Quantstamp

Trust Wallet Smart Account

Executive Summary

This audit report was prepared by Quantstamp, the leader in blockchain security.

Type	Smart Contract Wallet
Timeline	2025-03-17 through 2025-04-10
Language	Solidity
Methods	Architecture Review, Unit Testing, Functional Testing, Computer-Aided Verification, Manual Review
Specification	None
Source Code	• https://github.com/trustwallet/Biz #cadd55d
Auditors	• Nikita Belenkov Senior Auditing Engineer • Rabib Islam Senior Auditing Engineer • Hytham Farah Auditing Engineer • Andy Lin Senior Auditing Engineer • Ruben Koch Senior Auditing Engineer • Yamen Merhi Auditing Engineer • Tim Sigl Auditing Engineer

Documentation quality	Low
Test quality	Medium
Total Findings	6 Fixed: 3 Acknowledged: 3
High severity findings	0
Medium severity findings	0
Low severity findings	2 Fixed: 2
Undetermined severity findings	0
Informational findings	4 Fixed: 1 Acknowledged: 3

Summary of Findings

This audit focused on a minimalistic smart account implementation. The intended use case of this is an EIP-7702 delegate account. The user would delegate their EOA to the `Biz` contract, after which the code storage slot in the EOA would point to the delegated contract with some magic bytes. The contract enables 3 main flows:

1. An ERC-4337 path invoked by the `EntryPoint` contract, requiring both a valid signature and an active ERC-4337 flag.
2. A self-execution path accessible exclusively to the owner EOA.
3. A gasless third-party execution path callable by any address but requiring valid owner EOA signature verification.

No major issues were identified during the audit. A few low- and information-severity issues were identified, ranging from missing support for token receivers to EIP-712 improvement to avoid replay attacks.

Overall, the contract is well-designed and kept as simple as possible. The test suite could be improved.

Fix Review Update

All issues have been fixed or reasonably acknowledged. The test suite has been updated to reflect the changes in the codebase.

ID	DESCRIPTION	SEVERITY	STATUS
QS-TWSA-1	Missing Support for ERC-165 for Token Receiver Interfaces	Low	Fixed
QS-TWSA-2	Incomplete EIP-712 Signature Implementation	Low	Fixed
QS-TWSA-3	Newly Delegated EOA Is Not Guaranteed to Have Nonce of 0	Informational	Acknowledged
QS-TWSA-4	Missing Return Value Handling in `_call()` Function	Informational	Acknowledged

ID	DESCRIPTION	SEVERITY	STATUS
QS-TWSA-5	External Storage Not Referenced in `accountStorageBases()`	Informational	Acknowledged
QS-TWSA-6	Coupling Between Validation and Execution in 4337 Context Could Be Further Strengthened	Informational	Fixed

Assessment Breakdown

Quantstamp's objective was to evaluate the repository for security-related issues, code quality, and adherence to specification and best practices.

> **Disclaimer**
> Only features that are contained within the repositories at the commit hashes specified on the front page of the report are within the scope of the audit and fix review. All features added in future revisions of the code are excluded from consideration in this report.

Possible issues we looked for included (but are not limited to):

- Transaction-ordering dependence
- Timestamp dependence
- Mishandled exceptions and call stack limits
- Unsafe external calls
- Integer overflow / underflow
- Number rounding errors
- Reentrancy and cross-function vulnerabilities
- Denial of service / logical oversights
- Access control
- Centralization of power
- Business logic contradicting the specification
- Code clones, functionality duplication
- Gas usage
- Arbitrary token minting

Methodology

1. Code review that includes the following
    1. Review of the specifications, sources, and instructions provided to Quantstamp to make sure we understand the size, scope, and functionality of the smart contract.
    2. Manual review of code, which is the process of reading source code line-by-line in an attempt to identify potential vulnerabilities.
    3. Comparison to specification, which is the process of checking whether the code does what the specifications, sources, and instructions provided to Quantstamp describe.
2. Testing and automated analysis that includes the following:
    1. Test coverage analysis, which is the process of determining whether the test cases are actually covering the code and how much code is exercised when we run those test cases.
    2. Symbolic execution, which is analyzing a program to determine what inputs cause each part of a program to execute.
3. Best practices review, which is a review of the smart contracts to improve efficiency, effectiveness, clarity, maintainability, security, and control based on the established industry and academic practices, recommendations, and research.
4. Specific, itemized, and actionable recommendations to help you take steps to secure your smart contracts.

Scope

Files Included

Repo: https://github.com/trustwallet/Biz(cadd55dbd6ef757f886d3161d7ce6768f537944a) Files: `Biz.sol` and `BizGuard.sol`
Repo: `https://github.com/trustwallet/Biz`

Included Paths: `src/`

Files Excluded

Repo: https://github.com/trustwallet/Biz(cadd55dbd6ef757f886d3161d7ce6768f537944a) Files: None

Operational Considerations

- A normal encoded call through any execute to the `BizGuard` can be used to increment the nonce to invalidate a sig. This can also happen with a call of `executeSignature()` by signing new data with the current nonce.
- The `checkGuard` modifier violates the ERC-7562 STO-033 storage rule, as it reads a storage slot in a non-entity contract, that being `BizGuard`, when the user's account is not staked. This will lead to the UserOp being dropped in a conventional bundler.
- It is still possible to bypass the `check4337Flag` by undelegating the contract, changing storage, and redelegating the same contract. This does involve a more complex user phishing attack and there isn't a fix to protect against this, except by removing storage reads. This flag is only for emergency purposes in case of an `EntryPoint` compromise, which would need to be paired with the aforementioned sophisticated phishing for any harm.
- At the end of `validateUserOp()`, funds are sent back to the `EntryPoint`. The code relies on correct behavior of the `EntryPoint`, where the call would revert if the transfer does not succeed.

Definitions

- **High severity** – High-severity issues usually put a large number of users' sensitive information at risk, or are reasonably likely to lead to catastrophic impact for client's reputation or serious financial implications for client and users.
- **Medium severity** – Medium-severity issues tend to put a subset of users' sensitive information at risk, would be detrimental for the client's reputation if exploited, or are reasonably likely to lead to moderate financial impact.
- **Low severity** – The risk is relatively small and could not be exploited on a recurring basis, or is a risk that the client has indicated is low impact in view of the client's business circumstances.
- **Informational** – The issue does not post an immediate risk, but is relevant to security best practices or Defence in Depth.
- **Undetermined** – The impact of the issue is uncertain.
- **Fixed** – Adjusted program implementation, requirements or constraints to eliminate the risk.
- **Mitigated** – Implemented actions to minimize the impact or likelihood of the risk.
- **Acknowledged** – The issue remains in the code but is a result of an intentional business or design decision. As such, it is supposed to be addressed outside the programmatic means, such as: 1) comments, documentation, README, FAQ; 2) business processes; 3) analyses showing that the issue shall have no negative consequences in practice (e.g., gas analysis, deployment settings).

Appendix

File Signatures

The following are the SHA-256 hashes of the reviewed files. A file with a different SHA-256 hash has been modified, intentionally or otherwise, after the security review. You are cautioned that a different SHA-256 hash could be (but is not necessarily) an indication of a changed condition or potential vulnerability that was not within the scope of the review.

Files

Repo: `https://github.com/trustwallet/Biz`

- `9a7...df2 ./src/Biz.sol`
- `5e2...22a ./src/BizGuard.sol`

Test Suite Results

The test suite is made of 14 tests, of which all pass. It could be further improved.

Fix Review Update

The test suite now has 27 tests, all of which are passed.

Code Coverage

Code coverage should be further improved, so that it is at least 90%.

Fix Review Update

Coverage has been improved significantly.

Changelog

- 2025-04-14 - Initial report

- 2025-04-16 - Final report

About Quantstamp

Quantstamp is a global leader in blockchain security. Founded in 2017, Quantstamp's mission is to securely onboard the next billion users to Web3 through its best-in-class Web3 security products and services.

Quantstamp's team consists of cybersecurity experts hailing from globally recognized organizations including Microsoft, AWS, BMW, Meta, and the Ethereum Foundation. Quantstamp engineers hold PhDs or advanced computer science degrees, with decades of combined experience in formal verification, static analysis, blockchain audits, penetration testing, and original leading-edge research.

To date, Quantstamp has performed more than 500 audits and secured over $200 billion in digital asset risk from hackers. Quantstamp has worked with a diverse range of customers, including startups, category leaders and financial institutions. Brands that Quantstamp has worked with include Ethereum 2.0, Binance, Visa, PayPal, Polygon, Avalanche, Curve, Solana, Compound, Lido, MakerDAO, Arbitrum, OpenSea and the World Economic Forum.

Quantstamp's collaborations and partnerships showcase our commitment to world-class research, development and security. We're honored to work with some of the top names in the industry and proud to secure the future of web3.

Notable Collaborations & Customers:

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- DeFi: Curve, Compound, Maker, Lido, Polygon, Arbitrum, SushiSwap
- NFT: OpenSea, Parallel, Dapper Labs, Decentraland, Sandbox, Axie Infinity, Illuvium, NBA Top Shot, Zora
- Academic institutions: National University of Singapore, MIT

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