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Requirements

- Have read/write permissions for folders and files.
- Download the project.
- 300MB free space, minimum.

Setting Up the Project

Set Up a Folder

- Make a new directory.
- Copy/paste or unzip the project directly into directory.
- Move into the directory with the project.

Install the Necessary Dependencies

- Install Node.js and npm, if they are not already installed.
    - Instructions on how to do so, with specific operating systems, can be found on the Node.js website.
        - To install from the command line, a Package Manager option can used.
        - To instead utilize an executable, download Node.js from the Prebuilt Installer page.
    - Verify that the installation worked by running `npm -v` from your terminal.
- From your terminal, run `npm install`.
- Move into the frontend directory (`cd frontend`).
- Run `npm install` again.
- Open a browser and install the MetaMask extension, if it is not already installed.
    - Instructions on how to do so, with specific browser and browser codebases, can be found on MetaMask's website. A guide can also be found in this project's User Manual.
    - Set up your MetaMask account so it can be used.

Running the Project

- From your terminal, move back into the main project directory.
- Run `npx hardhat node`.
- Open a new terminal tab or window.
- Move back into the main project directory.

- Deploy the smart contract using `npx hardhat run ignition/deploy.js`.
    - Don't forget to specify the network via a `--network` flag if necessary.
- Verify that output/target address matches the contractAddress on line 20 in "frontend/src/web3Handler.js".
    - If not, replace it with the output address.
- Deploy the IoT handler, if it is being used. Use `npx hardhat run ignition/iotHandler.js`.
    - Again, don't forget to specify the network via a `--network` flag if necessary.
- Move to the frontend folder (`cd frontend`).
- Then start the frontend with `npm run dev`.
- Open the localhost link as specified in a browser with MetaMask installed.

Maintenance Tips

- After updating dependencies, check to make sure the project still runs.
- Make sure your wallet activity data gets cleared from time to time – MetaMask doesn't like persistent data.
- The blockchain will clear if it is closed. If this is not a desired outcome, it should remain open and running.
- Check in on IoT use – IoT devices generate a lot of data, and while filtering the data does greatly reduce the amount they would have to send, the number of function calls they have could still be higher than anticipated.

Troubleshooting

- Try refreshing the page.
- If you've got the frontend running, try using the developer tools to see specific errors – sometimes the log will contain something more detailed than the page.
- Check the blockchain to see if there were any invalid eth_calls or any bounced contract calls. A reason for the bounce or invalid call will be shown directly below its occurrence.
- Try turning it off and turning it on again – end all the terminal tasks, clear MetaMask activity data (see Received Invalid Block Tag #. Latest Block Number is #.), close the browser, then restart everything.

Couldn't Download Compiler Version List

- Try a different network. Once the compiler is downloaded, this should no longer be an issue: recompiling in the future on the original network should not prove to be an issue.
- Try compiling the contract on Remix instead and download the compilation when done.

Address Already in Use

```
Error: listen EADDRINUSE: address already in use 127.0.0.1:8545
    at Server.setupListenHandle [as _listen2] (node:net:1904:16)
    at listenInCluster (node:net:1961:12)
    at doListen (node:net:2135:7)
    at processTicksAndRejections (node:internal/process/task_queues:83:21)
```

- A Node network is likely already running.
    - Search open terminals for a running Node network – end its task (Ctrl+C/⌘+C) it if you intend to restart the network.
    - If no open terminals are open, try checking your Task Manager (Windows), Activity Monitor (Mac), or System Monitor (Linux) for a Node.js occurrence. End the task.

Hardhat Isn't Working

- Verify that you haven't copied the project into another folder with a Hardhat project. (Hardhat projects have to be kept in completely separate directories.)

Deploying the Smart Contract Does Not Result in an Address

- Double check the dependencies – try running `npm install` again in the main project directory.
- If an update to a dependency was just installed, consider downgrading or using a separate virtual environment for this project that contains the exact versions needed.
    - A tutorial on Python's venv can be found here. After activating, reinstall npm and Hardhat within the virtual environment.

Could Not Decode Result Data

```
Error: could not decode result data (value="0x", info={ "method": "balanceOf", "signature": "balanceOf(address)" }, code
=BAD_DATA, version=6.13.4)
    at makeError (C:\Users\ghost\Documents\kylee\blockchain\blockchain-project\node_modules\ethers\src.ts\utils\errors.t
s:694:21)
    at assert (C:\Users\ghost\Documents\kylee\blockchain\blockchain-project\node_modules\ethers\src.ts\utils\errors.ts:7
15:25)
    at Interface.decodeFunctionResult (C:\Users\ghost\Documents\kylee\blockchain\blockchain-project\node_modules\ethers\
src.ts\abi\interface.ts:916:15)
    at staticCallResult (C:\Users\ghost\Documents\kylee\blockchain\blockchain-project\node_modules\ethers\src.ts\contrac
t\contract.ts:346:35)
    at staticCall (C:\Users\ghost\Documents\kylee\blockchain\blockchain-project\node_modules\ethers\src.ts\contract\cont
ract.ts:303:24)
    at Proxy.balanceOf (C:\Users\ghost\Documents\kylee\blockchain\blockchain-project\node_modules\ethers\src.ts\contract
\contract.ts:351:41)
    at main (C:\Users\ghost\Documents\kylee\blockchain\blockchain-project\ignition\interact.js:10:27) {
  code: 'BAD_DATA',
  value: '0x',
  info: { method: 'balanceOf', signature: 'balanceOf(address)' },
  shortMessage: 'could not decode result data'
}
```

- Verify that you have a Node network running in another terminal. If not, navigate to the project directory in another terminal and start a Node network by using `npx hardhat node`.
- Make sure your command is correct: running the deployment script should also include specifying the network. The correct command is `npx hardhat run ignition/deploy.js --network localhost`.

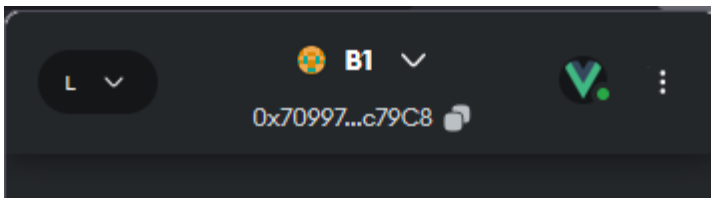
Npm Error Missing Script: “Dev”

```
npm error Missing script: "dev"
npm error
npm error To see a list of scripts, run:
npm error   npm run
```

- Navigate to the frontend directory of this project into your current terminal – you are likely not in the frontend folder.

Wallet Doesn’t Connect

- Check that MetaMask is unlocked.
- Check that your Node network is running in a terminal.
- Verify that you’ve added the network correctly in MetaMask.
    - Open the MetaMask pop-up on the project site.
    - Verify that there is a green V with a green dot below it in the upper right corner, as seen below.



        - If there is not, make sure your frontend is running. Start it if it is not.
- Verify that your account is added to the list of accessible accounts.
    - Click the green V in the upper right corner.
    - If your current account cannot be found in the list, select "+ Connect more accounts".
- Refresh the page.
- If the error is still not fixed, restart the browser.

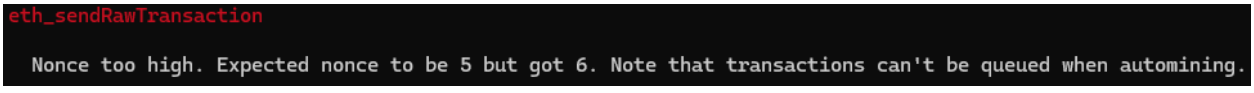
Unable to Confirm Transaction

- Insufficient funds prevent users from adding to the blockchain. Verify that your account has enough tokens to pay for the gas.
- The deployment address can transfer tokens to and limits on other accounts; consider asking the deployment address for a boost.

Received Invalid Block Tag #. Latest Block Number is #.

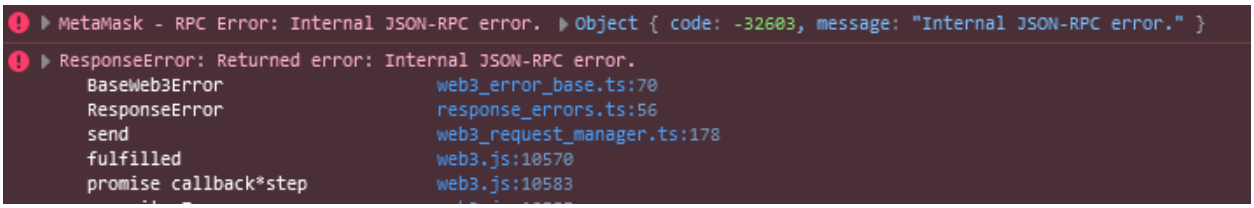
- If in use, close the IoT terminal (Ctrl+C/ ⌘+C).
- Close the Node network (blockchain) terminal (Ctrl+C/ ⌘+C).
- Close the frontend terminal (Ctrl+C/ ⌘+C).
- Clear your MetaMask nonces.
    - Open your MetaMask extension.
    - Go to "Settings" (in the hamburger/navigation menu in the corner).
    - Select "Advanced".
    - Hit "Clear activity tab data".
    - Repeat this on any MetaMask accounts you are using with this project.
- Close your browser.
- Restart the blockchain and frontend terminals, as well as the IoT one if necessary.
- Reopen your browser and navigate back to the site.

Nonce Too High. Expected Nonce to be # but Got #.



- This is a MetaMask issue. See Received Invalid Block Tag #. Latest Block Number is #.

MetaMask – RPC Error: Internal JSON-RPC error.



- This is a MetaMask issue. See Received Invalid Block Tag #. Latest Block Number is #.

Limit Shown is Negative

- This means your account has gone over its limit. While chemicals from the IoT devices and manual input will continue to be pushed to the blockchain, the initial limit set for your account was lower than the amount of chemicals you have used.
- This is intended, because this blockchain's purpose is to track farm chemical usage, not to prevent information from being pushed to it when a limit is reached.

Page Shows "Please install MetaMask!" and Limits are N/A

- Try refreshing the page.
- Verify that your MetaMask account is unlocked.
- Check that your MetaMask is connected to the current network.

Limits are N/A but Page Has Correct MetaMask Address

- Verify that your Node network is running.
- Make sure you deployed the smart contract (via running the deploy.js file).
- Try refreshing the page.

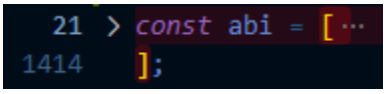
Submit Button Doesn't Submit

- Your account likely never had its chemical limits set. This means that the deployer has not authorized you (set your limits), and it unfortunately means that you cannot push anything to the blockchain.

Other Issues

- If anything in the smart contract changes (i.e. if you've altered the smart contract), it has to be recompiled. This will generate a new ABI.
    - Whenever this occurs, the ABI beginning on line 21 in the web3Handler.js file must be replaced with the new version.
    - The new ABI can be found in line 5 of the CropToken.json file in the "artifacts/contracts/FarmChemicalContract.sol" folders.

    - The easiest way to copy this over is to use an IDE that supports “hiding” functions (see example below), then highlight the whole bracketed chunk and replace it.



- Changing any files or documentation attached to this project? Within the “files” folder is a “tree.txt”, which contains a tree structure with only the most important files labelled, such as the smart contract or the deploy.js file.
- Run into a bug or an issue that isn’t covered by this manual? Open a GitHub issue.

Managing Smart Contract Interactions

- Periodically verify that IoT devices aren’t utilizing too many resources. Unnecessary data pushes can rack up fees.
- Don’t share private keys with anyone – if you were to switch devices, that’s how you’d log into your account again, so anyone with your private key would be able to log into your wallet.
    - If your account has smart contract calls that you don’t remember adding and that aren’t from your IoT devices, consider whether or not someone else could have obtained access to your account.
- Clear your nonce/activity data from MetaMask every time you close the blockchain, to ensure that the data doesn’t persist the next time it’s used.