SECURITY AUDIT REPORT

DZap Zapping

DATE

02 June 2025

PREPARED BY

0xTeam.

WEB3 AUDITS

info@0xTeam.Space

0xTeamSpace

0xTeamSpace

Contents

Revision History & Version Control

Version	Date	Author's	Description
1.0	28 May 2025	Gurkirat & Adithya	Initial Audit Report
2.0	30 May 2025	Gurkirat & Adithya	Secondary Audit Report
3.0	02 June 2025	Gurkirat & Adithya	Final Audit Report

0xTeam conducted a comprehensive Security Audit on the DZap to ensure the overall code quality, security, and correctness. The review focused on ensuring that the code functions as intended, identifying potential vulnerabilities, and safeguarding the integrity of DZap's operations against possible attacks.

Report Structure

The report is divided into two primary sections:

1. **Executive Summary** : Provides a high-level overview of the audit findings.
2. **Technical Analysis** : Offers a detailed examination of the Smart contracts code.

Note :
The analysis is static and manual, exclusively focused on the smart contract code. The information provided in this report should be used to assess the security, quality, and expected behavior of the code.

1.0 Disclaimer

This is a summary of our audit findings based on our analysis, following industry best practices as of the date of this report.However, it is important to understand that no security audit can guarantee complete protection against all possible security threats. The audit focuses on Smart contracts coding practices and any issues found in the code, as detailed in this report. For a complete understanding of our analysis, you should read the full report. We have made every effort to conduct a thorough analysis, but it's important to note that you should not rely solely on this report and cannot make claims against us based on its contents. We strongly advise you to perform your own independent checks before making any decisions. Please read the disclaimer below for more information.

DISCLAIMER: By reading this report, you agree to the terms outlined in this disclaimer. If you do not agree, please stop reading immediately and delete any copies you have. This report is for informational purposes only and does not constitute investment advice. You should not rely on the report or its content, and 0xTeam and its affiliates (including all associated companies, employees, and representatives) are not responsible for any reliance on this report.The report is provided "as is" without any guarantees. 0xTeam excludes all warranties, conditions, or terms, including those implied by law, regarding quality, fitness for a purpose, and use of reasonable care. Except where prohibited by law, 0xTeam is not liable for any type of loss or damage, including direct, indirect, special, or consequential damages, arising from the use or inability to use this report. The findings are solely based on the Smart contracts code provided to us.

2.0 Executive Summary

2.1 Overview

0xTeam has meticulously audited the DZap Zapping Smart contracts project. The primary objective of this audit was to assess the security, functionality, and reliability of the DZap's before their deployment on the blockchain. The audit focused on identifying potential vulnerabilities, evaluating the contract's adherence to best practices, and providing recommendations to mitigate any identified risks. The comprehensive analysis conducted during this period ensures that the DZap is robust and secure, offering a reliable environment for its users.

2.2 Scope

The scope of this audit involved a thorough analysis of the DZap Zapping Smart contracts, focusing on evaluating its quality, rigorously assessing its security, and carefully verifying the correctness of the code to ensure it functions as intended without any vulnerabilities.

Files in Examination:

Language	Solidity
In-Scope	• contracts\wallet\DZapExecutor.sol • contracts\wallet\DZapWallet.sol • contracts\wallet\DZapWalletFactory.sol • contracts\zap\DZapZapCore.sol
Fixed Review Commit Hash	d1def85b720df5cde679bcd36ffef8d1dbc37c33

OUT-OF-SCOPE: External Smart contracts code, other imported code.

2.3 Audit Summary

Name	Verified	Audited	Vulnerabilities
DZap	Yes	Yes	Refer Section 5.0

2.4 Summary of Findings

ID	Title	Severity	Fixed
[L-01]	Missing Zero Address Check in Executor Whitelisting	LOW	✔
[L-02]	State variables that could be declared immutable	LOW	✔
[L-03]	Missing Optional Deadline Parameter in EIP-712 Signed Data for Additional Replay Protection	LOW	✔

2.5 Vulnerability Summary

High	Medium	Low	Informational
0	0	3	0

2.6 Recommendation Summary

Severity

Issues	High	Medium	Low	Informational
Open	0	0	3	0
Resolved			3	
Acknowledged				
Partially Resolved				

- **Open:** Unresolved security vulnerabilities requiring resolution.
- **Resolved:** Previously identified vulnerabilities that have been fixed.
- **Acknowledged:** Identified vulnerabilities noted but not yet resolved.
- **Partially Resolved:** Risks mitigated but not fully resolved.

3.0 Checked Vulnerabilities

We examined Smart contracts for widely recognized and specific vulnerabilities. Below are some of the common vulnerabilities considered.

Category	Check Items
Source Code Review	➔ Reentrancy Vulnerabilities ➔ Ownership Control ➔ Time-Based Dependencies ➔ Gas Usage in Loops ➔ Transaction Sequence Dependencies ➔ Style Guide Compliance ➔ EIP Standard Compliance ➔ External Call Verification ➔ Mathematical Checks ➔ Type Safety ➔ Visibility Settings ➔ Deployment Accuracy ➔ Repository Consistency
Functional Testing	➔ Business Logic Validation ➔ Feature Verification ➔ Access Control and Authorization ➔ Escrow Security ➔ Token Supply Management ➔ Asset Protection ➔ User Balance Integrity ➔ Data Reliability ➔ Emergency Shutdown Mechanism

4.0 Techniques , Methods & Tools Used

The following techniques, methods, and tools were used to review all the smart contracts

- **Structural Analysis:**
  EThis involves examining the overall design and architecture of the smart contract. We ensure that the contract is logically organised, scalable, and follows industry best practices. This step is crucial for identifying potential structural issues that could lead to vulnerabilities or maintenance challenges in the future.

- **Static Analysis:**
  Static analysis is conducted using automated tools to scan the contract's codebase for common vulnerabilities and security risks without executing the code. This process helps identify issues such as reentrancy, arithmetic errors, and potential denial-of-service (DOS) vulnerabilities early on, allowing for quick remediation.

- **Code Review / Manual Analysis:**
  A manual, in-depth review of the smart contract's code is performed to verify the logic and ensure it matches the intended functionality as described in the project's documentation. During this phase, we also confirm the findings from the static analysis and check for any additional issues that may not have been detected by automated tools.

- **Dynamic Analysis:**
  Dynamic analysis involves executing the smart contract in various controlled environments to observe its behaviour under different conditions. This step includes running comprehensive test cases, performing unit tests, and monitoring gas consumption to ensure the contract operates efficiently and securely in real-world scenarios.

- **Tools and Platforms Used for Audit:**
  Utilising tools such as Remix , Slither, Aderyn, Solhint for static analysis, and platforms like Hardhat and Foundry for dynamic testing and simulation.

Note: The following values for "Severity" mean:

- High: Direct and severe impact on the funds or the main functionality of the protocol.
- Medium: Indirect impact on the funds or the protocol's functionality.
- Low: Minimal impact on the funds or the protocol's main functionality.
- Informational: Suggestions related to good coding practices and gas efficiency.

5.0 Technical Analysis

Low

[L-01] Missing Zero Address Check in Executor Whitelisting

Severity
Low

Location	Functions
Contracts\wallet\DZapExecutor.sol	➔ `_setExecutors()` [Line-92]

Issue Description
The _setExecutors internal function does not validate that the addresses provided in the _executorsArr array are non-zero. This allows address(0) to be whitelisted as an executor in the _executors mapping. Although the zero address cannot be used as a valid msg.sender, storing it in the whitelist mapping pollutes contract state.

Impact / Proof of Concept
If address(0) is passed to the setExecutorWhitelisting function:
`setExecutorWhitelisting([address(0)], true);`

Then _executors[address(0)] will be set to true, despite address(0) being an invalid or non-existent actor. Although msg.sender == address(0) is not practically possible, the presence of address(0) in an access control mapping may mislead developers, auditors, or off-chain systems relying on accurate executor lists. This could result in incorrect assumptions, wasted gas, or issues in other parts of the system if this mapping is reused.

```
before(async () => {
    signers = await getNamedSigners()
    chainId = parseInt((await ethers.provider.getNetwork()).chainId.toString())

    // ----------------------------------------
    mock = await deployMockContract(signers.deployer)
    adapters = await deployAdapters(signers.deployer)

    contracts = await deployContracts(signers.deployer, {
      [CONTRACTS.DZapWalletManager]: [
        signers.walletManagerOwner.address,
```

```
        DEFAULT_QUORUM,
        [
          signers.validator1.address,
          signers.validator2.address,
          signers.validator3.address,
        ],
      ],
      [CONTRACTS.DZapWalletFactory]: [signers.factoryOwner.address],
      [CONTRACTS.DZapExecutor]: [
        signers.executorOwner.address,
        placeholders.factoryAddress,
        [signers.walletExecutor1.address,
          "0x0000000000000000000000000000000000000000"
        ],
      ],
    })

    await mintTokenForErc20Exchange(mock)

    // ----------------------------------------

    snapshotId = await snapshot.take()
  })

describe('1) Deployment', async () => {
    it('1.1 Should correctly deploy and initialze it', async () => {
      expect(await contracts.dZapExecutor.owner()).equal(
        signers.executorOwner.address
      )
      expect(await contracts.dZapExecutor.DZAP_FACTORY()).equal(
        contracts.address.dZapWalletFactory
      )
      expect(
        await contracts.dZapExecutor.isExecutorWhitelisted(
          signers.walletExecutor1.address
        )
      ).equal(true)
      expect(
        await contracts.dZapExecutor.isExecutorWhitelisted(
          "0x0000000000000000000000000000000000000000"
        )
      ).equal(true)
      console.log(`Is address walletExecutor1 ${signers.walletExecutor1.address}
whitelisted or not`,await contracts.dZapExecutor.isExecutorWhitelisted(
        signers.walletExecutor1.address
      ))
      console.log("Is address(0) whitelisted or not",await
contracts.dZapExecutor.isExecutorWhitelisted(
        "0x0000000000000000000000000000000000000000"
      ))
      expect(
```

```
        await contracts.dZapExecutor.isExecutorWhitelisted(
          signers.walletExecutor2.address
        )
      ).equal(false)
    })
  })
```

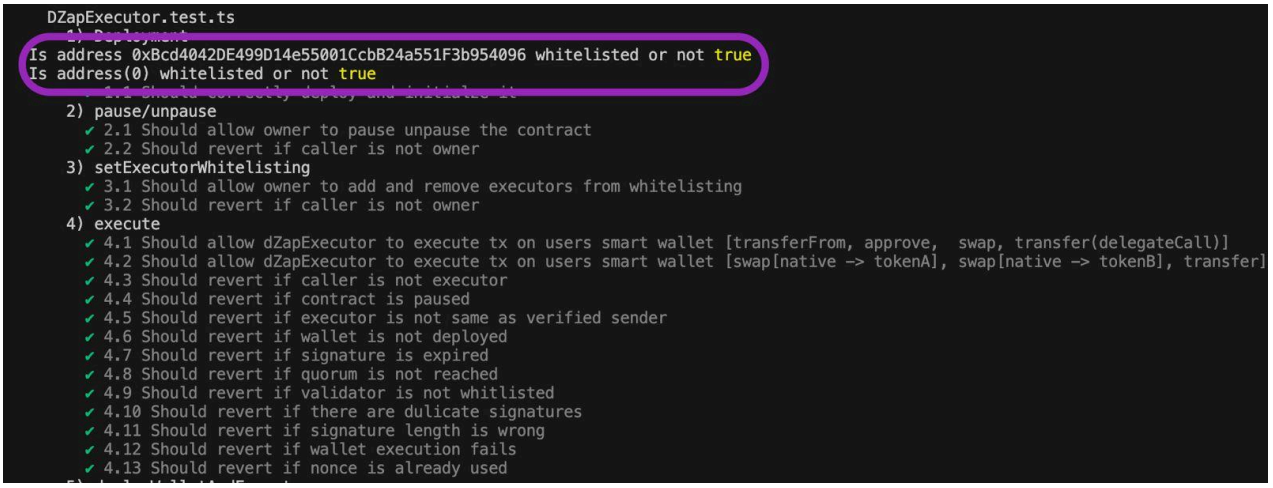
While deployment have added address(0) as a whitelisted address.

```
        ],
      ],
      [CONTRACTS.DZapWalletFactory]: [signers.factoryOwner.address],
      [CONTRACTS.DZapExecutor]: [
        signers.executorOwner.address,
        placeholders.factoryAddress,
        [signers.walletExecutor1.address,
          "0x0000000000000000000000000000000000000000"
        ],
      ],
    })
```

```
describe('DZapExecutor.test.ts', async () => {
  describe('1) Deployment', async () => {
    it('1.1 Should correctly deploy and initialze it', async () => {
      expect(await contracts.dZapExecutor.owner()).equal(
        signers.executorOwner.address
      )
      expect(await contracts.dZapExecutor.DZAP_FACTORY()).equal(
        contracts.address.dZapWalletFactory
      )
      expect(
        await contracts.dZapExecutor.isExecutorWhitelisted(
          signers.walletExecutor1.address
        )
      ).equal(true)
      expect(
        await contracts.dZapExecutor.isExecutorWhitelisted(
          "0x0000000000000000000000000000000000000000"
        )
      ).equal(true)
      console.log(`Is address walletExecutor1 ${signers.walletExecutor1.address} whitelisted or not`,await contracts.dZapEx
        signers.walletExecutor1.address
      ))
      console.log("Is address(0) whitelisted or not",await contracts.dZapExecutor.isExecutorWhitelisted(
        "0x0000000000000000000000000000000000000000"
      ))

      expect(
        await contracts.dZapExecutor.isExecutorWhitelisted(
          signers.walletExecutor2.address
        )
      ).equal(false)
    })
  })

```

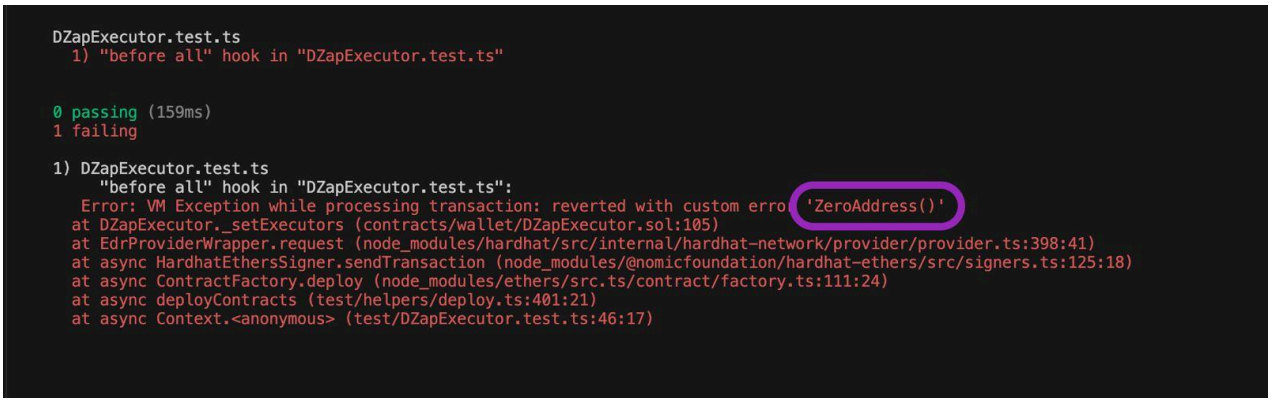


Recommendation

Add an explicit check to ensure that no address(0) is allowed in the executor list: Solidity

```
function _setExecutors(address[] memory _executorsArr, bool
_whitelisted) private {
        uint256 length = _executorsArr.length;
        for (uint256 i; i < length; ++i) {
            require(_executorsArr[i] != address(0), ZeroAddress());
            _executors[_executorsArr[i]] = _whitelisted;
        }
    }
```

Now, we could see that, when we rerun the test, it reverts with Zero Address could not be passed in the array.



Status : Resolved

[L-02] State variables that could be declared immutable

Severity
Low

Location	Functions
Contracts\zap\DZapZapCore.sol	➔ `state variable - permit2,[Line-42]`

Issue Description
Permit2 is only assigned in the constructor. Therefore it can be made immutable as immutable values are cheaper to read.
State variables that are not updated following deployment should be declared immutable to save gas.

Impact / Proof of Concept
While this issue doesn't directly impact the functionality of the contract, the contract can benefit from the use of constant and immutable keywords for variables that do not change after deployment. This can save gas costs by storing the variables directly in the bytecode.

```
address public permit2;
```

Recommendation
Add the immutable attribute to state variables that never change or are set only in the constructor.

```
address public immutable permit2;
```

Status : Resolved

[L-03] Missing Optional Deadline Parameter in EIP-712 Signed Data for Additional Replay Protection

Severity
Low

Location	Functions
Contracts\zap\DZapZapCore.sol	➔ `bytes32 private constant _SIGNED_DATA_TYPEHASH` & `function zap(...) - [Line-51,162]`

Issue Description
The current SignedZapData type used for EIP-712 signature verification includes a nonce to prevent replay attacks:

```
bytes32 private constant _SIGNED_DATA_TYPEHASH = keccak256("SignedZapData(bytes32 txId,address user,address referral,uint256 nonce,bytes32 data)");
```

While the nonce mechanism effectively prevents replay of the same signed transaction, the absence of a deadline or expiry timestamp means that a valid signature could be executed at any future time, as long as the nonce remains unused.

Impact / Proof of Concept
This does not represent a critical security flaw since nonce tracking already protects against exact replay attacks. However, it allows signed messages to remain valid indefinitely until the nonce is incremented. Including a deadline would limit the window during which a signature is valid, reducing risks associated with exposure of signed messages.

Recommendation
Consider adding an optional uint256 deadline field to the typed data and enforce a check that the current block timestamp is less than or equal to the deadline during signature verification.

```
update the _SIGNED_DATA_TYPEHASH accordingly  and add a check in the zap(bytes32 _transactionId, bytes32 _vHash, ... ) to check for deadline
require(block.timestamp <= deadline, "Signature expired");.
```

Status : Resolved

6.0 Auditing Approach and Methodologies Applied

The Solidity smart contract was audited using a comprehensive approach to ensure the highest level of security and reliability. Careful attention was given to the following key areas to ensure the overall quality of the code:

- **Code quality and structure**: We conducted a detailed review of the codebase to identify any potential issues related to code structure, readability, and maintainability. This included analysing the overall architecture of the Solidity smart contract and reviewing the code to ensure it follows best practices and coding standards.
- **Security vulnerabilities**: Our team used manual techniques to identify any potential security vulnerabilities that could be exploited by attackers. This involved a thorough analysis of the code to identify any potential weaknesses, such as buffer overflows, injection vulnerabilities, signatures, and deprecated functions.
- **Documentation and comments**: Our team reviewed the code documentation and comments to ensure they accurately describe the code's intended behaviour and logic. This helps developers to better understand the codebase and make modifications without introducing new issues.
- **Compliance with best practices**: We checked that the code follows best practices and coding standards that are recommended by the Solidity community and industry experts. This ensures that the Solidity smart contract is secure, reliable, and efficient.

Our audit team followed OWASP and Ethereum (Solidity) community security guidelines for this audit. As a result, we were able to identify potential issues and provide recommendations to improve the smart contract's security and performance.

Throughout the audit of the smart contracts, our team placed great emphasis on ensuring the overall quality of the code and the use of industry best practices. We meticulously reviewed the codebase to ensure that it was thoroughly documented and that all comments and logic aligned with the intended behaviour. Our approach to the audit was comprehensive, methodical, and aimed at ensuring that the smart contract was secure, reliable, and optimised for performance.

6.1 Code Review / Manual Analysis

Our team conducted a manual analysis of the Solidity smart contracts to identify new vulnerabilities or to verify vulnerabilities found during static and manual analysis. We carefully analysed every line of code and made sure that all instructions provided during the onboarding phase were followed. Through our manual analysis, we were able to identify potential vulnerabilities that may have been missed by automated tools and ensure that the smart contract was secure and reliable.

6.2 Tools Used for Audit

In the course of our audit, we leveraged a suite of tools to bolster the security and performance of our program. While our team drew on their expertise and industry best practices, we also integrated various tools into our development environment. Noteworthy among them are Remix,Slither, Aderyn, Solhint for Static Analysis and Hardhat & Foundry for Dynamic Analysis. This holistic approach ensures a thorough analysis, uncovering potential issues that automated tools alone might overlook. 0xTeam takes pride in utilising these tools, which significantly contribute to the quality, security, and maintainability of our codebase

7.0 Limitations on Disclosure and Use of this Report

This report contains information concerning potential details of the DZap Project and methods for exploiting them. 0xTeam recommends that special precautions be taken to protect the confidentiality of both this document and the information contained herein. Security Assessment is an uncertain process, based on past experiences, currently available information, and known threats. All information security systems, which by their nature are dependent on human beings, are vulnerable to some degree. Therefore, while 0xTeam considers the major security vulnerabilities of the analysed systems to have been identified, there can be no assurance that any exercise of this nature will identify all possible vulnerabilities or propose exhaustive and operationally viable recommendations to mitigate those exposures. In addition, the analysis set forth herein is based on the technologies and known threats as of the date of this report. As technologies and risks change over time, the vulnerabilities associated with the operation of the DZap Smart contracts Code Base described in this report, as well as the actions necessary to reduce the exposure to such vulnerabilities, will also change. 0xTeam makes no undertaking to supplement or update this report based on changed circumstances or facts of which 0xTeam becomes aware after the date hereof, absent a specific written agreement to perform the supplemental or updated analysis. This report may recommend that 0xTeam use certain software or hardware products manufactured or maintained by other vendors. 0xTeam bases these recommendations upon its prior experience with the capabilities of those products. Nonetheless, 0xTeam does not and cannot warrant that a particular product will work as advertised by the vendor, nor that it will operate in the manner intended. This report was prepared by 0xTeam for the exclusive benefit of DZap and is proprietary information. The Non-Disclosure Agreement (NDA) in effect between 0xTeam and DZap governs the disclosure of this report to all other parties including product vendors and suppliers.