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操作过程

https://www.bilibili.com/video/BV1WN4111754/?spm_id_from=333.1007.0.0

完善合约代码

003_CrowdFund.sol

```
// SPDX-License-Identifier: MIT
pragma solidity ^0.8.17;

interface IERC20 {
    function transfer(address, uint) external returns (bool);

    function transferFrom(address, address, uint) external
returns (bool);
}

contract CrowdFund {
    struct Campaign {
        // 活动创建人
        address creator;
        // 目标筹集金额
        uint goal;
        // 已筹集资金
        uint pledged;
        // 开始时间
        uint32 startAt;
        // 结束时间
        uint32 endAt;
        // 是否已领取
        bool claimed;
    }

    IERC20 public immutable token;

    // 活动的 id 也是根据 count 来创建
    uint public count;

    // 查看第几个众筹活动
    mapping(uint => Campaign) public campaigns;
```

```
    // campaign id => pledger => amount pledged
    // 参与某个活动的人投的钱
    mapping(uint => mapping(address => uint)) public
pledgedAmount;

    // 以下事件需要全部被用上!
    // 创建活动事件
    event Launch(
        uint id,
        address creator,
        uint goal,
        uint32 startAt,
        uint32 endAt
    );

    // 投资事件
    event Pledge(uint id, address caller, uint amount);
    // 撤资事件
    event Unpledge(uint id, address caller, uint amount);
    // 提取众筹
    event Claim(uint id);
    // 取回众筹股份
    event Refund(uint id, address caller, uint amount);

    constructor(address _token) {
        token = IERC20(_token);
        count = 0;
    }

    function launch(uint _goal, uint32 _startAt, uint32 _endAt)
external {
        require(_startAt >= block.timestamp, "start at < now");
        require(_endAt >= _startAt, "end at < start at");
        require(_endAt <= _startAt + 20 minutes, "end at > max
duration"); // 最长活动时间为 20 分钟

        // 补全
        Campaign memory camplaunch = Campaign(
            msg.sender,
            _goal,
            0,
            _startAt,
            _endAt,
            false
```

```
        );

        count++;
        campaigns[count] = camplaunch;

        emit Launch(count, msg.sender, _goal, _startAt,
_endAt);
    }

    function pledge(uint _id, uint _amount) external {
        require(_id <= count, "no this activity");
        Campaign storage campaign = campaigns[_id];
        require(!campaign.claimed, "claimed");
        // require(campaign.pledged + _amount <= campaign.goal,
"over");
        require(block.timestamp >= campaign.startAt, "not
started");
        require(block.timestamp <= campaign.endAt, "ended");

        // 补全
        token.transferFrom(msg.sender, address(this), _amount);
        campaign.pledged += _amount;
        campaigns[_id] = campaign;
        pledgedAmount[_id][msg.sender] += _amount;
        emit Pledge(_id, msg.sender, _amount);
    }

    function unpledge(uint _id, uint _amount) external {
        // 补全
        require(_id <= count, "no this activity");
        Campaign storage campaign = campaigns[_id];
        require(!campaign.claimed, "claimed");
        require(_amount <= pledgedAmount[_id][msg.sender],
"over");
        require(_amount <= campaign.pledged, "over");

        require(block.timestamp >= campaign.startAt, "not
started");
        require(block.timestamp <= campaign.endAt, "ended");

        // 补全
        token.transfer(msg.sender, _amount);
        campaign.pledged -= _amount;
        campaigns[_id] = campaign;
```

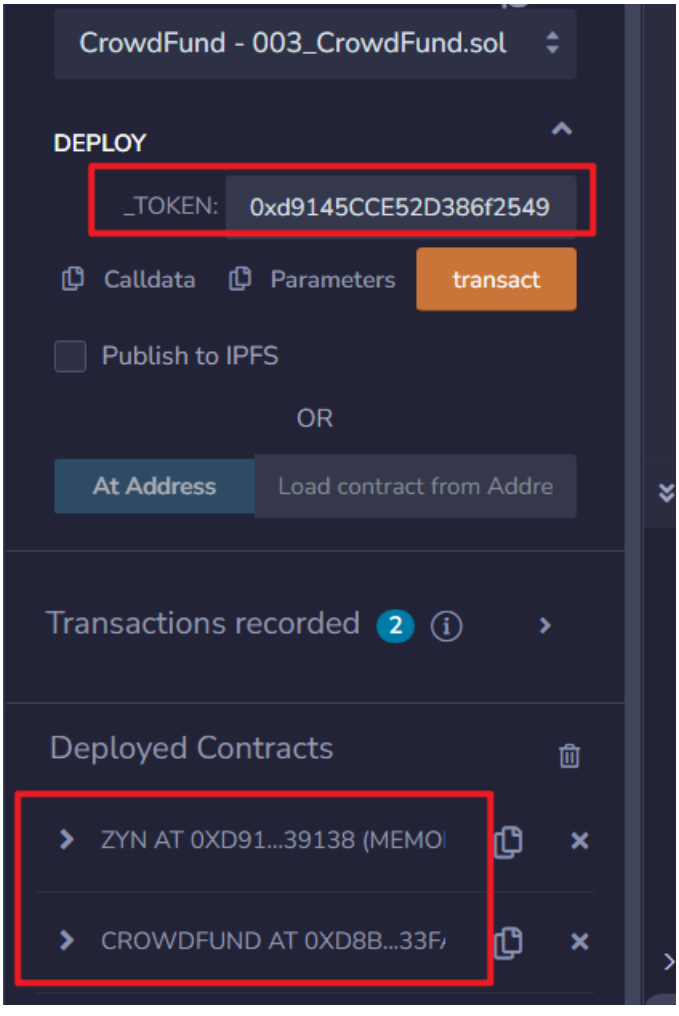
```
        pledgedAmount[_id][msg.sender] -= _amount;
        emit Unpledge(_id, msg.sender, _amount);
    }

    function claim(uint _id) external {
        // 补全
        require(_id <= count, "no this activity");
        Campaign storage campaign = campaigns[_id];

        require(!campaign.claimed, "claimed");
        require(campaign.creator == msg.sender, "not creator");
        require(block.timestamp > campaign.endAt, "not ended");
        require(campaign.pledged >= campaign.goal, "pledged <
goal");

        // 补全
        token.transfer(msg.sender, campaign.pledged);
        campaign.claimed = true;
        campaigns[_id] = campaign;
        emit Claim(_id);
    }

    function refund(uint _id) external {
        // 补全
        require(_id <= count, "no this activity");
        Campaign storage campaign = campaigns[_id];

        require(!campaign.claimed, "claimed");
        require(pledgedAmount[_id][msg.sender] > 0);
        require(block.timestamp > campaign.endAt, "not ended");
        require(campaign.pledged < campaign.goal, "pledged >=
goal");

        // 补全
        token.transfer(msg.sender,
pledgedAmount[_id][msg.sender]);

        emit Refund(_id, msg.sender,
pledgedAmount[_id][msg.sender]);
    }

    function getTimeStamp() public view returns (uint256) {
        return block.timestamp;
    }
```

```
}
```

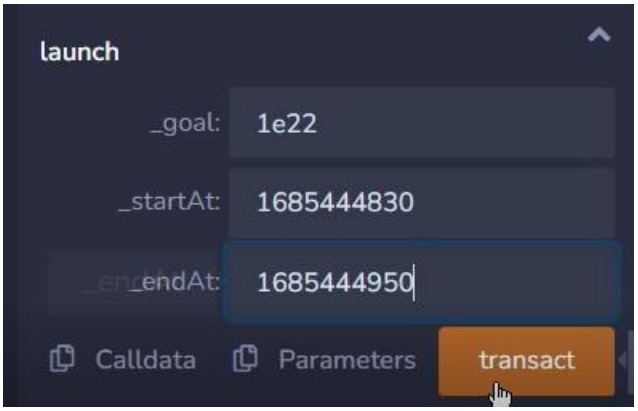
实验过程

1. 用户可以创建众筹活动；(launch)
2. 其他用户可以使用 ERC20 进行参与；(pledge)
3. 在活动未结束前，可以撤回已经参与的份额；(unpledge)
4. 活动结束之后，如果达到众筹目标，活动创始人可以取走活动里所有的币；(claim)
5. 活动结束之后，如果没有达到众筹目标，用户可以取回自己参与的份额。(refund)

1. 部署

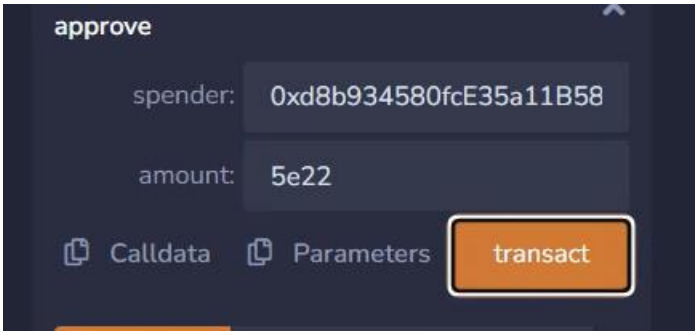


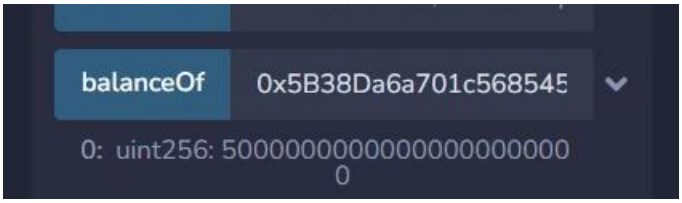
2. 创建一个众筹活动 目标一万 十分钟(一分钟=60)
这里为了简单 我用的 120 秒

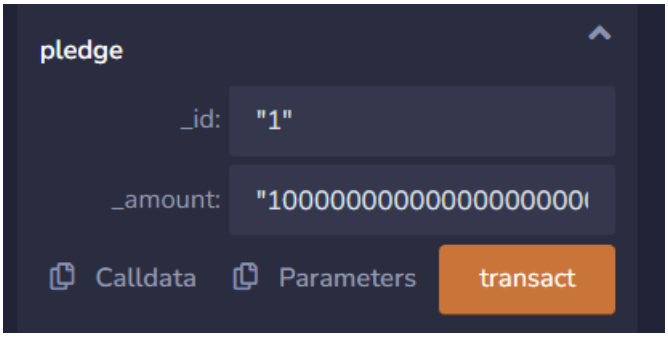


3. 查询创建的活动，这里为了简单 我用的 120 秒

4. 等待时间 准备参与

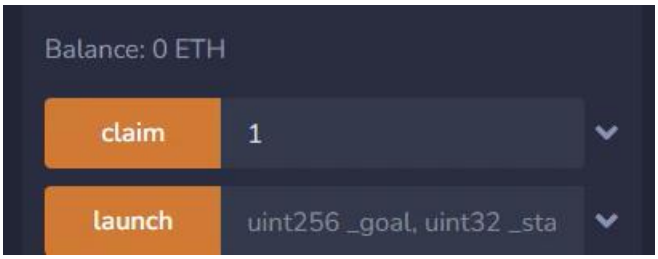






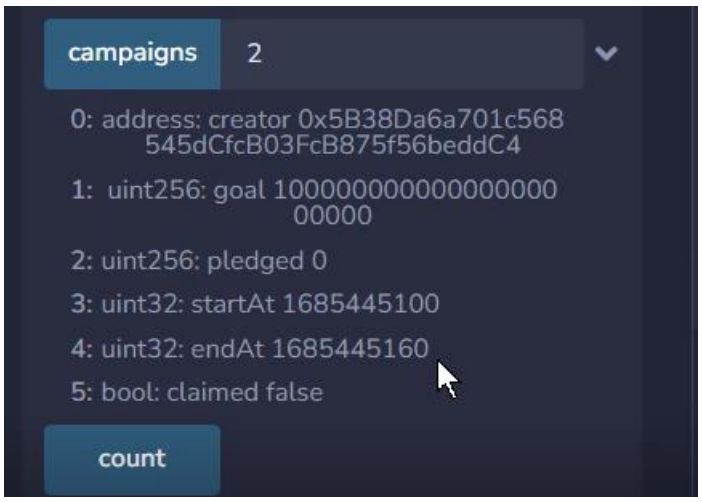
5. 查看状态

6. 等待结束时间之后，创建人可以通过 claim 取出所有的币



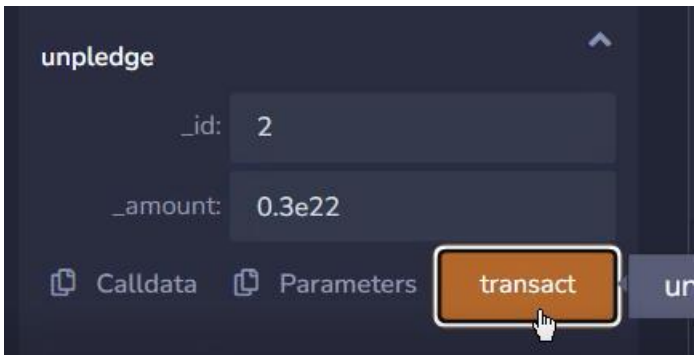
7. 创建一个新的众筹活动（没按照老师的数据，以自己仅有的 token 数据做的）

8. 查询状态

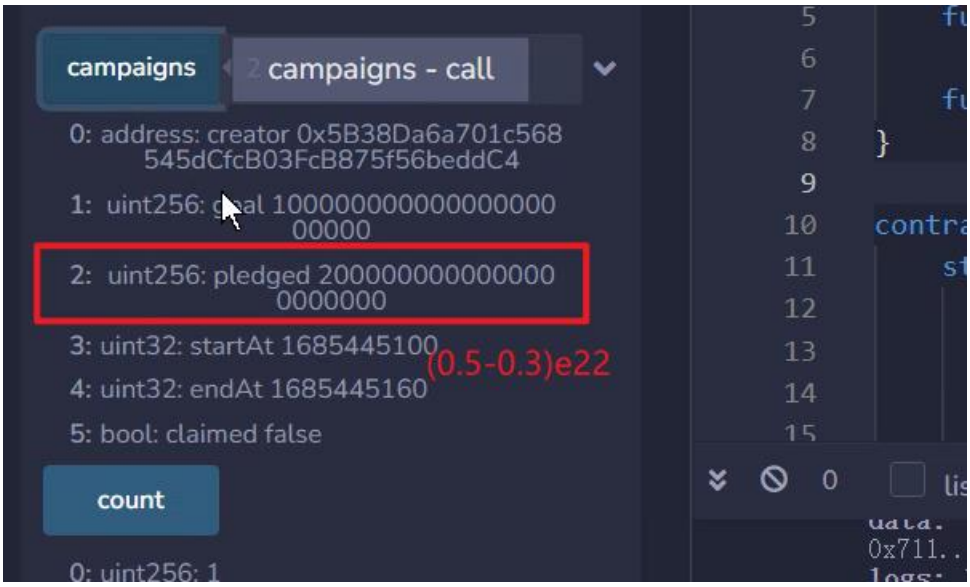


9. 开始后参与投资

10. 取回部分资金



11. 查询活动状态


campaigns
campaigns - call
0: address: creator 0x5B38Da6a701c568
545dCfcB03FcB875f56beddC4
1: uint256: goal 100000000000000000
00000
2: uint256: pledged 200000000000000
0000000
3: uint32: startAt 1685445100
4: uint32: endAt 1685445160
5: bool: claimed false
count
0: uint256: 1
(0.5-0.3)e22
5
6
7
8
9
10
11
12
13
14
15
}
contra
0

12. Refund 取回


refund
_id:
"2"
Calldata
Parameters
transact