OMNISCIA

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SMART CONTRACT AUDIT REPORT

Boson Protocol

V2.4.2 Update Security Audit


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Online report: boson-protocol-v2.4.2-update-security-audit

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V2.4.2 Update Security Audit Security Audit

Audit Report Revisions

Commit Hash	Date	Audit Report Hash
f099648a49	April 24th 2025	992b0c0fe8
db298d6b7e	May 20th 2025	26ab22fce2
db298d6b7e	May 23rd 2025	d8c27d198b
db298d6b7e	June 6th 2025	46a463ad9d

Audit Overview

We were tasked with performing an audit of the Boson Protocol codebase and in particular their V2.4.2 code update.

Specifically, we validated the following changes:

- Support for price range based fees per token
- Refactor of offer fulfilment to escrow in all circumstances so as to simplify logic
- Alleviation of potential voucher silent mint misbehaviour resulting in buyer fund loss (griefing attack vector)
- Support for non-zero prices of price discovery offers via enforcement of `buyerCancelPenalty` coverage during order fulfilment
- Introduction and integration of two new pausable regions

Over the course of the audit, we identified did not identify any non-informational issues within the codebase and instead made some inconsistency observations as well as optimization recommendations.

We advise the Boson Protocol team to evaluate all informational findings identified in the report and consider addressing them so as to maintain the code's high quality standard.

Post-Audit Conclusion

The Boson Protocol team iterated through all findings within the report and provided us with a revised commit hash to evaluate all exhibits on.

We evaluated all alleviations performed by Boson Protocol and have identified that all exhibits have been adequately dealt with no outstanding issues remaining in the report.

Audit Synopsis

Severity	Identified	Alleviated	Partially Alleviated	Acknowledged
Unknown	0	0	0	0
Informational	5	5	0	0
Minor	0	0	0	0
Medium	0	0	0	0
Major	0	0	0	0

During the audit, we filtered and validated a total of **0 findings utilizing static analysis** tools as well as identified a total of **5 findings during the manual review** of the codebase.

- 🎯 **Scope**
- 💻 **Compilation**
- 🔍 **Static Analysis**
- 👁️ **Manual Review**
- 🖌️ **Code Style**

Scope

The audit engagement encompassed a specific list of contracts that were present in the commit hash of the repository that was in scope. The tables below detail certain meta-data about the target of the security assessment and a navigation chart is present at the end that links to the relevant findings per file.

Target

- Repository: **https://github.com/bosonprotocol/boson-protocol-contracts**
- Commit: f099648a49045c8bad1a1bdb8e2c4ffcf67b69da
- Language: Solidity
- Network: Ethereum, Polygon POS, Base, Optimism, Arbitrum One
- Revisions: **f099648a49**, **db298d6b7e**

Contracts Assessed

File	Total Finding(s)
AgentHandlerFacet.sol (AHF)	0
AccountHandlerFacet.sol (AHT)	0
BosonTypes.sol (BTS)	0
BosonVoucher.sol (BVR)	0
BuyerHandlerFacet.sol (BHF)	0
BosonPriceDiscovery.sol (BPD)	1
ConfigHandlerFacet.sol (CHF)	0
DisputeHandlerFacet.sol (DHF)	0
DisputeResolverHandlerFacet.sol (DRH)	0
FundsLib.sol (FLB)	0

MetaTransactionsHandlerFacet.sol (MTH)	1
OfferBase.sol (OBE)	1
OfferHandlerFacet.sol (OHF)	1
ProtocolLib.sol (PLB)	0
PausableBase.sol (PBE)	0
ProtocolBase.sol (PBS)	1
PriceDiscoveryBase.sol (PDB)	0
PriceDiscoveryHandlerFacet.sol (PDH)	0
ProtocolInitializationHandlerFacet.sol (PIH)	0
SellerHandlerFacet.sol (SHF)	0
SequentialCommitHandlerFacet.sol (SCH)	0

Compilation

The project utilizes `hardhat` as its development pipeline tool, containing an array of tests and scripts coded in JavaScript.

To compile the project, the `compile` command needs to be issued via the `npx` CLI tool to `hardhat`:

```
BASH

npx hardhat compile
```

The `hardhat` tool automatically selects Solidity version `0.8.22` based on the version specified within the `hardhat.config.js` file.

The project contains discrepancies with regards to the Solidity version used, however, they are solely located in external dependencies and can thus be safely ignored.

The `pragma` statements have been locked to `0.8.22` (`=0.8.22`), the same version utilized for our static analysis as well as optimizational review of the codebase.

During compilation with the `hardhat` pipeline, no errors were identified that relate to the syntax or bytecode size of the contracts.

Static Analysis

The execution of our static analysis toolkit identified **137 potential issues** within the codebase of which **137 were ruled out to be false positives** or negligible findings.

Manual Review

A **thorough line-by-line review** was conducted on the codebase to identify potential malfunctions and vulnerabilities in Boson Protocol's v2.4.2 update.

As the engagement at hand represents a code delta, intricate care was put into ensuring that no security traits have been regressed and that all updates have been applied safely.

We validated that **all state transitions of the system occur within sane criteria** and that all rudimentary formulas within the system execute as expected. We were unable to pinpoint any non-informational issues within the codebase and instead remarked a few optimizations as well as documentational inconsistencies that the Boson Protocol team should consider.

Additionally, the system was investigated for any other commonly present attack vectors such as re-entrancy attacks, mathematical truncations, logical flaws and **ERC / EIP** standard inconsistencies. The documentation of the project was satisfactory to an exemplary extent, containing extensive in line documentation accompanied by technical documents meant to illustrate the various flows the system is meant to support.

A total of **5 findings** were identified over the course of the manual review of which **no findings** concerned the behaviour and security of the system. The non-security related findings, such as optimizations, are included in the separate **Code Style** chapter.

Code Style

During the manual portion of the audit, we identified **5 optimizations** that can be applied to the codebase that will decrease the operational cost associated with the execution of a particular function and generally ensure that the project complies with the latest best practices and standards in Solidity.

Additionally, this section of the audit contains any opinionated adjustments we believe the code should make to make it more legible as well as truer to its purpose.

These optimizations are enumerated below:

ID	Severity	Addressed	Title
BPD-01C	Informational	Yes	Ineffectual Usage of Safe Arithmetics
MTH-01C	Informational	Nullified	Non-Standard Specification of Version
OBE-01C	Informational	Yes	Invalid NatSpec Requirements
OHF-01C	Informational	Yes	Invalid NatSpec Requirements
PBS-01C	Informational	Yes	Ineffectual Usage of Safe Arithmetics

BosonPriceDiscovery Code Style Findings

BPD-01C: Ineffectual Usage of Safe Arithmetics

Type	Severity	Location
Language Specific	Informational	BosonPriceDiscovery.sol:L246

Description:

The linked mathematical operation is guaranteed to be performed safely by logical inference, such as surrounding conditionals evaluated in `require` checks or `if-else` constructs.

Example:

contracts/protocol/clients/priceDiscovery/BosonPriceDiscovery.sol

SOL

```sol
238 if (thisNativeBalanceAfter > thisNativeBalanceBefore) {
239     // _msgSender==address(0) represents the wrapper, where it's not allowed to return the surplus
240     if (_msgSender == address(0)) revert NativeNotAllowed();
241
242     // Return the surplus to the sender
243     FundsLib.transferFundsFromProtocol(
244         address(0),
245         payable(_msgSender),
246         thisNativeBalanceAfter - thisNativeBalanceBefore
247     );
```

Example (Cont.):

```sol
248 }
```

Recommendation:

Given that safe arithmetics are toggled on by default in `pragma` versions of `0.8.X`, we advise the linked statement to be wrapped in an `unchecked` code block thereby optimizing its execution cost.

Alleviation:

The referenced arithmetic operation has been wrapped in an `unchecked` code block as advised.

MetaTransactionsHandlerFacet Code Style Findings

MTH-01C: Non-Standard Specification of Version

Type	Severity	Location
Code Style	Informational	MetaTransactionsHandlerFacet.sol:L25

Description:

The referenced specification of the system's version (`v2.4.0`) is done so without the dot separator (i.e. `v240`) which is non-standard and ambiguous.

Example:

contracts/protocol/facets/MetaTransactionsHandlerFacet.sol

SOL

```
25  ) public onlyUninitialized(type(IBosonMetaTransactionsHandler).interfaceId ^
bytes4("v240")) {
```

Recommendation:

We advise the dot to be introduced, ensuring that the version conforms to the semantic versioning system.

Alleviation:

The non-standard specification has been removed from the codebase rendering this exhibit no longer applicable.

OfferBase Code Style Findings

OBE-01C: Invalid NatSpec Requirements

Type	Severity	Location
Code Style	Informational	**OfferBase.sol**: • I-1: **L33** • I-2: **L100**

Description:

The referenced requirements have been regressed based on **PR#946**, rendering them to be misleading as to the code's implementation.

Example:

contracts/protocol/bases/OfferBase.sol

SOL

```
89  * Reverts if:
90  * - Valid from date is greater than valid until date
91  * - Valid until date is not in the future
92  * - Both fixed voucher expiration date and voucher redemption duration are
defined
93  * - Neither of fixed voucher expiration date and voucher redemption duration are
defined
94  * - Voucher redeemable period is fixed, but it ends before it starts
95  * - Voucher redeemable period is fixed, but it ends before offer expires
96  * - Dispute period is less than minimum dispute period
97  * - Resolution period is not between the minimum and the maximum resolution
period
98  * - Voided is set to true
```

Example (Cont.):

```sol
99  * - Available quantity is set to zero
100 * - Offer type is discovery and the price is not set to zero
```

Recommendation:

We advise them to be omitted, optimizing the code's documentation.

Alleviation:

The invalid comments have been removed as advised.

OfferHandlerFacet Code Style Findings

OHF-01C: Invalid NatSpec Requirements

Type	Severity	Location
Code Style	Informational	**OfferHandlerFacet.sol**: • I-1: **L41** • I-2: **L94**

Description:

The referenced requirements have been regressed based on **PR#946**, rendering them to be misleading as to the code's implementation.

Example:

contracts/protocol/facets/OfferHandlerFacet.sol

SOL

```
79  * Reverts if:
80  * - The offers region of protocol is paused
81  * - Number of elements in offers, offerDates, offerDurations, disputeResolverIds,
agentIds and feeLimits do not match
82  * - For any offer:
83  *   - Caller is not an assistant
84  *   - Valid from date is greater than valid until date
85  *   - Valid until date is not in the future
86  *   - Both voucher expiration date and voucher expiration period are defined
87  *   - Neither of voucher expiration date and voucher expiration period are
defined
88  *   - Voucher redeemable period is fixed, but it ends before it starts
```

Example (Cont.):

```sol
89  *   - Voucher redeemable period is fixed, but it ends before offer expires
90  *   - Dispute period is less than minimum dispute period
91  *   - Resolution period is not between the minimum and the maximum resolution
period
92  *   - Voided is set to true
93  *   - Available quantity is set to zero
94  *   - Offer type is discovery and the price is not set to zero
```

Recommendation:

We advise them to be omitted, optimizing the code's documentation.

Alleviation:

The invalid comments have been removed as advised.

ProtocolBase Code Style Findings

PBS-01C: Ineffectual Usage of Safe Arithmetics

Type	Severity	Location
Language Specific	Informational	**ProtocolBase.sol**: • I-1: **L724** • I-2: **L731**

Description:

The linked mathematical operations are guaranteed to be performed safely by surrounding conditionals evaluated in either `require` checks or `if-else` constructs.

Example:

contracts/protocol/bases/ProtocolBase.sol

SOL

```sol
723 if (priceRangesLength > 0) {
724     for (uint256 i; i < priceRangesLength - 1; ++i) {
725         if (_price <= priceRanges[i]) {
726             // Return the fee percentage for the matching price range
727             return feePercentages[i];
728         }
729     }
730     // If price exceeds all ranges, use the highest fee percentage
731     return feePercentages[priceRangesLength - 1];
732 }
```

Recommendation:

Given that safe arithmetics are toggled on by default in `pragma` versions of `0.8.X`, we advise the linked statements to be wrapped in `unchecked` code blocks thereby optimizing their execution cost.

Alleviation:

The first arithmetic operation has been wrapped in an `unchecked` code block whereas the second arithmetic operation has been removed.

As such, we consider this exhibit fully addressed.

Finding Types

A description of each finding type included in the report can be found below and is linked by each respective finding. A full list of finding types Omniscia has defined will be viewable at the central audit methodology we will publish soon.

Input Sanitization

As there are no inherent guarantees to the inputs a function accepts, a set of guards should always be in place to sanitize the values passed in to a particular function.

Indeterminate Code

These types of issues arise when a linked code segment may not behave as expected, either due to mistyped code, convoluted if blocks, overlapping functions / variable names and other ambiguous statements.

Language Specific

Language specific issues arise from certain peculiarities that the Circom language boasts that discerns it from other conventional programming languages.

Curve Specific

Circom defaults to using the BN128 scalar field (a 254-bit prime field), but it also supports BSL12-381 (which has a 255-bit scalar field) and Goldilocks (with a 64-bit scalar field). However, since there are no constants denoting either the prime or the prime size in bits available in the Circom language, some Circomlib templates like `Sign` (which returns the sign of the input signal), and `AliasCheck` (used by the strict versions of `Num2Bits` and `Bits2Num`), hardcode either the BN128 prime size or some other constant related to BN128. Using these circuits with a custom prime may thus lead to unexpected results and should be avoided.

Code Style

In these types of findings, we identify whether a project conforms to a particular naming convention and whether that convention is consistent within the codebase and legible. In case of inconsistencies, we point them out under this category. Additionally, variable shadowing falls under this category as well which is identified when a local-level variable contains the same name as a toplevel variable in the circuit.

Mathematical Operations

This category is used when a mathematical issue is identified. This implies an issue with the implementation of a calculation compared to the specifications.

Logical Fault

This category is a bit broad and is meant to cover implementations that contain flaws in the way they are implemented, either due to unimplemented functionality, unaccounted-for edge cases or similar extraordinary scenarios.

Privacy Concern

This category is used when information that is meant to be kept private is made public in some way.

Proof Concern

Under-constrained signals are one of the most common issues in zero-knowledge circuits. Issues with proof generation fall under this category.

Severity Definition

In the ever-evolving world of blockchain technology, vulnerabilities continue to take on new forms and arise as more innovative projects manifest, new blockchain-level features are introduced, and novel layer-2 solutions are launched. When performing security reviews, we are tasked with classifying the various types of vulnerabilities we identify into subcategories to better aid our readers in understanding their impact.

Within this page, we will clarify what each severity level stands for and our approach in categorizing the findings we pinpoint in our audits. To note, all severity assessments are performed **as if the contract's logic cannot be upgraded** regardless of the underlying implementation.

Severity Levels

There are five distinct severity levels within our reports; `unknown`, `informational`, `minor`, `medium`, and `major`. A TL;DR overview table can be found below as well as a dedicated chapter to each severity level:

	Impact (None)	Impact (Low)	Impact (Moderate)	Impact (High)
Likelihood (None)	Informational	Informational	Informational	Informational
Likelihood (Low)	Informational	Minor	Minor	Medium
Likelihood (Moderate)	Informational	Minor	Medium	Major
Likelihood (High)	Informational	Medium	Major	Major

Unknown Severity

The `unknown` severity level is reserved for misbehaviors we observe in the codebase that cannot be quantified using the above metrics. Examples of such vulnerabilities include potentially desirable system behavior that is undocumented, reliance on external dependencies that are out-of-scope but could result in some form of vulnerability arising, use of external out-of-scope contracts that appears incorrect but cannot be pinpointed, and other such vulnerabilities.

In general, `unknown` severity level vulnerabilities require follow-up information by the project being audited and are either adjusted in severity (if valid), or marked as nullified (if invalid).

Additionally, the `unknown` severity level is sometimes assigned to centralization issues that cannot be assessed in likelihood due to their exploitation being tied to the honesty of the project's team.

Informational Severity

The `informational` severity level is dedicated to findings that do not affect the code functionally and tend to be stylistic or optimizational in nature. Certain edge cases are also set under `informational` vulnerabilities, such as overflow operations that will not manifest in the lifetime of the contract but should be guarded against as a best practice, to give an example.

Minor Severity

The `minor` severity level is meant for vulnerabilities that require functional changes in the code but tend to either have little impact or be unlikely to be recreated in a production environment. These findings can be acknowledged except for findings with a moderate impact but low likelihood which must be alleviated.

Medium Severity

The `medium` severity level is assigned to vulnerabilities that must be alleviated and have an observable impact on the overall project. These findings can only be acknowdged if the project deems them desirable behavior and we disagree with their point-of-view, instead urging them to reconsider their stance while marking the exhibit as acknowledged given that the project has ultimate say as to what vulnerabilities they end up patching in their system.

Major Severity

The `major` severity level is the maximum that can be specified for a finding and indicates a significant flaw in the code that must be alleviated.

Likelihood & Impact Assessment

As the preface chapter specifies, the blockchain space is constantly reinventing itself meaning that new vulnerabilities take place and our understanding of what security means differs year-to-year.

In order to reliably assess the likelihood and impact of a particular vulnerability, we instead apply an abstract measurement of a vulnerability's impact, duration the impact is applied for, and probability that the vulnerability would be exploited in a production environment.

Our proposed definitions are inspired by multiple sources in the security community and are as follows:

- Impact (High): A core invariant of the protocol can be broken for an extended duration.
- Impact (Moderate): A non-core invariant of the protocol can be broken for an extended duration or at scale, or an otherwise major-severity issue is reduced due to hypotheticals or external factors affecting likelihood.
- Impact (Low): A non-core invariant of the protocol can be broken with reduced likelihood or impact.
- Impact (None): A code or documentation flaw whose impact does not achieve low severity, or an issue without theoretical impact; a valuable best-practice
- Likelihood (High): A flaw in the code that can be exploited trivially and is ever-present.
- Likelihood (Moderate): A flaw in the code that requires some external factors to be exploited that are likely to manifest in practice.
- Likelihood (Low): A flaw in the code that requires multiple external factors to be exploited that may manifest in practice but would be unlikely to do so.
- Likelihood (None): A flaw in the code that requires external factors proven to be impossible in a production environment, either due to mathematical constraints, operational constraints, or system-related factors (i.e. EIP-20 tokens not being re-entrant).

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