



Data structures in Solidity

Arrays and mappings

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Multiuser PiggyBank

Exercise 1

The screenshot shows the Remix IDE interface. On the left, the 'DEPLOY & RUN TRANSACTIONS' panel is active, displaying the contract 'PiggyArray - PiggyArray.sol'. The 'Deploy' button is highlighted. Below it, the 'Transactions recorded' section shows 15 transactions. The 'Deployed Contracts' section lists the contract 'PIGGYARRAY AT 0x86E...E7223 (MEI)' with a balance of 0 ETH. The main editor displays the Solidity code for the PiggyArray contract, which includes a Client struct, a findUser function, and a deposit function. The bottom panel shows the transaction log with a pending transaction for the deployment of PiggyArray at address 0x86E...E7223.

Exercise 2

The screenshot shows the Remix IDE interface. On the left, the 'DEPLOY & RUN TRANSACTIONS' panel is active, displaying the contract 'PiggyMapping - PiggyMapping.sol'. The 'Deploy' button is highlighted. Below it, the 'Transactions recorded' section shows 16 transactions. The 'Deployed Contracts' section lists the contract 'PIGGYMapping AT 0x01D...6F58A' with a balance of 0 ETH. The main editor displays the Solidity code for the PiggyMapping contract, which includes a Client struct, a mapping, and functions for deposit and addClient. The bottom panel shows the transaction log with a pending transaction for the deployment of PiggyMapping at address 0x01D...6F58A.



Exercise 3

addClient			Execution cost	
<u>Name</u>	<u>Amount</u>	<u>Address</u>	<u>PiggyArray</u>	<u>PiggyMapping</u>
Huey	10.000	A	89.907	25.682
Dewey	20.000	B	75.342	45.582
Louie	30.000	C	99.409	45.582

- In the piggyArray Implementation we don't see a great execution cost difference probably because the array is not big enough. Another thing we have to take into account is that we are showing the execution cost, that is independent of the Amount deposited.
- The piggyMapping addClient cost is a function of the size of the client name (also tested of Bouie which had a cost of 45.582 and Fuey of cost 25.682)

Exercise 4

addClient		Execution cost (gas)	
<u>Name</u>	<u>Address</u>	<u>PiggyArray</u>	<u>PiggyMapping</u>
Huey	A	7.102	2.386
Louie	C	12.172	2.386
Sylvester	D	10.073	2.386

- Contrary to the first exercise, in this example we can observe a big difference (almost x2) between calls from address A and C. Sylvester doesn't follow the trend because it's not a valid client and when findUser returns false, it stops the execution and reverts.
- The getBalance execution cost is constant for PiggyMapping, regardless of the existence of the account.



Exercise 5

```
function checkBalances() external view returns (bool)
{
    uint sum = 0;
    for(uint i = 0; i < _addresses.length; i++)
    {
        sum += _clients[_addresses[i]].balance;
    }
    return (sum == address(this).balance);
}
```

- We have implemented the function checkBalances that computes the total sum of client's balances and returns true if the sum equals the contract's balance.