Blockchain for Industrial Engineers: Decentralized Application Development

บล็อกเชนสำหรับวิศวกรอุตสาหการ: การพัฒนาแอปพลิเคชันแบบกระจายศูนย์

Lottery - last time

```
// SPDX-License-Identifier: GPL-3.0

pragma solidity >=0.7.0 <0.9.0;


contract lottery {
    address public manager;

    constructor () {
        manager = msg.sender;
    }
}
```

Add players arrays

```
address[] public players;
```

Add `enter` function

```
function enter() public payable {
    players.push(msg.sender);
}
```

Function type

Type	Description
view	This function returns data and does not modify the contract's data.
pure	This function does not read or modify the contract's data.
payable	When someone call this function, they might send ether along.

msg.value

The 'msg' Global Variable	
Property Name	Property Name
msg.data	'Data' field from the call or transaction that invoked the current function
msg.gas	Amount of gas the current function invocation has available
msg.sender	Address of the account that started the current function invocation
msg.value	Amount of ether (in wei) that was sent along with the function invocation

Add a check for minimum amount

```
require(msg.value > 0.1 ether, "Please send at least 0.1 ETH.");
```

`require` function

- Used to verify inputs and conditions before execution.
- If the condition is false, then the require function immediately stops execution.

```
require(sum == 10, "Incorrect");
```

Unit converter

- 1 ether (ETH) = 1e18 wei
  - 1 ETH = 1,000,000,000,000,000,000 wei
- Link

Add `getPlayers` function

```
function getPlayers() public view returns(address[] memory) {
    return players;
}
```

Add a function to generate random number

```
function random() private view returns (uint256) {
  ...
}
```

Random number

- Solidity code should be deterministic
  - It will run on multiple nodes.
- We need an algorithm that is able to generate a random number once, and use it on multiple nodes.

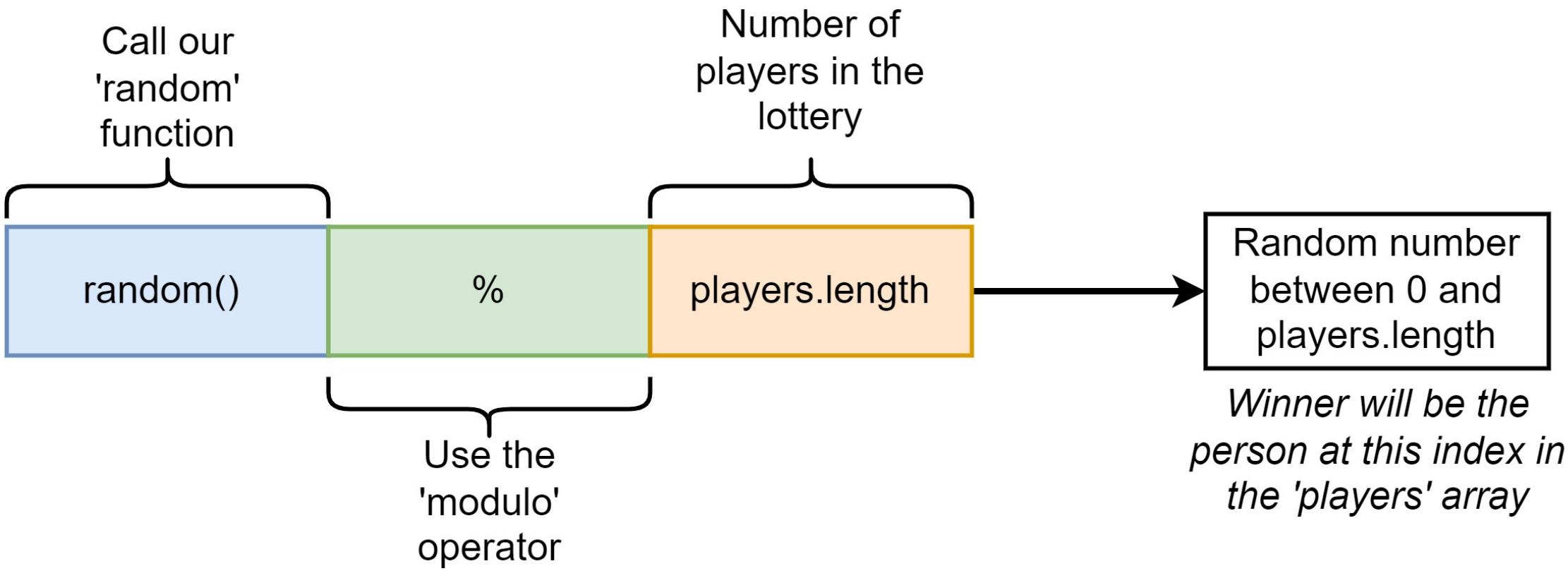
Psudeo-random number generation

- Use `block.timestamp` and `block.difficulty`
- ➡️ `abi.encodedPacked()`
  - Argument-encoding function
  - Output: `bytes` (dynamic array of `byte`)
- ➡️ `keccak256()`
  - Hash function
  - Output: `bytes32` (array of exactly 32 bytes long)
- ➡️ `uint256()`
  - Output: `uint256`

Add `pickWinner` function

```
function pickWinner() public {
    uint256 idx = random() % players.length;
    uint256 balance = address(this).balance;
    payable(players[idx]).transfer(balance);
}
```

Select a winner



`this` keyword

- Pointer to the current contract.
- Convertible to `address`.
  - `address(this)`

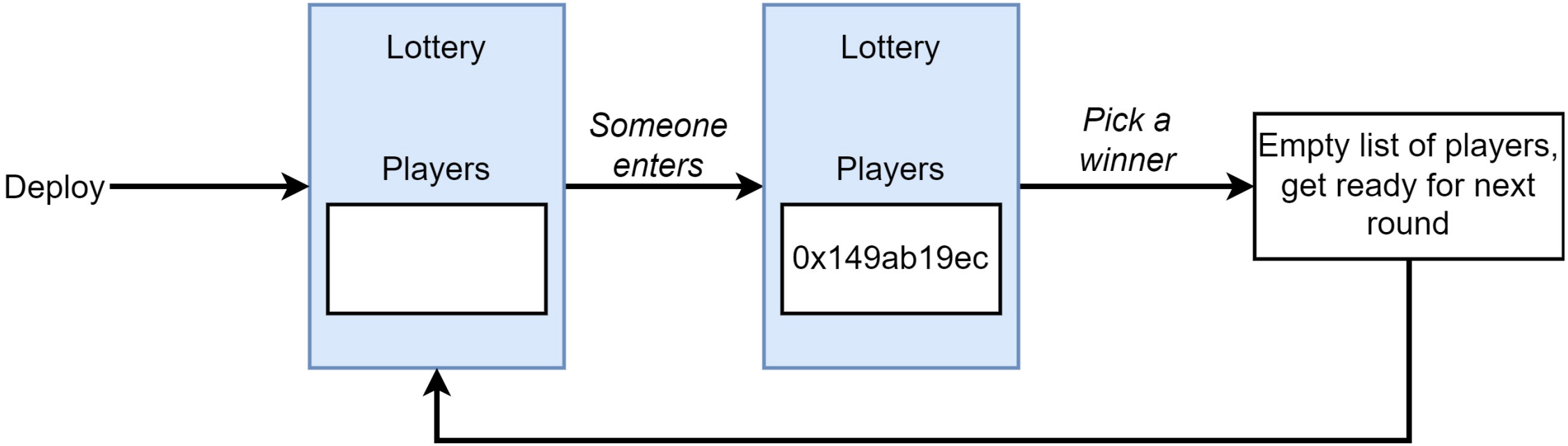
`address` vs `address payable` types

- The `address` and `address payable` are different types.
- You can use `.transfer(..)` on `address payable`, but not on `address`.
- To change from `address` to `address payable`,
  - Use `payable(...)` function

Reset

```
players = new address[](0);
```

Reset


Lottery
Players
Deploy
Someone enters
Lottery
Players
0x149ab19ec
Pick a winner
Empty list of players, get ready for next round

Validation

```
require(msg.sender == manager, "You need to be a manager.");
require(players.length > 0, "Need at least one player.");
```

Let's play a lottery.