contracts. In object-oriented programming, inheritance is a mechanism that allows one class (or contract, in the case of Solidity) to inherit properties and methods from another class. It shows the relationships between different contracts and how they are related to each other through inheritance.



## Centralization Privileges

*Centralization can arise when one or more parties have privileged access or control over the contract's functionality, data, or decision-making. This can occur, for example, if the contract is controlled by a single entity or if certain participants have special permissions or abilities that others do not.*

In the project, there are authorities that have access to the following functions:

File	Privileges
<b>BallExchange</b>	<ul style="list-style-type: none"> <li>onlyOwner               <ul style="list-style-type: none"> <li>The owner has no privileges in the contract</li> </ul> </li> </ul>
<b>BallFactory</b>	<ul style="list-style-type: none"> <li>The fee to setter address can set the fee receiver address</li> </ul>
<b>MasterChef</b>	<ul style="list-style-type: none"> <li>onlyOwner               <ul style="list-style-type: none"> <li>Add a new pool</li> <li>Burn tokens pending for burn</li> <li>Update Cake Rate</li> <li>Update burn admin address and whitelist addresses for special pools</li> <li>Update Boost Contract that can update the boost multiplier</li> </ul> </li> <li>The dev, NFT, and Partner addresses can update their respective addresses</li> </ul>

## Recommendations

To avoid potential hacking risks, it is advisable for the client to manage the private key of the privileged account with care. Additionally, we recommend enhancing the security practices of centralized privileges or roles in the protocol through a decentralized mechanism or smart-contract-based accounts, such as multi-signature wallets.

Here are some suggestions of what the client can do:

- Consider using multi-signature wallets: Multi-signature wallets require multiple parties to sign off on a transaction before it can be executed, providing an extra layer of security e.g. Gnosis Safe
- Use of a timelock at least with a latency of e.g. 48-72 hours for awareness of privileged operations
- Introduce a DAO/Governance/Voting module to increase transparency and user involvement



- Consider Renouncing the ownership so that the owner cannot modify any state variables of the contract anymore. Make sure to set up everything before renouncing.





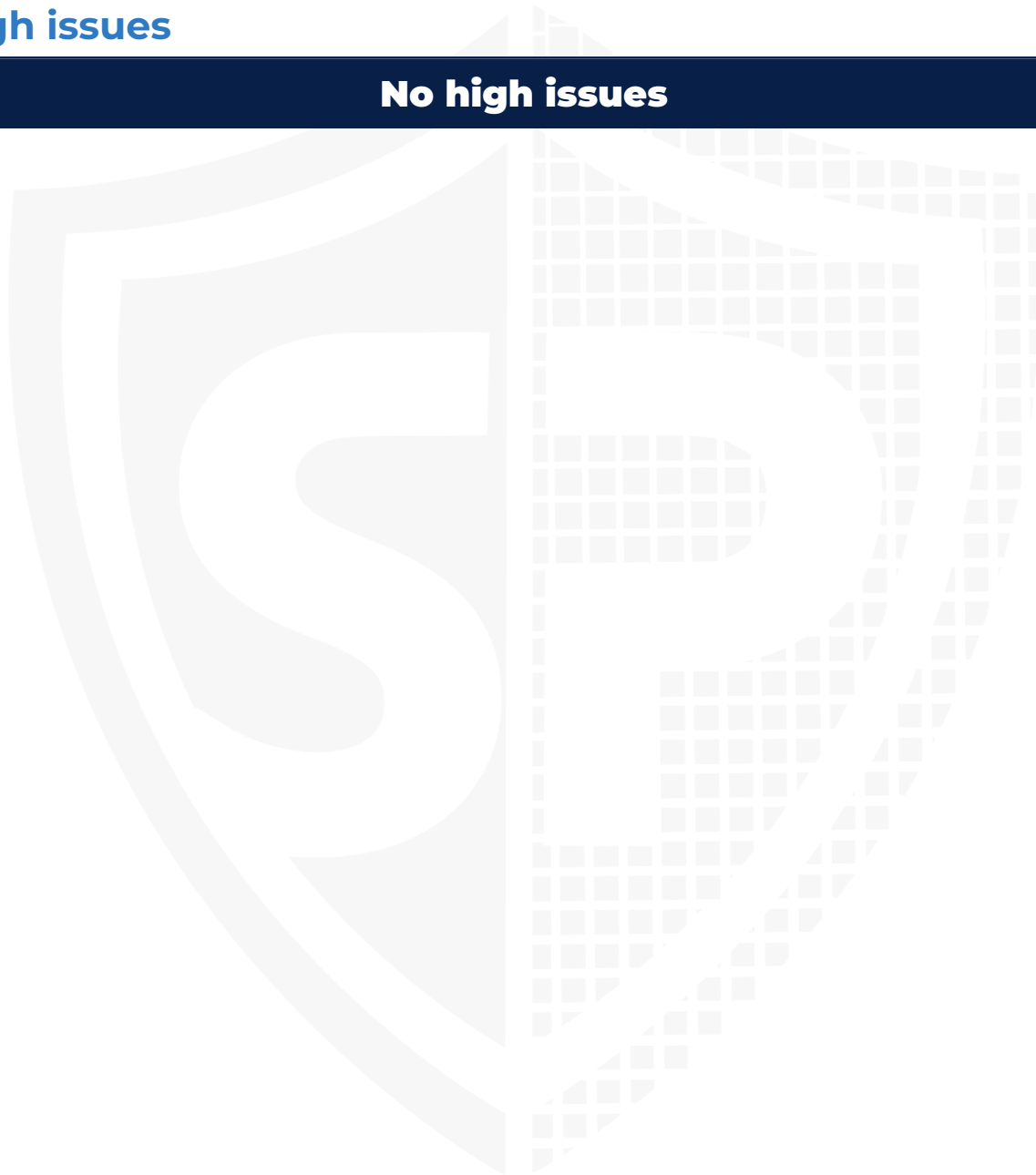
# Audit Results

## Critical issues

**No critical issues**

## High issues

**No high issues**



## Medium issues

### #1 | Owner can Freeze Assets

File	Severity	Location	Status
BallExchange	Medium	L175	Fixed

**Description** - The owner can call the “freeze” function and then all the other public functions of the contract will be locked and the users will be forced to hold their tokens. Hence, all trading will be stopped.

**Remediation** - We recommend not locking all functionalities in the contract and making it less centralized.

### #2 | Owner can burn tokens tokens

File	Severity	Location	Status
BallExchange	Medium	L450	Fixed

**Description** - The owner of the contract is able to burn tokens from any wallet without approval. Moreover, 20% of the total burn amount will be transferred to the Fee Account which is in the control of the owner.

**Remediation** - Make sure that it is not possible to burn tokens without allowance.



## Low issues

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### #1 | Old Compiler version

File	Severity	Location	Status
BallFactory BallRouter MasterChef	Low	N/A	Open

**Description** - The contracts use outdated compiler versions, which are not recommended for deployment as they may be susceptible to known vulnerabilities.

**Remediation** - Use a newer pragma version. At least use the 0.8.18 version.

## Informational issues

### #1 | NatSpec documentation missing

File	Severity	Location	Status
All	Informational	N/A	Fixed

**Description** - If you started to comment on your code, comment on all other functions, variables etc.

### #2 | Floating Pragma

File	Severity	Location	Status
All	Informational	N/A	Open

**Description** - The contracts should be deployed with the same compiler version and flag that they have been tested thoroughly. Locking the pragma helps to ensure that contracts do not accidentally get deployed using other versions.

### #3 | Contract doesn't import npm packages from source (like OpenZeppelin etc.)

File	Severity	Location	Status
All	Informational	N/A	Open

**Description** - We recommend importing all packages from npm directly without flattening the contract. Functions could be modified or can be susceptible to vulnerabilities.

### #4 | Wrong NatSpec Documentation

File	Severity	Location	Status
BallExchange	Informational	L450	Fixed

**Description** - The comments in the code are not aligned with the logic. The comment says that the burn will occur with allowance, but there is no such check for it.

## #5 | State Variable Default Visibility

File	Severity	Location	Status
BallExchange	Informational	L238, 241, 243	Fixed

**Description** - It is best practice to set the visibility of state variables explicitly.

## #6 | Missing Error Message

File	Severity	Location	Status
BallExchange	Informational	L474	Fixed

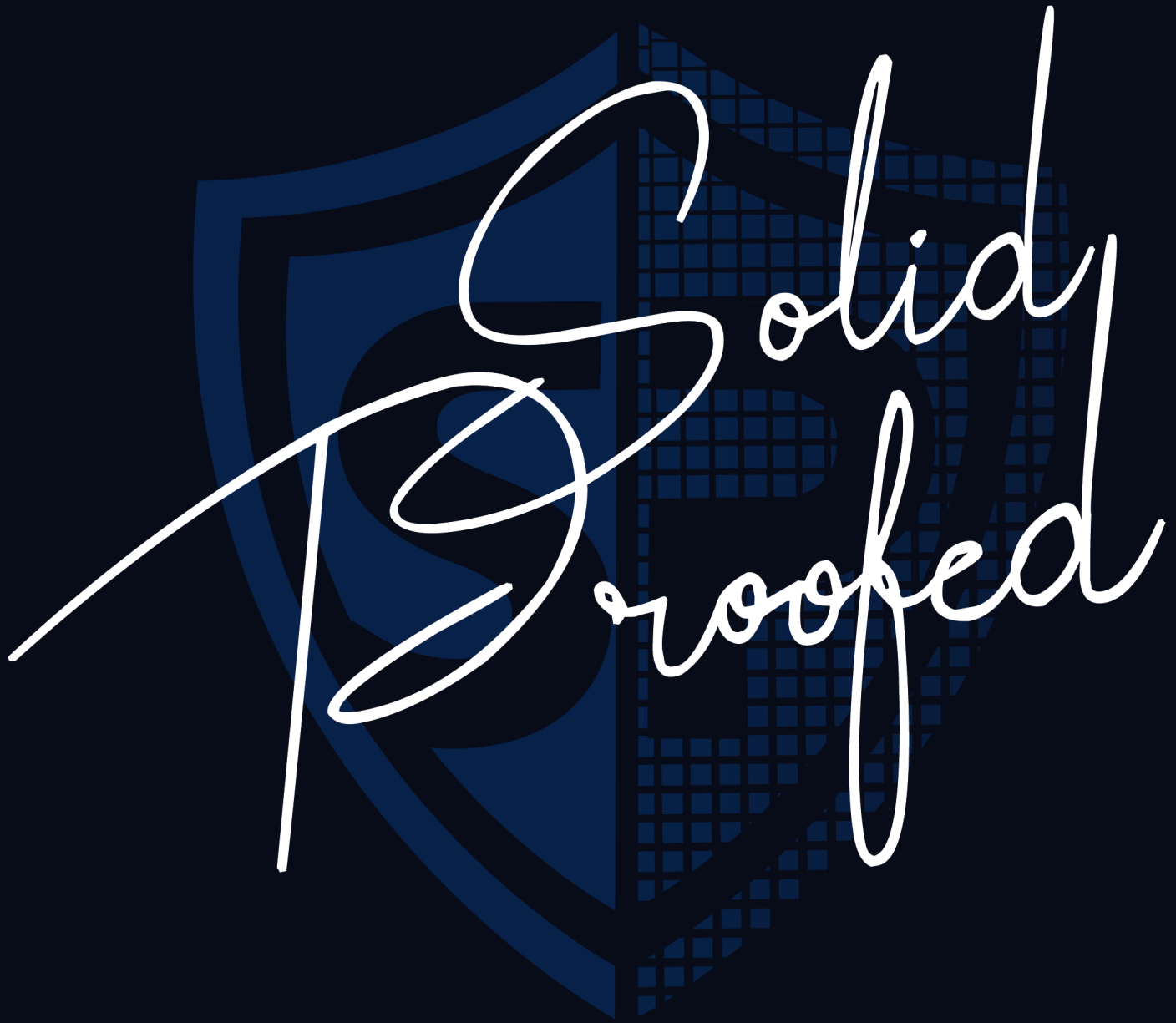
**Description** - We recommend displaying error messages inside the revert statement

**Note for Investors** - In the Masterchef contract, every time the "updatePool" function is called, a certain amount of tokens will be transferred to the dev, nft, and partner addresses. However, the amount (ratio) which will be transferred is deducted from the reward.

We recommend investors do their own research before investing because this update in the Masterchef contract may hinder the intended rewards that may or may not be promised by the project team.

## Legend for the Issue Status

Attribute or Symbol	Meaning
Open	The issue is not fixed by the project team.
Fixed	The issue is fixed by the project team.
Acknowledged(ACK)	The issue has been acknowledged or declared as part of business logic.



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