

Adding View Functions

Adding Encrypted Balance Retrieval

To enhance our contract with secure balance viewing, we're going to implement `agetBalanceEncrypted()` function. This function will employ permissions to enforce access control, ensuring that only the rightful owner can retrieve and decrypt their encrypted balance.

Defining the Function

We'll start by adding a new function to our `WrappingERC20` contract. This function will use the `onlySender(perm)` modifier from the `Permissioned` contract to ensure that only the message sender, validated through a signature, can access their encrypted balance.

```
function getBalanceEncrypted(Permission calldata perm) public view onlySender(perm) returns (euint32) { return _encBalances[msg.sender]; }
```

Off-Chain Signature Generation

Users will need to generate a signature off-chain, using EIP-712 to sign their balance retrieval request. This signature proves that the user has authorized the retrieval of their encrypted balance.

Executing the Function

When calling `getBalanceEncrypted()`, the user includes their off-chain generated signature as a parameter. The function will execute only if the signature is valid and matches `themsig.sender`, returning the user's encrypted balance.

Putting it All Together

```
pragma solidity ^ 0.8 .20 ;

import

"@fhenixprotocol/contracts/access/Permissioned.sol" ; import

"@openzeppelin/contracts/token/ERC20/ERC20.sol" ; import

"@fhenixprotocol/contracts/FHE.sol" ;

contract WrappingERC20 is ERC20 ,
    Permissioned
{
    mapping ( address
=> euint32 ) internal _encBalances ;

    constructor ( string memory name , string memory symbol )
        ERC20 ( name , symbol )
    { _mint ( msg . sender ,
        100
        *
        10
        **

        uint ( decimals ( ) ) ) ; }

    function
        wrap ( uint32 amount )
    public
```

```

{ // Make sure that the sender has enough of the public balance require ( balanceOf ( msg . sender )
    = amount ) ; // Burn public balance _burn ( msg . sender , amount ) ;

// convert public amount to shielded by encrypting it uint32 shieldedAmount =
FHE . asEuint32 ( amount ) ; // Add shielded balance to his current balance _encBalances [ msg . sender ]
= _encBalances [ msg . sender ]
+ shieldedAmount ; }

function
unwrap ( inEuint32 memory amount )

public
{ uint32 _amount =

FHE . asEuint32 ( amount ) ; // verify that our shielded balance is greater or equal than the requested amount FHE . req (
_encBalances [ msg . sender ] . gte ( _amount ) ) ; // subtract amount from shielded balance _encBalances [ msg . sender ]
= _encBalances [ msg . sender ]
- _amount ; // add amount to caller's public balance by calling the mint function _mint ( msg . sender ,
FHE . decrypt ( _amount ) ) ; }

function
transferEncrypted ( address to , inEuint32 calldata encryptedAmount )

public
{ uint32 amount =

FHE . asEuint32 ( encryptedAmount ) ; // Make sure the sender has enough tokens. FHE . req ( amount . lte ( _encBalances
[ msg . sender ] ) ) ;

// Add to the balance of to and subtract from the balance of from. _encBalances [ to ]
= _encBalances [ to ]
+ amount ; _encBalances [ msg . sender ]
= _encBalances [ msg . sender ]
- amount ; }

function
getBalanceEncrypted ( Permission calldata perm ) public view onlySender ( perm ) returns
( uint256 )

{ return
FHE . decrypt ( _encBalances [ msg . sender ] ) ; }

```

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