

Hardhat Upgrades :

Smart contract yang telah terdeploy ternyata dapat diubah setiap waktu. Penambahan fitur smart contract atau bug fix menjadi salah satu alasan mengapa smart contract dapat diupgrade. Terdapat beberapa metode untuk mengupgrade smart contract tersebut.

Berikut percobaan pada remix. Terdapat contract B yang memiliki fungsi setVars() dengan 3 variabel. Dibuat juga contract A dengan fungsi yang sama, namun tidak memiliki variabel. Kita coba compile dan deploy contract B.

The screenshot shows the Remix IDE interface. On the left, the 'DEPLOY & RUN TRANSACTIONS' sidebar is visible, showing the account '0x5B3...eddC4 (99.999999%)', a gas limit of 3000000, and a value of 0 Wei. The contract selected is 'B - DelegateCallExample.sol'. The main editor displays the Solidity code for 'DelegateCallExample.sol'. The code defines two contracts: 'B' and 'A'. Contract 'B' has a 'setVars' function that updates its state variables 'num', 'sender', and 'value'. Contract 'A' has a 'setVars' function that delegates the call to Contract 'B'. The bottom panel shows the transaction log with a successful deployment of Contract B.

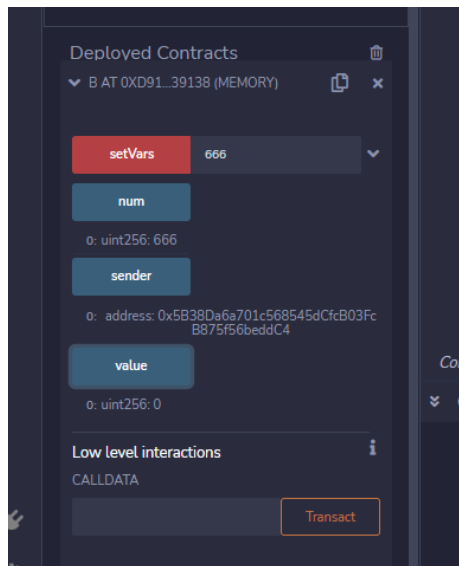
```
1 // SPDX-License-Identifier: MIT
2
3 // Be sure to check out solidity-by-example
4 // https://solidity-by-example.org/delegatecall
5
6 pragma solidity ^0.8.7;
7
8 // NOTE: Deploy this contract first
9 contract B {
10     // NOTE: storage layout must be the same as contract A
11     uint256 public num;
12     address public sender;
13     uint256 public value;
14
15     function setVars(uint256 _num) public payable {
16         num = _num;
17         sender = msg.sender;
18         value = msg.value;
19     }
20 }
21
22 contract A {
23     uint256 public num;
24     address public sender;
25     uint256 public value;
26
27     function setVars(address _contract, uint256 _num) public payable {
28         // A's storage is set, B is not modified.
29         (bool success, bytes memory data) = _contract.delegatecall(
30             abi.encodeWithSignature("setVars(uint256)", _num)
31         );
32     }
33 }
34
```

ContractDefinition B 1 reference(s)

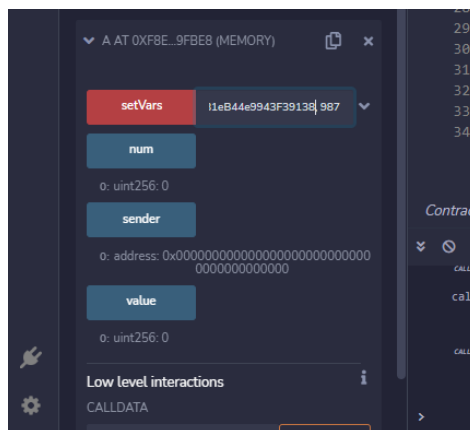
Type the library name to see available commands.
creation of B pending...

[vm] from: 0x5B3...eddC4 to: B.(constructor) value: 0 wei data: 0x608...70033 logs: 0 hash: 0xe13...d3f66

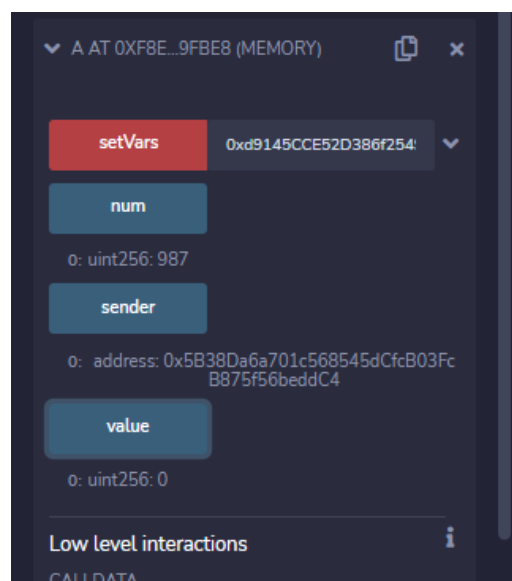
Ketika kita set setVars dengan sebuah nilai maka akan dapat informasi berupa



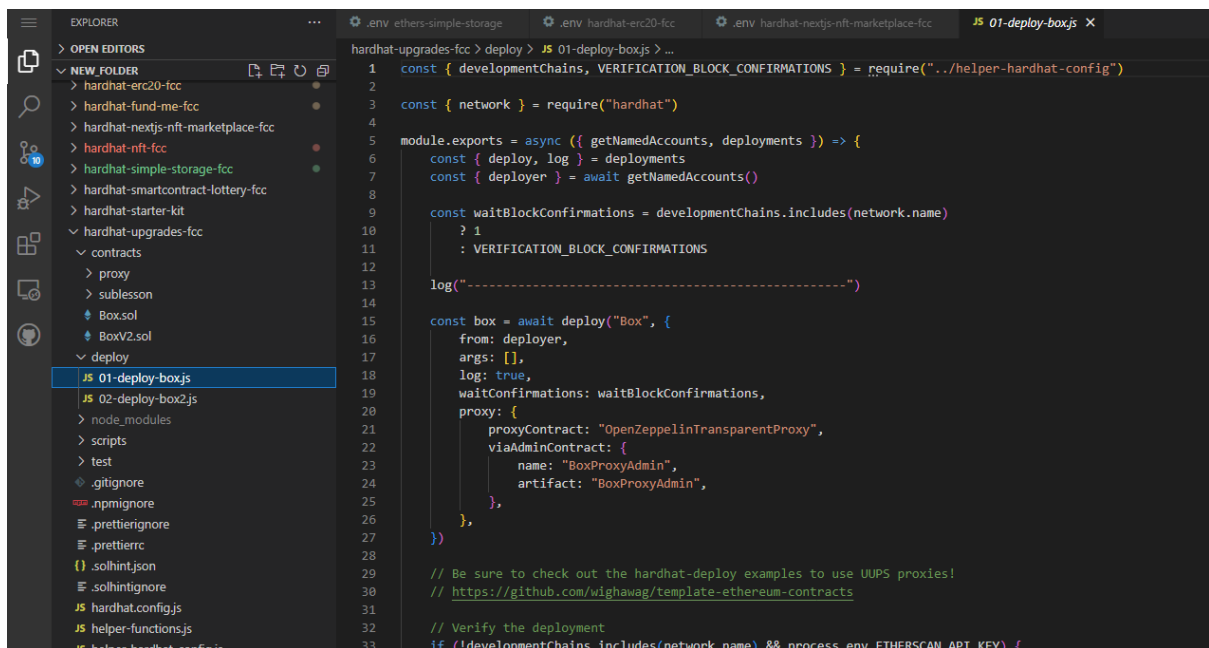
Setelah itu, deploy contract A dan isi setVars dengan alamat contract B dan sebuah nilai



Ternyata pada contract A bila diberikan address contract B, variabel yang berada pada contract B terkirim sehingga contract A dapat menampung variabel dari smart contract. Ini karena delegate call dapat meminjam fungsi dengan storage yang ekuivalennya.

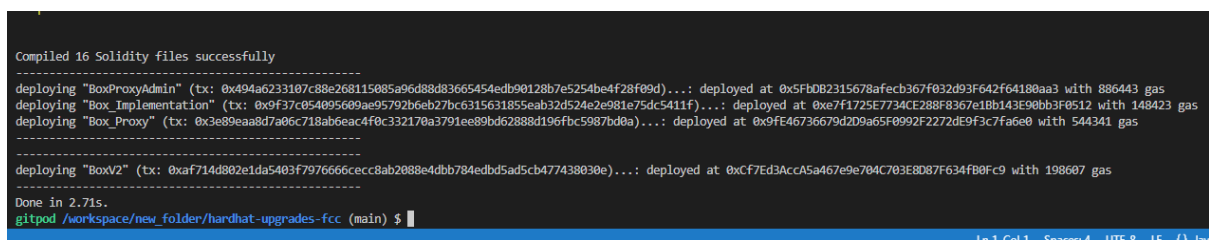


Berikut implementasi dengan hardhat



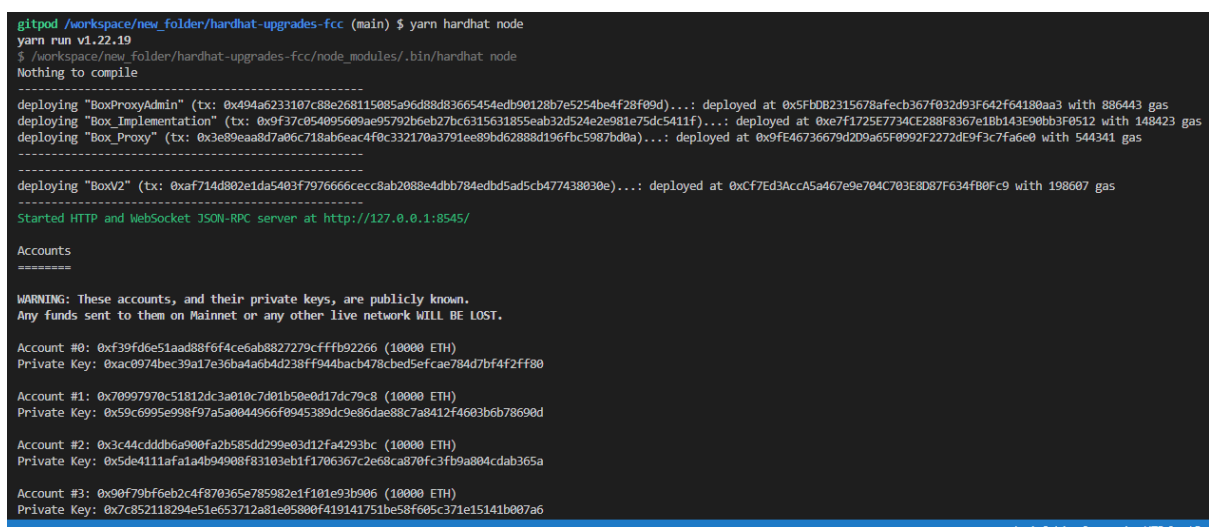
```
1 const { developmentChains, VERIFICATION_BLOCK_CONFIRMATIONS } = require("../helper-hardhat-config")
2
3 const { network } = require("hardhat")
4
5 module.exports = async ({ getNamedAccounts, deployments }) => {
6   const { deploy, log } = deployments
7   const { deployer } = await getNamedAccounts()
8
9   const waitBlockConfirmations = developmentChains.includes(network.name)
10     ? 1
11     : VERIFICATION_BLOCK_CONFIRMATIONS
12
13   log("-----")
14
15   const box = await deploy("Box", {
16     from: deployer,
17     args: [],
18     log: true,
19     waitConfirmations: waitBlockConfirmations,
20     proxy: {
21       proxyContract: "OpenZeppelinTransparentProxy",
22       viaAdminContract: {
23         name: "BoxProxyAdmin",
24         artifact: "BoxProxyAdmin",
25       },
26     },
27   })
28
29   // Be sure to check out the hardhat-deploy examples to use UUPS proxies!
30   // https://github.com/wighawag/template-ethereum-contracts
31
32   // Verify the deployment
33   if (!developmentChains.includes(network.name) && process.env.ETHERSCAN_API_KEY) {
```

Deploy smart contract untuk membuat BoxProxyAdmin, Box_Implementation, dan Box_Proxy



```
Compiled 16 Solidity files successfully
-----
deploying "BoxProxyAdmin" (tx: 0x494a6233107c88e268115085a96d88d83665454edb90128b7e5254be4f28f09d)....: deployed at 0x5Fb082315678afecb367f032d93f642f64180aa3 with 886443 gas
deploying "Box_Implementation" (tx: 0x9f37c054095609ae95792b6eb27bc6315631855eab32d524e2e981e75dc5411f)....: deployed at 0xe7f1725e7734CE288F8367e18b143E90bb3F0512 with 148423 gas
deploying "Box_Proxy" (tx: 0x3e89eaa8d7a06c718ab6eac4f0c332170a3791ee89bd62888d196fbc5987bd0a)....: deployed at 0x9fe46736679d209a65f0992f2272de9f3c7fa6e0 with 544341 gas
-----
deploying "BoxV2" (tx: 0xaf714d802e1da5403f7976666cecc8ab2088e4dbb784edbd5ad5cb477438030e)....: deployed at 0xcF7Ed3AccA5a467e9e704C703E8D87F634f80Fc9 with 198607 gas
Done in 2.71s.
gitpod /workspace/new_folder/hardhat-upgrades-fcc (main) $ █
```

Ketika mendeploy node pada smart contract, contract sebelumnya akan terdeploy, juga ditambah dengan contract BoxV2 dan beberapa akun yang dibuat



```
gitpod /workspace/new_folder/hardhat-upgrades-fcc (main) $ yarn hardhat node
yarn run v1.22.19
$ /workspace/new_folder/hardhat-upgrades-fcc/node_modules/.bin/hardhat node
Nothing to compile
-----
deploying "BoxProxyAdmin" (tx: 0x494a6233107c88e268115085a96d88d83665454edb90128b7e5254be4f28f09d)....: deployed at 0x5Fb082315678afecb367f032d93f642f64180aa3 with 886443 gas
deploying "Box_Implementation" (tx: 0x9f37c054095609ae95792b6eb27bc6315631855eab32d524e2e981e75dc5411f)....: deployed at 0xe7f1725e7734CE288F8367e18b143E90bb3F0512 with 148423 gas
deploying "Box_Proxy" (tx: 0x3e89eaa8d7a06c718ab6eac4f0c332170a3791ee89bd62888d196fbc5987bd0a)....: deployed at 0x9fe46736679d209a65f0992f2272de9f3c7fa6e0 with 544341 gas
-----
deploying "BoxV2" (tx: 0xaf714d802e1da5403f7976666cecc8ab2088e4dbb784edbd5ad5cb477438030e)....: deployed at 0xcF7Ed3AccA5a467e9e704C703E8D87F634f80Fc9 with 198607 gas
-----
Started HTTP and WebSocket JSON-RPC server at http://127.0.0.1:18545/

Accounts
=====

WARNING: These accounts, and their private keys, are publicly known.
Any funds sent to them on Mainnet or any other live network WILL BE LOST.

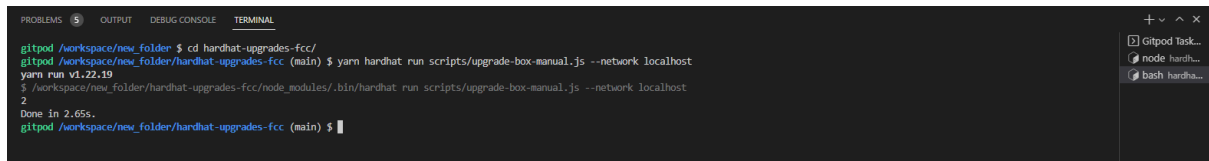
Account #0: 0xf39fd6e51aad88f644ce6ab8827279cfff92266 (10000 ETH)
Private Key: 0xac0974bec39a17e36ba4a6b4d238ff944abac478cdbe5fcae784d7bf4f2ff80

Account #1: 0x70997970c51812dc3a010c7d01b50e0d17dc79c8 (10000 ETH)
Private Key: 0x59c6995e998f97a50044966f0945389dc9e86dae88c7a8412f4603b6b78690d

Account #2: 0x3c44cdddb6a900fa2b585dd299e03d12fa4293bc (10000 ETH)
Private Key: 0x5de4111afa1a4b949088f3103eb1f1706367c2e68ca870fc3fb9a804cdab365a

Account #3: 0x90f79bf6eb2c4f870365e785982e1f101e93b906 (10000 ETH)
Private Key: 0x7c852118294e51e653712a81e05800419141751be58f605c371e15141b007a6
```

Buka terminal baru dan jalankan perintah `yarn hardhat run scripts/upgrade-box-manual.js --network localhost` untuk mengupdate box



```
gitpod /workspace/new_folder $ cd hardhat-upgrades-fcc/
gitpod /workspace/new_folder/hardhat-upgrades-fcc (main) $ yarn hardhat run scripts/upgrade-box-manual.js --network localhost
yarn run v1.22.19
$ /workspace/new_folder/hardhat-upgrades-fcc/node_modules/.bin/hardhat run scripts/upgrade-box-manual.js --network localhost
2
Done in 2.65s.
gitpod /workspace/new_folder/hardhat-upgrades-fcc (main) $
```