

Crosschain 2022

Crosschain asset transfer for Non-Fungible Tokens

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About NFT

non-fungible tokens (NFT) are distinguishable assets that can be used to represent ownership.

- Physical assets such as houses, cars, or artwork
- Virtual collectables such as digital art, or collectable cards,
- Certificates such as Birth certificates, diplomas

NFT token and applications

- The NFT is a kind of token that has a unique identification and cannot be replaced or swapped with another.
- The specification of the NFT is in ERC721 and in a later version of ERC1440.
- One key feature of ERC721 is a field called id that contains a unique value for each token.
- ERC721 are most frequently used to represent creative artwork.
- Projects in NFT include 0xCert, Cryptokitty, OpenSea, DecentraLand, Cryptopunk, etc.

NFT sample code

```
pragma solidity ^0.7.0;
import
"https://github.com/OpenZeppelin/openzeppelin-contracts/blob/release-v3.4/contracts/token/ERC721/ERC721.sol";

contract TTCDiploma is ERC721 {
    uint private _tokenIds;
    address admin;

    constructor() ERC721("TexasTechnologyCollegeDiploma", "TTC") public {
        admin = msg.sender;
    }
    function issueDiploma(address student, string memory tokenURI) public returns (uint256) {
        require(msg.sender == admin); // only admin can issue diploma.
        _tokenIds++;

        uint256 newDiplomaId = _tokenIds;
        _mint(student, newDiplomaId);
        _setTokenURI(newDiplomaId, tokenURI);
        return newDiplomaId;
    }
}
```

NFT Characteristics

- Each NFT token has an index that is unique
- Each NFT token has an owner
- Since NFTs can point to a physical or virtual asset outside the blockchain, there is an interface ERC721Metadata that defines a function called tokenURL.
function tokenURI(uint256 _tokenId) external view returns (string);
- This tokenURL function takes an input of _tokenId and returns a Universal Resource Identifier (URI) that points to a NFT item defined in a conventional digital system.
- Each NFT token can be transferred from one owner to another with the following function:
function transferFrom(address _from, address _to, uint256 _tokenId) external payable;
- There are also other functions or interfaces that help NFT tokens to be assigned, transferred or identified.

What is crosschain

- What is crosschain: transfer of assets and data

Lock-and-Mint

- Lock with source chain
- Transfer with crosschain bridge nodes
- Mint on the target chain

Burn and Unlock (Redeem)

Unburn the asset on the target chain

Transfer unlock transaction to the target chain

Unlock the asset on the source chain

NFT crosschain characteristics

Uniqueness: When a NFT is minted on another blockchain, the NFT on the source chain should be locked.

Multiple crosschain: A NFT can be cross-transfer from source chain A, to the first target chain B, and then to the second target chain C, and so forth.

Usability: The third party application should render the URI of the NFT on the target chain

Market place on both chains: a NFT be traded on the marketplace on both chains.

Crosschain staking and slashing for NFT: The value of NFT are subjective and make staking for NFT not accurate

Why NFT crosschain

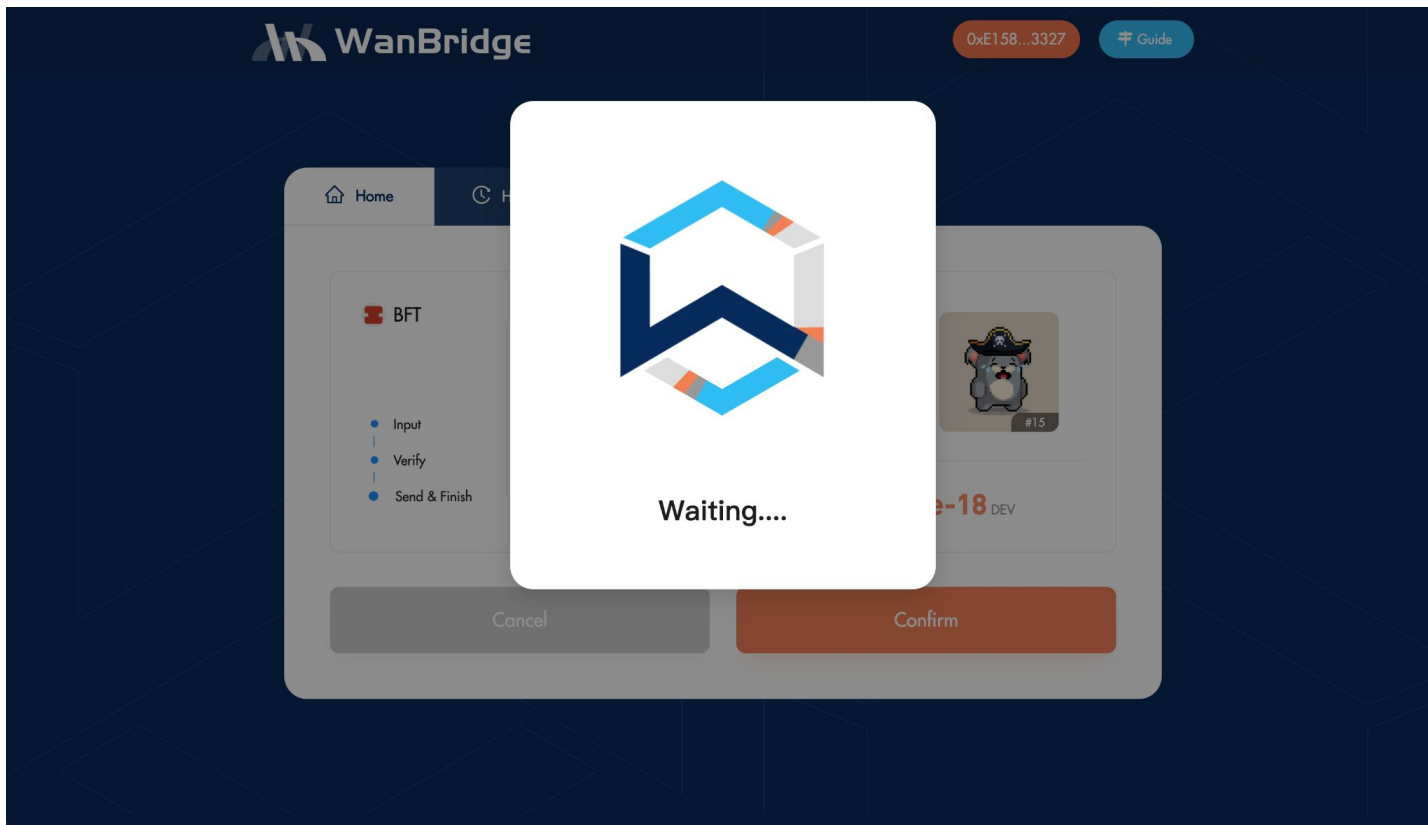
- NFT asset can be crosschain transfer to other blockchains for trading
- Save transaction gas fee and improve scalability
- NFT specific applications
- Mint-once, Use anywhere

NFT crosschain use case

The screenshot shows a wallet interface with a dark blue header containing 'Home' and 'History' tabs. The 'History' tab is active. On the left, there is a sidebar with 'BFT Asset' and a 'Moonbase... From' button. Below that is a green double-headed arrow icon and an 'Ethereum To' button. The main area displays a transaction with the following details:

- From:** 0xE158fAF421F95E344157cE04Cc7985Af7C783327
- Balance:** 1 BFT.m
- Recipient:** 0xE158fAF421F95E344157cE04Cc7985Af7C783327
- NFT:** A dog wearing a pirate hat, labeled #15.
- Action:** A large orange button labeled 'Next'.

NFT crosschain use case




NFT crosschain use case



Asset	BFT
Chain Pair	Moonbase Alpha ↗ Ethereum
From	0xE158fAF421F95E3...c7985Af7C783327
Recipient	0xE158fAF421F95E3...c7985Af7C783327
Card ID	15
Fee	2e-18 DEV
Received	15
Status	Success
TxHash	0x9bfdd7b24012aee2...10ce26ecc144ebc6

NFT crosschain use case

 [Home](#) [Validators](#) [Storemen](#) **Cross-Chain** [Tokens](#) [Transactions](#) [Bridge](#) [Useful Link](#)

Token Pair BFT Ethereum ↔ BFT.m Moonbase Alpha

Overview

From Address 0x8e2bb2ad14b3d0539171e7dac72a5449afc847f9 To Address 0xf2677e0c570e1135eb71c727f3e0d0ea23c58338

No. of Transfers 46

Transactions

No	LockHash	HTLC/Time	From	To	Status	Amount
1	0x9bfdd7b24012ae...	5 mins 15 secs ago	(Moonbase Alpha) 0xe158faf421f95e3...	(Ethereum) 0xe158faf421f95e3...	Processing	15 BFT.m
2	0x4e39f0641af705e...	70 days 23 hrs ago	(Ethereum) 0xe158faf421f95e3...	(Moonbase Alpha) ...	Success	15 BFT
3	0xc2f62f7ec957069...	81 days 2 hrs ago	(Moonbase Alpha) 0x8b157b3ffead48c...	(Ethereum) 0x8b157b3ffead48c...	Success	5 BFT.m
4	0x8924630f9e291d...	81 days 5 hrs ago	(Ethereum) 0x8b157b3ffead48c...	(Moonbase Alpha) ...	Success	10 BFT
5	0x605001cfb79d19...	81 days 5 hrs ago	(Ethereum) 0x8b157b3ffead48c...	(Moonbase Alpha) ...	Success	5 BFT
6	0xf2fe939f2585e1b...	81 days 6 hrs ago	(Moonbase Alpha) 0x8b157b3ffead48c...	(Ethereum) 0x8b157b3ffead48c...	Success	5 BFT.m
7	0x5ecfb1b3751c69...	81 days 6 hrs ago	(Ethereum) 0x8b157b3ffead48c...	(Moonbase Alpha) ...	Success	5 BFT
8	0x2b728c23730e07...	81 days 7 hrs ago	(Moonbase Alpha) 0xdfef53824f96809...	(Ethereum) 0x8b157b3ffead48c...	Success	5 BFT.m

NFT crosschain mechanism

Initiate transfer

- Locking NFT asset
- Messaging NFT asset crosschain event
- Minting NFT asset

NFT crosschain mechanism

Redeem

- Burning NFT asset
- Messaging NFT asset crosschain event
- Unlocking NFT asset

NFT crosschain challenges

- Staking for NFT bridges
- tokenURI transfer
- Third party dapps for crosschain NFT
- Updating of NFT smart contract on the source chain
- Security considerations (MPC etc)