Week 9: Gas Optimization. EVM-Related Security. Understanding Bytecode

Suggested Materials

- Udemy
  - Advanced Solidity: Gas Optimization
  - Advanced Solidity: Yul and Assembly
- Other useful videos
  - What is an Ethereum Virtual Machine (Beginner)
  - Ethereum EVM in Depth (advanced)
  - EVM Explanation 2 (advanced)
  - Gas + EVM Tutorial
  - More Yul
- EVM playground
- https://www.notonlyowner.com/learn/what-happens-when-you-send-one-dai
- Function selector repository: https://www.4byte.directory
- Very interesting demo of how the constructor works: https://github.com/petr-hejda/fake-number

What is due at the end of the week

- [ ] EVM Puzzles
  - [ ] Complete all 9: https://github.com/fvictorio/evm-puzzles
  - [ ] Put an explanation for your solution into your GitHub. Warning: puzzle number 7 is tricker than the others.
  - [ ] https://github.com/daltyboy11/more-evm-puzzles (complete all 9)
- [ ] Ethernaut
  - [ ] Ethernaut 8 (understanding solidity storage)
  - [ ] Ethernaut 12 (understanding solidity storage)
  - [ ] Ethernaut 13 (passing gas to a smart contract)
  - [ ] Ethernaut 18 (assembly)
  - [ ] Ethernaut 19 (understanding solidity storage)
- [ ] Gas puzzles
  - [ ] https://github.com/RareSkills/gas-puzzles
    - [ ] Complete Array Sum and Require

- [ ] Hints: https://betterprogramming.pub/the-ultimate-100-point-checklist-before-sending-your-smart-contract-for-audit-af9a5b5d95d0

- [ ] Gas Dashboard

  We will make a dashboard of three charts that helps us understand EIP 1559 and the distribution of miner tips. You can use any Ethereum RPC provider you like, for this. Some popular ones are Alchemy, Infura, and Moralis

  - [ ] The first chart is the BASEFEE of each block. So the X-axis is the block number, and the Y-axis is the BASEFEE. If you aren't sure what that is, watch the lecture from the Gas Savings Course on EIP 1559 part 1 and 2.
  - [ ] The second chart is the ratio of gasUsed over gasLimit (plot this as a percentage). What do you notice about the relationship between this ratio and the BASEFEE? Make sure you plot these charts side by side (or better yet, overlay them if you can)
  - [ ] The third chart is the distribution of the miner tip per block. This should be a histogram of 100 transactions randomly sampled. This histogram should show the latest block and change when a new block is mined. What do you notice about this distribution?