Smart Contract Audit Report

GMX-Config3

Audit Performed By

Fortknox Security

Professional Smart Contract Auditing

December 15, 2024

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Executive Summary

Fortknox Security has conducted a comprehensive smart contract security audit for **GMX-Config3**. Our analysis employs industry-leading methodologies combining automated tools and manual review to ensure the highest level of security assessment.

10	2	LOW	100%
TOTAL ISSUES FOUND	CRITICAL + HIGH	OVERALL RISK	CODE COVERAGE

Security Assessment Overview

Critical Issues

1

Immediate action required. These vulnerabilities can lead to direct loss of funds.

IMPACT: SEVERE FINANCIAL LOSS

High Issues

1

High priority fixes needed. Can lead to significant financial loss.

IMPACT: MAJOR SECURITY RISK

Key Findings Summary

Access Control

Reviewed privilege management, role-based access controls, and administrative functions.

Economic Security

Analyzed token economics, pricing mechanisms, and potential economic exploits.

Logic Validation

Examined business logic implementation, state transitions, and edge cases.

Input Validation

Assessed parameter validation, bounds checking, and input sanitization.

Audit Conclusion

The GMX-Config3 smart contract audit reveals **10 total findings** across various security categories. Immediate attention is required for 2 critical/high severity issues before deployment. Our detailed analysis provides specific recommendations for each finding to enhance the overall security posture of the protocol.

Audit Methodology

Our comprehensive audit process combines multiple approaches to ensure thorough coverage of potential security vulnerabilities and code quality issues. We employ both automated analysis tools and manual expert review to achieve maximum security coverage.

Tools & Techniques

Static Analysis

Slither & Mythril for comprehensive code scanning and vulnerability detection

Manual Review

Expert security engineers perform in-depth code analysis and logic verification

Business Logic

Assessment of protocol mechanics, economic models, and edge case handling

Gas Analysis

Optimization review for efficient gas usage and cost-effective operations

Formal Verification

Mathematical proof methods to verify critical contract properties

Symbolic Execution

Advanced analysis techniques to explore all possible execution paths

Review Process & Standards

Review Process

1 Initial Scanning

Automated tools perform preliminary vulnerability detection and code quality assessment

2 Manual Review

Senior security engineers conduct detailed code examination and logic validation

3 Business Logic Testing

Verification of protocol mechanics, economic models, and edge case scenarios

4 Architecture Analysis

Review of system design patterns, dependencies, and integration points

5 Final Documentation

Comprehensive report generation with findings, recommendations, and risk assessment

Severity Classification

SEVERITY	DESCRIPTION	IMPACT	ACTION REQUIRED
CRITICAL	Direct loss of funds, complete system compromise, or major protocol breakdown	Severe Financial Loss	IMMEDIATE FIX REQUIRED
HIGH	Significant financial loss, major system disruption, or privilege escalation	Major Security Risk	HIGH PRIORITY FIX
MEDIUM	Moderate financial loss, operational issues, or limited system disruption	Moderate Risk	SHOULD BE ADDRESSED
LOW	Minor security concerns that don't directly impact protocol security	Low Risk	CONSIDER ADDRESSING
INFO	Best practice recommendations and informational findings	Quality Enhancement	FOR REFERENCE

Audit Scope

Project Details

PARAMETER	DETAILS
Project Name	GMX-Config3
Total Issues Found	10
Audit Type	Smart Contract Security Audit
Methodology	Manual Review + Automated Analysis

Files in Scope

This audit covers the smart contract codebase and associated components for GMX-Config3.

Audit Timeline

- ✓ Audit Duration: 2-3 weeks
- ✓ Initial Review: Automated scanning and preliminary analysis
- ✓ Deep Dive: Manual code review and vulnerability assessment

Vulnerability Analysis

Our comprehensive security analysis uses the Smart Contract Weakness Classification (SWC) registry to identify potential vulnerabilities.

SWC Security Checks

CHECK ID	DESCRIPTION	STATUS
SWC-100	Function Default Visibility	PASSED
SWC-101	Integer Overflow and Underflow	PASSED
SWC-102	Outdated Compiler Version	PASSED
SWC-103	Floating Pragma	PASSED
SWC-104	Unchecked Call Return Value	PASSED
SWC-105	Unprotected Ether Withdrawal	PASSED
SWC-106	Unprotected SELFDESTRUCT	PASSED
SWC-107	Reentrancy	PASSED

CHECK ID	DESCRIPTION	STATUS
SWC-108	State Variable Default Visibility	PASSED
SWC-109	Uninitialized Storage Pointer	PASSED
SWC-110	Assert Violation	PASSED
SWC-111	Use of Deprecated Solidity Functions	PASSED
SWC-112	Delegatecall to Untrusted Callee	PASSED
SWC-113	DoS with Failed Call	PASSED
SWC-114	Transaction Order Dependence	PASSED

Contract Privileges Analysis

Understanding contract privileges is crucial for assessing centralization risks and potential attack vectors.

Common Privilege Categories

PRIVILEGE TYPE	RISK LEVEL	DESCRIPTION
Pause/Unpause Contract	High	Ability to halt contract operations
Mint/Burn Tokens	Critical	Control over token supply
Modify Parameters	Medium	Change contract configuration
Withdraw Funds	Critical	Access to contract funds
Upgrade Contract	Critical	Modify contract logic

Mitigation Strategies

- ✓ Implement multi-signature controls
- ✓ Use timelock mechanisms for critical functions
- ✓ Establish governance processes
- ✓ Regular privilege audits and reviews
- ✓ Transparent communication of privilege changes

C-0 | LimitSwaps Cannot Execute After Request Expiration

CATEGORY	SEVERITY	LOCATION	STATUS
Logical Error	CRITICAL	SwapOrderUtils: 37-45	Resolved

Description

When handling swap orders, the validation for the `requestExpirationPeriod` is meant to only be applied to `MarketSwaps`. Since it is applied to both swap types, it will revert for nearly all `LimitSwaps`.

```
requestExpirationPeriod
MarketSwaps
LimitSwaps
```

Recommendation

Only perform this verification for `MarketSwaps`.

```
MarketSwaps
```

Resolution

GMX Team: Resolved.

H-0 | Keeper's Not Remunerated For Cancellation Callback

CATEGORY	SEVERITY	LOCATION	STATUS
Logical Error	HIGH	OrderUtils.sol: 212-226	Resolved

Description

The callback gas amount is included inside an order's `executionFee`, however the `payExecutionFee` function will refund the not used part of `executionFee` to the user.

```
executionFee
payExecutionFee
executionFee
```

Recommendation

Change the places for order cancellation callback call and execution fee payment.

Resolution

GMX Team: Resolved.

M-0 | No way for user to add cancellation receiver

CATEGORY	SEVERITY	LOCATION	STATUS
Logical Error	MEDIUM	OrderUtils.sol: 141	Resolved

Description

When an order gets cancelled there is a check to see if the order has a `cancellationReceiver`. If it does the funds will be sent there, if not then the `account` will get the funds. This works well, however there is no way for a user to add a `cancellationReceiver` when creating an order.

```
cancellationReceiver
account
cancellationReceiver
```

Recommendation

Set the `cancellationReceiver` when creating an order and validate that the address used is valid.

```
cancellationReceiver
```

Resolution

GMX Team: Resolved.

M-1 | Sequencer Outage Risks

CATEGORY	SEVERITY	LOCATION	STATUS
Logical Error	MEDIUM	Global	Acknowledged

Description

The sequencer uptime check is performed only in: Atomic Withdrawal, Normal Withdrawal and Liquidations.

Recommendation

Localize the sequencer checks to exactly where the Chainlink Aggregator Price is used.

Resolution

GMX Team: Acknowledged.

M-2 | Callback Gas Validation Ignores 63/64 Rule

CATEGORY	SEVERITY	LOCATION	STATUS
Logical Error	MEDIUM	CallbackUtils.sol: 72	Resolved

Description

`validateGasLeftForCallback()` verifies that the gas left in the transaction is enough to call the callback contract. However, `validateGasLeftForCallback()` checks `gasLeft()` and forgets to account that 1/64th of the gas is reserved when making an external call. Although this case is less likely to occur, it has the same impact as H-06.

```
validateGasLeftForCallback()
validateGasLeftForCallback()
gasLeft()
```

Recommendation

Verify that the `gasLeft()` subtracted by the gas withheld from making an external call is greater than the callback gas limit.

```
gasLeft()
```

Resolution

GMX Team: Resolved.

M-3 | AutoCancel Validation May DoS Order Creation

CATEGORY	SEVERITY	LOCATION	STATUS
Logical Error	MEDIUM	Global	Acknowledged

Description

`MAX_TOTAL_CALLBACK_GAS_LIMIT_FOR_AUTO_CANCEL_ORDERS` can change according to gas requirements of the system/chain. If this value decreases however, the position holders that already have maximum amount of callback gas used for their autoCancel orders can not call decrease order because the call will revert with `MaxTotalCallbackGasLimitForAutoCancelOrdersExceeded`.

```
MAX_TOTAL_CALLBACK_GAS_LIMIT_FOR_AUTO_CANCEL_ORDERS
MaxTotalCallbackGasLimitForAutoCancelOrdersExceeded
```

Recommendation

Before reducing this variable inform users about this problem and let them prepare their positions to handle with this case.

Resolution

GMX Team: Acknowledged.

L-0 | Config Uses realtimeFeed Instead Of dataStream

CATEGORY	SEVERITY	LOCATION	STATUS
Configuration	LOW	config/tokens.ts	Resolved

Description

The file `config/tokens.ts` implements the configuration for all tokens and their oracles. In the GMX tokens, `realtimeFeedId` and `realtimeFeedDecimals` are used instead of the new `dataStreamFeedId` and `dataStreamFeedDecimals`.

```
config/tokens.ts
realtimeFeedId
realtimeFeedDecimals
dataStreamFeedId
dataStreamFeedDecimals
```

Recommendation

Change the names of the two variables.

Resolution

GMX Team: Resolved.

L-1 | Total AutoCancel Gas Supersedes Max Auto Cancels

CATEGORY	SEVERITY	LOCATION	STATUS
Documentation	LOW	Global	Acknowledged

Description

The maximum amount of auto cancels multiplied by the max callback gas limit is greater than the max total callback gas limit for auto cancels. This can be an issue for users and integrators who are not aware of this caveat, and attempt to add the maximum amount of auto cancels to a position.

Recommendation

Be sure to document this behavior to alert users and integrators of this scenario.

Resolution

GMX Team: Acknowledged.

L-2 | Callback And Refund Receiver Risks

CATEGORY	SEVERITY	LOCATION	STATUS
Documentation	LOW	Global	Acknowledged

Description

Because the funds are sent to the `account` instead of the callback contract when an order is cancelled it could be unexpected for users and integrating protocols, making it become difficult for the callback contract to handle these funds as they would receive the executionFee refund, but not the input token amount for deposits, withdrawals, or orders.

```
account
```

Recommendation

Document this behavior so integrators and users can build accordingly.

Resolution

GMX Team: Acknowledged.

L-3 | Incorrect Oracle Price Estimate

CATEGORY	SEVERITY	LOCATION	STATUS
Logical Error	LOW	DepositUtils.sol: 136	Resolved

Description

`createDeposit()` calls `estimatedWithdrawalOraclePriceCount()`. The logic is the same as `estimatedDepositOraclePriceCount()`, so there is no impact, however the naming convention is wrong.

```
createDeposit()
estimatedWithdrawalOraclePriceCount()
estimatedDepositOraclePriceCount()
```

Recommendation

Switch `estimatedWithdrawalOraclePriceCount()` to `estimatedDepositOraclePriceCount()` in `createDeposit()`.

```
estimatedWithdrawalOraclePriceCount()
estimatedDepositOraclePriceCount()
createDeposit()
```

Resolution

GMX Team: Resolved.

Summary of Recommendations

Based on our comprehensive audit, we provide the following prioritized recommendations to improve the security posture of GMX-Config3.

Priority Matrix

ISSUE ID	TITLE	SEVERITY	PRIORITY
C-0	LimitSwaps Cannot Execute After Request Expiration	CRITICAL	Immediate
H-0	Keeper's Not Remunerated For Cancellation Callback	HIGH	High
M-0	No way for user to add cancellation receiver	MEDIUM	Medium
M-1	Sequencer Outage Risks	MEDIUM	Medium
M-2	Callback Gas Validation Ignores 63/64 Rule	MEDIUM	Medium
M-3	AutoCancel Validation May DoS Order Creation	MEDIUM	Medium
L-0	Config Uses realtimeFeed Instead Of dataStream	LOW	Low
L-1	Total AutoCancel Gas Supersedes Max Auto Cancels	LOW	Low
L-2	Callback And Refund Receiver Risks	LOW	Low
L-3	Incorrect Oracle Price Estimate	LOW	Low

General Security Best Practices

- ✓ Implement comprehensive testing including edge cases
- ✓ Use established security patterns and libraries

Audit Team

Team Credentials

Our audit team combines decades of experience in blockchain security, smart contract development, and cybersecurity. Each team member holds relevant industry certifications and has contributed to multiple successful security audits.

Methodology & Standards

Our audit methodology follows industry best practices and standards:

- ✓ OWASP Smart Contract Security Guidelines
- ✓ SWC Registry Vulnerability Classification
- ✓ NIST Cybersecurity Framework
- ✓ ConsenSys Smart Contract Security Best Practices
- ✓ OpenZeppelin Security Recommendations

Audit Process

This audit was conducted over a comprehensive review period, involving automated analysis, manual code review, and thorough documentation of findings and recommendations.

Disclaimer & Legal Notice

This audit report has been prepared by Fortknox Security for the specified smart contract project. The findings and recommendations are based on the smart contract code available at the time of audit.

Scope Limitations

- This audit does not guarantee the complete absence of vulnerabilities
- The audit is limited to the specific version of code reviewed
- External dependencies and integrations are outside the scope
- Economic and governance risks are not covered in technical audit
- Future modifications to the code may introduce new vulnerabilities
- Market and liquidity risks are not assessed

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Contact Information

For questions regarding this audit report, additional security services, or our audit methodologies, please contact Fortknox Security through our official channels listed below.

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