ABDK CONSULTING

SMART CONTRACT AUDIT

1inch

LimitOrderProtocol

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SMART CONTRACT AUDIT CONCLUSION

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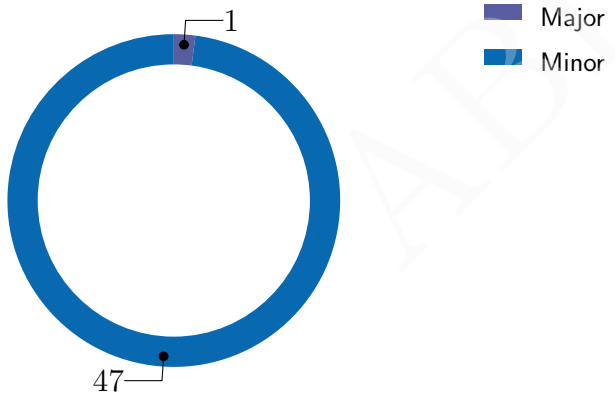
08th June 2021

We've been asked to review the Limit Order Protocol smart contract as part of 1inch ecosystem. We have found only one major issue and a few minor ones. The most important issues were fixed.



Findings

ID	Severity	Category	Status
CVF-1	Minor	Suboptimal	Info
CVF-2	Minor	Procedural	Info
CVF-3	Minor	Procedural	Info
CVF-4	Minor	Procedural	Info
CVF-5	Minor	Bad naming	Info
CVF-6	Minor	Suboptimal	Info
CVF-7	Minor	Suboptimal	Info
CVF-8	Minor	Documentation	Info
CVF-9	Minor	Suboptimal	Info
CVF-10	Minor	Suboptimal	Info
CVF-11	Minor	Flaw	Fixed
CVF-12	Minor	Bad naming	Fixed
CVF-13	Minor	Bad datatype	Fixed
CVF-14	Minor	Unclear behavior	Info
CVF-15	Minor	Suboptimal	Info
CVF-16	Minor	Suboptimal	Fixed
CVF-17	Minor	Flaw	Fixed
CVF-18	Minor	Suboptimal	Info
CVF-19	Minor	Suboptimal	Info
CVF-20	Minor	Procedural	Info
CVF-21	Minor	Suboptimal	Fixed
CVF-22	Minor	Procedural	Fixed
CVF-23	Major	Flaw	Fixed
CVF-24	Minor	Suboptimal	Fixed
CVF-25	Minor	Procedural	Info
CVF-26	Minor	Procedural	Info
CVF-27	Minor	Suboptimal	Info

ID	Severity	Category	Status
CVF-28	Minor	Flaw	Fixed
CVF-29	Minor	Suboptimal	Info
CVF-30	Minor	Suboptimal	Info
CVF-31	Minor	Procedural	Info
CVF-32	Minor	Flaw	Fixed
CVF-33	Minor	Bad naming	Info
CVF-34	Minor	Suboptimal	Info
CVF-35	Minor	Unclear behavior	Info
CVF-36	Minor	Suboptimal	Fixed
CVF-37	Minor	Suboptimal	Info
CVF-38	Minor	Suboptimal	Info
CVF-39	Minor	Suboptimal	Info
CVF-40	Minor	Unclear behavior	Info
CVF-41	Minor	Bad naming	Info
CVF-42	Minor	Suboptimal	Info
CVF-43	Minor	Suboptimal	Info
CVF-44	Minor	Unclear behavior	Info
CVF-45	Minor	Flaw	Fixed
CVF-46	Minor	Suboptimal	Info
CVF-47	Minor	Suboptimal	Info
CVF-48	Minor	Unclear behavior	Info

Contents

1 Document properties

Version

Version	Date	Author	Description
0.1	May 28, 2021	D. Khovratovich	Initial Draft
0.2	May 28, 2021	D. Khovratovich	Minor revision
1.0	May 31, 2021	D. Khovratovich	Release
1.1	June 3, 2021	D. Khovratovich	Add client comment
2.0	June 4, 2021	D. Khovratovich	Release
2.1	June 7, 2021	D. Khovratovich	Delete CFV-13
2.0	June 8, 2021	D. Khovratovich	Release

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2 Introduction

The following document provides the result of the audit performed by ABDK Consulting at the customer request. The audit goal is a general review of the smart contracts structure, critical/major bugs detection and issuing the general recommendations.

We were given access to the 1inch repo, release abdk-audit. The files are written in Solidity language and are located here:

- helpers/AmountCalculator.sol;
- helpers/ERC1155Proxy.sol;
- helpers/ERC20Proxy.sol;
- helpers/ERC721Proxy.sol;
- helpers/ImmutableOwner.sol;
- helpers/NonceManager.sol;
- helpers/PredicateHelper.sol;
- interfaces/InteractiveMaker.sol;
- libraries/ArgumentsDecoder.sol;
- libraries/UncheckedAddress.sol;
- LimitOrderProtocol.sol.

The authors applied some fixes based on our feedback. The new version is 1inch repo, release audit-final.

2.1 About ABDK

ABDK Consulting, established in 2016, is a leading service provider in the space of blockchain development and audit. It has contributed to numerous blockchain projects, and co-authored some widely known blockchain primitives like Poseidon hash function. The ABDK Audit Team, led by Mikhail Vladimirov and Dmitry Khovratovich, has conducted over 40 audits of blockchain projects in Solidity, Rust, Circom, C++, JavaScript, and other languages.

2.2 Disclaimer

Note that the performed audit represents current best practices and smart contract standards which are relevant at the date of publication. After fixing the indicated issues the smart contracts should be re-audited.

2.3 Methodology

The methodology is not a strict formal procedure, but rather a collection of methods and tactics that combined differently and tuned for every particular project, depending on the project structure and and used technologies, as well as on what the client is expecting from the audit. In current audit we use:

- **General Code Assessment**. The code is reviewed for clarity, consistency, style, and for whether it follows code best practices applicable to the particular programming language used. We check indentation, naming convention, commented code blocks, code duplication, confusing names, confusing, irrelevant, or missing comments etc. At this phase we also understand overall code structure.
- **Entity Usage Analysis**. Usages of various entities defined in the code are analysed. This includes both: internal usages from other parts of the code as well as potential external usages. We check that entities are defined in proper places and that their visibility scopes and access levels are relevant. At this phase we understand overall system architecture and how different parts of the code are related to each other.
- **Access Control Analysis**. For those entities, that could be accessed externally, access control measures are analysed. We check that access control is relevant and is done properly. At this phase we understand user roles and permissions, as well as what assets the system ought to protect.
- **Code Logic Analysis**. The code logic of particular functions is analysed for correctness and efficiency. We check that code actually does what it is supposed to do, that algorithms are optimal and correct, and that proper data types are used. We also check that external libraries used in the code are up to date and relevant to the tasks they solve in the code. At this phase we also understand data structures used and the purposes they are used for.

3 Detailed Results

3.1 CVF-1

- **Severity** Minor
- **Status** Info
- **Category** Suboptimal
- **Source** AmountCalculator.sol

Recommendation Since this function calls an arbitrary external contract, it probably should not be specified as view.
Client Comment It is marked view because it only does static calls.

Listing 1:

```
21 function arbitraryStaticCall(address target, bytes memory data)
   ↪ external view returns(uint256) {
```

3.2 CVF-2

- **Severity** Minor
- **Status** Info
- **Category** Procedural
- **Source** LimitOrderProtocol.sol

Description EIP712 is not imported explicitly.
Recommendation Consider doing this.
Client Comment Won't fix.

Listing 2:

```
21 EIP712("1inch Limit Order Protocol", "1"),
```

3.3 CVF-3

- **Severity** Minor
- **Status** Info
- **Category** Procedural
- **Source** LimitOrderProtocol.sol

Recommendation This is not needed since Solidity 0.8.
Client Comment We use that for convenient revert messages (lines 92, 227) and for trySub (line 193).

Listing 3:

```
 6 "@openzeppelin/contracts/utils/math/SafeMath.sol";

30     using SafeMath for uint256;
```

3.4 CVF-4

- **Severity** Minor
- **Status** Info
- **Category** Procedural
- **Source** LimitOrderProtocol.sol

Description The commented code should probably be removed.
Client Comment Natspec docs are in progress.

Listing 4:

```
35 // Partial Fill:
   //    getMakerAmount := GetMakerAmountHelper.disablePartialFill(
   ↪ makerAmount, ...)
   //
   // Expiration Mask:
   //    predicate := PredicateHelper.timestampBelow(deadline)
40 //
   // Maker Nonce:
   //    predicate := this.nonceEquals(makerAddress, makerNonce)
```

3.5 CVF-5

- **Severity** Minor
- **Status** Info
- **Category** Bad naming
- **Source** LimitOrderProtocol.sol

Recommendation Events are usually named via nouns, such as "OrderFill", "OrderFillRFQ", or just "Fill", "FillRFQ".
Client Comment Won't fix.

Listing 5:

```
44 event OrderFilled(

50 event OrderFilledRFQ(
```

3.6 CVF-6

- **Severity** Minor
- **Status** Info
- **Category** Suboptimal
- **Source** LimitOrderProtocol.sol

Recommendation These parameters should be indexed.
Client Comment Won't fix.

Listing 6:

```
46 bytes32 orderHash,

51 bytes32 orderHash,
```

3.7 CVF-7

- **Severity** Minor
- **Status** Info
- **Category** Suboptimal
- **Source** LimitOrderProtocol.sol

Recommendation This value could be made a compile-time constant rather than an immutable variable.
Client Comment For some reason immutable is more gas efficient than constant.

Listing 7:

```
84 bytes4 immutable private _maxSelector = bytes4(uint32(IERC20.
   ↪ transferFrom.selector) + 10);
```

3.8 CVF-8

- **Severity** Minor
- **Status** Info
- **Category** Documentation
- **Source** LimitOrderProtocol.sol

Description Semantics of keys in these mappings is unclear.
Recommendation Consider adding documentation comments.
Client Comment Natspec docs are in progress.

Listing 8:

```
86 mapping(bytes32 => uint256) private _remaining;
mapping(address => mapping(uint256 => uint256)) private
   ↪ _invalidator;
```

3.9 CVF-9

- **Severity** Minor
- **Status** Info
- **Category** Suboptimal
- **Source** LimitOrderProtocol.sol

Recommendation This function would not be necessary if the '_remaining' mapping would be public.
Client Comment Won't fix.

Listing 9:

```
98 function remainingRaw(bytes32 orderHash) external view returns(
   ↪ uint256) {
```

3.10 CVF-10

- **Severity** Minor
- **Status** Info
- **Category** Suboptimal
- **Source** LimitOrderProtocol.sol

Recommendation These functions are quite generic ans should probably be moved to some helper or library.
Client Comment Won't fix.

Listing 10:

```
113 function checkPredicate(Order memory order) public view returns(
    ↪ bool) {

119 function simulateTransferFroms(IERC20[] calldata tokens, bytes[]
    ↪  calldata data) external {
```

3.11 CVF-11

- **Severity** Minor
- **Status** Fixed
- **Category** Flaw
- **Source** LimitOrderProtocol.sol

Recommendation There should be a check that 'tokens' and 'data' have the same length.

Listing 11:

```
119 function simulateTransferFroms(IERC20[] calldata tokens, bytes[]
    ↪  calldata data) external {
```

3.12 CVF-12

- **Severity** Minor
- **Status** Fixed
- **Category** Bad naming
- **Source** LimitOrderProtocol.sol

Recommendation The name is confusing, as the functionality of this method is quite generic as it just passes arbitrary calls to other contracts, and is not restricted to 'transferFroms'.

Listing 12:

```
119 function simulateTransferFroms(IERC20[] calldata tokens, bytes[]
    ↪  calldata data) external {
```

3.13 CVF-13

- **Severity** Minor
- **Status** Fixed
- **Category** Bad datatype
- **Source** LimitOrderProtocol.sol

Recommendation The indexes of various parameters should be made named constants.

Listing 13:

```
135 require(order.makerAssetData.decodeAddress(0) == msg.sender, "
    ↪ LOP: Access denied");

152 address maker = order.makerAssetData.decodeAddress(0);

158 uint256 orderMakerAmount = order.makerAssetData.decodeUint256(2)
    ↪ ;
    uint256 orderTakerAmount = order.takerAssetData.decodeUint256(2)
    ↪ ;

202         remainingMakerAmount = order.makerAssetData.
                ↪ decodeUint256(2);

223     takingAmount = (makingAmount == order.makerAssetData.
            ↪ decodeUint256(2))
            ? order.takerAssetData.decodeUint256(2)

228     makingAmount = (takingAmount == order.takerAssetData.
            ↪ decodeUint256(2))
            ? order.makerAssetData.decodeUint256(2)

249     InteractiveMaker(order.makerAssetData.decodeAddress(0))

310 address maker = address(makerAssetData.decodeAddress(0));

319 address orderTakerAddress = makerAssetData.decodeAddress(1);

321     makerAssetData.patchAddress(1, taker);

328     makerAssetData.patchUint256(2, makingAmount);

340 takerAssetData.patchAddress(0, taker);

344     takerAssetData.patchUint256(2, takingAmount);
```

3.14 CVF-14

- **Severity** Minor
- **Status** Info
- **Category** Unclear behavior
- **Source** LimitOrderProtocol.sol

Description The function does not check that an order was created. Probably it is ok.
Client Comment It is ok, because you might want to cancel the order before someone tries to fill it.

Listing 14:

```
138 _remaining[orderHash] = 1;
```

3.15 CVF-15

- **Severity** Minor
- **Status** Info
- **Category** Suboptimal
- **Source** LimitOrderProtocol.sol

Description Emitting the 'OrderFilled' event on order cancellation is confusing.
Recommendation Consider emitting a separate cancellation event.
Client Comment Won't fix.

Listing 15:

```
139 emit OrderFilled(msg.sender, orderHash, 0);
```

3.16 CVF-16

- **Severity** Minor
- **Status** Fixed
- **Category** Suboptimal
- **Source** LimitOrderProtocol.sol

Recommendation Right shift and bitwise 'and' would be more efficient.

Listing 16:

```
143 _invalidator[msg.sender][uint64(orderInfo) / 256] |= (1 << (
    ↪ orderInfo % 256));

153 uint256 invalidator = _invalidator[maker][uint64(order.info) /
    ↪ 256];
    require(invalidator & (1 << (order.info % 256)) == 0, "LOP:
    ↪ already filled");
    _invalidator[maker][uint64(order.info) / 256] = invalidator | (1
    ↪ << (order.info % 256));
```

3.17 CVF-17

- **Severity** Minor
- **Status** Fixed
- **Category** Flaw
- **Source** LimitOrderProtocol.sol

Recommendation The expression "1 « (order.info % 256)" is calculated twice.

Listing 17:

```
154 require(invalidator & (1 << (order.info % 256)) == 0, "LOP:
    ↪ already filled");
_invalidator[maker][uint64(order.info) / 256] = invalidator | (1
    ↪ << (order.info % 256));
```

3.18 CVF-18

- **Severity** Minor
- **Status** Info
- **Category** Suboptimal
- **Source** LimitOrderProtocol.sol

Recommendation There are functions for this in 'AmountCalculator'.
Client Comment Inlined for 50-60 gas efficiency.

Listing 18:

```
170 takingAmount = (makingAmount * orderTakerAmount +
    ↪ orderMakerAmount - 1) / orderMakerAmount;

173 makingAmount = takingAmount * orderMakerAmount /
    ↪ orderTakerAmount;
```

3.19 CVF-19

- **Severity** Minor
- **Status** Info
- **Category** Suboptimal
- **Source** LimitOrderProtocol.sol

Recommendation The function emits the remaining amount, which can be acquired from the contract directly, but does not emit the actual making/taking amounts, which might be more relevant.
Client Comment Won't fix.

Listing 19:

```
242 emit OrderFilled(msg.sender, orderHash, remainingMakerAmount);

256 return (makingAmount, takingAmount);
```

3.20 CVF-20

- **Severity** Minor
- **Status** Info
- **Category** Procedural
- **Source** LimitOrderProtocol.sol

Description We didn't review this function.
Client Comment Ok.

Listing 20:

```
260 return _hashTypedDataV4(

280 return _hashTypedDataV4(
```

3.21 CVF-21

- **Severity** Minor
- **Status** Fixed
- **Category** Suboptimal
- **Source** LimitOrderProtocol.sol

Recommendation The return statement is redundant as the callee does not return anything.

Listing 21:

```
299 return _validate(order.makerAssetData, order.takerAssetData,
    ↪ signature, orderHash);
```

3.22 CVF-22

- **Severity** Minor
- **Status** Fixed
- **Category** Procedural
- **Source** LimitOrderProtocol.sol

Description ECDSA is not imported explicitly.
Recommendation Consider doing this.

Listing 22:

```
311 if ((signature.length != 65 && signature.length != 64) || ECDSA.
    ↪ recover(orderHash, signature) != maker) {
```

3.23 CVF-23

- **Severity** Major
- **Status** Fixed
- **Category** Flaw
- **Source** LimitOrderProtocol.sol

Description ECDSA.recover' will revert in case the signature is invalid, thus preventing 'isValidSignature' on the maker to be called. Common way is to check the code size of the potential signer, and if it is non-zero, call isValidSignature on it, otherwise try validating the ECDSA signature.

Listing 23:

```
311 if ((signature.length != 65 && signature.length != 64) || ECDSA.
    ↪ recover(orderHash, signature) != maker) {
```

3.24 CVF-24

- **Severity** Minor
- **Status** Fixed
- **Category** Suboptimal
- **Source** UncheckedAddress.sol

Recommendation The "returndata_size" variable is redundant as it is used only once.

Listing 24:

```
40 let returndata_size := mload(returndata)
revert(add(32, returndata), returndata_size)
```

3.25 CVF-25

- **Severity** Minor
- **Status** Info
- **Category** Procedural
- **Source** ArgumentsDecoder.sol

Recommendation It is not checked that the data length is at least 4 bytes.
Client Comment It is checked externally in '_validate' function.

Listing 25:

```
7 function decodeSelector(bytes memory data) internal pure returns
    ↪ (bytes4 selector) {
```

3.26 CVF-26

- **Severity** Minor
- **Status** Info
- **Category** Procedural
- **Source** ArgumentsDecoder.sol

Recommendation It is not checked that the argument position is within the array length.
Client Comment It is checked externally in '_validate' function.

Listing 26:

```
13 function decodeAddress(bytes memory data, uint256 argumentIndex)
     ↪ internal pure returns(address account) {

19 function decodeUint256(bytes memory data, uint256 argumentIndex)
     ↪ internal pure returns(uint256 value) {

25 function patchAddress(bytes memory data, uint256 argumentIndex,
     ↪ address account) internal pure {

31 function patchUint256(bytes memory data, uint256 argumentIndex,
     ↪ uint256 value) internal pure {
```

3.27 CVF-27

- **Severity** Minor
- **Status** Info
- **Category** Suboptimal
- **Source** ArgumentsDecoder.sol

Recommendation Left shift would be more efficient, than multiplication.
Client Comment It is already done by optimizer.

Listing 27:

```
15 account := mload(add(add(data, 0x24), mul(argumentIndex, 0x20)))
```

3.28 CVF-28

- **Severity** Minor
- **Status** Fixed
- **Category** Flaw
- **Source** PredicateHelper.sol

Recommendation The data array length is not checked.

Listing 28:

```
11 function or(address[] calldata targets, bytes[] calldata data)
     ↪ external view returns(bool) {

22 function and(address[] calldata targets, bytes[] calldata data)
     ↪ external view returns(bool) {
```

3.29 CVF-29

- **Severity** Minor
- **Status** Info
- **Category** Suboptimal
- **Source** PredicateHelper.sol

Recommendation A single array of structures with two fields would be more efficient that two parallel arrays.
Client Comment Won't fix.

Listing 29:

```
11 function or(address[] calldata targets, bytes[] calldata data)
   ↪ external view returns(bool) {
```

3.30 CVF-30

- **Severity** Minor
- **Status** Info
- **Category** Suboptimal
- **Source** PredicateHelper.sol

Recommendation These functions should be declared as public rather than external, to make internal calls possible.
Client Comment Won't fix.

Listing 30:

```
11 function or(address[] calldata targets, bytes[] calldata data)
   ↪ external view returns(bool) {

22 function and(address[] calldata targets, bytes[] calldata data)
   ↪ external view returns(bool) {

33 function eq(uint256 value, address target, bytes memory data)
   ↪ external view returns(bool) {

38 function lt(uint256 value, address target, bytes memory data)
   ↪ external view returns(bool) {

43 function gt(uint256 value, address target, bytes memory data)
   ↪ external view returns(bool) {

48 function timestampBelow(uint256 time) external view returns(bool
   ↪ ) {
```

3.31 CVF-31

- **Severity** Minor
- **Status** Info
- **Category** Procedural
- **Source** PredicateHelper.sol

Recommendation The argument order is counterintuitive: usually the lefthand operand is the first input.
Client Comment Won't fix.

Listing 31:

```
33 function eq(uint256 value, address target, bytes memory data)
   ↪ external view returns(bool) {

38 function lt(uint256 value, address target, bytes memory data)
   ↪ external view returns(bool) {

43 function gt(uint256 value, address target, bytes memory data)
   ↪ external view returns(bool) {
```

3.32 CVF-32

- **Severity** Minor
- **Status** Fixed
- **Category** Flaw
- **Source** PredicateHelper.sol

Recommendation The result length is not checked.

Listing 32:

```
34 bytes memory result = target.uncheckedFunctionStaticCall(data, "
   ↪ PH: eq");

39 bytes memory result = target.uncheckedFunctionStaticCall(data, "
   ↪ PH: lt");

44 bytes memory result = target.uncheckedFunctionStaticCall(data, "
   ↪ PH: gt");
```

3.33 CVF-33

- **Severity** Minor
- **Status** Info
- **Category** Bad naming
- **Source** NonceManager.sol

Recommendation Events are usually named via nouns, such as 'NonceIncrease'.
Client Comment Won't fix.

Listing 33:

```
7 event NonceIncreased(address indexed maker, uint256 newNonce);
```

3.34 CVF-34

- **Severity** Minor
- **Status** Info
- **Category** Suboptimal
- **Source** NonceManager.sol

Recommendation These functions should probably return the updated nonce for convenience.
Client Comment Won't fix.

Listing 34:

```
11 function increaseNonce() external {

15 function advanceNonce(uint8 amount) public {
```

3.35 CVF-35

- **Severity** Minor
- **Status** Info
- **Category** Unclear behavior
- **Source** NonceManager.sol

Description What is the reason to allow increases by more than 1, if intermediate values can not be used?
Client Comment Intermediate values can be used by combining predicate helper with nonce manager.

Listing 35:

```
15 function advanceNonce(uint8 amount) public {
```

3.36 CVF-36

- **Severity** Minor
- **Status** Fixed
- **Category** Suboptimal
- **Source** NonceManager.sol

Recommendation This could be rewritten in one sentence: 'emit NonceIncreased (msg.sender, nonce [msg.sender] += amount);'

Listing 36:

```
16 uint256 newNonce = nonce[msg.sender] + amount;
   nonce[msg.sender] = newNonce;
   emit NonceIncreased(msg.sender, newNonce);
```

3.37 CVF-37

- **Severity** Minor
- **Status** Info
- **Category** Suboptimal
- **Source** NonceManager.sol

Recommendation This function is probably redundant as the nonce mapping is public.
Client Comment It is used to create predicate

Listing 37:

```
21 function nonceEquals(address makerAddress, uint256 makerNonce)
     ↪ external view returns(bool) {
```

3.38 CVF-38

- **Severity** Minor
- **Status** Info
- **Category** Suboptimal
- **Source** ERC20Proxy.sol

Recommendation This inheritance is not used and probably should be removed as the descendants inherit 'ImmutableOwner' anyway.
Client Comment It is used for onlyImmutableOwner

Listing 38:

```
12 contract ERC20Proxy is ImmutableOwner {
```

3.39 CVF-39

- **Severity** Minor
- **Status** Info
- **Category** Suboptimal
- **Source** ERC20Proxy.sol

Description The constructor of this contract doesn't explicitly call the constructor of a base contract. This makes it less convenient to use this contract.
Recommendation Consider explicitly accepting the owner address as a constructor argument and forwarding it to the contractor of the "ImmutableOwner" contract.
Client Comment Won't fix.

Listing 39:

```
15 constructor() {
```

3.40 CVF-40

- **Severity** Minor
- **Status** Info
- **Category** Unclear behavior
- **Source** ERC20Proxy.sol

Description This function looks like a dirty hack. Why should it have the selector close to the normal 'transferFrom' function?
Client Comment Because we do arbitrary calls in '_callMakerAssetTransferFrom' and we wanted to limit the range of selectors that can be called.

Listing 40:

```
19 // keccak256("func_50BkM4K(address,address,uint256,address)") =
   ↪ 0x23b872de
20 function func_50BkM4K(address from, address to, uint256 amount,
   ↪ IERC20 token) external onlyImmutableOwner {
```

3.41 CVF-41

- **Severity** Minor
- **Status** Info
- **Category** Bad naming
- **Source** ImmutableOwner.sol

Description The word "immutable" is redundant in the variable name. Note, that this variable is public and thus its name is a part of the contract's public API.
Client Comment Won't fix.

Listing 41:

```
7 address public immutable immutableOwner;
```

3.42 CVF-42

- **Severity** Minor
- **Status** Info
- **Category** Suboptimal
- **Source** ERC1155Proxy.sol

Description This inheritance is not used and probably should be removed as the descendants inherit 'ImmutableOwner' anyway.
Client Comment It is used for 'onlyImmutableOwner'.

Listing 42:

```
13 contract ERC1155Proxy is ImmutableOwner {
```

3.43 CVF-43

- **Severity** Minor
- **Status** Info
- **Category** Suboptimal
- **Source** ERC1155Proxy.sol

Description The constructor of this contract doesn't explicitly call the constructor of a base contract. This makes it less convenient to use this contract.
Recommendation Consider explicitly accepting the owner address as a constructor argument and forwarding it to the contractor of the 'ImmutableOwner' contract.
Client Comment Won't fix.

Listing 43:

```
14 constructor() {
```

3.44 CVF-44

- **Severity** Minor
- **Status** Info
- **Category** Unclear behavior
- **Source** ERC1155Proxy.sol

Description These functions look like dirty hacks. Why should they have these specific selectors?
Client Comment Because we do arbitrary calls in '_callMakerAssetTransferFrom' and we wanted to limit the range of selectors that can be called.

Listing 44:

```
18 // keccak256("func_00cMjE8(address,address,uint256,address,
   ↪ uint256)") == 0x23b872e1
function func_00cMjE8(address from, address to, uint256 amount,
   ↪ IERC1155 token, uint256 tokenId) external
   ↪ onlyImmutableOwner {
```

3.45 CVF-45

- **Severity** Minor
- **Status** Fixed
- **Category** Flaw
- **Source** ERC1155Proxy.sol

Recommendation The function always sends empty data to the token recipient. Probably it should allow the data to be passed by the caller.

Listing 45:

```
20 token.safeTransferFrom(from, to, tokenId, amount, "");
```

3.46 CVF-46

- **Severity** Minor
- **Status** Info
- **Category** Suboptimal
- **Source** ERC721Proxy.sol

Recommendation This inheritance is not used and probably should be removed as the descendants inherit 'ImmutableOwner' anyway.
Client Comment It is used for 'onlyImmutableOwner'.

Listing 46:

```
13 contract ERC721Proxy is ImmutableOwner {
```

3.47 CVF-47

- **Severity** Minor
- **Status** Info
- **Category** Suboptimal
- **Source** ERC721Proxy.sol

Description The constructor of this contract doesn't explicitly call the constructor of a base contract.This makes it less convenient to use this contract.
Recommendation Consider explicitly accepting the owner address as a constructor argument and forwarding it to the contractor of the 'ImmutableOwner' contract.
Client Comment Won't fix.

Listing 47:

```
14 constructor() {
```

3.48 CVF-48

- **Severity** Minor
- **Status** Info
- **Category** Unclear behavior
- **Source** ERC721Proxy.sol

Description These functions look like dirty hacks. Why should they have these specific selectors?
Client Comment Because we do arbitrary calls in '_callMakerAssetTransferFrom' and we wanted to limit the range of selectors that can be called.

Listing 48:

```
19 // keccak256("func_40aVqeY(address,address,uint256,address)") ==
   ↪ 0x23b872df
20 function func_40aVqeY(address from, address to, uint256 tokenId,
   ↪ IERC721 token) external onlyImmutableOwner {

24 // keccak256("func_20xtkDI(address,address,uint256,address)" ==
   ↪ 0x23b872e0
   function func_20xtkDI(address from, address to, uint256 tokenId,
   ↪ IERC721 token) external onlyImmutableOwner {
```