

NFT 실습



간단한 NFT 발행 및 전송 실습



컨트랙트 소유자 / 디지털 작품 생산자

토큰 생성 및 발행

NFT 토큰 소유

서버 제공

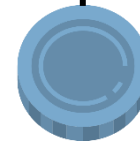
토큰 ID 관리

NFT 토큰 발행

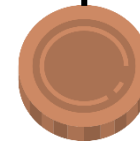


서버

관련 데이터



Token 1



Token 2



Token 3

<https://eips.ethereum.org/EIPS/eip-721>

Every ERC-721 compliant contract must implement the **ERC721** and **ERC165** interfaces (subject to "caveats" below):

```
pragma solidity ^0.4.20;

/// @title ERC-721 Non-Fungible Token Standard
/// @dev See https://eips.ethereum.org/EIPS/eip-721
/// Note: the ERC-165 identifier for this interface is 0x80ac58cd.
interface ERC721 /* is ERC165 */ {
    /// @dev This emits when ownership of any NFT changes by any mechanism.
    /// This event emits when NFTs are created ('from' == 0) and destroyed
    /// ('to' == 0). Exception: during contract creation, any number of NFTs
    /// may be created and assigned without emitting Transfer. At the time of
    /// any transfer, the approved address for that NFT (if any) is reset to none.
    event Transfer(address indexed _from, address indexed _to, uint256 indexed _tokenId);

    /// @dev This emits when the approved address for an NFT is changed or
    /// reaffirmed. The zero address indicates there is no approved address.
    /// When a Transfer event emits, this also indicates that the approved
    /// address for that NFT (if any) is reset to none.
    event Approval(address indexed _owner, address indexed _approved, uint256 indexed _tokenId);

    /// @dev This emits when an operator is enabled or disabled for an owner.
    /// The operator can manage all NFTs of the owner.
    event ApprovalForAll(address indexed _owner, address indexed _operator, bool _approved);

    /// @notice Count all NFTs assigned to an owner
    /// @dev NFTs assigned to the zero address are considered invalid, and this
    /// function throws for queries about the zero address.
    /// @param _owner An address for whom to query the balance
    /// @return The number of NFTs owned by '_owner', possibly zero
    function balanceOf(address _owner) external view returns (uint256);
```

```
/// @notice Find the owner of an NFT
/// @dev NFTs assigned to zero address are considered invalid, and queries
/// about them do throw.
/// @param _tokenId The identifier for an NFT
/// @return The address of the owner of the NFT
function ownerOf(uint256 _tokenId) external view returns (address);

/// @notice Transfers the ownership of an NFT from one address to another address
/// @dev Throws unless 'msg.sender' is the current owner, an authorized
/// operator, or the approved address for this NFT. Throws if '_from' is
/// not the current owner. Throws if '_to' is the zero address. Throws if
/// '_tokenId' is not a valid NFT. When transfer is complete, this function
/// checks if '_to' is a smart contract (code size > 0). If so, it calls
/// 'onERC721Received' on '_to' and throws if the return value is not
/// 'bytes4(keccak256("onERC721Received(address,address,uint256,bytes)"))'.
/// @param _from The current owner of the NFT
/// @param _to The new owner
/// @param _tokenId The NFT to transfer
/// @param data Additional data with no specified format, sent in call to '_to'
function safeTransferFrom(address _from, address _to, uint256 _tokenId, bytes data) external payable;

/// @notice Transfers the ownership of an NFT from one address to another address
/// @dev This works identically to the other function with an extra data parameter,
/// except this function just sets data to "".
/// @param _from The current owner of the NFT
/// @param _to The new owner
/// @param _tokenId The NFT to transfer
function safeTransferFrom(address _from, address _to, uint256 _tokenId) external payable;
```

<https://eips.ethereum.org/EIPS/eip-721>

Every ERC-721 compliant contract must implement the **ERC721** and **ERC165** interfaces (subject to "caveats" below):

```
function transferFrom(address _from, address _to, uint256 _tokenId) external payable;

/// @notice Change or reaffirm the approved address for an NFT
/// @dev The zero address indicates there is no approved address.
/// Throws unless 'msg.sender' is the current NFT owner, or an authorized
/// operator of the current owner.
/// @param _approved The new approved NFT controller
/// @param _tokenId The NFT to approve
function approve(address _approved, uint256 _tokenId) external payable;

/// @notice Enable or disable approval for a third party ("operator") to manage
/// all of 'msg.sender''s assets
/// @dev Emits the ApprovalForAll event. The contract MUST allow
/// multiple operators per owner.
/// @param _operator Address to add to the set of authorized operators
/// @param _approved True if the operator is approved, false to revoke approval
function setApprovalForAll(address _operator, bool _approved) external;

/// @notice Get the approved address for a single NFT
/// @dev Throws if '_tokenId' is not a valid NFT.
/// @param _tokenId The NFT to find the approved address for
/// @return The approved address for this NFT, or the zero address if there is none
function getApproved(uint256 _tokenId) external view returns (address);

/// @notice Query if an address is an authorized operator for another address
/// @param _owner The address that owns the NFTs
/// @param _operator The address that acts on behalf of the owner
/// @return True if '_operator' is an approved operator for '_owner', false otherwise
function isApprovedForAll(address _owner, address _operator) external view returns (bool);
```

```
interface ERC165 {
    /// @notice Query if a contract implements an interface
    /// @param interfaceID The interface identifier, as specified in ERC-165
    /// @dev Interface identification is specified in ERC-165. This function
    /// uses less than 30,000 gas.
    /// @return 'true' if the contract implements 'interfaceID' and
    /// 'interfaceID' is not 0xffffffff, 'false' otherwise
    function supportsInterface(bytes4 interfaceID) external view returns (bool);
}
```

<https://eips.ethereum.org/EIPS/eip-721>

A wallet/broker/auction application MUST implement the **wallet interface** if it will accept safe transfers.

```
/// @dev Note: the ERC-165 identifier for this interface is 0x150b7a02.  
interface ERC721TokenReceiver {  
    /// @notice Handle the receipt of an NFT  
    /// @dev The ERC721 smart contract calls this function on the recipient  
    /// after a 'transfer'. This function MAY throw to revert and reject the  
    /// transfer. Return of other than the magic value MUST result in the  
    /// transaction being reverted.  
    /// Note: the contract address is always the message sender.  
    /// @param _operator The address which called 'safeTransferFrom' function  
    /// @param _from The address which previously owned the token  
    /// @param _tokenId The NFT identifier which is being transferred  
    /// @param _data Additional data with no specified format  
    /// @return `bytes4(keccak256("onERC721Received(address,address,uint256,bytes)"))`  
    /// unless throwing  
    function onERC721Received(address _operator, address _from, uint256 _tokenId, bytes _data) external returns(bytes4);  
}
```

<https://eips.ethereum.org/EIPS/eip-721>

The **metadata extension** is OPTIONAL for ERC-721 smart contracts (see "caveats", below). This allows your smart contract to be interrogated for its name and for details about the assets which your NFTs represent.

```
/// @title ERC-721 Non-Fungible Token Standard, optional metadata extension  
/// @dev See https://eips.ethereum.org/EIPS/eip-721  
/// Note: the ERC-165 identifier for this interface is 0x5b5e139f.  
interface ERC721Metadata /* is ERC721 */ {  
    /// @notice A descriptive name for a collection of NFTs in this contract  
    function name() external view returns (string _name);  
  
    /// @notice An abbreviated name for NFTs in this contract  
    function symbol() external view returns (string _symbol);  
  
    /// @notice A distinct Uniform Resource Identifier (URI) for a given asset.  
    /// @dev Throws if '_tokenId' is not a valid NFT. URIs are defined in RFC  
    /// 3986. The URI may point to a JSON file that conforms to the "ERC721  
    /// Metadata JSON Schema".  
    function tokenURI(uint256 _tokenId) external view returns (string);  
}
```

<https://eips.ethereum.org/EIPS/eip-721>

The **enumeration extension** is **OPTIONAL** for ERC-721 smart contracts (see "caveats", below). This allows your contract to publish its full list of NFTs and make them discoverable.

```
/// @title ERC-721 Non-Fungible Token Standard, optional enumeration extension
/// @dev See https://eips.ethereum.org/EIPS/eip-721
/// Note: the ERC-165 identifier for this interface is 0x780e9d63.
interface ERC721Enumerable /* is ERC721 */ {
    /// @notice Count NFTs tracked by this contract
    /// @return A count of valid NFTs tracked by this contract, where each one of
    /// them has an assigned and queryable owner not equal to the zero address
    function totalSupply() external view returns (uint256);

    /// @notice Enumerate valid NFTs
    /// @dev Throws if `_index` >= `totalSupply()`.
    /// @param _index A counter less than `totalSupply()`
    /// @return The token identifier for the `_index`th NFT,
    /// (sort order not specified)
    function tokenByIndex(uint256 _index) external view returns (uint256);

    /// @notice Enumerate NFTs assigned to an owner
    /// @dev Throws if `_index` >= `balanceOf(_owner)` or if
    /// `_owner` is the zero address, representing invalid NFTs.
    /// @param _owner An address where we are interested in NFTs owned by them
    /// @param _index A counter less than `balanceOf(_owner)`
    /// @return The token identifier for the `_index`th NFT assigned to `_owner`,
    /// (sort order not specified)
    function tokenOfOwnerByIndex(address _owner, uint256 _index) external view returns (uint256);
}
```

<https://ethereum.org/en/developers/docs/standards/tokens/erc-721/>

Methods

```
1 function balanceOf(address _owner) external view returns (uint256);
2 function ownerOf(uint256 _tokenId) external view returns (address);
3 function safeTransferFrom(address _from, address _to, uint256
  _tokenId, bytes data) external payable;
4 function safeTransferFrom(address _from, address _to, uint256
  _tokenId) external payable;
5 function transferFrom(address _from, address _to, uint256 _tokenId)
  external payable;
6 function approve(address _approved, uint256 _tokenId) external
  payable;
7 function setApprovalForAll(address _operator, bool _approved)
  external;
8 function getApproved(uint256 _tokenId) external view returns
  (address);
9 function isApprovedForAll(address _owner, address _operator)
  external view returns (bool);
10
```

Events

```
1 event Transfer(address indexed _from, address indexed _to, uint256
  indexed _tokenId);
2 event Approval(address indexed _owner, address indexed _approved,
  uint256 indexed _tokenId);
3 event ApprovalForAll(address indexed _owner, address indexed
  _operator, bool _approved);
4
```


간단한 NFT 발행 및 전송 실습

```

1  pragma solidity ^0.4.20;
2
3  contract Contract721 {
4
5      string private _name;
6      string private _symbol;
7
8      mapping(uint256 => address) private _owners;
9      mapping(address => uint256) private _balances;
10     mapping(uint256 => address) private _tokenApprovals;
11     mapping(uint256 => string) private _metadata;
12
13     constructor(string name_, string symbol_, string metadata_, uint256 tokenId){
14         _name = name_;
15         _symbol = symbol_;
16         _mint(tokenId, metadata_);
17     }
18
19     function _mint(uint256 tokenId, string metadata_) internal {
20         require(!_exists(tokenId), "Token already minted");
21
22         _balances[msg.sender] += 1;
23         _owners[tokenId] = msg.sender;
24         _metadata[tokenId] = metadata_;
25     }
26
27
28     function name() public view returns (string){
29         return _name;
30     }
31
32     function symbol() public view returns (string){
33         return _symbol;
34     }
35
36     function _exists(uint256 tokenId) internal returns (bool) {
37         return _owners[tokenId] != address(0);
38     }
39
40     function additionalMint(uint tokenId, string metadata) external {
41         _mint(tokenId, metadata);
42     }

```

```

40     function additionalMint(uint tokenId, string metadata) external {
41         _mint(tokenId, metadata);
42     }
43
44
45     function balanceOf(address _owner) external view returns (uint256) {
46         return _balances[_owner];
47     }
48
49
50     function ownerOf(uint256 _tokenId) external view returns (address) {
51         address owner = _owners[_tokenId];
52         return owner;
53     }
54
55     function getMetaData(uint256 _tokenId) external view returns (string){
56         string metadata = _metadata[_tokenId];
57         return metadata;
58     }
59
60     function transferFrom(address _from, address _to, uint256 _tokenId) external payable {
61         _transfer(_from, _to, _tokenId);
62     }
63
64     function _transfer(address from, address to, uint256 tokenId) internal{
65         _balances[from] -= 1;
66         _balances[to] += 1;
67         _owners[tokenId] = to;
68     }
69
70
71 }

```

하이퍼레저 베수 구동

```

MINGW64:/e/besu_privateNetwork/besu_network/node1
system888@DESKTOP-QM35NPN MINGW64 /e/besu_privateNetwork/besu_network/node1
$ |

MINGW64:/e/besu_privateNetwork/besu_network/node2
system888@DESKTOP-QM35NPN MINGW64 /e/besu_privateNetwork/besu_network/node2
$ |

MINGW64:/e/besu_privateNetwork/besu_network/node3
system888@DESKTOP-QM35NPN MINGW64 /e/besu_privateNetwork/besu_network/node3
$ |

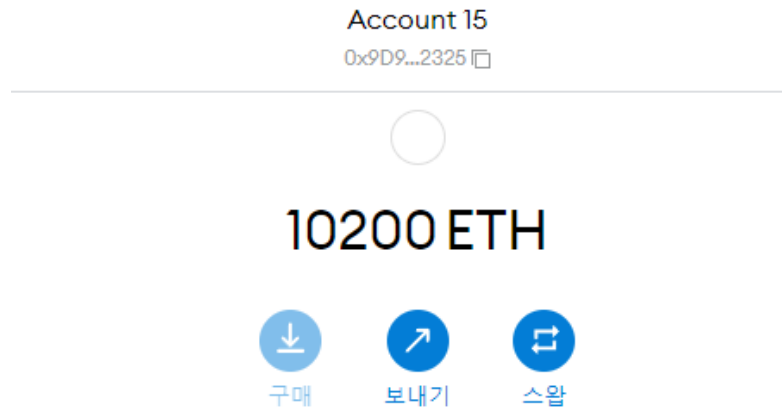
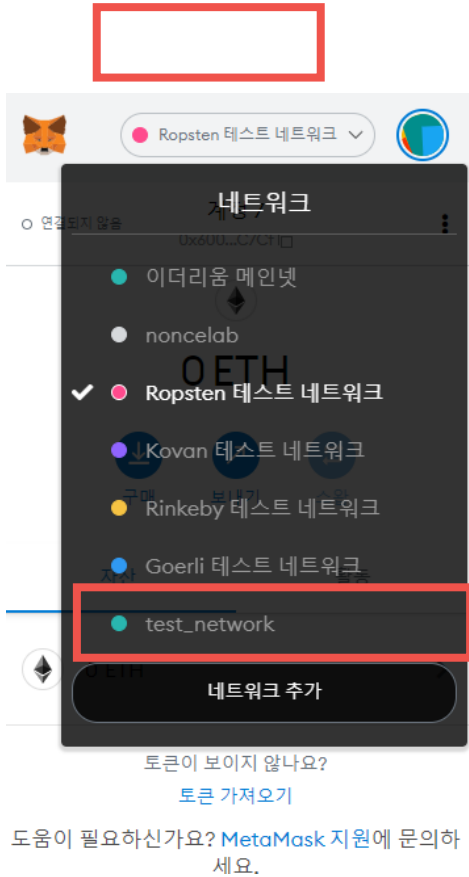
MINGW64:/e/besu_privateNetwork/besu_network/node4
system888@DESKTOP-QM35NPN MINGW64 /e/besu_privateNetwork/besu_network/node4
$ |

ControllerBuilder | Produced #8,733 / 0 tx / 0 pending / 0 (0.0%) gas / (0xc6761d9
28ca667e1d85b9950fcaa2ee66d75cc08cbefb371aa525a4fd3d634a)
2022-03-09 16:19:08.134+09:00 | EthScheduler-Workers-1 | INFO | PersistBlockTas
k | Imported #8,734 / 0 tx / 0 om / 0 (0.0%) gas / (0xc99c99024e5c8d2c96217be6b4
aa3d7c1b45c05070deafab343b3f8b8df3a5) in 0.000s. Peers: 3
2022-03-09 16:19:08.135+09:00 | BftProcessorExecutor-IBFT-0 | INFO | IbfBesuCo
ntrollerBuilder | Imported #8,734 / 0 tx / 0 pending / 0 (0.0%) gas / (0xc99c990
24e5c8d2c96217be6b4aa3d7c1b45c05070deafab343b3f8b8df3a5)
2022-03-09 16:19:10.163+09:00 | BftProcessorExecutor-IBFT-0 | INFO | IbfBesuCo
ntrollerBuilder | Imported #8,735 / 0 tx / 0 pending / 0 (0.0%) gas / (0x370c2bd
c9d86a8ec1539d0d7a1291f5c6f6c90ab5a862977cc0c7e24c233fd09)
2022-03-09 16:19:12.123+09:00 | BftProcessorExecutor-IBFT-0 | INFO | IbfBesuCo
ntrollerBuilder | Imported #8,736 / 0 tx / 0 pending / 0 (0.0%) gas / (0xf198e66
c007a79bbdc926e77bbf131e39fa47764f78194a7110b01855194c8c)
2022-03-09 16:19:14.121+09:00 | BftProcessorExecutor-IBFT-0 | INFO | IbfBesuCo
ntrollerBuilder | Produced #8,737 / 0 tx / 0 pending / 0 (0.0%) gas / (0x50b92e0
13a36a51503c544dac35e8fe762e071d5ffa1c57d68877a1d2d05667)
2022-03-09 16:19:16.146+09:00 | BftProcessorExecutor-IBFT-0 | INFO | IbfBesuCo
ntrollerBuilder | Imported #8,738 / 0 tx / 0 pending / 0 (0.0%) gas / (0x1030166
b465eae05c0930c1d99172223cc63b2df71a037efed9f079afff49d5)
2022-03-09 16:19:18.137+09:00 | BftProcessorExecutor-IBFT-0 | INFO | IbfBesuCo
ntrollerBuilder | Imported #8,739 / 0 tx / 0 pending / 0 (0.0%) gas / (0xe4217e7
8a81a95f0e53d99bbb8ac08725aa369623cc0e98fe3103cd29dfebb4)
ControllerBuilder | Produced #8,732 / 0 tx / 0 pending / 0 (0.0%) gas / (0x44eb3dc
93bacbf38c2483551055369f6fe27e05605540de6fc4c1bb92ebdcf4d)
2022-03-09 16:19:06.118+09:00 | BftProcessorExecutor-IBFT-0 | INFO | IbfBesuCo
ntrollerBuilder | Imported #8,733 / 0 tx / 0 pending / 0 (0.0%) gas / (0xc6761d9
28ca667e1d85b9950fcaa2ee66d75cc08cbefb371aa525a4fd3d634a)
2022-03-09 16:19:08.125+09:00 | BftProcessorExecutor-IBFT-0 | INFO | IbfBesuCo
ntrollerBuilder | Imported #8,734 / 0 tx / 0 pending / 0 (0.0%) gas / (0xc99c990
24e5c8d2c96217be6b4aa3d7c1b45c05070deafab343b3f8b8df3a5)
2022-03-09 16:19:10.157+09:00 | BftProcessorExecutor-IBFT-0 | INFO | IbfBesuCo
ntrollerBuilder | Imported #8,735 / 0 tx / 0 pending / 0 (0.0%) gas / (0x370c2bd
c9d86a8ec1539d0d7a1291f5c6f6c90ab5a862977cc0c7e24c233fd09)
2022-03-09 16:19:12.156+09:00 | BftProcessorExecutor-IBFT-0 | INFO | IbfBesuCo
ntrollerBuilder | Produced #8,736 / 0 tx / 0 pending / 0 (0.0%) gas / (0xf198e66
c007a79bbdc926e77bbf131e39fa47764f78194a7110b01855194c8c)
2022-03-09 16:19:12.156+09:00 | EthScheduler-Workers-2 | INFO | PersistBlockTas
k | Imported #8,736 / 0 tx / 0 om / 0 (0.0%) gas / (0xf198e66c007a79bbdc926e77b
bf131e39fa47764f78194a7110b01855194c8c) in 0.004s. Peers: 4
2022-03-09 16:19:14.117+09:00 | BftProcessorExecutor-IBFT-0 | INFO | IbfBesuCo
ntrollerBuilder | Imported #8,737 / 0 tx / 0 pending / 0 (0.0%) gas / (0x50b92e0
13a36a51503c544dac35e8fe762e071d5ffa1c57d68877a1d2d05667)
2022-03-09 16:19:16.132+09:00 | BftProcessorExecutor-IBFT-0 | INFO | IbfBesuCo
ntrollerBuilder | Imported #8,738 / 0 tx / 0 pending / 0 (0.0%) gas / (0x1030166
b465eae05c0930c1d99172223cc63b2df71a037efed9f079afff49d5)
ControllerBuilder | Imported #8,733 / 0 tx / 0 pending / 0 (0.0%) gas / (0xc6761d9
28ca667e1d85b9950fcaa2ee66d75cc08cbefb371aa525a4fd3d634a)
2022-03-09 16:19:08.129+09:00 | BftProcessorExecutor-IBFT-0 | INFO | IbfBesuCo
ntrollerBuilder | Produced #8,734 / 0 tx / 0 pending / 0 (0.0%) gas / (0xc99c990
24e5c8d2c96217be6b4aa3d7c1b45c05070deafab343b3f8b8df3a5)
2022-03-09 16:19:10.182+09:00 | BftProcessorExecutor-IBFT-0 | INFO | IbfBesuCo
ntrollerBuilder | Imported #8,735 / 0 tx / 0 pending / 0 (0.0%) gas / (0x370c2bd
c9d86a8ec1539d0d7a1291f5c6f6c90ab5a862977cc0c7e24c233fd09)
2022-03-09 16:19:10.200+09:00 | EthScheduler-Workers-0 | INFO | PersistBlockTas
k | Imported #8,735 / 0 tx / 0 om / 0 (0.0%) gas / (0x370c2bdc9d86a8ec1539d0d7a1
291f5c6f6c90ab5a862977cc0c7e24c233fd09) in 0.005s. Peers: 4
2022-03-09 16:19:12.154+09:00 | BftProcessorExecutor-IBFT-0 | INFO | IbfBesuCo
ntrollerBuilder | Imported #8,736 / 0 tx / 0 pending / 0 (0.0%) gas / (0xf198e66
c007a79bbdc926e77bbf131e39fa47764f78194a7110b01855194c8c)
2022-03-09 16:19:12.154+09:00 | EthScheduler-Workers-2 | INFO | PersistBlockTas
k | Imported #8,736 / 0 tx / 0 om / 0 (0.0%) gas / (0xf198e66c007a79bbdc926e77b
bf131e39fa47764f78194a7110b01855194c8c) in 0.000s. Peers: 4
2022-03-09 16:19:14.123+09:00 | BftProcessorExecutor-IBFT-0 | INFO | IbfBesuCo
ntrollerBuilder | Imported #8,737 / 0 tx / 0 pending / 0 (0.0%) gas / (0x50b92e0
13a36a51503c544dac35e8fe762e071d5ffa1c57d68877a1d2d05667)
2022-03-09 16:19:16.139+09:00 | BftProcessorExecutor-IBFT-0 | INFO | IbfBesuCo
ntrollerBuilder | Imported #8,738 / 0 tx / 0 pending / 0 (0.0%) gas / (0x1030166
b465eae05c0930c1d99172223cc63b2df71a037efed9f079afff49d5)
ControllerBuilder | Produced #8,733 / 0 tx / 0 pending / 0 (0.0%) gas / (0xc6761d9
28ca667e1d85b9950fcaa2ee66d75cc08cbefb371aa525a4fd3d634a)
2022-03-09 16:19:08.129+09:00 | BftProcessorExecutor-IBFT-0 | INFO | IbfBesuCo
ntrollerBuilder | Produced #8,734 / 0 tx / 0 pending / 0 (0.0%) gas / (0xc99c990
24e5c8d2c96217be6b4aa3d7c1b45c05070deafab343b3f8b8df3a5)
2022-03-09 16:19:10.166+09:00 | BftProcessorExecutor-IBFT-0 | INFO | IbfBesuCo
ntrollerBuilder | Produced #8,735 / 0 tx / 0 pending / 0 (0.0%) gas / (0x370c2bd
c9d86a8ec1539d0d7a1291f5c6f6c90ab5a862977cc0c7e24c233fd09)
2022-03-09 16:19:12.137+09:00 | BftProcessorExecutor-IBFT-0 | INFO | IbfBesuCo
ntrollerBuilder | Imported #8,736 / 0 tx / 0 pending / 0 (0.0%) gas / (0xf198e66
c007a79bbdc926e77bbf131e39fa47764f78194a7110b01855194c8c)
2022-03-09 16:19:12.137+09:00 | EthScheduler-Workers-2 | INFO | PersistBlockTas
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bf131e39fa47764f78194a7110b01855194c8c) in 0.000s. Peers: 3
2022-03-09 16:19:14.117+09:00 | BftProcessorExecutor-IBFT-0 | INFO | IbfBesuCo
ntrollerBuilder | Imported #8,737 / 0 tx / 0 pending / 0 (0.0%) gas / (0x50b92e0
13a36a51503c544dac35e8fe762e071d5ffa1c57d68877a1d2d05667)
2022-03-09 16:19:16.151+09:00 | EthScheduler-Workers-1 | INFO | PersistBlockTas
k | Imported #8,738 / 0 tx / 0 om / 0 (0.0%) gas / (0x1030166b465eae05c0930c1d99
172223cc63b2df71a037efed9f079afff49d5) in 0.009s. Peers: 3
2022-03-09 16:19:16.151+09:00 | BftProcessorExecutor-IBFT-0 | INFO | IbfBesuCo
ntrollerBuilder | Imported #8,738 / 0 tx / 0 pending / 0 (0.0%) gas / (0x1030166
b465eae05c0930c1d99172223cc63b2df71a037efed9f079afff49d5)

```

NFT 실습

하이퍼레저 베수와 메타마스크 연결
이후, remix 연동



스마트 컨트랙트 배포

ENVIRONMENT

Injected Web3

Custom (1337) network

ACCOUNT

0x9D9...02325 (10199.999)

GAS LIMIT

3000000

VALUE

0

Wei

CONTRACT

Contract721 - Contract721.sol

DEPLOY

NAME: seToken

SYMBOL: ST

METADATA: hello world

TOKENID: 1

transact

test_network

Account 15 → 새 계약

https://remix.ethereum.org

계약 배포

세부 정보 데이터

예산 가스 요금

0.0 ETH

제안 사이트

최대 요금 0 ETH

합계

0.0 ETH

금액 + 가스 요금

최대 금액: 0 ETH

거부

확인

토큰 가져오기

맞춤형 토큰

기존 토큰의 가짜 버전 생성을 포함하여 누구나 토큰을 생성할 수 있습니다. 사기 및 보안 위험에 대해 자세히 알아보기

토큰 계약 주소

0xFF37F0A000e1B954E1b862aD75994a521cbf

토큰 기호

ST

토큰 십진수

1

맞춤형 토큰 추가

< Account 15 / ssss

0.1 ssss

보내기 스왑

transferFrom

_from:

0x9D9a133eFE458949E30F6

_to:

0x40c91d1d7669873486ea7!

_tokenId:

1

transact

test_network

Account 16

→

Account 16

https://remix.ethereum.org

전송 위치

1 ssss

세부 정보

데이터

HEX

편집

예상 가스 요금

0.0 ETH

제한 사이트

최대 요금 0 ETH

합계

\$0.00 1 ssss + 0

금액 + 가스 요금

최대 금액: 1 ssss + 0.000000

거부

확인

< Account 16 / ssss



1 ssss



보내기



스왑

NFT 발행의 핵심

```
1 pragma solidity ^0.4.20;
2
3 contract Contract721 {
4
5     string private _name;
6     string private _symbol;
7
8     mapping(uint256 => address) private _owners;
9     mapping(address => uint256) private _balances;
10    mapping(uint256 => address) private _tokenApprovals;
11    mapping(uint256 => string) private _metadata;
12
13    constructor(string name_, string symbol_, string metadata_, uint256 tokenId){
14        _name = name_;
15        _symbol = symbol_;
16        _mint(tokenId, metadata_);
17    }
18
19    function _mint(uint256 tokenId, string metadata_) internal {
20        require(!_exists(tokenId), "Token already minted");
21
22        _balances[msg.sender] +=1;
23        _owners[tokenId] = msg.sender;
24        _metadata[tokenId] = metadata_;
25    }
26
27    function name() public view returns (string){
28        return _name;
29    }
30
31    function symbol() public view returns (string){
32        return _symbol;
33    }
34
35    function _exists(uint256 tokenId) internal returns (bool) {
36        return _owners[tokenId] != address(0);
37    }
38
39    function additionalMint(uint tokenId, string metadata) external {
40        _mint(tokenId, metadata);
41    }
42 }
```

- Token ID와 사용자의 매칭이 잘 되는가
- TokenID가 잘 생성이 되는가
- 소유자 개념이 잘 등록이 되는가

NFT 실습



컨트랙트 소유자 및 관리자

토큰 생성 및 발행

서버 제공

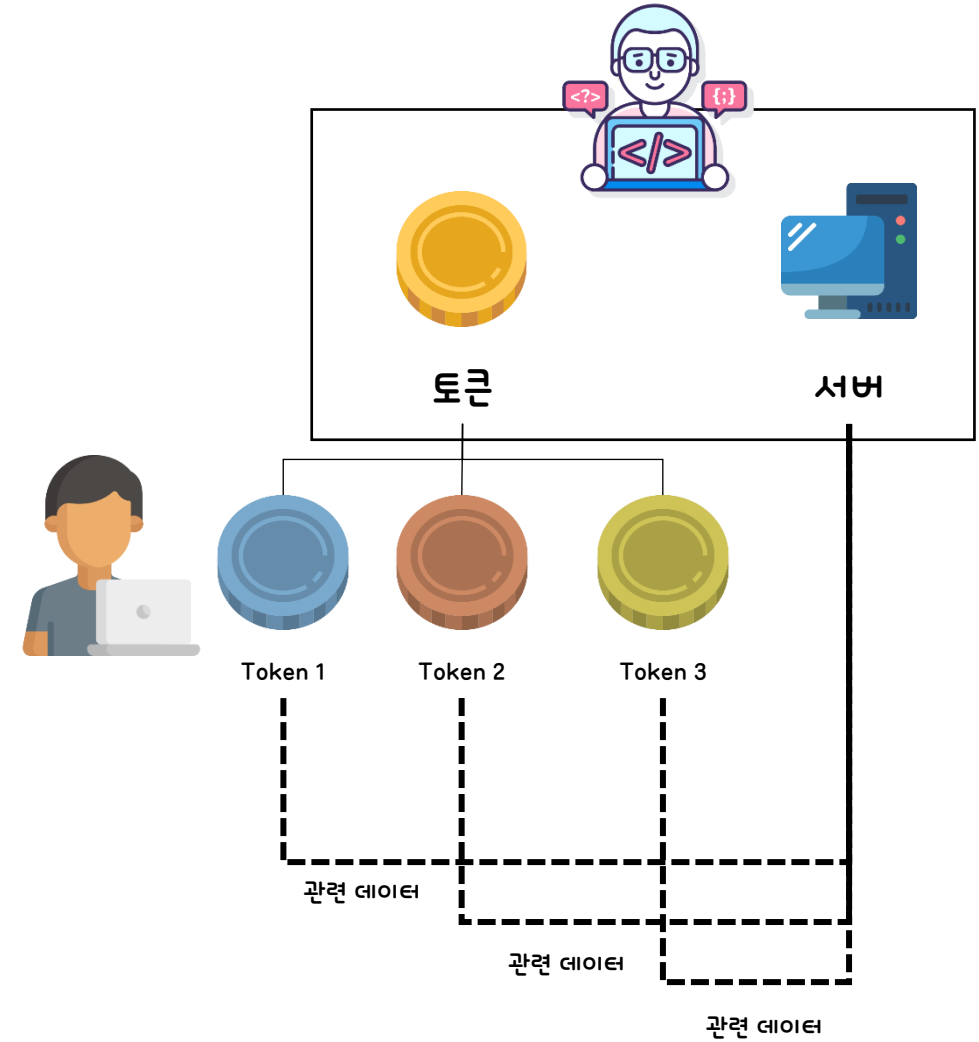
NFT 토큰 발행



디지털 작품 생산자

NFT 토큰 소유

토큰 ID 관리





<https://github.com/OpenZeppelin/openzeppelin-contracts>

OpenZeppelin / openzeppelin-contracts
Public

Code
Issues 95
Pull requests 30
Actions
Security 5
Insights

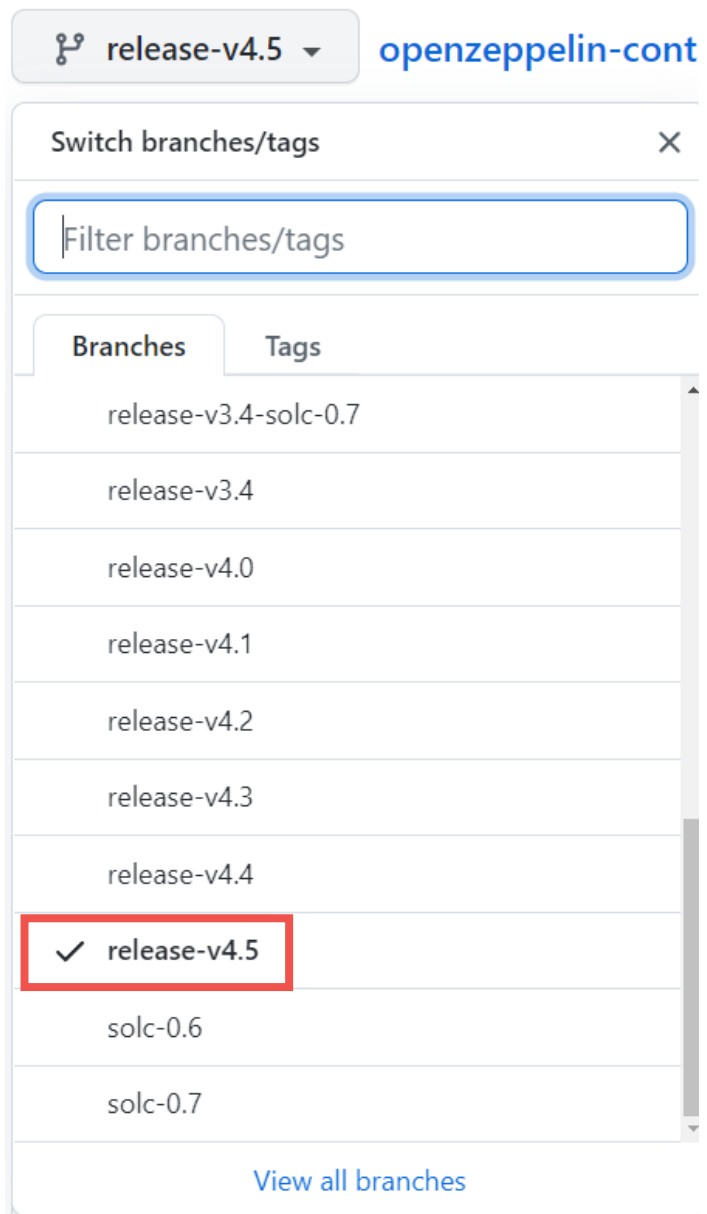
master
24 branches
95 tags
Go to file
Add file
Code

cjxe Fix typo (#3241)

c239e1a 2 days ago

2,718 commits

.github	Update actions/checkout action to v3 (#3234)	5 days ago
audit	Use "OpenZeppelin Contracts" where appropriate (#2778)	8 months ago
certora	Add Certora's Governance verification rules (#2997)	2 months ago
contracts	Fix typo (#3241)	2 days ago
docs	Simplify ERC721 example (#3115)	last month
hardhat	Transition from buidler to hardhat	13 months ago
migrations	Clean up npm package (#904)	4 years ago
scripts	Fix docs navigation	18 days ago
test	Extend Governor with parameterized votes (#3043)	5 days ago
.codecov.yml	Configure Codecov parameters	15 months ago
.editorconfig	Add documentation for proxies (#2344)	2 years ago



<https://docs.openzeppelin.com/contracts/4.x/api/token/erc721>

The EIP specifies four interfaces:

- [IERC721](#) : Core functionality required in all compliant implementation.
- [IERC721Metadata](#) : Optional extension that adds name, symbol, and token URI, almost always included.
- [IERC721Enumerable](#) : Optional extension that allows enumerating the tokens on chain, often not included since it requires large gas overhead.
- [IERC721Receiver](#) : An interface that must be implemented by contracts if they want to accept tokens through `safeTransferFrom`.

OpenZeppelin Contracts provides implementations of all four interfaces:

- [ERC721](#) : The core and metadata extensions, with a base URI mechanism.
- [ERC721Enumerable](#) : The enumerable extension.
- [ERC721Holder](#) : A bare bones implementation of the receiver interface.

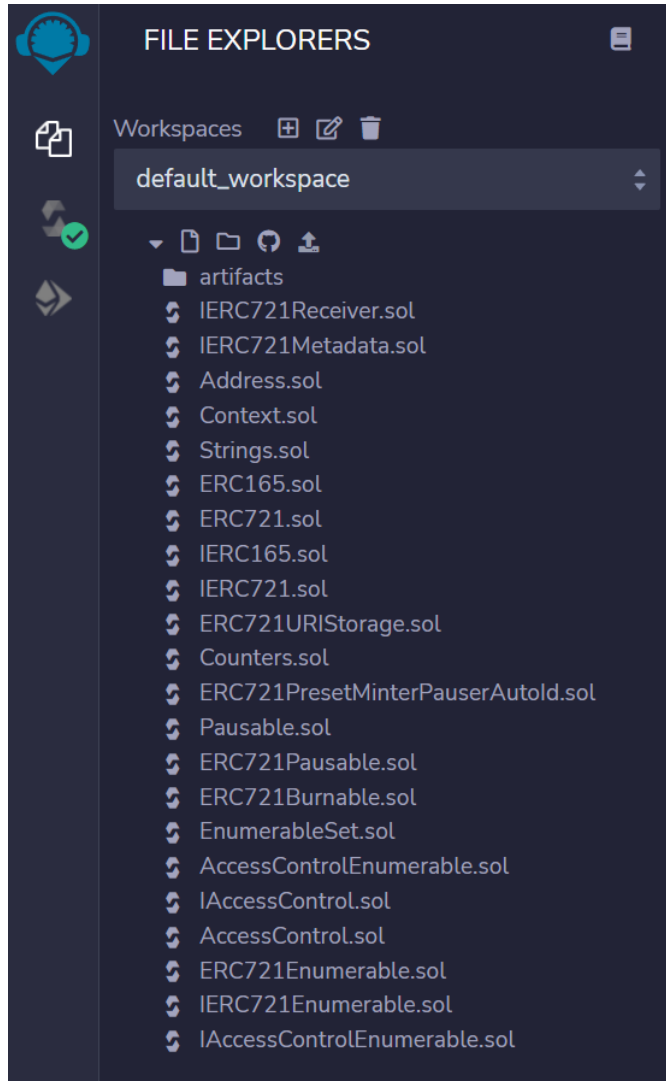
Additionally there are a few of other extensions:

- [ERC721URIStorage](#) : A more flexible but more expensive way of storing metadata.
- [ERC721Votes](#) : Support for voting and vote delegation.
- [ERC721Royalty](#) : A way to signal royalty information following ERC2981.
- [ERC721Pausable](#) : A primitive to pause contract operation.
- [ERC721Burnable](#) : A way for token holders to burn their own tokens.

- 제공하는 Smart Contract들은 Core 요소들일뿐
- 해당 Core 요소들을 돌리기 위한 스마트 컨트랙트가 한개 더 필요함

Index	파일명	파일 위치
1	ERC721.sol	openzeppelin-contracts/contracts/token/ERC721/ERC721.sol
2	IERC721.sol	openzeppelin-contracts/contracts/token/ERC721/IERC721.sol
3	IERC721Receiver.sol	openzeppelin-contracts/contracts/token/ERC721/IERC721Receiver.sol
4	Address.sol	openzeppelin-contracts/contracts/utils/Address.sol
5	Context.sol	openzeppelin-contracts/contracts/utils/Context.sol
6	Strings.sol	openzeppelin-contracts/contracts/utils/Strings.sol
7	ERC165.sol	openzeppelin-contracts/contracts/utils/introspection/ERC165.sol
8	IERC165.sol	openzeppelin-contracts/contracts/utils/introspection/IERC165.sol
9	IERC721Metadata.sol	openzeppelin-contracts/contracts/token/ERC721/extensions/IERC721Metadata.sol
10	ERC721URIStorage.sol	openzeppelin-contracts/contracts/token/ERC721/extensions/ERC721URIStorage.sol
11	ERC721PresetMinterPauserAutoid.sol	openzeppelin-contracts/contracts/token/ERC721/presets/ERC721PresetMinterPauserAutoid.sol
12	ERC721Enumerable.sol	openzeppelin-contracts/contracts/token/ERC721/extensions/ERC721Enumerable.sol
13	ERC721Burnable.sol	openzeppelin-contracts/contracts/token/ERC721/extensions/ERC721Burnable.sol
14	ERC721Pausable.sol	openzeppelin-contracts/contracts/token/ERC721/extensions/ERC721Pausable.sol
15	AccessControlEnumerable.sol	openzeppelin-contracts/contracts/access/AccessControlEnumerable.sol
16	Counters.sol	openzeppelin-contracts/contracts/utils/Counters.sol
17	Pausable.sol	openzeppelin-contracts/contracts/security/Pausable.sol
18	EnumerableSet.sol	openzeppelin-contracts/contracts/utils/structs/EnumerableSet.sol
19	IAccessControlEnumerable.sol	openzeppelin-contracts/contracts/access/IAccessControlEnumerable.sol
20	AccessControl.sol	openzeppelin-contracts/contracts/access/AccessControl.sol
21	IERC721Enumerable.sol	openzeppelin-contracts/contracts/token/ERC721/extensions/IERC721Enumerable.sol
22	IAccessControl.sol	openzeppelin-contracts/contracts/access/IAccessControl.sol

Remix에 넣으면서 import 경로 정리



```
import "./IERC721.sol";
import "./IERC721Receiver.sol";
import "./IERC721Metadata.sol";
import "./Address.sol";
import "./Context.sol";
import "./Strings.sol";
import "./ERC165.sol";
```

모든 sol 파일 확인해서 동일 경로에 있도록 수정

Remix VM 테스트

DEPLOY & RUN TRANSACTIONS

ENVIRONMENT

JavaScript VM (London)

VM

ACCOUNT

0xAb8...35cb2 (99.999999999998579 ether)

GAS LIMIT

3000000

VALUE

0

Wei

CONTRACT

ERC721PresetMinterPauserAutold - ERC721PresetMinterPauserAutold.sol

DEPLOY

NAME: test

SYMBOL: test

BASETOKENURI: testURL

transact

☐ Publish to IPFS

✓

[vm] from: 0xAb8...35cb2 to: ERC721PresetMinterPauserAutold.(constructor) value: 0 wei data: 0x608...00000
logs: 3 hash: 0x114...3cc0f

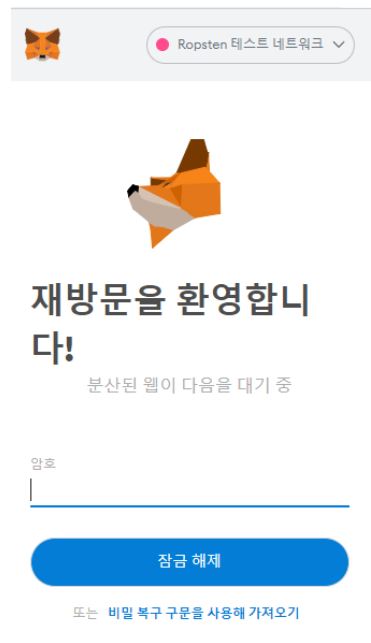
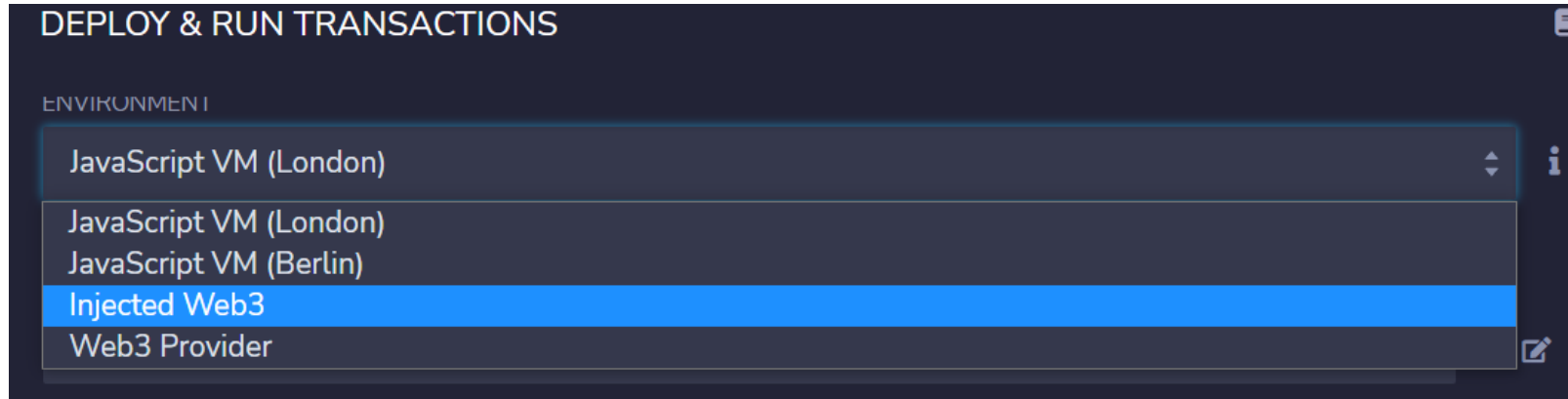
Debug

> ERC721PRESETMINTERPAUSERAUTOID AT 0X417...2600F (MEMORY)

Deployed Contracts	
▼ ERC721PRESETMINTERPAUSERAUTOID AT 0X417...2600F (MEMORY)	
approve	address to, uint256 tokenId
burn	uint256 tokenId
grantRole	bytes32 role, address account
mint	address to
pause	
renounceRole	bytes32 role, address account
revokeRole	bytes32 role, address account
safeTransferFr...	address from, address to, uint256 tokenId
safeTransferFr...	address from, address to, uint256 tokenId, bytes _data
setApprovalFo...	address operator, bool approved
transferFrom	address from, address to, uint256 tokenId
unpause	

balanceOf	address owner
DEFAULT_AD...	
getApproved	uint256 tokenId
getRoleAdmin	bytes32 role
getRoleMember	bytes32 role, uint256 index
getRoleMemb...	bytes32 role
hasRole	bytes32 role, address account
isApprovedFor...	address owner, address operator
MINTER_ROLE	
name	
ownerOf	uint256 tokenId
paused	
PAUSER_ROLE	
supportsInterf...	bytes4 interfaced
symbol	
tokenByIndex	uint256 index
tokenOfOwner...	address owner, uint256 index
tokenURI	uint256 tokenId
totalSupply	

테스트넷 배포 해보기



테스트넷 배포 해보기

DEPLOY & RUN TRANSACTIONS

ENVIRONMENT

Injected Web3

Ropsten (3) network

ACCOUNT

0xB28...98CAf (4.579123607837619726 ether)

GAS LIMIT

3000000

VALUE

0

Ether

CONTRACT

ERC721PresetMinterPauserAutold - ERC721PresetMinterPauserAutold.sol

DEPLOY

NAME: seotest

SYMBOL: seo

BASETOKENURI: testURL

transact

MetaMask Notification

Ropsten 테스트 네트워크

Account 5

→

새 계약

https://remix.ethereum.org

계약 배포

세부 정보

데이터

편집

예상 가스 요금

0.01097597 ETH

제안 사이트

최대 요금

합계

0.01097597

금액 + 가스 요금

최대 금액: 0.01097597 ETH

거부

확인

테스트넷 배포 해보기

[view on etherscan](#)



[block:12061830 txIndex:3] from: 0xB28...98CAf to: ERC721PresetMinterPauserAutoid.(constructor) value: 0 wei
data: 0x608...00000 logs: 3 hash: 0x019...75393

Debug



➤ ERC721PRESETMINTERPAUSERAUTOID AT 0XEA1...52B75 (BLOCKCHAIN)



Transaction Details

Overview

Logs (3)

State

[This is a Ropsten **Testnet** transaction only]

Transaction Hash:

0x03be1731cd0ff1c65b4a9f6669925c6a4e47ca03b2f67b0390873fd6160093b

Status:

Success

Block:

120618302 Block Confirmations

Timestamp:

24 secs ago (Mar-09-2022 05:04:12 AM +UTC)

From:

0xb286aeb0ef11b9f9efeb110d9acab51fa298caf

To:

[Contract 0xea16c990dd078a3167d45ac1c3344cea1ca52b75 Created]

Value:

0 Ether (\$0.00)

Transaction Fee:

0.010975970100978924 Ether (\$0.00)

Gas Price:

0.000000002500000023 Ether (2.500000023 Gwei)

Click to see More

A transaction is a cryptographically signed instruction from an account that changes the state of the blockchain. Block explorers track the details of all transactions in the network. Learn more about transactions in our Knowledge Base.

Block #12061830

Overview

[This is a Ropsten **Testnet** block only]

Block Height:

12061830

Timestamp:

38 secs ago (Mar-09-2022 05:04:12 AM +UTC)

Transactions:

5 transactions and 3 contract internal transactions in this block

Mined by:

0x3c0e319ced31717b5c6dc921610423e9a748ee66 in 57 secs

Block Reward:

2.0118005956 Ether (2 + 0.01180059570711468 - 0.00000000010711468)

Uncles Reward:

0

Difficulty:

4,202,737,897

Total Difficulty:

40,039,621,309,827,448

Size:

23,342 bytes

Gas Used:

4,657,160 (58.21%) +16% Gas Target

Gas Limit:

8,000,000

Base Fee Per Gas:

23 wei (0.000000023 Gwei)

Burnt Fees:

0.00000000010711468 Ether

Extra Data:

rlfgethgo1.17.5linux (Hex:0xd883010a10846765746888676f312e31372e35856c696e7578)

Click to see more

Contract

0xEA16c990dD078A3167D45ac1C3344cEa1Ca52b75

Contract Overview

Balance:0 Ether

More Info

My Name Tag:Not Available

Contract Creator:0xb286aeb0ef11b9f9efe... at txn 0x03be1731cd0ff1c65b4...

Transactions

Contract

Events

Latest 1 from a total of 1 transactions

Txn Hash	Method	Block	Age	From	To	Value	Txn Fee
0x03be1731cd0ff1c65b4...	0x60806040	12061830	1 min ago	0xb286aeb0ef11b9f9efe...	INContract Creation	0 Ether	0.0109759701

[Download CSV Export]

Account 5
0xB28...8CAf

4.5681 ETH

↓

구매

↗

보내기

□

스왑

자산
활동

4.5681 ETH

>

토큰이 보이지 않나요?

토큰 가져오기

토큰 가져오기

×

맞춤형 토큰

1

기존 토큰의 가짜 버전 생성을 포함하여 누구나 토큰을 생성할 수 있습니다. [사기 및 보안 위험](#) 에 대해 자세히 알아보기

토큰 계약 주소

0xEA16c990dD078A3167D45ac1C3344cEa1C8

토큰 기호

seo

편집

토큰 십진수

필요한 토큰 십진수

토큰 십진수는 [Etherscan](#) 에서 찾을 수 있습니다.

29

mint

address to

▼

mint

to: 0xdc45BbA03A4CE2c9b27294B5F74B88420269C415

 transact

편집

예상 가스 요금 ⓘ

0.00031996

0.00032 ETH

제안 사이트
거의 < 15 초 후

최대 요금 0.00031996 ETH

합계

0.00031996

0.00031996 ETH

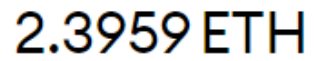
금액 + 가스 요금

최대 금액: 0.00031996 ETH

거부

확인

0xdc4...C415



구매



한글

) SBL

토큰 가져오기

i 기존 토큰의 가짜 버전 생성을 포함하여 누구나 토큰을 생성할 수 있습니다. **사기 및 보안 위험**에 대해 자세히 알아보기

0xEA16c990dD078A3167D45ac1C3344cEa1Cæ

편집

필요한 토큰 십진수
토큰 십진수는 Etherscan 에서 찾을 수 있습니다.

31

Account 1
0xdc4...C415

Token seotest ⓘ

Overview [ERC-721]

Max Total Supply: 1 seo ⓘ

Holders: 0

Transfers: 1

Profile Summary

Contract: 0xEA16c990dD078A3167D45ac1C3344cEa1Ca52b75

Transfers Holders Contract

A total of 1 transaction found

Txn Hash	Method ⓘ	Age	From	To	TokenID
0xb9980727a4d749741f...	Mint	3 mins ago	0x00000000000000000000...	→ 0xdc45bba03a4ce2c9b2...	0

[Download CSV Export ⬇]

토큰 가져오기 ×

맞춤형 토큰

기존 토큰의 가져와 버전 생성을 포함하여 누구나 토큰을 생성할 수 있습니다. [사기 및 보안 위험](#) 에 대해 자세히 알아보기

토큰 계약 주소

0xEA16c990dD078A3167D45ac1C3344cEa1Ca

토큰 기호 [편집](#)

seo

토큰 십진수

0

맞춤형 토큰 추가

< Account 1 / seo



1seo



보내기



스왑

거래가 없습니다.

전송전 스마트 컨트랙트로 전송 승인을 해야됨
Address 에는 보내고자 하는 사람의 주소

approve

to:

0xB286aeb0EF11b9f9EFfBe110d9ACab51FA298CAf

tokenId:

"0"



transact

보내기 위해서는 스마트컨트랙트의 transferFrom 사용

< Account 1 / seo



1seo



보내기



스왑



seo 지출 한도 승인

Mar 9 · remix.ethereum.org

transferFrom

from:

0xdc45BbA03A4CE2c9b27294B5F74B88420269C415

to:

0xB286aeb0EF11b9f9EFBe110d9ACab51FA298CAf

tokenId:

0

transact

NFT 실습

< Account 1 / seo



0seo



보내기



스왑



seo 보내기

Mar 9 · 수신: 0xb28...8caf

-0 seo



seo 지출 한도 승인

Mar 9 · remix.ethereum.org

< Account 5 / seo



1seo



보내기



스왑



Mint

Mar 9 · remix.ethereum.org

-0 ETH

-0 ETH

하이퍼레저 베수 구동

```

MINGW64/e/besu_privateNetwork/besu_network/node1
system88@DESKTOP-QM35NPN MINGW64 /e/besu_privateNetwork/besu_network/node1
$ |

MINGW64/e/besu_privateNetwork/besu_network/node2
system88@DESKTOP-QM35NPN MINGW64 /e/besu_privateNetwork/besu_network/node2
$ |

MINGW64/e/besu_privateNetwork/besu_network/node3
system88@DESKTOP-QM35NPN MINGW64 /e/besu_privateNetwork/besu_network/node3
$ |

MINGW64/e/besu_privateNetwork/besu_network/node4
system88@DESKTOP-QM35NPN MINGW64 /e/besu_privateNetwork/besu_network/node4
$ |

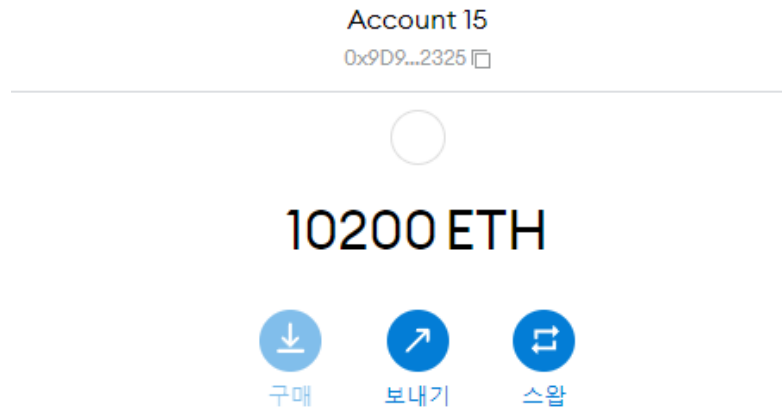
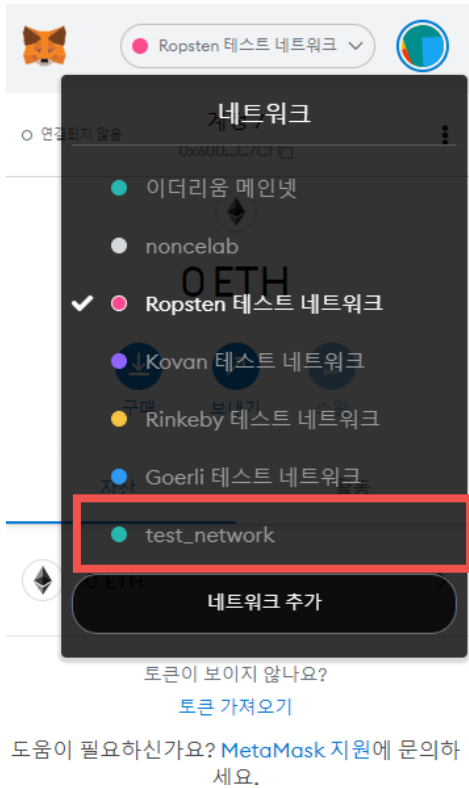
ControllerBuilder | Produced #8,733 / 0 tx / 0 pending / 0 (0.0%) gas / (0xc6761d9
28ca667e1d85b9950fcaa2ee66d75cc08cbefb371aa525a4fd3d634a)
2022-03-09 16:19:08.134+09:00 | EthScheduler-Workers-1 | INFO | PersistBlockTas
k | Imported #8,734 / 0 tx / 0 om / 0 (0.0%) gas / (0xc99c99024e5c8d2c96217be6b4
aa3d7c1b45c05707deafda343b3f8b8df3a5) in 0.000s. Peers: 3
2022-03-09 16:19:08.135+09:00 | BftProcessorExecutor-IBFT-0 | INFO | IbfBesuCo
ntrollerBuilder | Imported #8,734 / 0 tx / 0 pending / 0 (0.0%) gas / (0xc99c990
24e5c8d2c96217be6b4aa3d7c1b45c05707deafda343b3f8b8df3a5)
2022-03-09 16:19:10.163+09:00 | BftProcessorExecutor-IBFT-0 | INFO | IbfBesuCo
ntrollerBuilder | Imported #8,735 / 0 tx / 0 pending / 0 (0.0%) gas / (0x370c2bd
c9d86a8ec1539d0d7a1291f5c6f6c90ab5a862977cc0c7e24c233fd09)
2022-03-09 16:19:12.123+09:00 | BftProcessorExecutor-IBFT-0 | INFO | IbfBesuCo
ntrollerBuilder | Imported #8,736 / 0 tx / 0 pending / 0 (0.0%) gas / (0xf198e66
c007a79bbdc926e77bbf131e39fa47764f78194a7110b01855194c8c)
2022-03-09 16:19:14.121+09:00 | BftProcessorExecutor-IBFT-0 | INFO | IbfBesuCo
ntrollerBuilder | Produced #8,737 / 0 tx / 0 pending / 0 (0.0%) gas / (0x50b92e0
13a36a51503c544dac35e8fe762e071d5ffa1c57d68877a1d2d05667)
2022-03-09 16:19:16.146+09:00 | BftProcessorExecutor-IBFT-0 | INFO | IbfBesuCo
ntrollerBuilder | Imported #8,738 / 0 tx / 0 pending / 0 (0.0%) gas / (0x1030166
b465eae05c0930c1d99172223cc63b2df71a037efed9f079afff49d5)
2022-03-09 16:19:18.137+09:00 | BftProcessorExecutor-IBFT-0 | INFO | IbfBesuCo
ntrollerBuilder | Imported #8,739 / 0 tx / 0 pending / 0 (0.0%) gas / (0xe4217e7
ba81a95f0e53d99bbb8ac08725aa369623cc0e98fe3103cd29dfebb4)

ControllerBuilder | Produced #8,732 / 0 tx / 0 pending / 0 (0.0%) gas / (0x44eb3dc
93bacbf38c2483551055369f6fe27e05605540de6fc4c1bb92ebdcf4d)
2022-03-09 16:19:06.118+09:00 | BftProcessorExecutor-IBFT-0 | INFO | IbfBesuCo
ntrollerBuilder | Imported #8,733 / 0 tx / 0 pending / 0 (0.0%) gas / (0xc6761d9
28ca667e1d85b9950fcaa2ee66d75cc08cbefb371aa525a4fd3d634a)
2022-03-09 16:19:08.125+09:00 | BftProcessorExecutor-IBFT-0 | INFO | IbfBesuCo
ntrollerBuilder | Imported #8,734 / 0 tx / 0 pending / 0 (0.0%) gas / (0xc99c990
24e5c8d2c96217be6b4aa3d7c1b45c05707deafda343b3f8b8df3a5)
2022-03-09 16:19:10.157+09:00 | BftProcessorExecutor-IBFT-0 | INFO | IbfBesuCo
ntrollerBuilder | Imported #8,735 / 0 tx / 0 pending / 0 (0.0%) gas / (0x370c2bd
c9d86a8ec1539d0d7a1291f5c6f6c90ab5a862977cc0c7e24c233fd09)
2022-03-09 16:19:12.156+09:00 | BftProcessorExecutor-IBFT-0 | INFO | IbfBesuCo
ntrollerBuilder | Produced #8,736 / 0 tx / 0 pending / 0 (0.0%) gas / (0xf198e66
c007a79bbdc926e77bbf131e39fa47764f78194a7110b01855194c8c)
2022-03-09 16:19:12.156+09:00 | EthScheduler-Workers-2 | INFO | PersistBlockTas
k | Imported #8,736 / 0 tx / 0 om / 0 (0.0%) gas / (0xf198e66c007a79bbdc926e77b
bf131e39fa47764f78194a7110b01855194c8c) in 0.004s. Peers: 4
2022-03-09 16:19:14.117+09:00 | BftProcessorExecutor-IBFT-0 | INFO | IbfBesuCo
ntrollerBuilder | Imported #8,737 / 0 tx / 0 pending / 0 (0.0%) gas / (0x50b92e0
13a36a51503c544dac35e8fe762e071d5ffa1c57d68877a1d2d05667)
2022-03-09 16:19:16.132+09:00 | BftProcessorExecutor-IBFT-0 | INFO | IbfBesuCo
ntrollerBuilder | Imported #8,738 / 0 tx / 0 pending / 0 (0.0%) gas / (0x1030166
b465eae05c0930c1d99172223cc63b2df71a037efed9f079afff49d5)

ControllerBuilder | Imported #8,733 / 0 tx / 0 pending / 0 (0.0%) gas / (0xc6761d9
28ca667e1d85b9950fcaa2ee66d75cc08cbefb371aa525a4fd3d634a)
2022-03-09 16:19:08.129+09:00 | BftProcessorExecutor-IBFT-0 | INFO | IbfBesuCo
ntrollerBuilder | Produced #8,734 / 0 tx / 0 pending / 0 (0.0%) gas / (0xc99c990
24e5c8d2c96217be6b4aa3d7c1b45c05707deafda343b3f8b8df3a5)
2022-03-09 16:19:10.182+09:00 | BftProcessorExecutor-IBFT-0 | INFO | IbfBesuCo
ntrollerBuilder | Imported #8,735 / 0 tx / 0 pending / 0 (0.0%) gas / (0x370c2bd
c9d86a8ec1539d0d7a1291f5c6f6c90ab5a862977cc0c7e24c233fd09)
2022-03-09 16:19:10.200+09:00 | EthScheduler-Workers-0 | INFO | PersistBlockTas
k | Imported #8,735 / 0 tx / 0 om / 0 (0.0%) gas / (0x370c2bdc9d86a8ec1539d0d7a1
291f5c6f6c90ab5a862977cc0c7e24c233fd09) in 0.005s. Peers: 4
2022-03-09 16:19:12.154+09:00 | BftProcessorExecutor-IBFT-0 | INFO | IbfBesuCo
ntrollerBuilder | Imported #8,736 / 0 tx / 0 pending / 0 (0.0%) gas / (0xf198e66
c007a79bbdc926e77bbf131e39fa47764f78194a7110b01855194c8c)
2022-03-09 16:19:12.154+09:00 | EthScheduler-Workers-2 | INFO | PersistBlockTas
k | Imported #8,736 / 0 tx / 0 om / 0 (0.0%) gas / (0xf198e66c007a79bbdc926e77b
bf131e39fa47764f78194a7110b01855194c8c) in 0.000s. Peers: 3
2022-03-09 16:19:14.123+09:00 | BftProcessorExecutor-IBFT-0 | INFO | IbfBesuCo
ntrollerBuilder | Imported #8,737 / 0 tx / 0 pending / 0 (0.0%) gas / (0x50b92e0
13a36a51503c544dac35e8fe762e071d5ffa1c57d68877a1d2d05667)
2022-03-09 16:19:16.139+09:00 | BftProcessorExecutor-IBFT-0 | INFO | IbfBesuCo
ntrollerBuilder | Imported #8,738 / 0 tx / 0 pending / 0 (0.0%) gas / (0x1030166
b465eae05c0930c1d99172223cc63b2df71a037efed9f079afff49d5)
2022-03-09 16:19:16.151+09:00 | EthScheduler-Workers-1 | INFO | PersistBlockTas
k | Imported #8,738 / 0 tx / 0 om / 0 (0.0%) gas / (0x1030166b465eae05c0930c1d9
172223cc63b2df71a037efed9f079afff49d5) in 0.009s. Peers: 3
2022-03-09 16:19:16.151+09:00 | BftProcessorExecutor-IBFT-0 | INFO | IbfBesuCo
ntrollerBuilder | Imported #8,738 / 0 tx / 0 pending / 0 (0.0%) gas / (0x1030166
b465eae05c0930c1d99172223cc63b2df71a037efed9f079afff49d5)

```

하이퍼레저 베수와 메타마스크 연결 이후, remix 연동



스마트 컨트랙트 배포만 된거임 Mint를 통해서 다른사용자에게 Token ID 발행 필요

ENVIRONMENT

Injected Web3

Custom (1337) network

ACCOUNT

0x9D9...02325 (10199.9999)

GAS LIMIT

3000000

VALUE

0

Wei

CONTRACT

ERC721PresetMinterPauserAutold - E

DEPLOY

NAME: SJW

SYMBOL: SJW

BASETOKENURI: SJWURL

transact

test_network

Account 15

→

새 계약

https://remix.ethereum.org

계약 배포

세부 정보

데이터

편집

예상 가스 요금

0 0 ETH

제안 사이트

최대 요금 0 ETH

합계

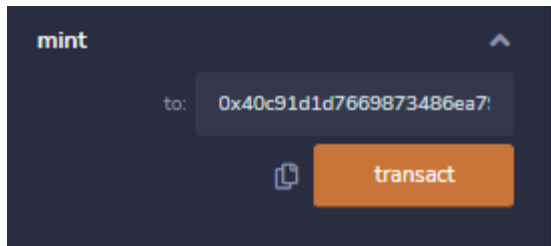
0 0 ETH

금액 + 가스 요금

최대 금액: 0 ETH

거부

확인



NFT 실습

Debug ^

✓ [block:9944 txIndex:0] from: 0x909...02325 to: ERC721PresetMinterPauserAutoId.mint(address) 0xf81...2Eb2e value: 0 wei data: 0x6a6...dca32 logs: 1 hash: 0xd97...02640

status true Transaction mined and execution succeed

transaction hash 0x0520aa0777e98357955c72653253802a01613a87269bd4fd9afcd81b38bdc78e9 ⓘ

from 0x909a193afe458949e30f804b184e000e11002325 ⓘ

to ERC721PresetMinterPauserAutoId.mint(address) 0xf81d90A9b2acc43Ec9b0057110242d740E72Eb2e ⓘ

gas 119863 gas ⓘ

transaction cost 117383 gas ⓘ

hash 0x0520aa0777e98357955c72653253802a01613a87269bd4fd9afcd81b38bdc78e9 ⓘ

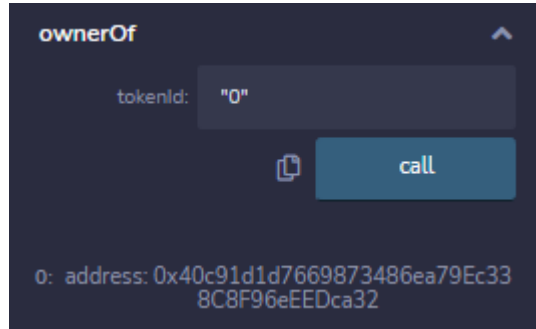
input 0x6a6...dca32 ⓘ

decoded input {
 "address to": "0x40c91d1d7669873428ea79E0938C8F90eEEDca32"
} ⓘ

decoded output - ⓘ

logs [
 {
 "from": "0xf81d90A9b2acc43Ec9b0057110242d740E72Eb2e",
 "to": "0x40c91d1d7669873428ea79E0938C8F90eEEDca32",
 "event": "Transfer",
 "args": {
 "0": "0x00",
 "1": "0x40c91d1d7669873428ea79E0938C8F90eEEDca32",
 "2": "0",
 "from": "0x00",
 "to": "0x40c91d1d7669873428ea79E0938C8F90eEEDca32",
 "tokenId": "0"
 }
 }
] ⓘ ⓘ

val 0 wei ⓘ



×

토큰 가져오기

맞춤형 토큰

!

기존 토큰의 가짜 버전 생성을 포함하여 누구나 토큰을 생성할 수 있습니다. [사기 및 보안 위험](#)에 대해 자세히 알아보기

토큰 계약 주소

0xf81d9DA3b2acc43Ec9b6D57110242d740E74

토큰 기호

SJW

토큰 십진수

0

맞춤형 토큰 추가

토큰 아이디 입력

전송

< Account 17 / SJW



0SJW



보내기



스왑

transferFrom

from:


0x40c91d1d7669873486ea71

to:

0xbDa6cE3177682C39fF36A

tokenId:

0

 **transact**

< Account 16 / SJW



0 SJW



보내기



스왑

< Account 17 / SJW



1 SJW



보내기



스왑

토큰 접근권한 부여

Account 16 / SJW

1SJW

보내기 스왑

0x40c...ca32 test_network

remix.ethereum.org

SJW에 액세스할 수 있는 권한을 부여하시겠습니까?

권한을 부여하면 다음 계정(가) 귀하의 자금에 액세스할 수 있습니다.

0xbda6...8024 권한 편집

거래 수수료 \$0.00

수수료가 이 요청과 연결되어 있습니다.

전체 거래 세부정보 보기

거부 확인

받는사람에게 Token을 보내겠다고 승인 요청

Q & A

