Audit

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Table of Major and Critical Issues

Contents

Chapter 1

Only for Auditors

1.1 To edit this documents

In the report.tex file, choose:

- **\soldraftfalse** to remove draft mode (watermarks, advises)
- **\solmodulestrue** to display modules by chapter instead of contracts
- **\soltablestrue** to display tables for parameters and returns
- **\solissuesfalse** to remove the table of issues

Issues can be entered with:

- **\issueCritical{title}{text}**
- **\issueMajor{title}{text}**
- **\issueMinor{title}{text}**

1.2 General Auditing Rules

- Check that types have the correct integer types (Pubkey : uint256, Amount: uint128, Time: uint64).
- Naming conventions: constants should for example be all uppercase, static variables should start with a prefix like `s_`, globals should start with a prefix like `g_` or `m_`, internal functions should start with a prefix `_`.
- Numbers should not appear in source, but be defined as constants.
- In constant definitions, verify that 2 consecutive errors have not the same error (common copy-paste error)

- Constants for amounts should be expressed in `ton` to prevent too many zeroes.
- Modifiers with `tvm.accept` must always check the source of the message
- Constructors with arguments must always check the source of the message to prevent anybody from calling the constructor and set variables instead of the real owner
- Failures should never happen after `tvm.accept` (such as `require`, division by zero, overflows, etc.)
- Most arguments should be protected by a `require`
- Before sending a message, the function should check that it has enough gas (to prevent a partial failure during the message sending phase)
- `tvm.accept` should only be called after verifying that the sender of the message if the contracts' owner

Chapter 2

Introduction

Chapter 3

Overview

Chapter 4

Library Modules

4.1 Module "Constants.sol"

4.1.1 Pragmas

ton	-solidity >= 0.43.0	

4.1.2 Contract Definitions

- Constants

4.2 Module "Errors.sol"

4.2.1 Pragmas

ton	-solidity >= 0.43.0	

4.2.2 Contract Definitions

- Errors

4.3 Module "true_nft_audit.sol"

4.3.1 Imports

../share/surfer/src/NftRoot.sol	
../share/surfer/src/Manager.sol	

Chapter 5

Interface Modules

5.1 Module "IData.sol"

5.1.1 Pragmas

ton	-solidity >= 0.43.0	

5.1.2 Contract Definitions

- IData

5.2 Module "IIndex.sol"

5.2.1 Pragmas

ton	-solidity >= 0.43.0	

5.2.2 Contract Definitions

- IIndex

5.3 Module "IIndexBasis.sol"

5.3.1 Pragmas

ton	-solidity >= 0.43.0	

5.3.2 Contract Definitions

- IIndexBasis

Chapter 6

Contract Modules

6.1 Module "Data.sol"

6.1.1 Pragmas

ton	-solidity >=0.43.0	
AbiHeader	expire	
AbiHeader	time	

6.1.2 Imports

./resolvers/IndexResolver.sol	
./interfaces/IData.sol	
./libraries/Constants.sol	
./libraries/Errors.sol	

6.1.3 Contract Definitions

- Data

6.2 Module "DataResolver.sol"

6.2.1 Pragmas

ton	-solidity >= 0.43.0	
AbiHeader	expire	
AbiHeader	time	

6.2.2 Imports

../Data.sol	

6.2.3 Contract Definitions

- DataResolver

6.3 Module "Index.sol"

6.3.1 Pragmas

ton	-solidity >=0.43.0	
AbiHeader	expire	
AbiHeader	time	

6.3.2 Imports

./interfaces/IIndex.sol	
./libraries/Errors.sol	

6.3.3 Contract Definitions

- Index

6.4 Module "IndexBasis.sol"

6.4.1 Pragmas

ton	-solidity >=0.43.0	
AbiHeader	expire	
AbiHeader	time	

6.4.2 Imports

./libraries/Errors.sol	

6.4.3 Contract Definitions

- IndexBasis

6.5 Module "IndexResolver.sol"

6.5.1 Pragmas

ton	-solidity >= 0.43.0	
AbiHeader	expire	
AbiHeader	time	

6.5.2 Imports

../Index.sol	

6.5.3 Contract Definitions

- IndexResolver

6.6 Module "Manager.sol"

6.6.1 Pragmas

ton	-solidity >= 0.43.0	
AbiHeader	expire	
AbiHeader	time	

6.6.2 Imports

./NftRoot.sol	
./libraries/Constants.sol	
./libraries/Errors.sol	

6.6.3 Contract Definitions

- Manager

6.7 Module "NftRoot.sol"

6.7.1 Pragmas

ton	-solidity >=0.43.0	
AbiHeader	expire	
AbiHeader	time	

6.7.2 Imports

./resolvers/IndexResolver.sol	
./resolvers/DataResolver.sol	
./IndexBasis.sol	
./interfaces/IIndexBasis.sol	
./libraries/Constants.sol	
./libraries/Errors.sol	

6.7.3 Contract Definitions

- NftRoot

Chapter 7

Contract Data

Contents

7.1 Overview

In file `Data.sol`

7.2 Contract Inheritance

IData	
IndexResolver	

7.3 Static Variable Definitions

uint256	_id	

```
17      uint256 static _id;
```

7.4 Variable Definitions

address	_addrRoot	
		used in @9.Data.destruct
		used in @9.Data.destruct
		used in @9.Data.deployIndex
		used in @9.Data.deployIndex
		used in @9.Data.deployIndex
		assigned in @9.Data.:constructor
		used in @9.Data.:constructor
address	_addrOwner	
		used in @9.Data.getOwner
		used in @9.Data.destruct
		used in @9.Data.destruct
		assigned in @9.Data.:constructor
		used in @9.Data.:constructor
address	_addrAuthor	
		used in @9.Data.getInfo
		assigned in @9.Data.:constructor
		used in @9.Data.:constructor
string	_name	
		used in @9.Data.getInfo
		assigned in @9.Data.:constructor
		used in @9.Data.:constructor
string	_description	
		used in @9.Data.getInfo
		assigned in @9.Data.:constructor
		used in @9.Data.:constructor
string	_tokenCode	
		used in @9.Data.getInfo
		assigned in @9.Data.:constructor
		used in @9.Data.:constructor
uint64	_creationDate	
		used in @9.Data.getInfo
		assigned in @9.Data.:constructor
		used in @9.Data.:constructor
string	_comment	
		used in @9.Data.getInfo
		assigned in @9.Data.:constructor
		used in @9.Data.:constructor
mapping (uint128 => bytes)	_content	
		used in @9.Data.getInfo
		assigned in @9.Data.:constructor
		used in @9.Data.:constructor

```
    address _addrRoot;
```

```
    address _addrOwner;
```

```
    address _addrAuthor;
```

```
    string _name;
```

```
    string _description;
```

```
    string _tokenCode;
```

```
    uint64 _creationDate;
```

```
    string _comment;
```

```
    mapping(uint128 => bytes) _content;
```

7.5 Constructor Definitions

7.5.1 Constructor

Critical issue: Constructor for Data (fake)
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- TODO

```
    constructor(
        address addrOwner,
        TvmCell codeIndex,
        address addrAuthor,
        string name,
        string description,
        string tokenCode,
        uint64 creationDate,
        string comment,
        uint128 index,
        bytes part
    ) public {
        optional(TvmCell) optSalt = tvm.codeSalt(tvm.code());
        require(optSalt.hasValue(), Errors.ERROR_EMPTY_SALT);
        (address addrRoot) = optSalt
            .get()
            .toSlice()
            .decode(address);
        require(msg.sender == addrRoot, Errors.
            ERROR_MESSAGE_SENDER_IS_NOT_ROOT);
```

```
47          require(msg.value >= Constants.MIN_FOR_DEPLOY);
48          _addrRoot = addrRoot;
49          _addrOwner = addrOwner;
50          _addrAuthor = addrAuthor;
51          _name = name;
52          _description = description;
53          _tokenCode = tokenCode;
54          _creationDate = creationDate;
55          _comment = comment;
56          _codeIndex = codeIndex;
57
58          _content[index] = part;
59
60          deployIndex(addrOwner);
61      }
```

7.6 Public Method Definitions

7.6.1 Function destruct

- TODO

```
77      function destruct(address recipient) public {
78          require(msg.sender == _addrRoot, Errors.
                ERROR_MESSAGE_SENDER_IS_NOT_ROOT);
79
80          address oldIndexOwner = resolveIndex(address(0), address(
                this), _addrOwner);
81          IIndex(oldIndexOwner).destruct();
82          address oldIndexOwnerRoot = resolveIndex(_addrRoot, address
                (this), _addrOwner);
83          IIndex(oldIndexOwnerRoot).destruct();
84
85          recipient.transfer(0, false, 64);
86          selfdestruct(recipient);
87      }
```

7.6.2 Function getInfo

- TODO

```
94      function getInfo() public view override
95      returns(
96          mapping(uint128 => bytes) content,
97          address author,
98          string name,
99          string description,
100         string tokenCode,
101         uint64 creationDate,
102         string comment
103     ) {
104         content = _content;
```

```
105         author = _addrAuthor;
106         name = _name;
107         description = _description;
108         tokenCode = _tokenCode;
109         creationDate = _creationDate;
110         comment = _comment;
111     }
```

7.6.3 Function getOwner

- TODO

```
89      function getOwner() public view override returns(address
            addrOwner, address addrNftData) {
90          addrOwner = _addrOwner;
91          addrNftData = address(this);
92      }
```

7.7 Internal Method Definitions

7.7.1 Function deployIndex

- TODO

```
63      function deployIndex(address owner) private {
64          TvmCell codeIndexOwner = _buildIndexCode(address(0), owner)
                ;
65          TvmCell stateIndexOwner = _buildIndexState(codeIndexOwner,
                address(this));
66          new Index
67              {stateInit: stateIndexOwner, value: Constants.
                    DEPLOY_INDEX_FEE, flag: 0}
68              (_addrRoot);
69
70          TvmCell codeIndexOwnerRoot = _buildIndexCode(_addrRoot,
                owner);
71          TvmCell stateIndexOwnerRoot = _buildIndexState(
                codeIndexOwnerRoot, address(this));
72          new Index
73              {stateInit: stateIndexOwnerRoot, value: Constants.
                    DEPLOY_INDEX_FEE, flag: 0}
74              (_addrRoot);
75      }
```

Chapter 8

Contract DataResolver

Contents

8.1 Overview

In file `DataResolver.sol`

8.2 Variable Definitions

TvmCell	_codeData	
		assigned in @2.NftRoot.:constructor
		used in @2.NftRoot.:constructor
		used in @7.DataResolver._buildDataCode

```
11     TvmCell _codeData;
```

8.3 Public Method Definitions

8.3.1 Function resolveCodeHashData

- TODO

```
13      function resolveCodeHashData() public view returns (uint256
            codeHashData) {
14          return tvm.hash(_buildDataCode(address(this)));
15      }
```

8.3.2 Function resolveData

- TODO

```
17      function resolveData(
18          address addrRoot,
19          uint256 id
20      ) public view returns (address addrData) {
21          TvmCell code = _buildDataCode(addrRoot);
22          TvmCell state = _buildDataState(code, id);
23          uint256 hashState = tvm.hash(state);
24          addrData = address.makeAddrStd(0, hashState);
25      }
```

8.4 Internal Method Definitions

8.4.1 Function _buildDataCode

- TODO

```
27      function _buildDataCode(address addrRoot) internal virtual view
            returns (TvmCell) {
28          TvmBuilder salt;
29          salt.store(addrRoot);
30          return tvm.setCodeSalt(_codeData, salt.toCell());
31      }
```

8.4.2 Function _buildDataState

- TODO

```
33      function _buildDataState(
34          TvmCell code,
35          uint256 id
36      ) internal virtual pure returns (TvmCell) {
37          return tvm.buildStateInit({
38              contr: Data,
```

```
39              varInit: {_id: id},
40              code: code
41          });
42      }
```

Chapter 9

Contract Index

Contents

9.1 Overview

In file `Index.sol`

9.2 Contract Inheritance

IIndex	

9.3 Static Variable Definitions

address	_addrData	
		used in @10.Index.getInfo
		used in @10.Index.destruct
		used in @10.Index.destruct
		used in @10.Index.:constructor

```
    address static _addrData;
```

9.4 Variable Definitions

address	_addrRoot	
		used in @10.Index.getInfo
		assigned in @10.Index.:constructor
		used in @10.Index.:constructor
		assigned in @10.Index.:constructor
		used in @10.Index.:constructor
address	_addrOwner	
		used in @10.Index.getInfo
		assigned in @10.Index.:constructor
		used in @10.Index.:constructor

```
    address _addrRoot;
```

```
    address _addrOwner;
```

9.5 Constructor Definitions

9.5.1 Constructor

Critical issue: Constructor for Index (fake)

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- TODO

```
    constructor(address root) public {
        optional(TvmCell) optSalt = tvm.codeSalt(tvm.code());
        require(optSalt.hasValue(), Errors.ERROR_EMPTY_SALT);
        (address addrRoot, address addrOwner) = optSalt
            .get()
            .toSlice()
            .decode(address, address);
        require(msg.sender == _addrData, Errors.
            ERROR_MESSAGE_SENDER_IS_NOT_OWNER);
        tvm.accept();
        _addrRoot = addrRoot;
```

```
25          _addrOwner = addrOwner;
26          if(addrRoot == address(0)) {
27              _addrRoot = root;
28          }
29      }
```

9.6 Public Method Definitions

9.6.1 Function destruct

- TODO

```
41      function destruct() public override {
42          require(msg.sender == _addrData, Errors.
                ERROR_MESSAGE_SENDER_IS_NOT_OWNER);
43          selfdestruct(_addrData);
44      }
```

9.6.2 Function getInfo

- TODO

```
31      function getInfo() public view override returns (
32          address addrRoot,
33          address addrOwner,
34          address addrData
35      ) {
36          addrRoot = _addrRoot;
37          addrOwner = _addrOwner;
38          addrData = _addrData;
39      }
```

Chapter 10

Contract IndexBasis

Contents

10.1 Overview

In file `IndexBasis.sol`

10.2 Static Variable Definitions

address	_addrRoot	
		used in @5.IndexBasis.getInfo
		used in @5.IndexBasis.destruct
uint256	_codeHashData	
		used in @5.IndexBasis.getInfo

```
9     address static _addrRoot;

10    uint256 static _codeHashData;
```

10.3 Modifier Definitions

10.3.1 Modifier onlyRoot

```
12      modifier onlyRoot() {
13          require(msg.sender == _addrRoot, Errors.
                ERROR_MESSAGE_SENDER_IS_NOT_ROOT);
14          tvm.accept();
15          _;
16      }
```

10.4 Constructor Definitions

10.4.1 Constructor

Critical issue: Constructor for IndexBasis (fake)

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- TODO

```
18      constructor() public onlyRoot {}
```

10.5 Public Method Definitions

10.5.1 Function destruct

- TODO

```
25      function destruct() public onlyRoot {
26          selfdestruct(_addrRoot);
27      }
```

10.5.2 Function getInfo

- TODO

```
20      function getInfo() public view returns (address addrRoot,
            uint256 codeHashData) {
21          addrRoot = _addrRoot;
22          codeHashData = _codeHashData;
23      }
```

Chapter 11

Contract IndexResolver

Contents

11.1 Overview

In file `IndexResolver.sol`

11.2 Variable Definitions

TvmCell	_codeIndex	
		used in @2.NftRoot.mintNft
		assigned in @2.NftRoot.:constructor
		used in @2.NftRoot.:constructor
		assigned in @9.Data.:constructor
		used in @9.Data.:constructor
		used in @8.IndexResolver._buildIndexCode

```
11      TvmCell _codeIndex;
```

11.3 Public Method Definitions

11.3.1 Function resolveCodeHashIndex

- TODO

```
13      function resolveCodeHashIndex(
14          address addrRoot,
15          address addrOwner
16      ) public view returns (uint256 codeHashIndex) {
17          return tvm.hash(_buildIndexCode(addrRoot, addrOwner));
18      }
```

11.3.2 Function resolveIndex

- TODO

```
20      function resolveIndex(
21          address addrRoot,
22          address addrData,
23          address addrOwner
24      ) public view returns (address addrIndex) {
25          TvmCell code = _buildIndexCode(addrRoot, addrOwner);
26          TvmCell state = _buildIndexState(code, addrData);
27          uint256 hashState = tvm.hash(state);
28          addrIndex = address.makeAddrStd(0, hashState);
29      }
```

11.4 Internal Method Definitions

11.4.1 Function _buildIndexCode

- TODO

```
31      function _buildIndexCode(
32          address addrRoot,
33          address addrOwner
34      ) internal virtual view returns (TvmCell) {
35          TvmBuilder salt;
36          salt.store(addrRoot);
37          salt.store(addrOwner);
38          return tvm.setCodeSalt(_codeIndex, salt.toCell());
39      }
```

11.4.2 Function _buildIndexState

- TODO

```
41      function _buildIndexState(
42          TvmCell code,
43          address addrData
44      ) internal virtual pure returns (TvmCell) {
45          return tvm.buildStateInit({
46              contr: Index,
47              varInit: {_addrData: addrData},
48              code: code
49          });
50      }
```

Chapter 12

Contract Manager

Contents

12.1 Overview

In file `Manager.sol`

12.2 Variable Definitions

TvmCell	_rootCode	
		used in @1.Manager._buildNftRootState
		assigned in @1.Manager.:constructor
		used in @1.Manager.:constructor

```
13     TvmCell _rootCode;
```

12.3 Constructor Definitions

12.3.1 Constructor

Critical issue: Constructor for Manager (fake)

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- TODO

```
    constructor (TvmCell rootCode) public {
        tvm.accept();
        _rootCode = rootCode;
    }
```

12.4 Public Method Definitions

12.4.1 Function deployRoot

- TODO

```
    function deployRoot(
        address addrOwner,
        TvmCell codeIndex,
        TvmCell codeData,
        string name,
        string description,
        string tokenCode,
        uint256 totalSupply,
        uint128 index,
        bytes part
    ) public view {
        tvm.accept();

        TvmCell stateNftRoot = _buildNftRootState(addrOwner);
        new NftRoot {stateInit: stateNftRoot, value: Constants.
            DEPLOY_INDEX_FEE}( codeIndex, codeData, name,
            description, tokenCode, totalSupply, index, part);
    }
```

12.5 Internal Method Definitions

12.5.1 Function _buildNftRootState

- TODO

```
37      function _buildNftRootState( address addrOwner) internal
            virtual view returns (TvmCell) {
38          TvmCell code = _rootCode.toSlice().loadRef();
39          return tvm.buildStateInit({
40              contr: NftRoot,
41              varInit: {_addrOwner: addrOwner},
42              code: code
43          });
44      }
```

Chapter 13

Contract NftRoot

Contents

13.1 Overview

In file `NftRoot.sol`

13.2 Contract Inheritance

DataResolver	
IndexResolver	

13.3 Static Variable Definitions

address	_addrOwner	

```
32      address static _addrOwner;
```

13.4 Variable Definitions

uint256	_totalMinted	
		assigned in @2.NftRoot.mintNft
		used in @2.NftRoot.mintNft
		used in @2.NftRoot.mintNft
		used in @2.NftRoot.mintNft
address	_addrBasis	
		used in @2.NftRoot.destructBasis
		assigned in @2.NftRoot.deployBasis
		used in @2.NftRoot.deployBasis
uint256	_totalSupply	
		used in @2.NftRoot.mintNft
		used in @2.NftRoot.getInfo
		assigned in @2.NftRoot.:constructor
		used in @2.NftRoot.:constructor
string	_name	
		used in @2.NftRoot.mintNft
		used in @2.NftRoot.getInfo
		assigned in @2.NftRoot.:constructor
		used in @2.NftRoot.:constructor
string	_description	
		used in @2.NftRoot.mintNft
		used in @2.NftRoot.getInfo
		assigned in @2.NftRoot.:constructor
		used in @2.NftRoot.:constructor
string	_tokenCode	
		used in @2.NftRoot.mintNft
		used in @2.NftRoot.getInfo
		assigned in @2.NftRoot.:constructor
		used in @2.NftRoot.:constructor
mapping (uint128 => bytes)	_content	
		used in @2.NftRoot.mintNft
		used in @2.NftRoot.getInfo
		assigned in @2.NftRoot.:constructor
		used in @2.NftRoot.:constructor
uint128	_price	
		assigned in @2.NftRoot.setPrice
		used in @2.NftRoot.setPrice
CHAPTER 13. CONTRACT NFTROOT		used in @2.NftRoot.getInfo 49
		used in @2.NftRoot.burn
		assigned in @2.NftRoot.:constructor
		used in @2.NftRoot.:constructor

```
    uint256 _totalMinted;

    address _addrBasis;

    uint256 _totalSupply;

    string _name;

    string _description;

    string _tokenCode;

    mapping(uint128 => bytes) _content;

    uint128 _price;
```

13.5 Modifier Definitions

13.5.1 Modifier onlyOwner

```
    modifier onlyOwner() {
        require(msg.sender == _addrOwner, Errors.
            ERROR_MESSAGE_SENDER_IS_NOT_OWNER);
        tvm.accept();
        _;
    }
```

13.6 Constructor Definitions

13.6.1 Constructor

Critical issue: Constructor for NftRoot (fake)

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- TODO

```
    constructor(
        TvmCell codeIndex,
        TvmCell codeData,
        string name,
        string description,
        string tokenCode,
        uint256 totalSupply,
        uint128 index,
        bytes part
    ) public {
```

```
50          tvm.accept();
51          _codeIndex = codeIndex;
52          _codeData = codeData;
53          _name = name;
54          _description = description;
55          _tokenCode = tokenCode;
56          _totalSupply = totalSupply;
57
58          _content[index] = part;
59
60          _price = 1 ton;
61      }
```

13.7 Public Method Definitions

13.7.1 Function burn

- TODO

```
123     function burn(address dataAddress, address owner) public
            onlyOwner {
124         require(msg.value >= (_price), Errors.
                ERROR_MSG_VALUE_LESS_THAN_PRICE);
125
126         Data(dataAddress).destruct
127             {value: msg.value, flag: 3, bounce: true}
128             (owner);
129     }
```

13.7.2 Function deployBasis

- TODO

```
85      function deployBasis(TvmCell codeIndexBasis) public onlyOwner {
86          require(msg.value > 0.5 ton, Errors.ERROR_NOT_ENOUGH_GRAMS)
                ;
87          uint256 codeHasData = resolveCodeHashData();
88          TvmCell state = tvm.buildStateInit({
89              contr: IndexBasis,
90              varInit: {
91                  _codeHashData: codeHasData,
92                  _addrRoot: address(this)
93              },
94              code: codeIndexBasis
95          });
96          _addrBasis = new IndexBasis{stateInit: state, value: 0.4
                ton}();
97      }
```

13.7.3 Function destructBasis

- TODO

```
99      function destructBasis() public view onlyOwner {
100         IIndexBasis(_addrBasis).destruct();
101     }
```

13.7.4 Function getInfo

- TODO

```
103     function getInfo() public view returns (
104         mapping(uint128 => bytes) content,
105         string name,
106         string description,
107         string tokenCode,
108         uint256 totalSupply,
109         uint128 price
110     ) {
111         content = _content;
112         name = _name;
113         description = _description;
114         tokenCode = _tokenCode;
115         totalSupply = _totalSupply;
116         price = _price;
117     }
```

13.7.5 Function mintNft

- TODO

```
63      function mintNft(uint64 creationDate, string comment, address
            owner) public onlyOwner {
64          require(msg.value >= 1.6 ton, Errors.ERROR_NOT_ENOUGH_GRAMS
                );
65          require(_totalMinted <= _totalSupply, Errors.
                ERROR_MINTED_TOO_MUCH);
66          TvmCell codeData = _buildDataCode(address(this));
67          TvmCell stateData = _buildDataState(codeData, _totalMinted)
                ;
68          new Data
69              {stateInit: stateData, value: 1.5 ton} (
70                  owner,
71                  _codeIndex,
72                  msg.sender,
73                  _name,
74                  _description,
75                  _tokenCode,
76                  creationDate,
77                  comment,
78                  0,
79                  _content[0]
```

```
80              );
81
82          _totalMinted++;
83      }
```

13.7.6 Function setPrice

- TODO

```
119     function setPrice(uint128 price) public onlyOwner {
120         _price = price;
121     }
```