SOLIDProof

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Blockchain Security | Smart Contract Audits | KYC Development | Marketing

MADE IN GERMANY

Arbalest Vault

AUDIT

SECURITY ASSESSMENT

04. July, 2023

FOR

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

SolidProof.io reports are not, nor should be considered, an "endorsement" or "disapproval" of any particular project or team. These reports are not, nor should be considered, an indication of the economics or value of any "product" or "asset" created by any team. SolidProof.io do not cover testing or auditing the integration with external contract or services (such as Unicrypt, Uniswap, PancakeSwap etc'...)

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Project Overview

Summary

Project Name	Arbalest
Website	https://www.arbalest.finance/
About the project	Arbalest is an auto-compounding yield Optimizer built on the arbitrium blockchain that allows its users to earn compound interest on their crypto holdings. Arbalest earns you the highest APYs with safety, effective and efficiency in mind.
Chain	Arbitrum One
Language	Solidity
Codebase Link	https://github.com/ArbalestFinance/Contracts/blob/main/AETVault.sol
Commit	e0fc1c2
Unit Tests	Not Provided

Social Medias

Telegram	https://t.me/arbalest_finance_official/
Twitter	https://twitter.com/ArbalestFinance
Facebook	N/A
Instagram	N/A
Github	N/A
Reddit	N/A
Medium	N/A
Discord	N/A
Youtube	N/A
TikTok	N/A
LinkedIn	N/A

Audit Summary

Version	Delivery Date	Changelog
v1.0	04. July 2023	• Layout Project • Automated- /Manual-Security Testing • Summary

Note - This Audit report consists of a security analysis of the **Arbalest Vault** smart contract. This analysis did not include functional testing (or unit testing) of the contract's logic.

File Overview

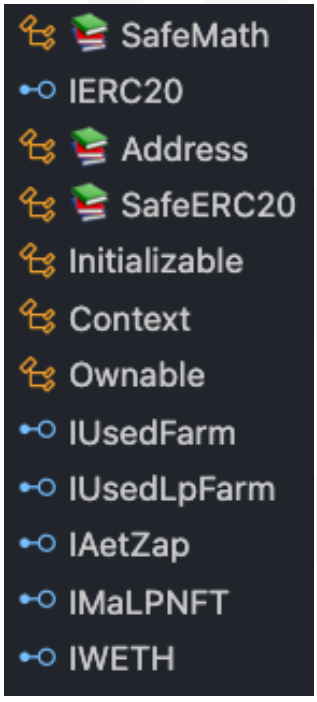
The Team provided us with the files that should be tested in the security assessment. This audit covered the following files listed below with an SHA-1 Hash.

File Name	SHA-1 Hash
contracts/AETVault.sol	55e2df03ef2f68c20b06cc8558293d158e21151b

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).



Note for Investors: We only Audited a token contract and a Vault contract for **Arbalest**. However, If the project has other contracts (for example, a Presale, staking contract etc), and they were not provided to us in the audit scope, then we cannot comment on its security and are not responsible for it in any way. Moreover, the actual code of the interfaces used in the vault contract was not provided to us so we cannot comment on their security.

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)
Critical	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.
High	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 aspossible.
Medium	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.
Low	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.
Informational	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 an upgradeable	❌ Deployer can update the contract with new functionalities
Description	The deployer can replace the old contract with a new one with new features. Be aware of this, because the owner can add new features that may have a negative impact on your investments.
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	N/A

Note - If the contract is not deployed then we would consider the ownership to be not renounced. Moreover, if there are no ownership functionalities, 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.
Comment	N/A

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

📝 Contracts	📚 Libraries	🔍 Interfaces	🎨 Abstract
4	3	7	0

Exposed Functions

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

🌐 Public	💰 Payable
48	4

External	Internal	Private	Pure	View
30	88	4	9	17

StateVariables

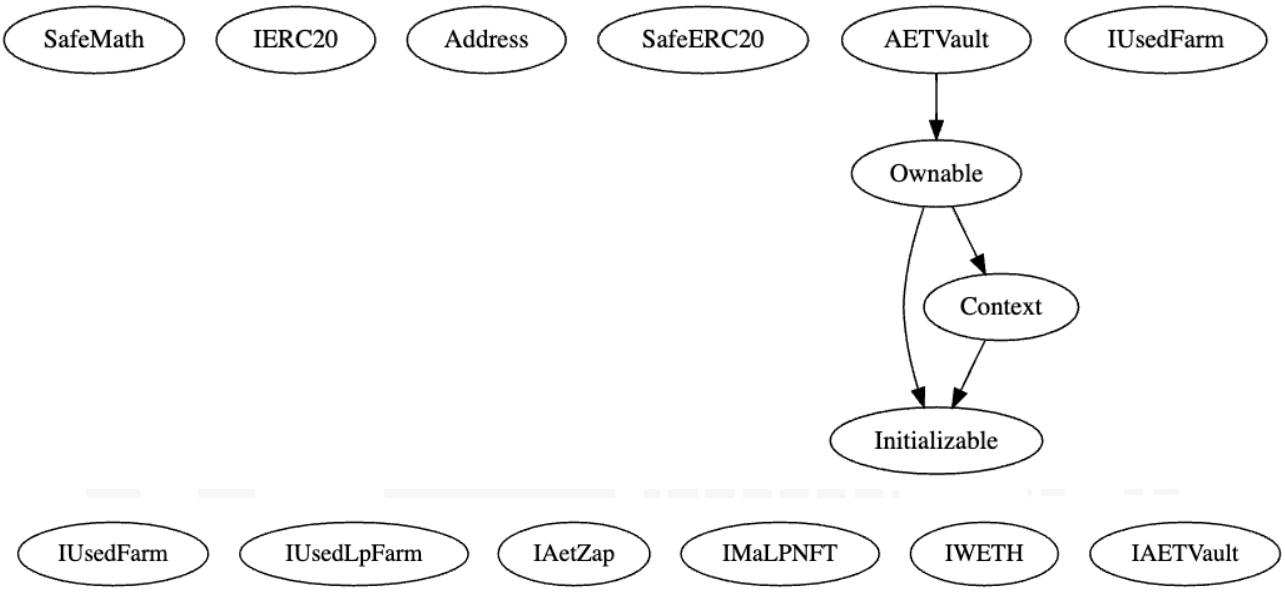
Total	🌐 Public
25	19

Capabilities

Solidity Versions observed	📤 Transfers ETH	💰 Can Receive Funds	🖥️ Uses Assembly	👥 DelegateCall
`>=0.6.0 <0.9.0`	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
Main	❖ only Gov Address – Change pool type – Set last stake amount – Set masterchef and lending pool addresses to any value. – Set Rtoken, AET ZAP, and GOV address ❖ onlyOwner - Change “want” address

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

#1 | Wrong Access control

File	Severity	Location	Status
Main	Medium	L707, 713	Open

Description - The harvest function is public but inside the logic, it is only callable by either the Masterchef address or the vault contract itself. This faulty logic arises because the harvest function calls the deposit function on lines 1203 and 1218 and the deposit function is implemented with the access control that only the Masterchef and the vault contracts are able to call it.

#2 | Logical Error

File	Severity	Location	Status
Main	Medium	L538, 1176	Open

Description - The onRewardEarn function will be called even when the pool type is above 3. Conclusively, the shares will also be added to the "_userAddress" even if the pool type is non-existing.

Remediation - Make sure that it is not possible to call this function if the pool type is non-existent.

#3 | Missng "isContract" check

File	Severity	Location	Status
Main	Medium	L1293, 1288	Open

Description - The contract doesn't have any checks to verify whether the master chef, lending pool, etc addresses are being set as a contract or not. However, if the Masterchef contract is set as an EOA only temporarily even then the EOA holder would be able to withdraw/deposit on anybody's behalf.

Remediation - We recommend putting a check to verify that address that is being set must not be an EOA

#4 | Missing Zero Address Validation

File	Severity	Location	Status
Main	Medium	L955, 977	Open

Description

- Make sure to validate that the address passed in the function parameters is “non-zero”. If this address is set to zero accidentally then the earn function will not work.
- Furthermore, in the deposit function if the user address is passed as zero then the earn rewards will be sent to the dead address

#5 | Missing Zero Address Validation

File	Severity	Location	Status
Main	Low	L1241, 1246, 1280—1303	Open

Description

- Make sure to validate that the address passed in the function parameters is “non-zero” otherwise the funds may be lost. The funds can be sent to a zero address if the address is not checked in the harvest function.

#6 | Missing Events

File	Severity	Location	Status
Main	Low	All	Open

Description

- Make sure to emit events for all the critical parameter changes in the contract to ensure the transparency and trackability of all the state variable changes in the contract.

#7 | Missng “value” check

File	Severity	Location	Status
Main	Low	L951, 931	Open

Description

- The value of the pool type must be below 4 because if it is above that then that pool type will not exist

#8 | Floating Pragma

File	Severity	Location	Status
Main	Informational	L713	Open

Description

- The current pragma Solidity directive is “>=0.6.0 <0.9.0". Contracts should be deployed with the same compiler version and flags that they have been tested thoroughly. Locking the pragma helps to ensure that contracts do not accidentally get deployed using other versions

9 | Contract doesn’t import npm packages from source (like OpenZeppelin etc.)

File	Severity	Location	Status
Main	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.

10 | Wrong Error Message

File	Severity	Location	Status
Main	Informational	L1126	Open

Description

- The error message is not aligned with the condition that is been checked. Hence, the error message must resemble the condition and provide a detailed message about why the condition has failed.

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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