

Karak

Smart Contract Security Assessment

Version 1.0

Audit dates: Jun 10 — Jun 17, 2024

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1. Introduction

1.1 About Zenith

Zenith is an offering by Code4rena that provides consultative audits from the very best security researchers in the space. We focus on crafting a tailored security team specifically for the needs of your codebase.

Learn more about us at https://code4rena.com/zenith.

1.2 Disclaimer

This report reflects an analysis conducted within a defined scope and time frame, based on provided materials and documentation. It does not encompass all possible vulnerabilities and should not be considered exhaustive.

The review and accompanying report are presented on an "as-is" and "as-available" basis, without any express or implied warranties.

Furthermore, this report neither endorses any specific project or team nor assures the complete security of the project.

1.3 Risk Classification

SEVERITY LEVEL	IMPACT: HIGH	IMPACT: MEDIUM	IMPACT: LOW
Likelihood: High	Critical	High	Medium
Likelihood: Medium	High	Medium	Low
Likelihood: Low	Medium	Low	Low

2. Executive Summary

2.1 About Karak

Karak is the universal restaking layer that makes it easy to provide cryptoeconomic security with any asset, and unlocks a new design space for developers to seamlessly and securely create innovative infrastructure designs. Karak enables protocols to tap into robust and secure trust networks from day one, significantly lowering the barrier to securing new protocols and eliminating the need for protocols to incentivize their own validator sets with a



highly dilutive reward mechanism, making the process of bootstrapping security more scalable, accessible, and affordable.

2.2 Scope

Repository	Risk-Harbor/karak-restaking/	
Commit Hash	16be0e4f3e64797193a00395e57d5a11a8f2f54d	

2.3 Audit Timeline

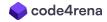
DATE	EVENT
Jun 10, 2024	Audit start
Jun 17, 2024	Audit end
Oct 25, 2024	Report published

2.4 Issues Found

SEVERITY	COUNT
Critical Risk	0
High Risk	0
Medium Risk	0
Low Risk	3
Informational	1
Total Issues	4

3. Findings Summary

ID	DESCRIPTION	STATUS
L-1	`implementation(address(0))` should not return `self.vaultImpl`	Resolved



L-2	Standard implementation can be set to reserved address (`address(1)`)	Resolved
L-3	`slashablePercentageWad` can exceed 100%	Resolved
I-1	Ambiguity in the DSS's slashable percentage returned from `Core.getDssSlashablePercentageWad` function	Resolved

4. Findings

4.1 Low Risk

A total of 3 low risk findings were identified.

[L-1] 'implementation(address(0))' should not return 'self.vaultImpl'

Severity: Low Status: Resolved

Context:

Core.sol#L308-L316

Description:

When deploying a Vault, if implementation is address(0), implementation is replaced with DEFAULT_VAULT_IMPLEMENTATION_FLAG and assigned to vaultToImplMap, which makes valid vaultToImplMap will not be address(0).

```
if (implementation == address(0)) {
     // Allows us to change all the standard vaults to a new
implementation
     implementation = Constants.DEFAULT_VAULT_IMPLEMENTATION_FLAG;
}
```

And in changeImplementationForVault(), a vaultToImplMap of address(O) is considered invalid.

```
if (self.vaultToImplMap[vault] == address(0)) revert
VaultNotAChildVault();
```

However, in implementation(), address(0) is considered valid and self.vaultImpl is returned.

This would make the implementation() of any non-Vault address be self.vaultImpl, which might have some side effects out of scope.

Recommendation:

It is recommended to make implementation(address(0)) return address(0)



```
function implementation(address vault) public view returns (address)
{
    CoreLib.Storage storage self = _self();
    address vaultImplOverride = self.vaultToImplMap[vault];

-    if (vaultImplOverride ==
Constants.DEFAULT_VAULT_IMPLEMENTATION_FLAG || vaultImplOverride ==
address(0)) {
+    if (vaultImplOverride ==
Constants.DEFAULT_VAULT_IMPLEMENTATION_FLAG) {
        return self.vaultImpl;
    }
    return vaultImplOverride;
}
```

Karak: <u>PR-287</u>

Zenith: Verified.

[L-2] Standard implementation can be set to reserved address ('address(1)')

Severity: Low Status: Resolved

Context:

• Core.sol#L171

Description:

address(1) is a reserved address for default implementation within the protocol. The protocol should not allow anyone to set the standard implementation address to address(1).

Recommendation:

To avoid any unexpected error or mistake, consider adding the following check since address(1) is reserved for default implementation.

```
+ if (newVaultImpl == Constants.DEFAULT_VAULT_IMPLEMENTATION_FLAG) revert
ReservedAddress();
```

Karak: Fixed in PR 287

Zenith: Verified

[L-3] `slashablePercentageWad` can exceed 100%

Severity: Low Status: Resolved

Context:

• Core.sol#L266

Description:

The slashablePercentageWad should never exceed 100%. However, it was found that the DSS can set it to a percentage beyond 100% via the Core.setDssSlashablePercentageWad function.

Recommendation:

To prevent any potential edge cases, ensure the DSS cannot set its slashable percentage to more than 100%.

```
+ require(slashablePercentageWad <= Constants.MAX_SLASHING_PERCENT_WAD)
```

In addition, consider disallowing DSS to set its slashable percentage to zero (if applicable).

Karak: Fixed in PR-318

Zenith: Verified

4.2 Informational

A total of 1 informational findings were identified.

[I-1] Ambiguity in the DSS's slashable percentage returned from `Core.getDssSlashablePercentageWad` function

Severity: Informational Status: Resolved

Context:

• Core.sol#L354

Description:

Within the <u>SlasherLib.validate</u> function, if the dssSlashablePercentageWad is not initialized (equal to zero), the slashable percentage is 100%.

```
uint256 maxSlashingWad = self.dssSlashablePercentageWad[dss] == 0
? Constants.MAX_SLASHING_PERCENT_WAD
: self.dssSlashablePercentageWad[dss];
```

This might cause some confusion for users who rely on the getDssSlashablePercentageWad function to determine a DSS's slashable percentage. When this function returns zero, it is unclear whether the DSS's slashable percentage is 0% or 100%. Users might think that the DSS's slashable percentage is 0%, while, in fact, it is 100%.

Recommendation:

Consider having a variable that keeps track of whether the dssSlashablePercentageWad has already been initialized so it can be used within the SlasherLib.validate function to only return MAX_SLASHING_PERCENT_WAD (100%) if it is uninitialized.

Alternatively, document this behavior in the NatSpec of this function.

Karak: Fixed in PR-287

Zenith: Verified