

Case study: Using OpenSea for price discovery

Introduction

Before v2.4.0 release, sellers could create only offers with fixed prices. If they wanted to offer (primary sale) the same item on an external marketplace (for example OpenSea), they could do it by preminting rNFTs and listing them. This was more capital-intensive than selling only in Boson dApp, since it required them to deposit more funds in the protocol in order to satisfy escrow requirements.

With Boson Protocol release v2.4.0, sellers will be able to leverage the external price discovery mechanisms to sell their products at the best price. This will allow for greater flexibility with pricing and will open new possibilities for building on top of Boson. For example, sellers can now use auctions or AMMs for the initial sale. On top of that, it does not require sellers to provide additional capital upfront to fill the escrow.

Boson price discovery can be used in two ways, depending on how the external price discovery mechanism operates.

1. With **native rNFTs**.

If the price discovery mechanism does not require locking rNFT in their contract and allows only the buyer or the seller to finalize the transaction, then the seller can use preminted rNFTs directly. They list them on an external price discovery mechanism, do the majority of the process there and only finalize the transaction through Boson Protocol.

2. With **wrapped rNFTs**.

If the price discovery mechanism requires depositing of rNFT, or additional security guarantees are needed (e.g. restrictions on who can finalize the transaction or preventing the seller from hiding the true price from the Boson Protocol), then Boson rNFTs must first be wrapped (i.e. deposited into wrapper contract) and then wrapped rNFT (WrNFT) are plugged into the external price discovery.

These approaches can be used both in the initial sale and in secondary sales (sequential commits). The benefits of using them instead of simply listing the rNFTs on secondary marketplaces are that they give the buyer all Boson Protocol guarantees and that they enforce the royalties on the protocol level.

In this document, we describe possible approaches to using OpenSea as the marketplace and compare them to preminted rNFTs.

User flows

This section describes the actions that sellers and buyers take in order to use OpenSea as a price discovery mechanism. Different price mechanisms might require different steps. The generic approach is described in [BPIP-4: Support price discovery](#).

Initial setup

Regardless of whether the native rNFTs or the wrapped rNFTs are used, the initial setup is the same. The seller must first create an offer on Boson and then premint the rNFTs that can be used in an external price discovery. This is done in three steps:

3. The seller creates a Price Discovery offer on Boson [*not yet supported in Boson dApp*]
 - a. Required offer parameters:
 - i. `priceType = 1; // PriceType.Discovery`
 - ii. `price = "0";`
 - iii. `buyerCancelPenalty = "0";`
4. The seller reserves range in the protocol [*not yet supported in Boson dApp*]
 - a. First owner of preminted rNFTs = seller (assistant);
5. The seller premits the rNFTs on Boson Voucher contract [*not yet supported in Boson dApp*]

#1 Native rNFT, trusted seller

In this approach, the seller premits the rNFTs and lists them directly on OpenSea. This allows buyers to place bids on OpenSea, but does not allow the seller to make counteroffers or make fixed-price offers. Buyers must also trust the seller to not abuse the protocol and encumber a lower amount than it was sold for (this trust assumption is similar to the trust assumption with preminted vouchers).

Steps:

1. The seller lists the item on OpenSea:
 - a. Boson dApp could support listing on OpenSea directly from the dApp (with OpenSea SDK). [*not yet supported in Boson dApp*]
 - b. The seller can list it directly on the OpenSea, using their UI:



List for sale

< List for sale

Choose a type of sale

Fixed price The item is listed at the price you set.	<input type="radio"/>
Sell to highest bidder The item is listed for auction. Learn More	<input checked="" type="radio"/>

Set a price

Starting price

 ETH

\$35,37

Duration

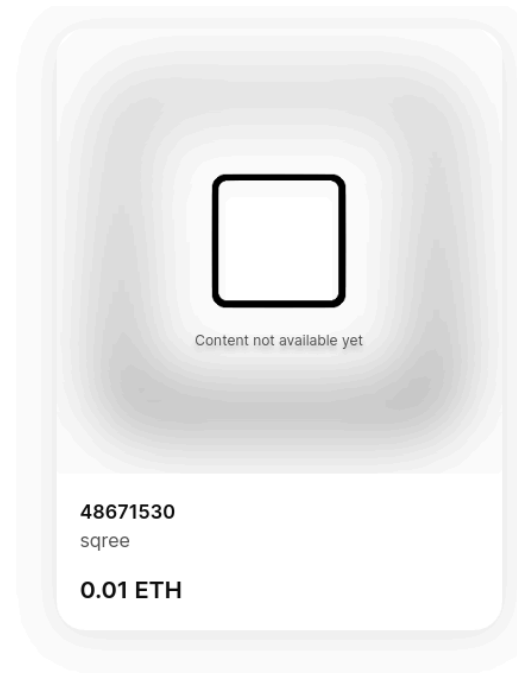
More options

Summary

Listing price	0,01 ETH
OpenSea fee	2.5%
Creator earnings ⓘ	0%

Total potential earnings **0,0097 ETH**
\$34,48 USD

Complete listing



The type of sale **must** be “sell to highest bidder”. If they set “Fixed price”, buyers cannot use OpenSea to buy it (they get “execution reverter error”).¹

2. The buyers can now place a bid. This example uses two potential buyers.
Buyer #1 places bid #1. When a buyer places a bid, they just approve the Seaport to transfer the funds, they don't pay it immediately.

¹If seller sets “fixed price”, the buyer has 2 options:

1. They could accept it via Boson Protocol. Boson dApp does not support it yet. Also it would mean the buyer must go to Boson dApp - in this case it would be much more efficient to just list a fixed price offer in the Boson dApp in the beginning.
2. The buyer can make a counter offer on OpenSea. This is equivalent to placing a bid in auction type listing, and the seller can then accept it.

Place a bid

48671621

sqree

0.01 ETH

\$35,41

Balance

0,0108 ETH

Floor price

0,01 ETH

Best offer

--

0.01

ETH

\$35,41 Total

Total offer amount: 0.01 ETH (\$35,41)

Place bid

3. Buyer #2 places bid #2.

Place a bid

48671621

sqree

0.0105 ETH

\$37,18

Balance

0,0198 ETH

Floor price

0,01 ETH

Best offer

0,01 ETH

0.0105

ETH

\$37,18 Total

Total offer amount: 0.0105 ETH (\$37,18)

Place bid

4. The seller's view in OpenSea:

🕒 Sale ends 28. marec 2024 at 11:46 dop.

Top bid -- Reserve price of 0,01 ETH met!

0,0105 ETH

\$37,17

Accept offer

0,0105 ETH

📁 Listings

☰ Offers

Price	USD Price	Quantity	Floor Difference	Expiration	From		
0,0105 ETH	\$37,17	1	5% above	in 10 days	6C0A9C	Counter	Accept
0,01 ETH	\$35,40	1	At floor	in 10 days	C2E8F0	Counter	Accept

OpenSea UI allows the seller to accept any offer, but if they try it, the execution will be reverted, since Boson Protocol requires that the final step starts in the Boson protocol. Boson dApp could show all OpenSea bids (they provide the API and SDK) and create the proper request to send to the network.

OpenSea UI allows the seller to counter the offer, but that results in the same issue as with fixed-price offers, so they should not do that.

5. Finalization is done through Boson Protocol. *[not yet supported in Boson dApp]*
The seller must prepare settlement instructions that work with SeaPort (OpenSea's protocol) and submit them to Boson. They take the buyer's signed order from OpenSea. However, the crucial part is that they set the Boson Protocol as the seller. During the finalization, the Boson Protocol temporarily takes ownership of the sold rNFT.

Overall, everything happens in a single transaction. The buyer gets the NFT, the protocol gets the funds. OpenSea detects the ownership change and ends the auction. Transaction triggers commit to buy, so the redemption period starts immediately.

Example of a successful transaction:

<https://mumbai.polygonscan.com/tx/0x8092e78d95277fb2a5df9ba5fcb567f431e7a81258abca835a788bd0d6e77eb8>

Diagram with all actions:

<https://miro.com/app/board/uXjVME6Q338=/?moveToWidget=3458764583097388621&cot=14>

Asset movement:

- Until the finalization, no assets are moved.
- During the finalization (atomically):
 - The exchange token is transferred from the buyer to the protocol (97.5%)
 - The exchange token is transferred from the buyer to OpenSea (2.5%)
 - Preminted rNFT is transferred from the seller to the protocol
 - Preminted rNFT is transferred from the protocol to the buyer

Features:

- Full OpenSea experience for buyers.
- No counteroffers.
- No fixed-price offers.
- Buyers must trust the seller.
- No up-front capital requirements.
- The sellers could do all actions inside Boson dApp (once implemented).
- OpenSea takes a 2.5% fee, which is non-refundable. Only the remainder stays in the escrow.

#2 Wrapped rNFTs

Although OpenSea can be used without a wrapper, wrapping the rNFT has some advantages:

- It can be made fully trustless. Without the wrapper, the advanced seller could manipulate the Seaport order to make it look like the actual price was lower. With the wrapper, the interaction with Seaport is predetermined and can guarantee that the full price will be escrowed.

- It allows the listing of fixed-price orders. Although counter-intuitive (why use fixed price in price discovery setting?), this option serves as a capital-efficient alternative to preminted vouchers.

The disadvantages of using the vouchers are:

- It requires an additional wrapper contract that sits between the voucher contract and the price discovery mechanism. Ideally, this contract is audited. Since it's not expected that the sellers will develop their own wrapper contracts, Boson could provide a contract factory that would deploy audited wrappers upon request².
- After the buyer acquires the WrNFT, it must be unwrapped so the buyer gets the rNFT and commit to buy is triggered. Since these are technically two different NFTs, OpenSea will keep two separate pages for them and the page of rNFT won't include the price history of WrNFT.
- Between finalization and unwrapping, funds belong to the wrapper contract. In general, we cannot ensure the atomicity of finalization on OpenSea and in Boson Protocol. In some cases it is possible, but even when it is not, the incentives to unwrap are high, so it's expected that either the seller or buyer will do it. But even if they don't, a third party could unwrap it and ensure that no WrNFT are stuck.
- Wrappers are specific for each price discovery mechanism. That means that the OpenSea wrapper will be different from a Zora wrapper for example. But that does not necessarily mean that the seller always needs multiple wrappers - they need only those relevant for the marketplaces they use, or the wrappers can even be combined into a single wrapper contract.

Additional information on wrapped vouchers: [📖 Wrapped Boson vouchers](#) .

User flows are slightly different, depending on whether the seller wants to list a fixed-price offer or they want to start an auction. In either case, the same wrapper contract can be used.

Fixed price

To create a fixed-price order on OpenSea using a voucher, the voucher itself acts as the offerer. When the buyer wraps the rNFT, the wrapper mints a WrNFT to itself and immediately lists it on OpenSea. When a buyer buys the item, the funds are transferred to the wrapper. When the unwrapping happens, the WrNFT is burned, the rNFT is transferred to the buyer and the funds are transferred to the Boson Protocol and put in the escrow.

Steps:

1. The seller approves the wrapper to transfer rNFTs on their behalf
2. The seller lists the rNFTs by calling "listFixedPricedOffer" on the wrapper.
 - a. The method does the following:
 - i. Transfer preminted rNFTs from the seller to itself
 - ii. Mints the WrNFTs with the same token ID. The owner of the wrNFTs is the wrapper.
 - iii. Calls seaport validation function. OpenSea lists it as a fixed-price offer.

² For initial price discovery it will always be the original seller that needs to provide the wrapper contract. For secondary sales, the rNFT owners can use the original seller's wrapper (if it was deployed) or they deploy their own.

- b. The seller must provide:
 - i. List of rNFT IDs to list
 - ii. Price
 - iii. End time
 3. A buyer finds the item on OS and buys it directly there, by clicking “Buy now”

Wrapped Boson Voucher (rNFT) S140_C0



#245683868916917570620556466565736648671616

Owned by 696E72

1 view

Sale ends 22. april 2024 at 9:36 dop.

Current price
0,001 ETH \$3,51

Buy now

Make offer

After the transaction is confirmed, the buyer owns the wrapped rNFT, and the wrapper contract gets the price (less the OpenSea fee). The rNFT still needs to be unwrapped. It cannot be done in a single transaction, since OS first transfers the rNFT and the exchange token afterwards

Example tx:

<https://mumbai.polygonscan.com/tx/0xf69faa3ac01f3e0b2f00d1636b751f6b51ac4a31d71016d0a67e1908a88f6266>

4. Unwrapping is done by calling Boson Protocol “commitToPriceDiscoveryOffer”:
 - a. The price must match the price on OS, reduced by OpenSea fee
 - b. Wrapped rNFT is burned, and true rNFT is transferred to the buyer
 - c. Funds are transferred from the wrapper contract to the Boson protocol
 - d. Redemption period starts
 - e. Anyone can call it.
 - i. The buyer is expected to be lazy. They won’t call unwrap until they need to do something with it (redeem/cancel), or the offer expiration is near.
 - ii. The seller is incentivized to call it immediately, so the redemption period starts and they can get the funds out as soon as possible
 - iii. Third-party services could do it for a fee.

Example tx:

<https://mumbai.polygonscan.com/tx/0x5bac8942cd5e1071d18c649417f56ab4e4148e8b2a091ed2ef3712609c0dc0fa>

Asset movement:

- During the listing, the rNFT is moved from the seller to the wrapper and WrNFT is minted.
- Then until the finalization on OpenSea (buyer clicks “buy now”), no assets are moved.

- During the finalization on OpenSea (atomically):
 - The exchange token is transferred from the buyer to the wrapper (97.5%)
 - The exchange token is transferred from the buyer to OpenSea (2.5%)
 - WrNFT is transferred from the wrapper to the buyer
- During the unwrapping:
 - The exchange token is transferred from the wrapper to Boson Protocol
 - WrNFT is burned and preminted rNFT is transferred from the wrapper to the buyer.

Features:

- Full OpenSea experience for buyers.
- Buyers don't have to trust the seller.
- No up-front capital requirements.
- The sellers could do all actions inside Boson dApp (once implemented).
- Unwrapping must be done in a separate transaction.
- OpenSea takes a 2.5% fee, which is non-refundable. Only the remainder stays in the escrow.

Auction

An auction with a wrapper is very similar to the auction with native rNFT with three main differences:

- The item listed on openSea is WrNFT, not rNFT. To offerer is the seller in both cases.
- The settlement instructions are constructed in the wrapper, therefore eliminating the possibility of tricking the system, so even the buyers don't have to trust the seller.
- After the buyer acquires the WrNFT it must be unwrapped.
 - The finalization can be done in two steps (finalize via wrapper, unwrap via Boson Protocol) or in a single step (finalize and unwrap via Boson Protocol).

In an auction with a wrapper, the original owner of WrNFT is the seller, so they can list it on OpenSea. Buyers place bids on OpenSea as usual, and when the seller decides to accept the bid, they call a specific method on the wrapper. The wrapper first transfers the WrNFT to itself (it becomes the offerer from OpenSea perspective) and then prepares the settlement data and forwards it to SeaPort. Since the wrapper is the offer, it receives the payment (less the OpenSea fee), which can be then forwarded to the Boson Protocol.

Steps:

1. The seller approves the wrapper to transfer rNFTs on their behalf
2. The seller wraps the rNFTs by calling "wrapForAuction" on the wrapper.
 - a. The method does the following:
 - i. Transfers preminted rNFTs from the seller to itself.
 - ii. Mints wrNFTs. The owner of the WrNFTs is the seller.
 - b. The seller must provide:
 - i. List of rNFT IDs to list

[the following steps are the same as steps 1.-4. in "#1 Native rNFT, trusted seller"]

3. The seller lists WrNFT on OpenSea
 - a. It could be done via dApp (once it's supported).

- b. It can be done via UI with the same considerations as when listing the native rNFTs.

4. Buyers place bids

Wrapped Boson Voucher (rNFT) S140_C0



#245683868916917570620556466565736648671538

Owned by 2A91A0

1 view

🕒 Sale ends 29. marec 2024 at 3:44 pop.

?

Minimum bid -- Reserve price not met.

0,001 ETH \$3,34

📄 Place bid

- 5. The seller accepts the bid by calling “finalizeAuction” on the wrapper.
The seller needs to provide the buyer’s signed OpenSea order. The wrapper first transfers the WrNFT to itself and sends the settlement instructions to OpenSea which transfers the WrNFT to the buyer and transfers the payment from the buyer to the wrapper and OpenSea.
Example tx:
<https://mumbai.polygonscan.com/tx/0xf8599b634c50538349be011c505723aae2c14add4eeef4f6216cb32d00c7b117>
- 6. Unwrapping is done by calling Boson Protocol “commitToPriceDiscoveryOffer”:
 - a. The price must match the price on OS, reduced by OpenSea fee
 - b. Wrapped rNFT is burned, and true rNFT is transferred to the buyer
 - c. Funds are transferred from the wrapper contract to the Boson protocol
 - d. Redemption period starts
 - e. Anyone can call it.
 - i. The buyer is expected to be lazy. They won’t call unwrap until they need to do something with it (redeem/cancel), or the offer expiration is near.
 - ii. The seller is incentivized to call it immediately, so the redemption period starts and they can get the funds out as soon as possible
 - iii. Third-party services could do it for a fee.

Example tx:

<https://mumbai.polygonscan.com/tx/0x834e6cfd5d8a862638d06aff94bdbb2969772699aca4189de2cb13eccb842cb5>

Note: steps 5 and 6 can be done in a single transaction. Example:

<https://mumbai.polygonscan.com/tx/0x06709c9b9c777e5b4bd3d58a41cc0bf1659e0aed8e8dbdc2019b322774842c01>

Asset movement:

- During the listing, the rNFT is moved from the seller to the wrapper and WrNFT is minted.

- Then until the finalization on OpenSea (buyer clicks “buy now”), no assets are moved.
- During the finalization on OpenSea (atomically):
 - The exchange token is transferred from the buyer to the wrapper (97.5%)
 - The exchange token is transferred from the buyer to OpenSea (2.5%)
 - WrNFT is transferred from the seller to the wrapper
 - WrNFT is transferred from the wrapper to the buyer
- During the unwrapping (atomically):
 - The exchange token is transferred from the wrapper to Boson Protocol
 - WrNFT is burned and preminted rNFT is transferred from the wrapper to the buyer.

Features:

- Full OpenSea experience for buyers.
- Buyers don't have to trust the seller.
- No up-front capital requirements.
- The sellers could do all actions inside Boson dApp (once implemented).
- OpenSea takes a 2.5% fee, which is non-refundable. Only the remainder stays in the escrow.

Comparison with preminted vouchers

	Preminted offers	Price discovery - native rNFTs	Price discovery - wrapped rNFTs
Offer type	Fixed price only	Auctions only	Both fixed price and auctions
Seller capital requirements	Needs to deposit the item price in the protocol before someone buys it	No upfront capital requirements	No upfront capital requirements
Finalization site	The sale is finalized on OpenSea	The sale is finalized in Boson Dapp	<p>The sale of wrapped rNFT can be finalized either on OS or in Boson Dapp.</p> <p>Unwrapping must be done in Boson dApp, if done manually by the seller or buyer. Unwrapping can be also done automatically by a backend when the sale is detected (to cost of unwrapping</p>

			then falls on the backend).
Buyer gets the rNFT:	Immediately after they buy it on OS.	Immediately after the seller accepts the bid.	After the sale on OS is completed, the buyer gets only the wrapped rNFT (immediately). To get the rNFT it must be unwrapped. Anyone can do it. The seller has the incentive to do it ASAP to get the money out. The redemption period starts only after it's unwrapped.
Trust assumptions	The buyer must trust the seller to list the same price in Boson Protocol and on openSea. They can verify it before they buy it.	The buyer must trust the seller to supply the correct price to Boson Protocol during the finalization. They cannot verify that upfront. In the worst case, the escrow does not have enough funds to pay out the buyer if the voucher is revoked or the exchange is disputed.	The wrapper code is immutable. No trust is needed.
UX	<p>Buyer:</p> <ul style="list-style-type: none"> - Can buy on OS - Cannot place a bid on OS <p>Seller:</p> <ul style="list-style-type: none"> - can use fixed-price OpenSea UX - it is possible to implement everything in the dApp 	<p>Buyer:</p> <ul style="list-style-type: none"> - Can place a bid on OS <p>Seller:</p> <ul style="list-style-type: none"> - can use auction OpenSea UX - need to finalize the sale inside Boson dApp - it is possible to implement everything in the dApp 	<p>Buyer:</p> <ul style="list-style-type: none"> - Full OpenSea UX - Potentially they need to unwrap it in boson dApp. It could be part of a redemption widget (unwrapAndRedeem) <p>Seller:</p> <ul style="list-style-type: none"> - wrapping in dApp - auction can be listed on OS or in dApp - fixed price can be listed in dApp - need to finalize the

			sale inside Boson dApp
Compatibility with other price discovery mechanisms	Fully compatible with any ERC721 marketplace	Not compatible with price discoveries that require to deposit rNFT. For others, different steps might be needed, depending on the price discovery mechanism requirements.	Each price discovery needs its own wrapper implementation. Multiple wrappers can be combined into a single contract. The approach is in theory compatible with any price discovery mechanism.