Marlowe - 3 Steps to Working DApp

Steps

- Design
- Test
- Integrate

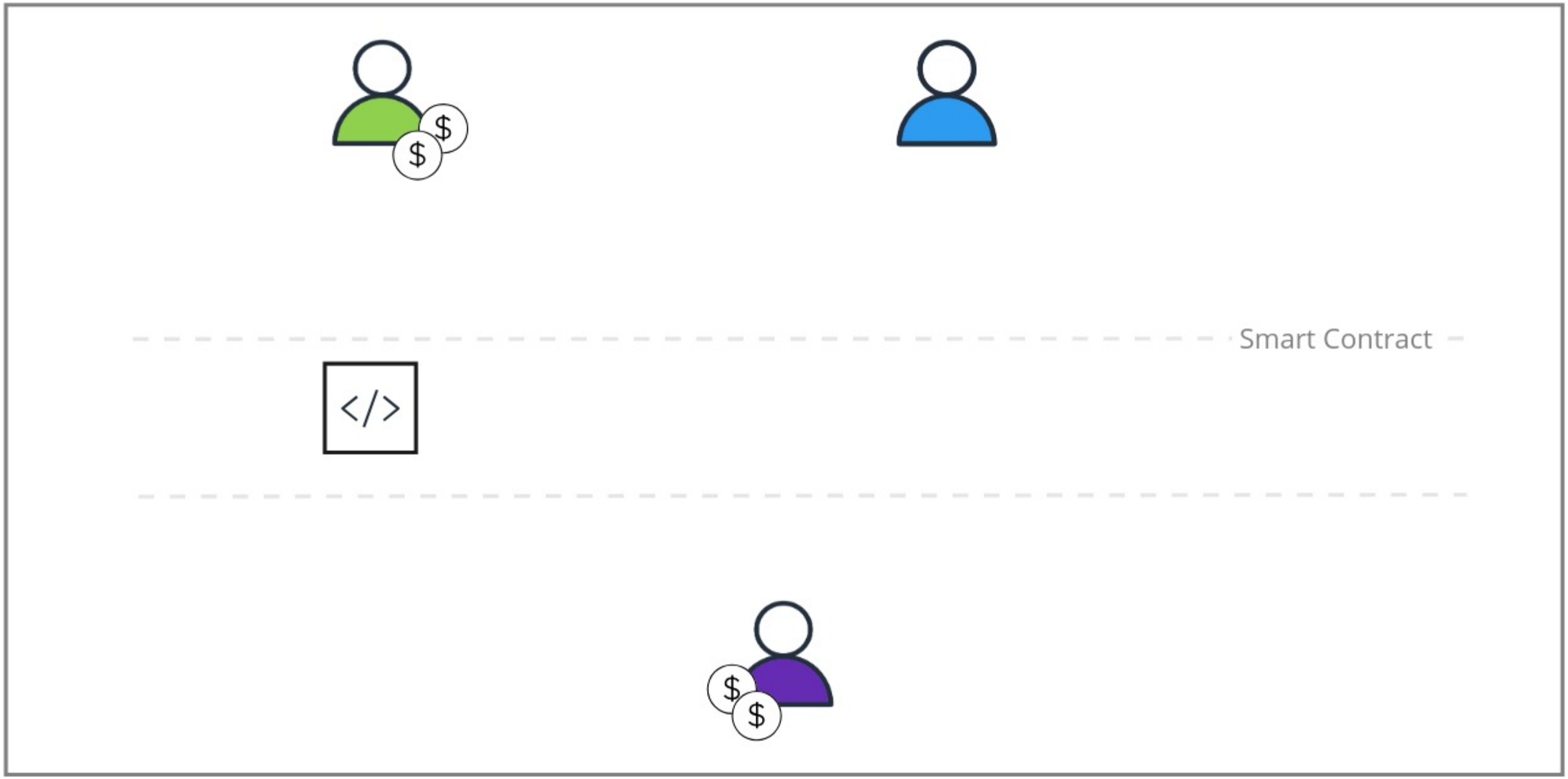
Project

On-Chain Betting Platform

Steps

- **Design**
- Test
- Integrate

"On-Chain Betting"



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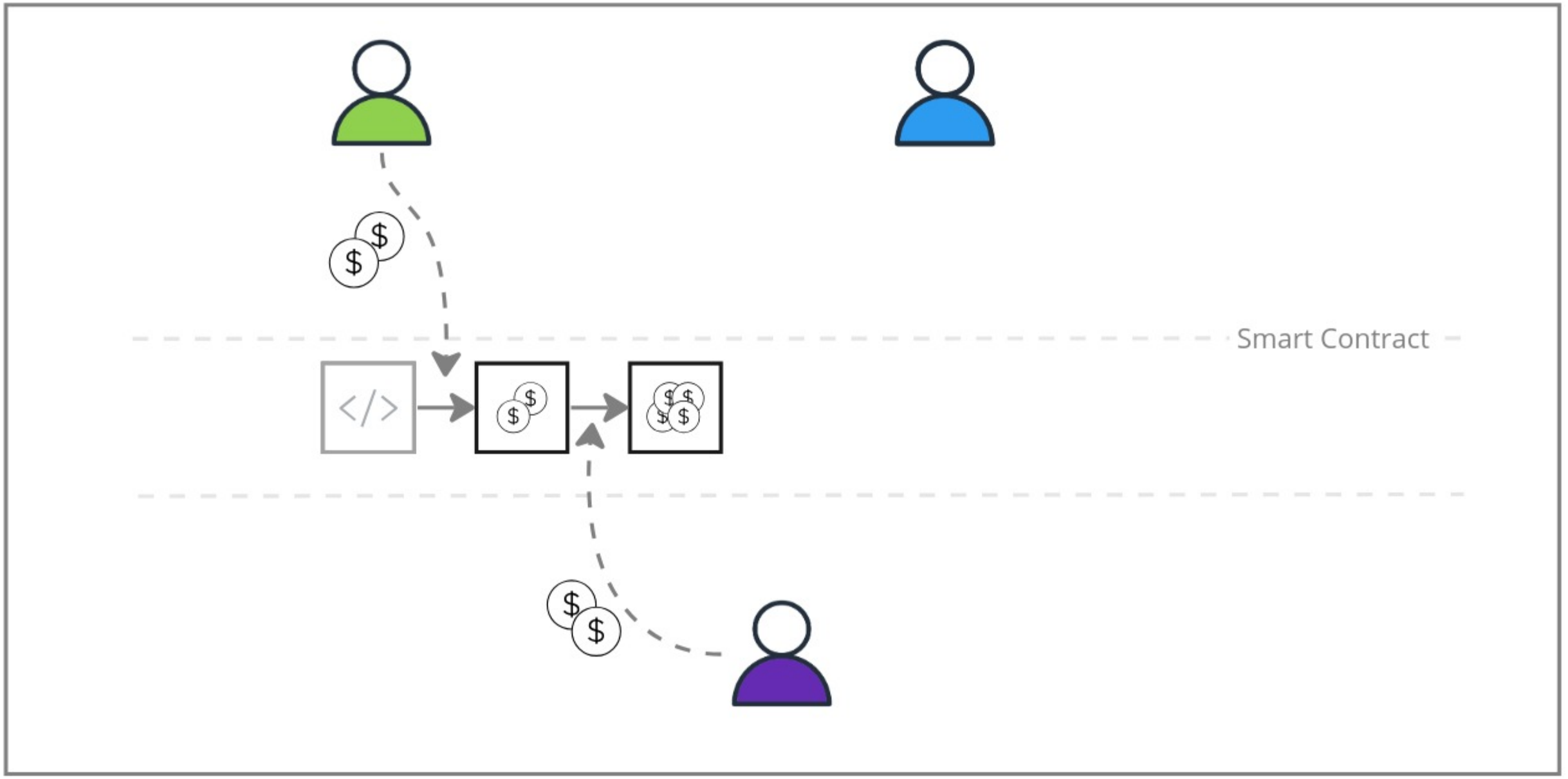

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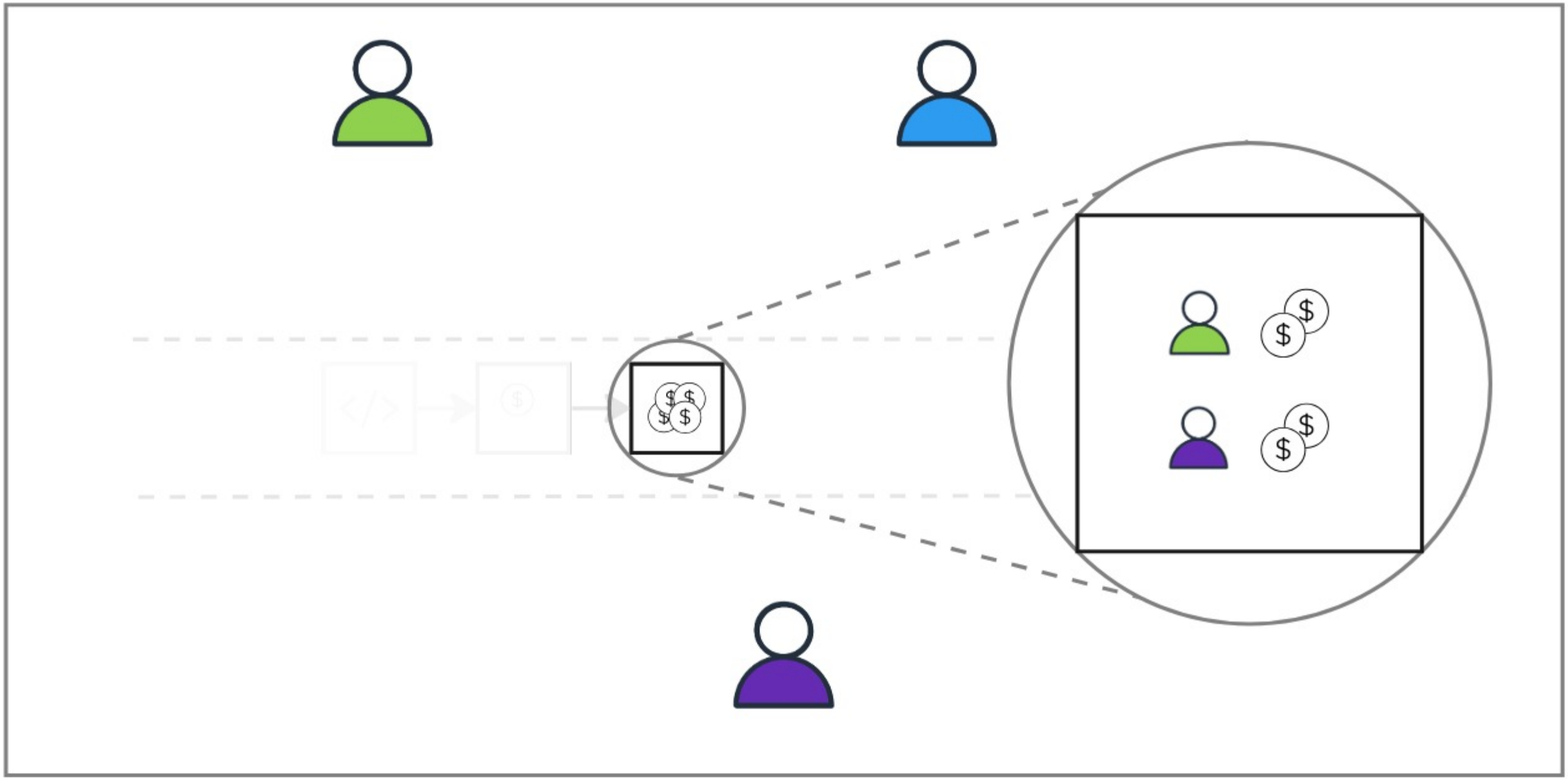

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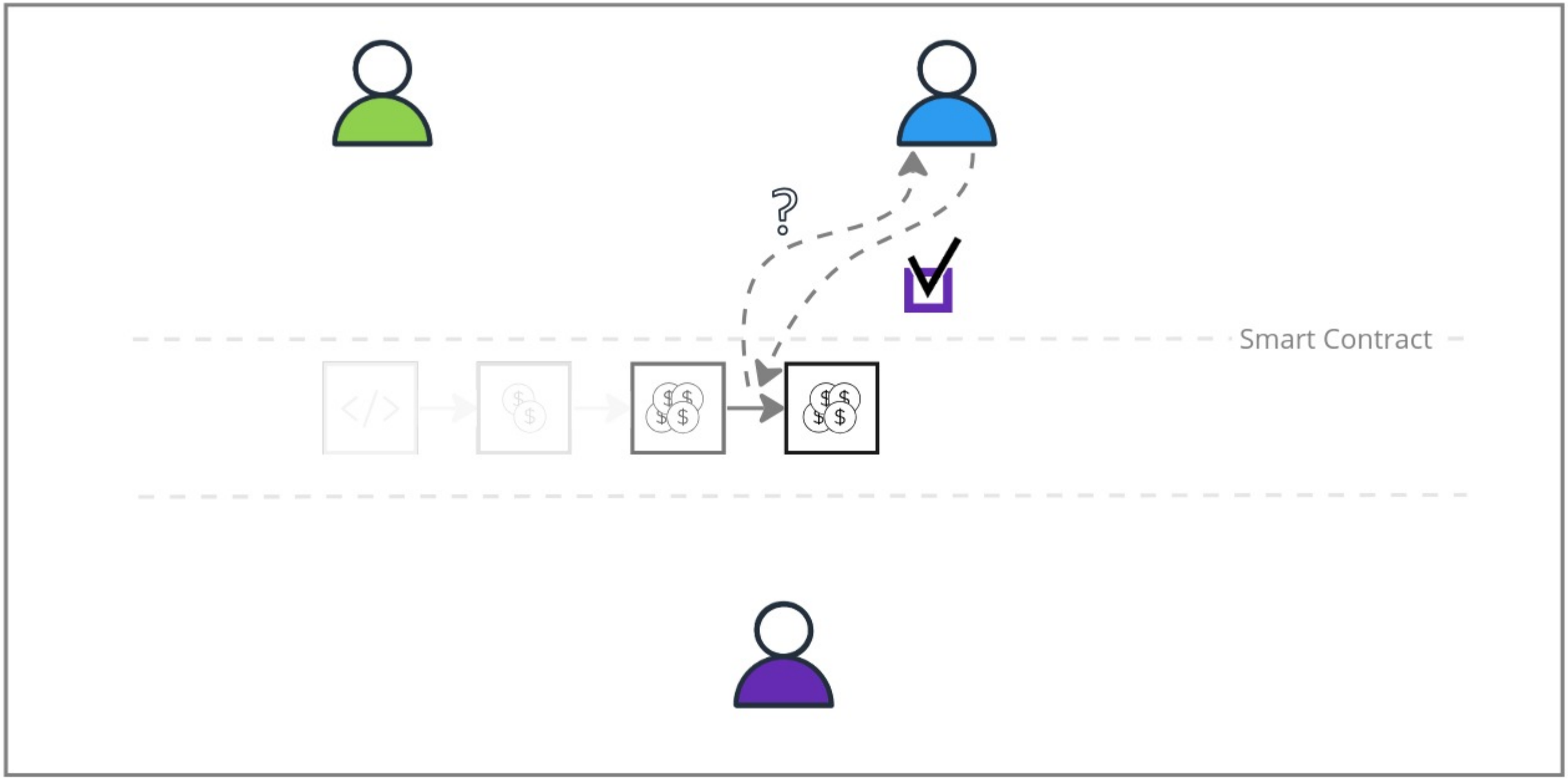

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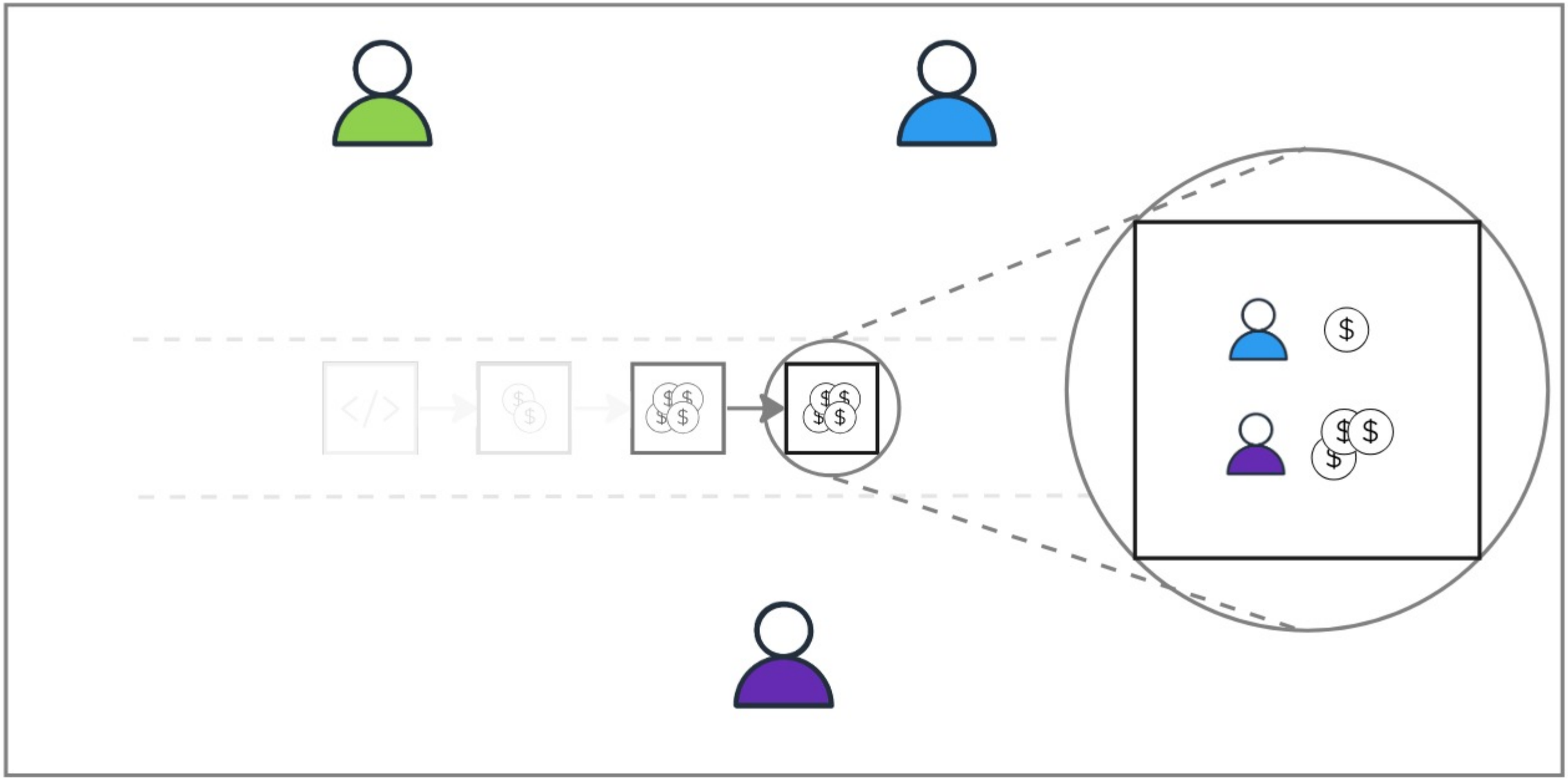

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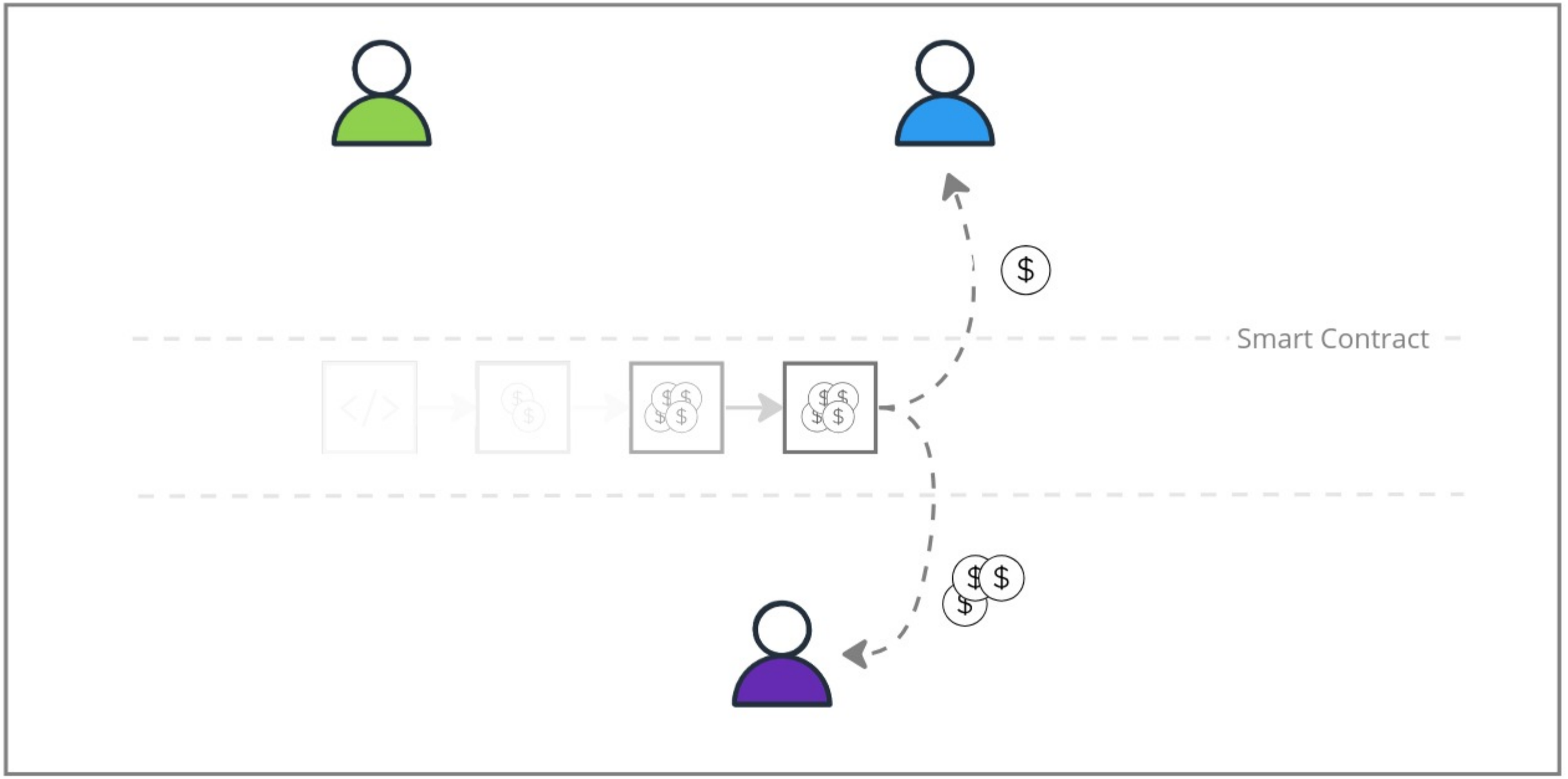

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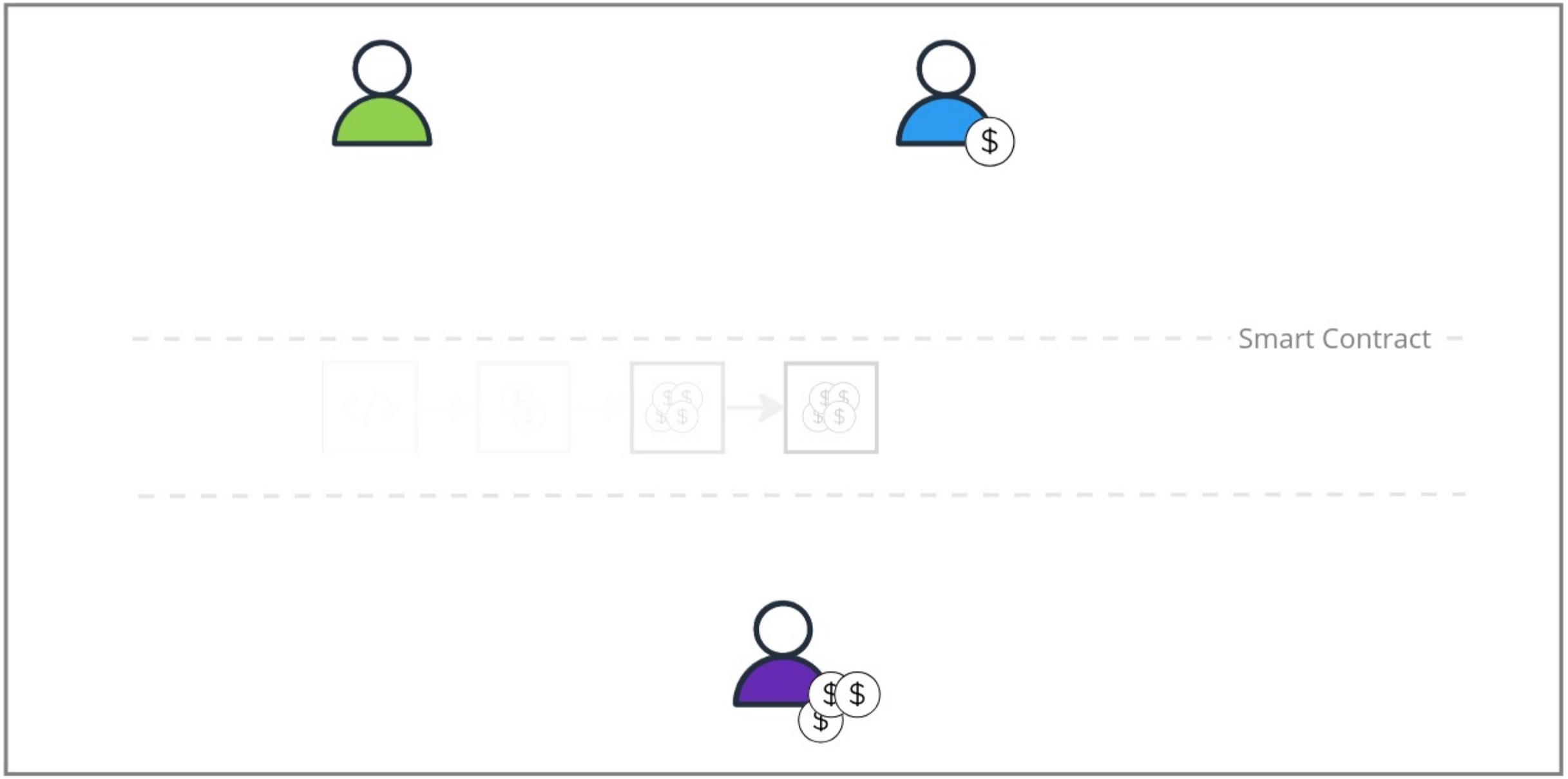
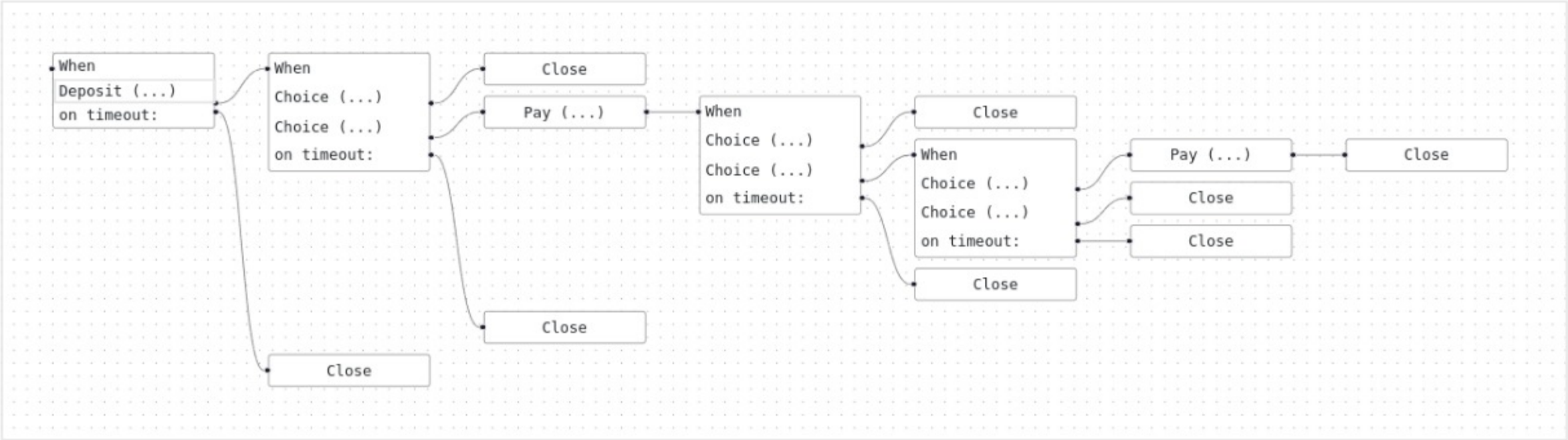
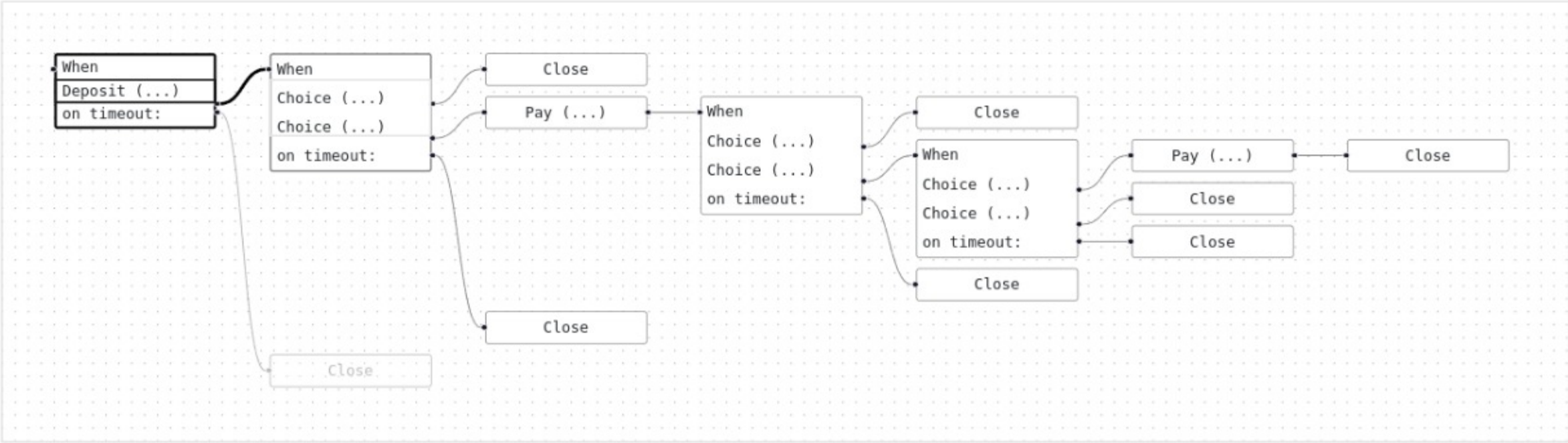


How Marlowe Operates



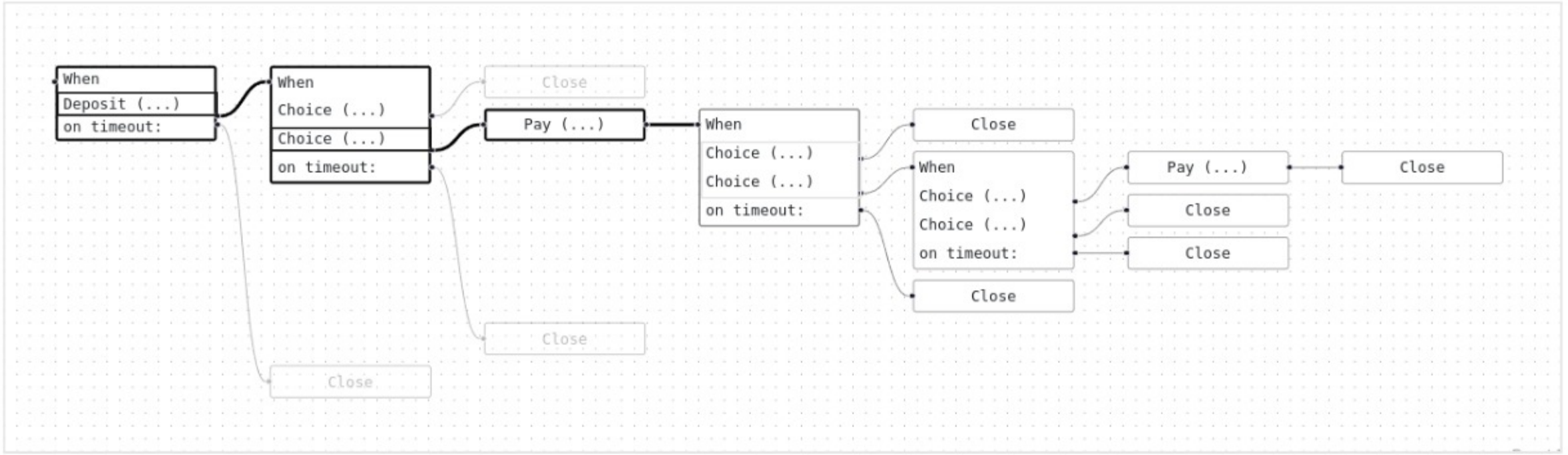
Contract structure is known upfront.

How Marlowe Operates



User inputs drives the execution.

How Marlowe Operates



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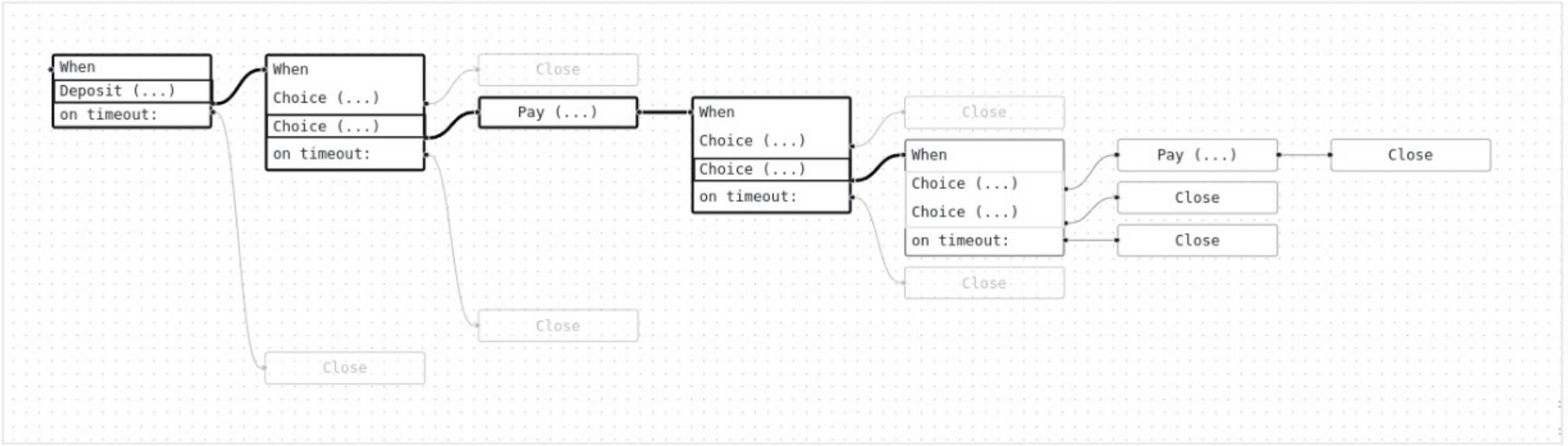
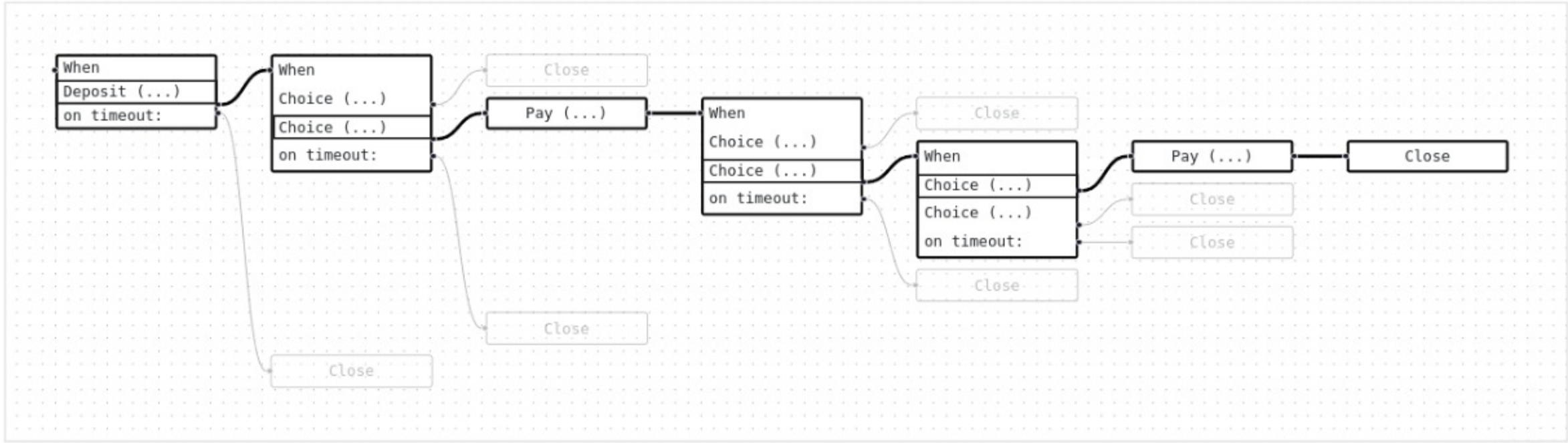


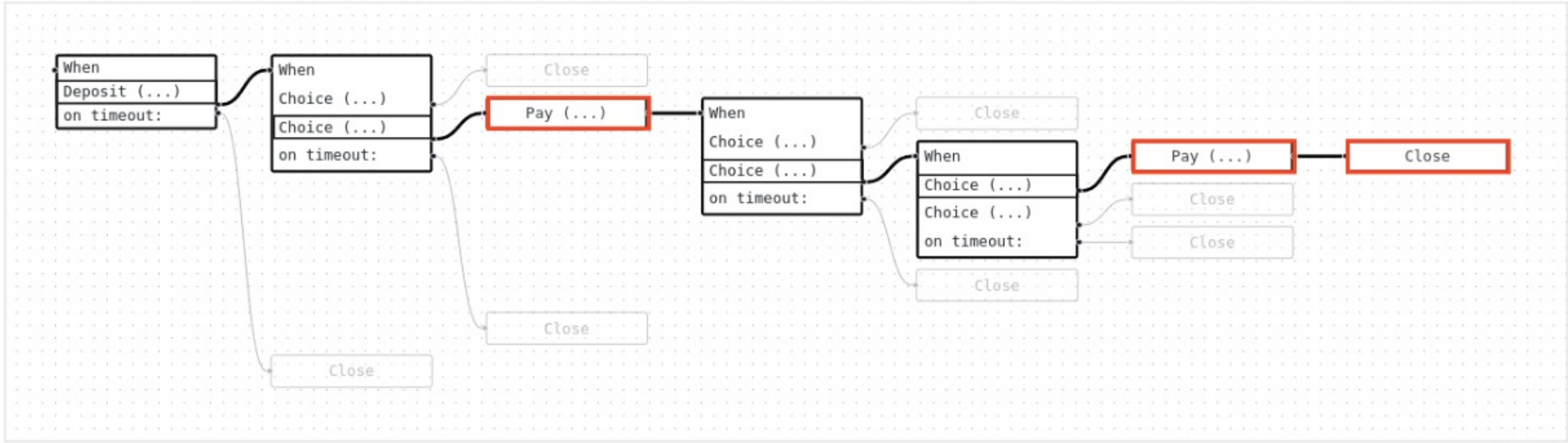
Circumstances drives the execution.

How Marlowe Operates



Path and values drive the cash flows.

How Marlowe Operates



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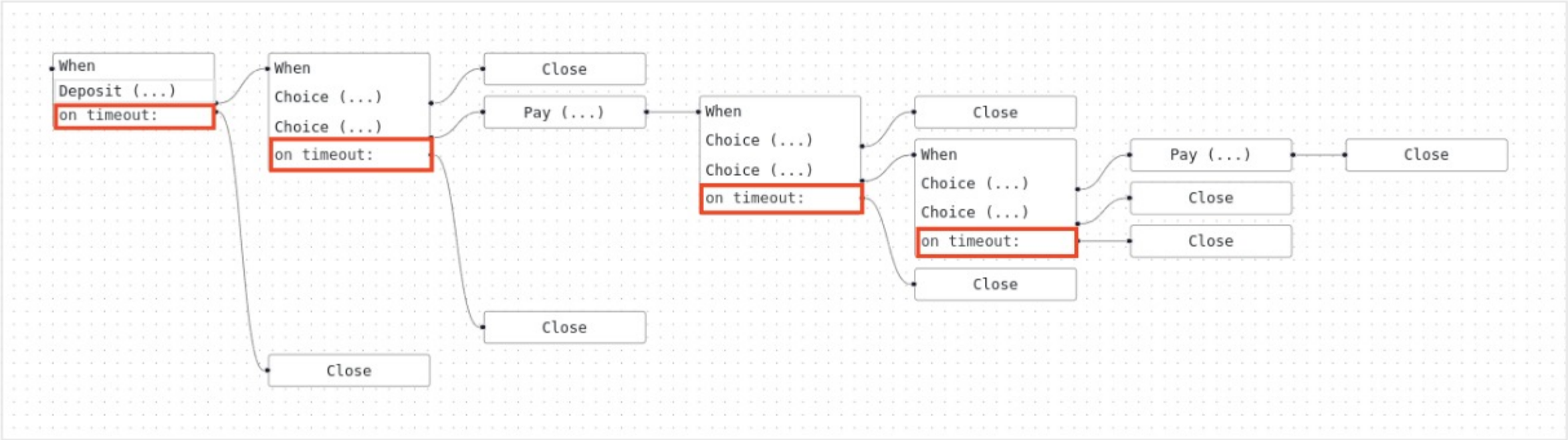
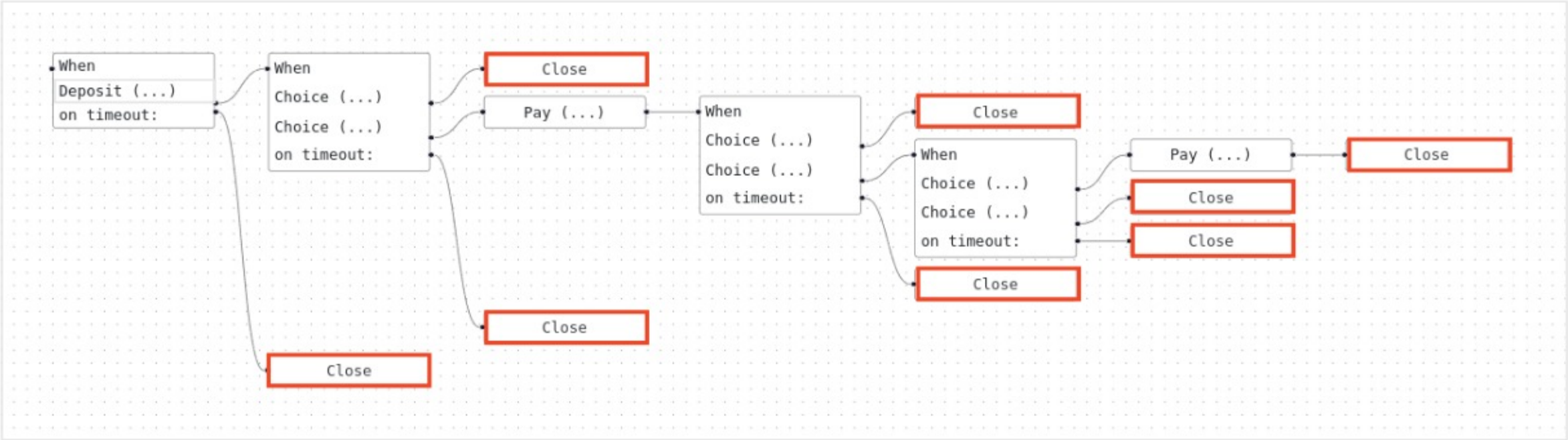
How Marlowe Operates



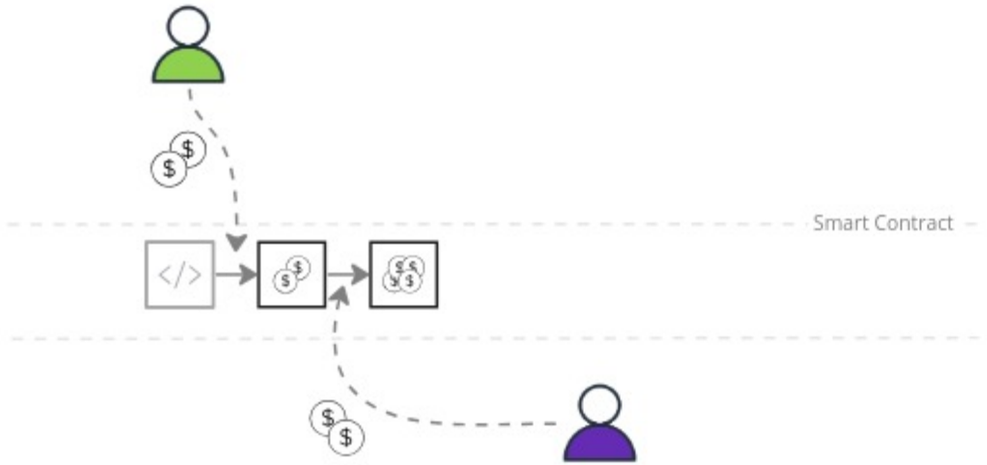
Time can influence the execution.

How Marlowe Operates



Every path is closed at the end.

Example: "On-Chain Betting"



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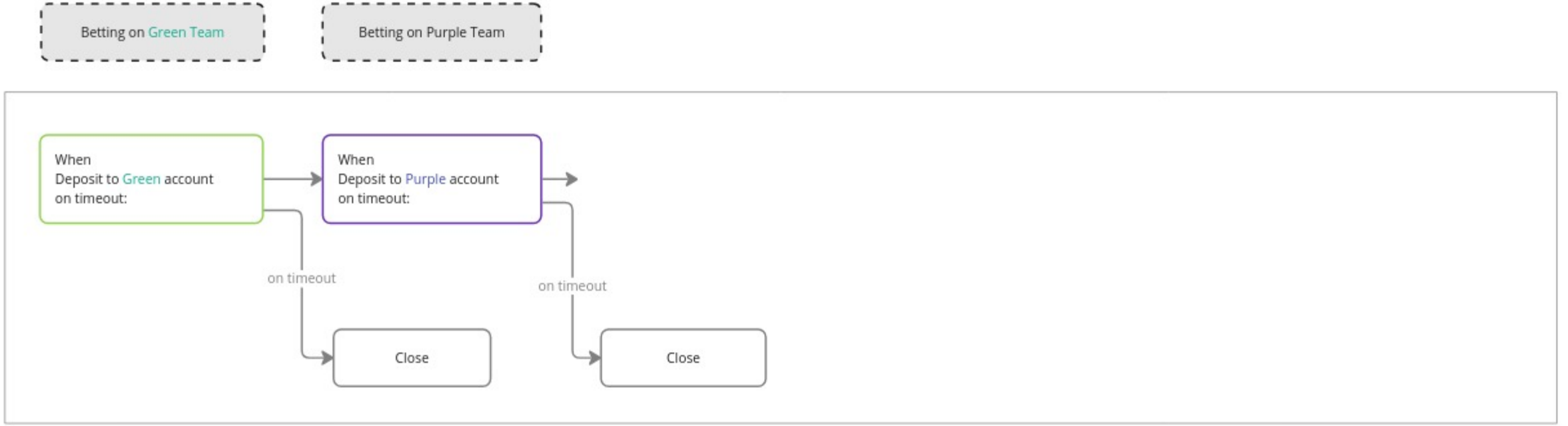

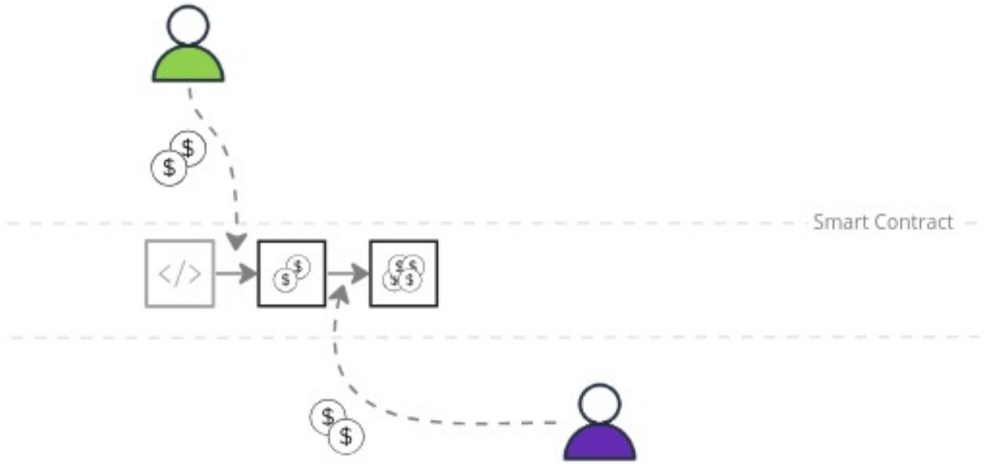

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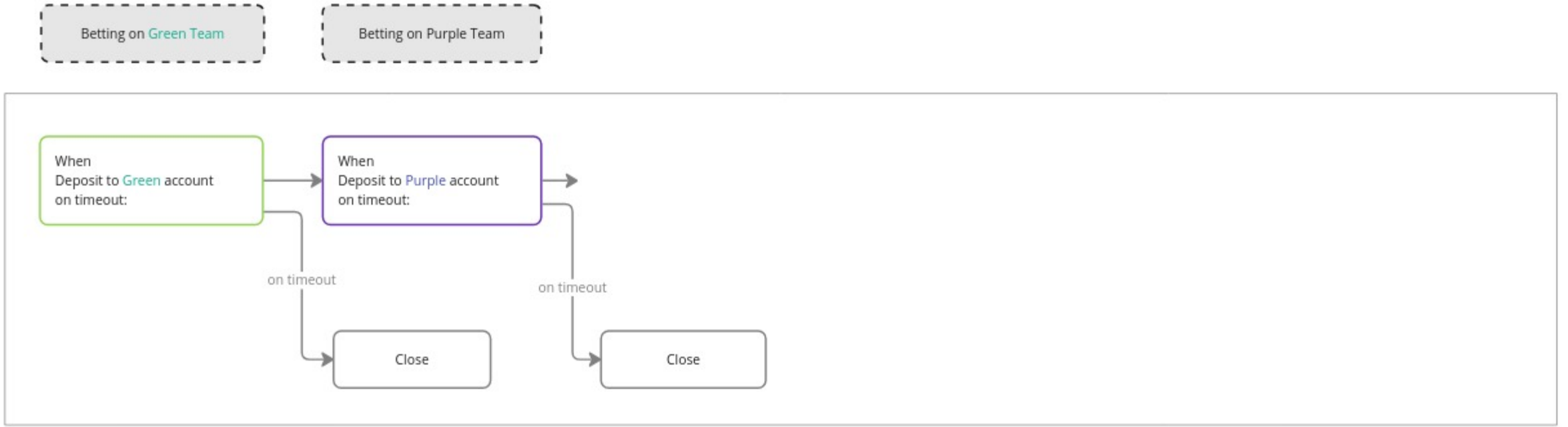

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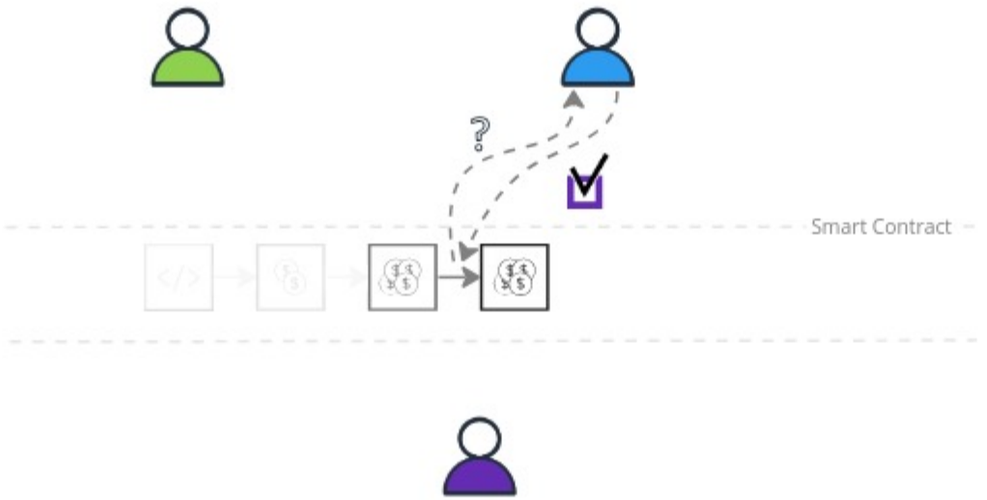

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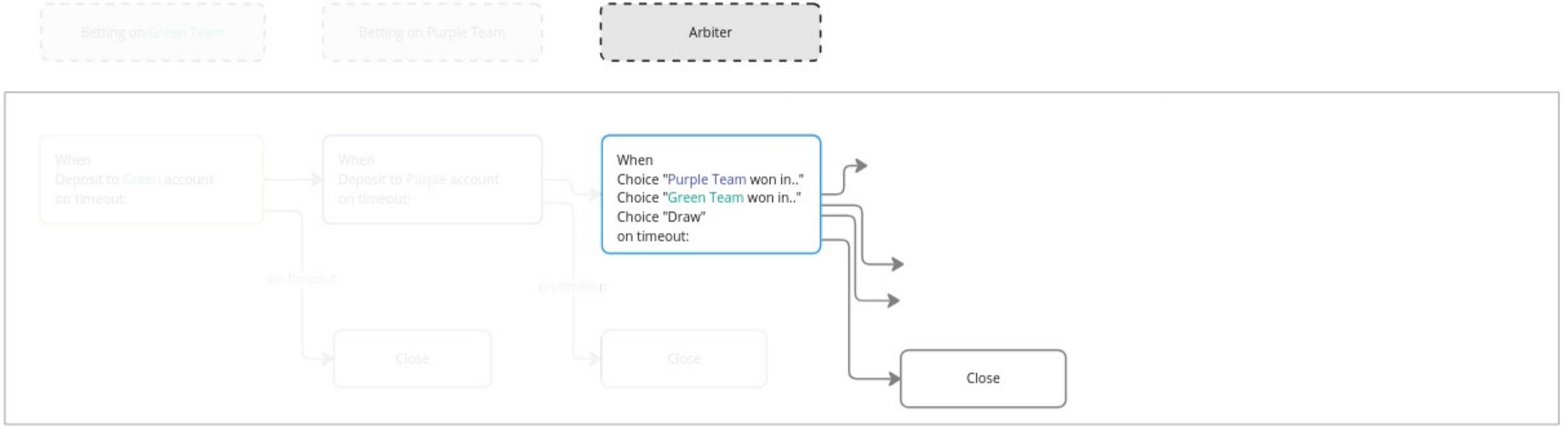

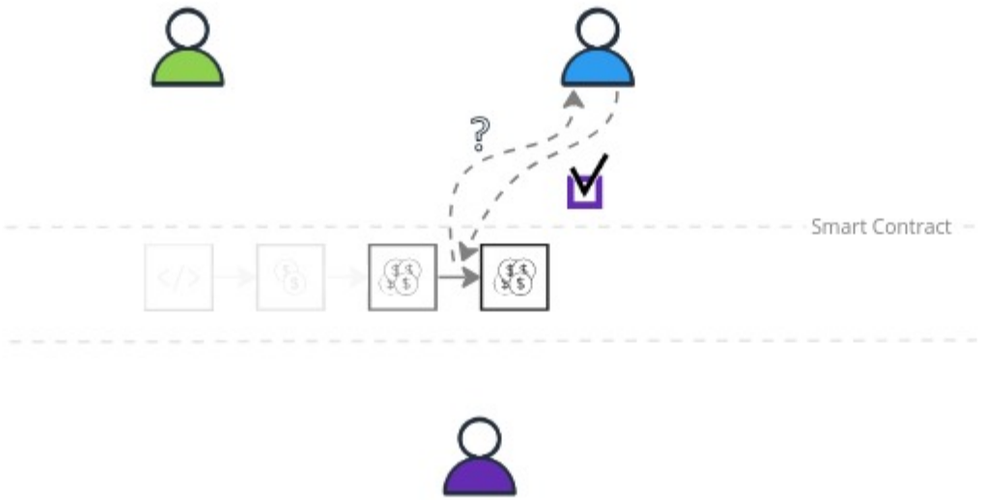

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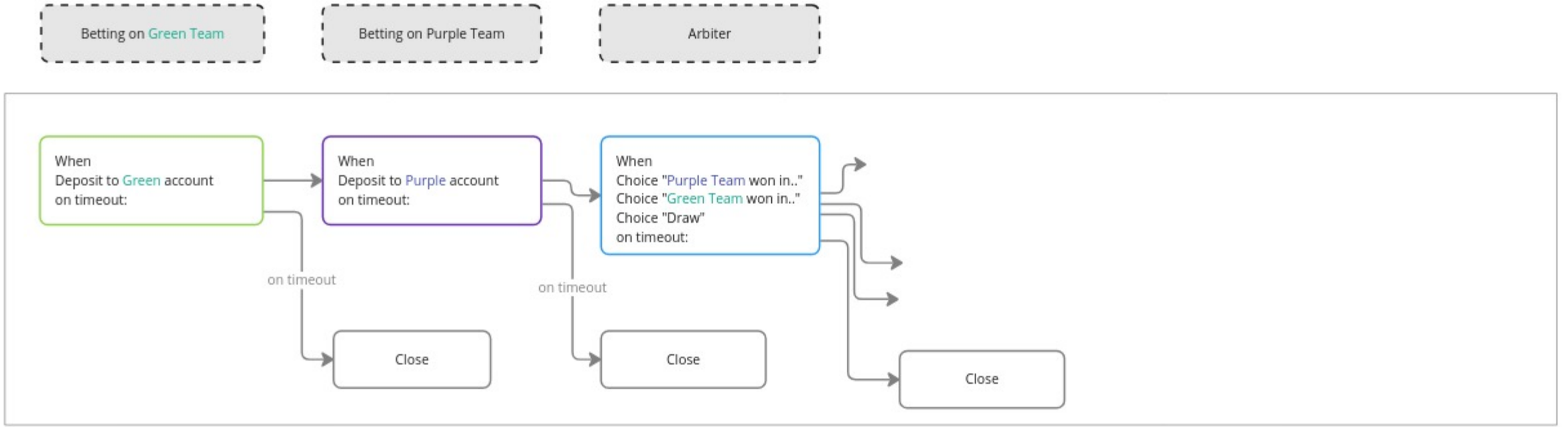

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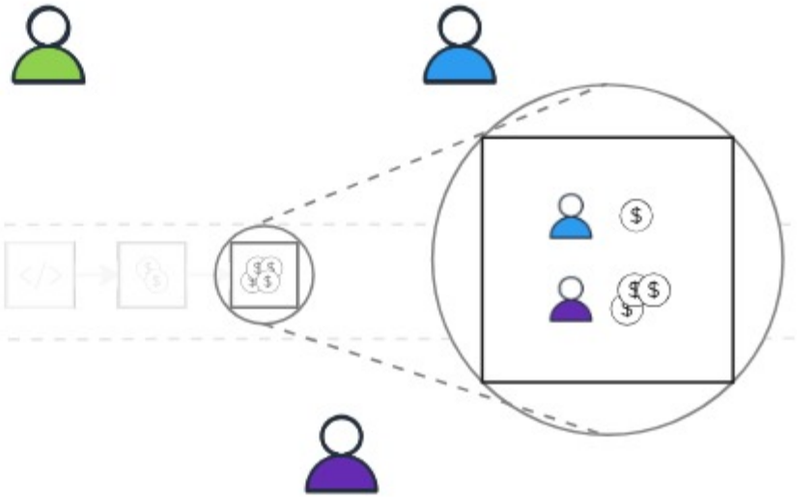

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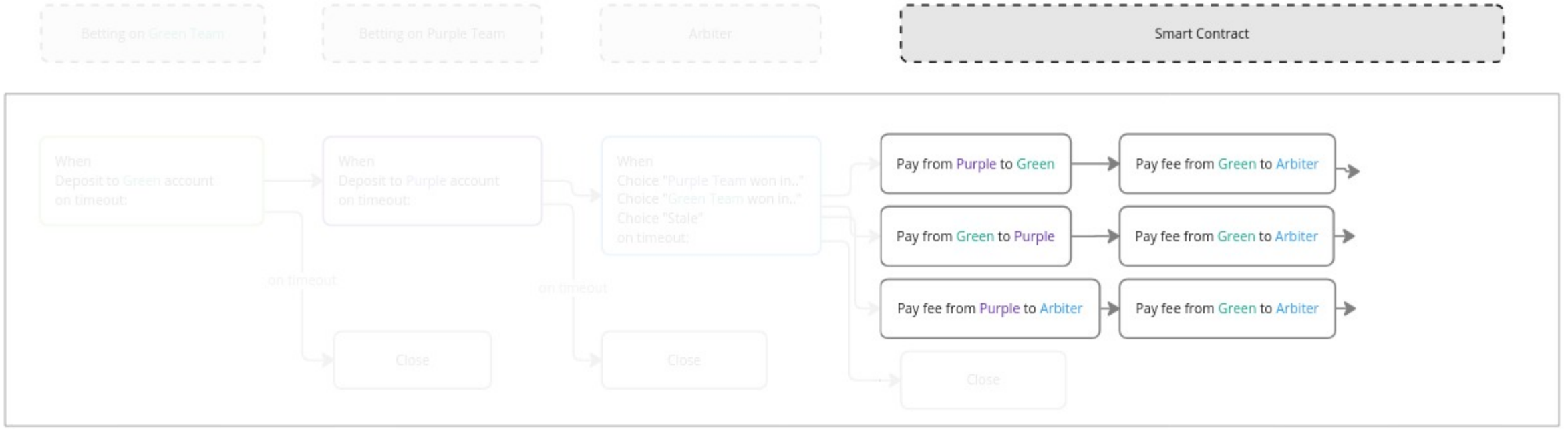

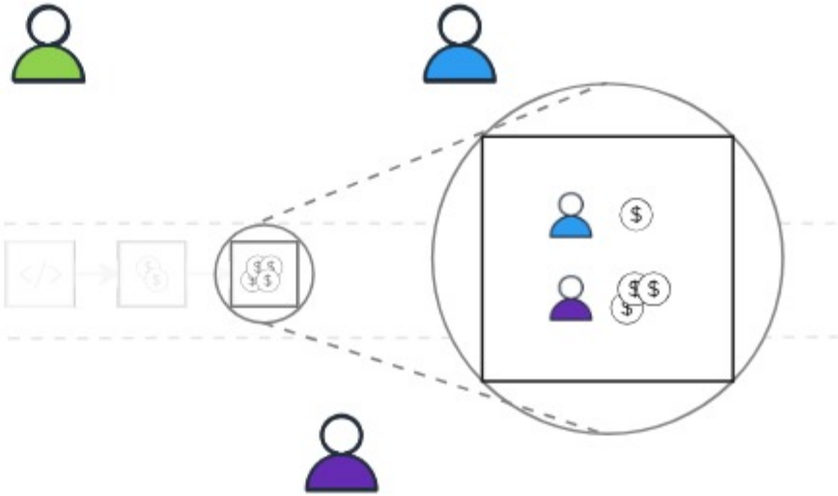

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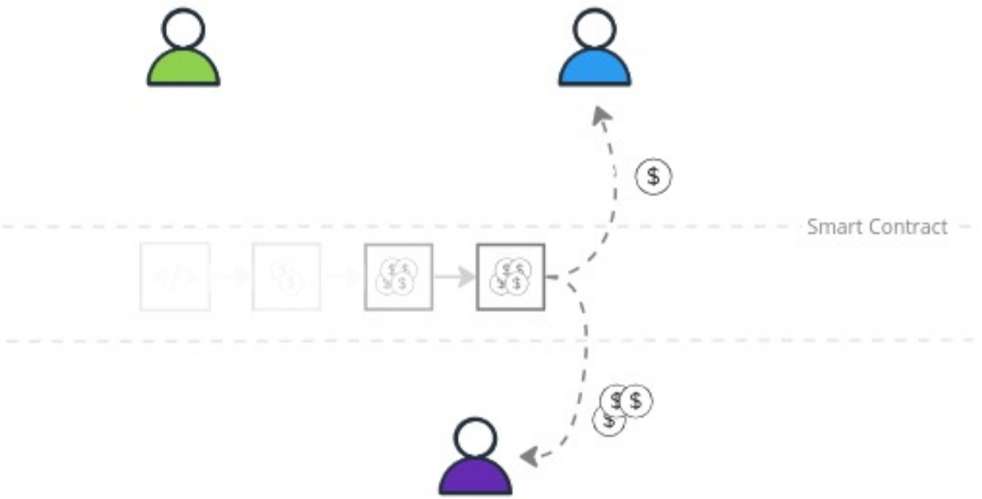

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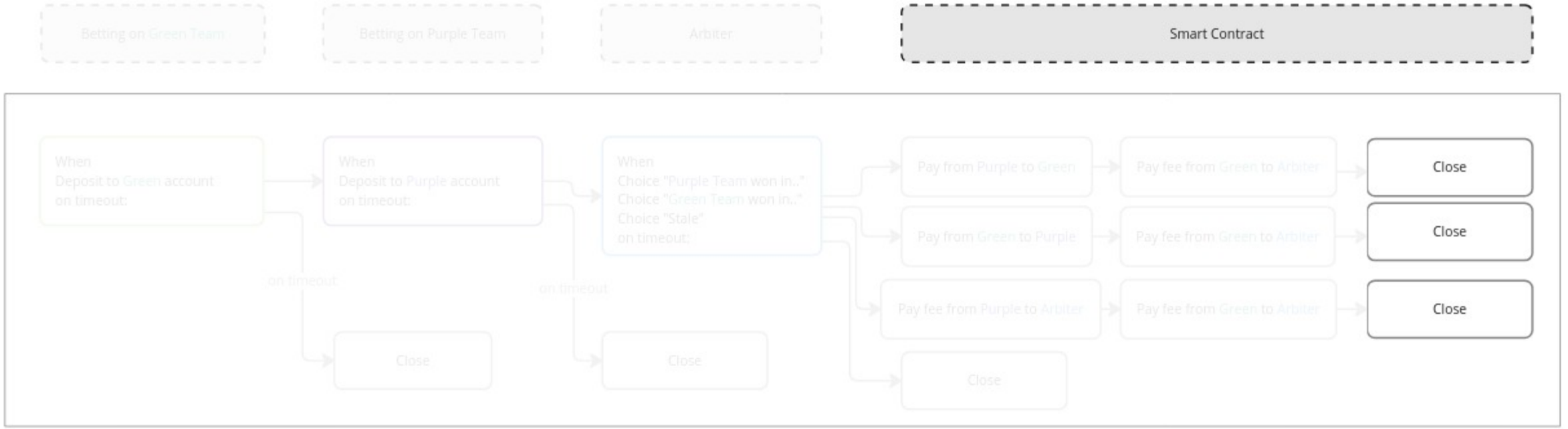

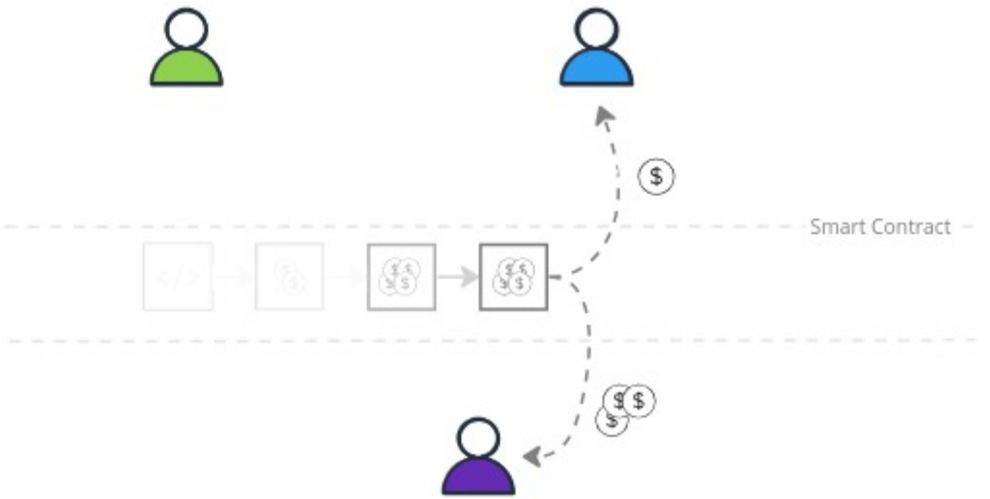

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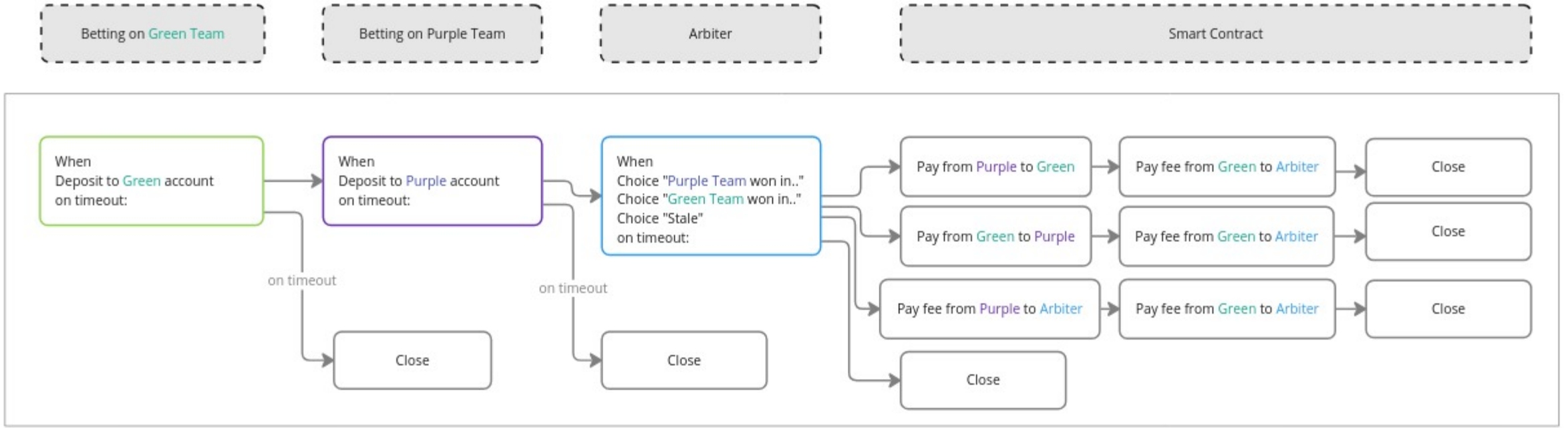

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Steps

- **Design**
- Test
- Integrate

Steps

- Design
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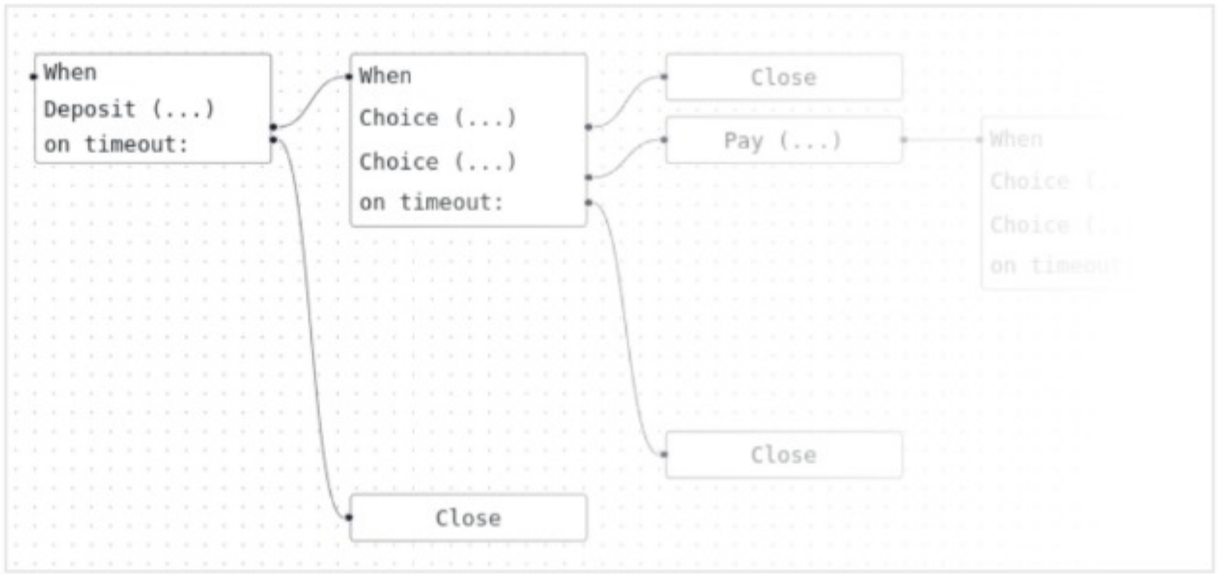
Test

- **Safety by construction**
- Static analysis
- Runner
- CLI tools
- Testing framework



Test

- Safety by construction
- **Static analysis**
- Runner
- CLI tools
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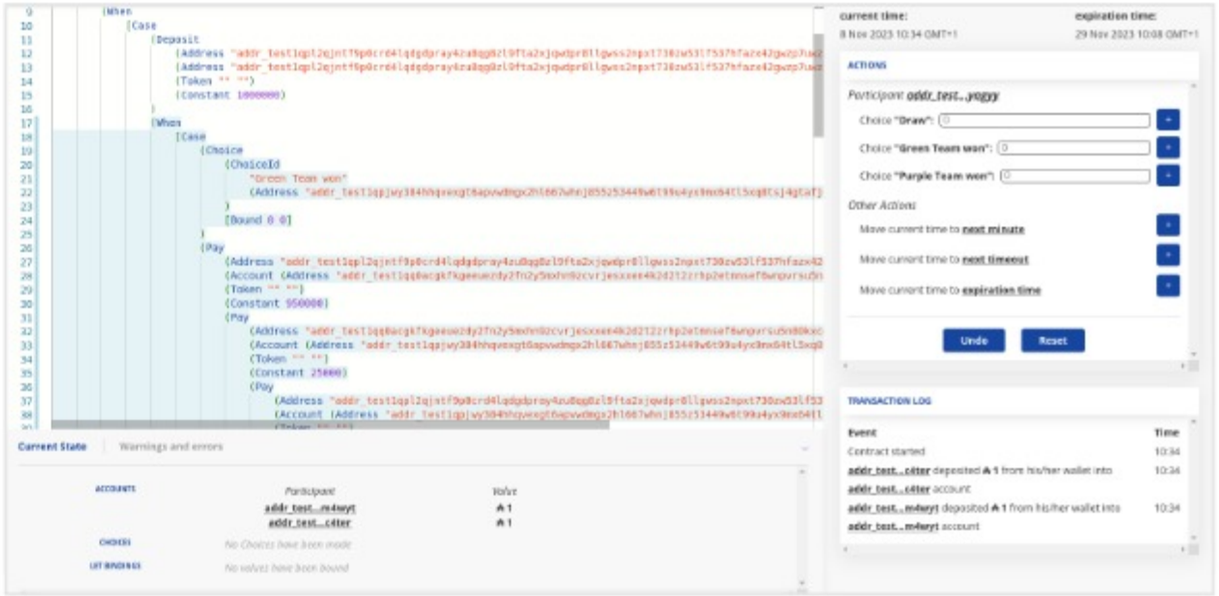
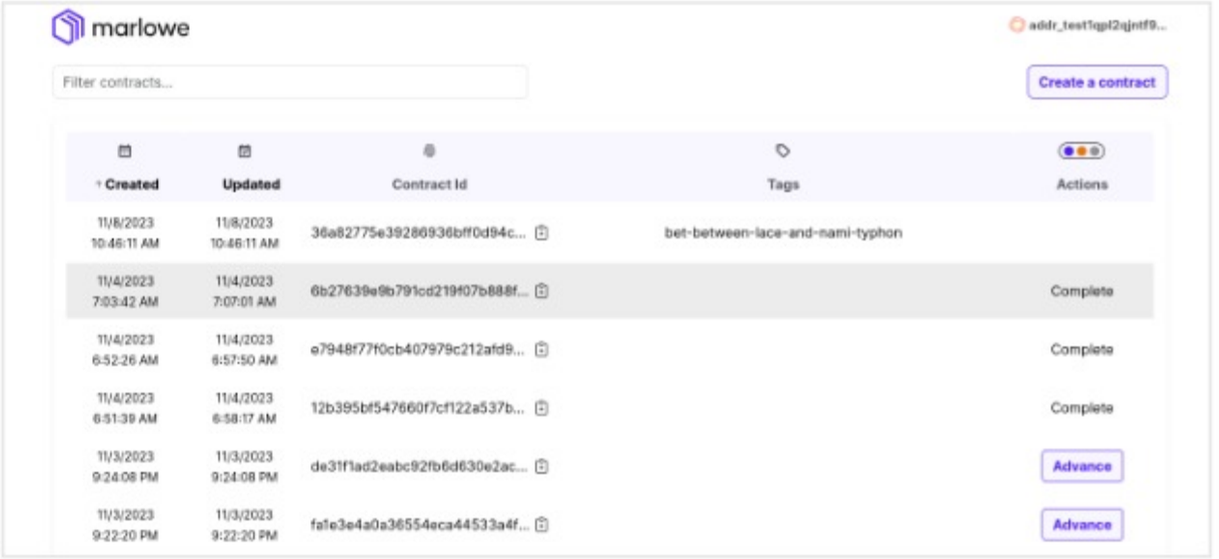


Test

- Safety by construction
- Static analysis
- **Runner**
- CLI tools
- Testing framework



Test

- Safety by construction
- Static analysis
- Runner
- **CLI tools**
- Testing framework

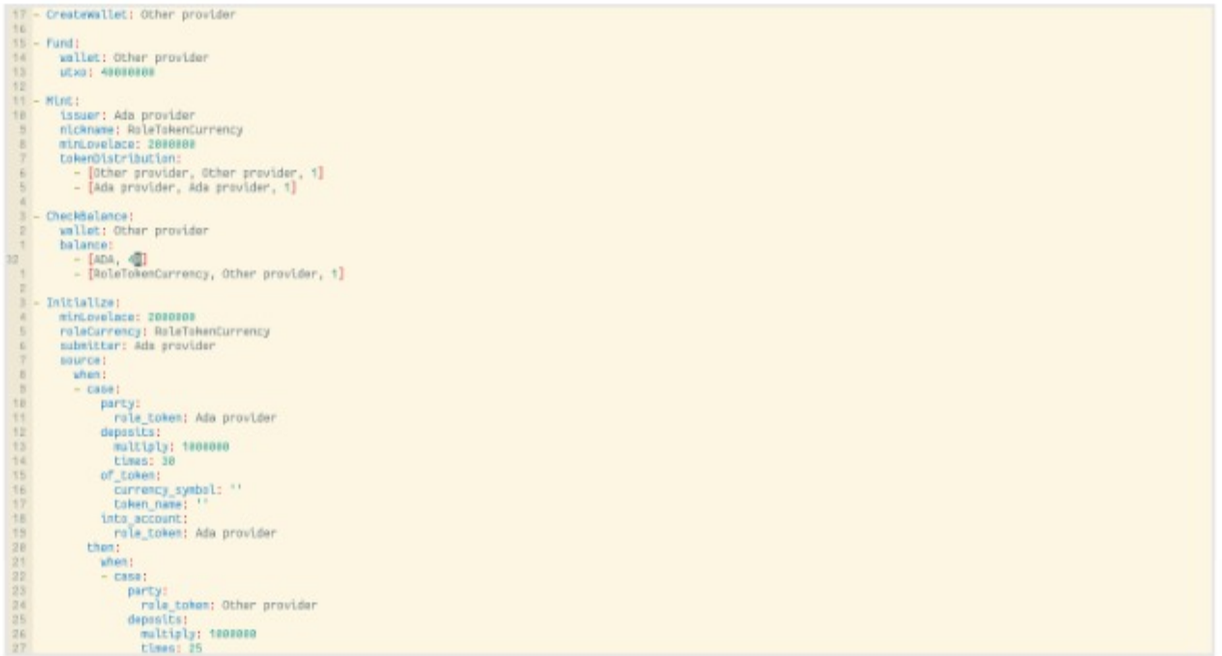
```
$ marlowe-cli run analyze --help
Usage: marlowe-cli run analyze (--mainnet | --testnet-magic INTEGER)
                               --socket-path SOCKET_FILE
                               --marlowe-file MARLOWE_FILE [--preconditions]
                               [--roles] [--tokens] [--maximum-value]
                               [--minimum-utxo] [--execution-cost]
                               [--transaction-size] [--best] [--verbose]

  [EXPERIMENTAL] Analyze a Marlowe contract.

Available options:
  --mainnet                Execute on mainnet.
  --testnet-magic INTEGER  Network magic. Defaults to the CARDANO_TESTNET_MAGIC
                           environment variable's value.
  --socket-path SOCKET_FILE
                           Location of the cardano-node socket file. Defaults to
                           the CARDANO_NODE_SOCKET_PATH environment variable's
                           value.
  --marlowe-file MARLOWE_FILE
                           JSON file with the state and contract.
  --preconditions          Whether to check preconditions for valid Marlowe
                           state.
  --roles                  Whether to check lengths of role names.
  --tokens                 Whether to check lengths of token names.
  --maximum-value          Whether to check the `maxValueSize` protocol limit.
  --minimum-utxo           Whether to check the `utxoCostPerWord` protocol
                           limit.
  --execution-cost         Whether to check the `maxTxExecutionUnits` protocol
                           limit.
  --transaction-size       Whether to check the `maxTxSize` protocol limit.
  --best                   Whether to compute tight estimates of worst-case
                           bounds, instead of generous estimates of those
                           bounds.
```

Test

- Safety by construction
- Static analysis
- Runner
- CLI tools
- **Testing framework**



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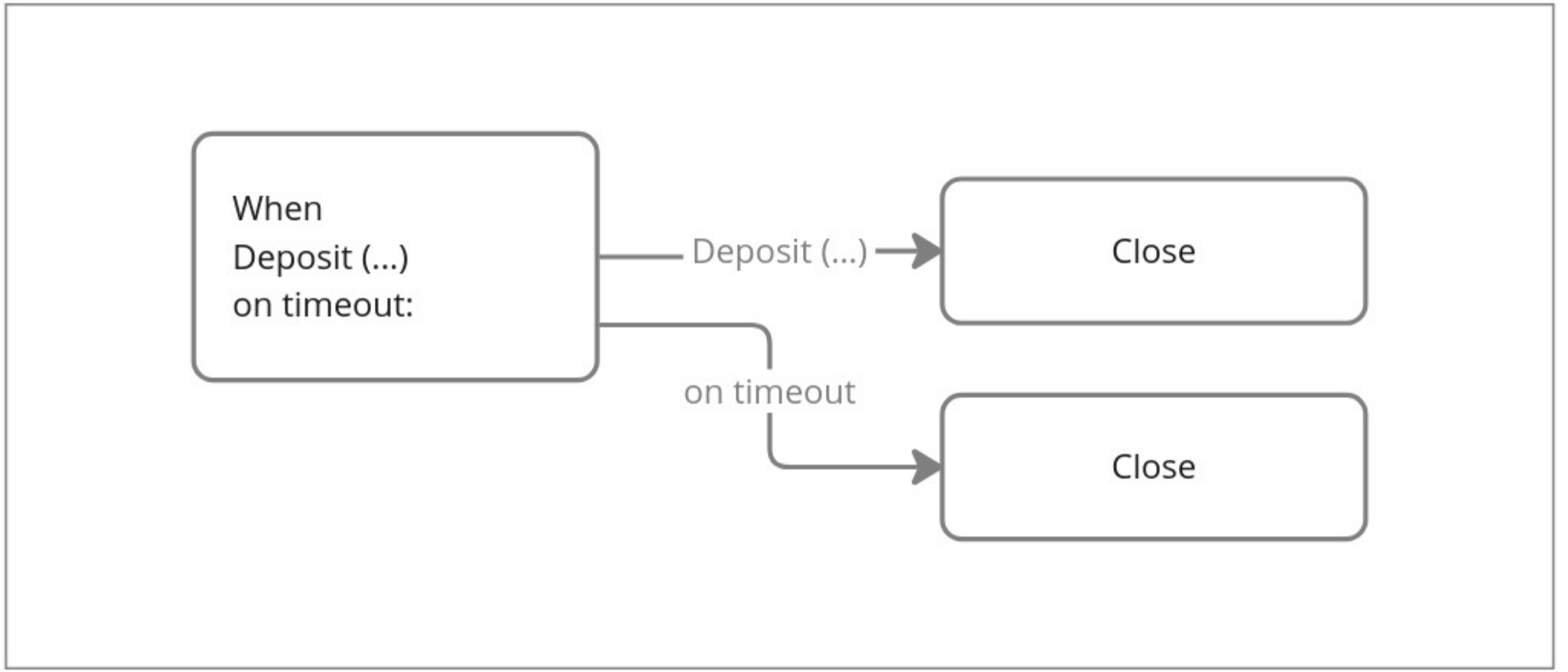
- **Integrate**

Dynamic Contract Generation



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Dynamic Contract Generation

```
{
  "when": [
    {
      "case": {
        "party": {
          "address": "addr_test1qq0acgkfkgeeuezdy2fn2y5mxhn9zcvrjesxxen4k2d2t2zrhp2e
              tmnsef6wnpvrsu5n80kxceafnxpv5te923agndxs5c4ter"
        },
        "deposits": 1000000,
        "of_token":
...
      }
      "then": "close",
    }
  ],
  "timeout": 1701252900000
  "timeout_continuation": "close",
}
```

Dynamic Contract Generation

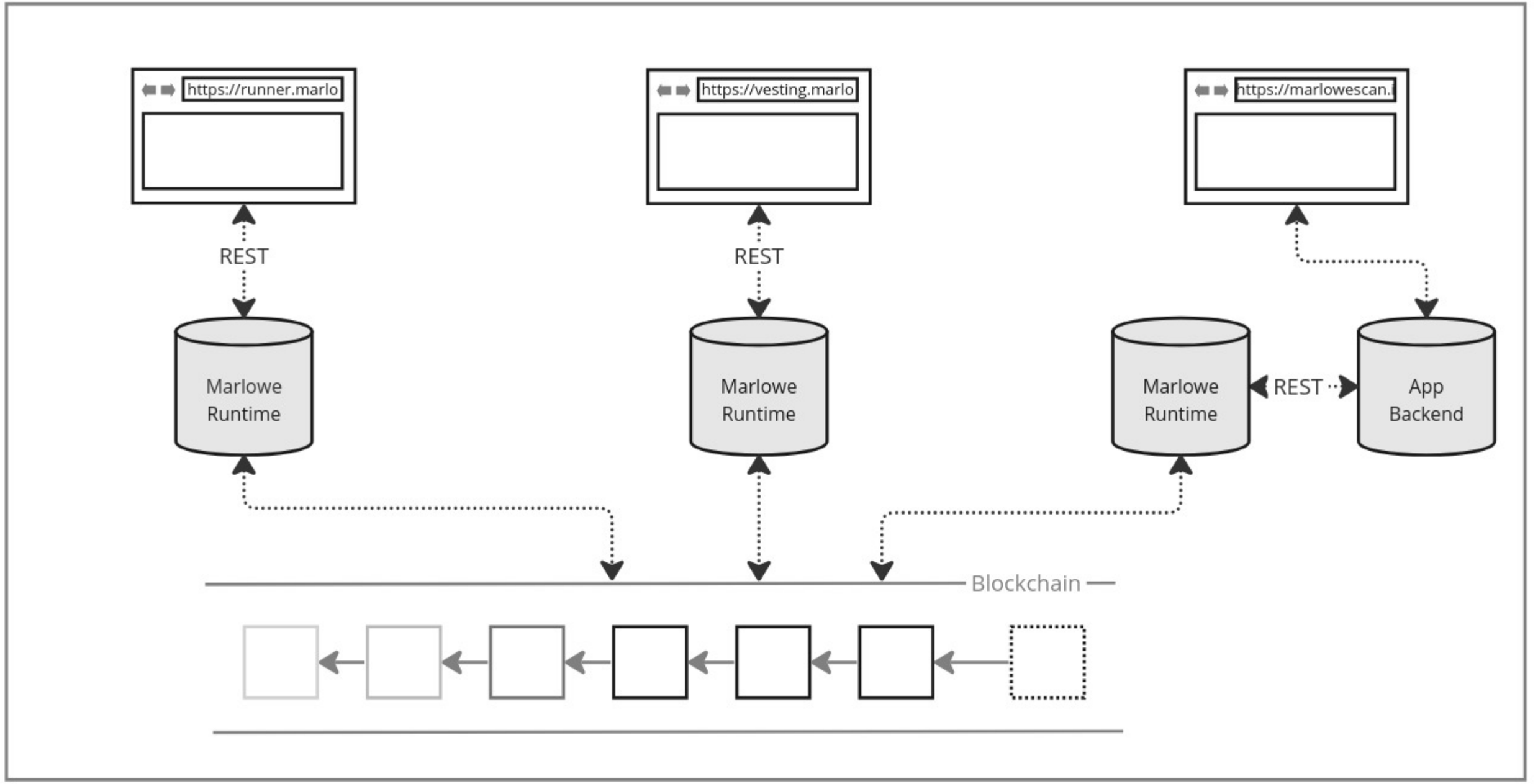
```
export const mkContract = (donor: Address, acceptor: Address): Contract => {
  const inTwentyFourHours = datetoTimeout(new Date(Date.now() + ...
  return {
    "when": [
      {
        "then": "close",
        "case": {
          "party": donor,
          "deposits": 100n,
...
    "timeout_continuation": "close",
    "timeout": inTwentyFourHours,
  }
};
```

- Full exercise
- marlowe-ts-sdk

Dynamic Contract Generation

- TS/JS: github.com/input-output-hk/marlowe-ts-sdk
- Rust: github.com/OlofBlomqvist/marlowe-rs
- Go: github.com/menabrealabs/marlowe
- Python: github.com/OlofBlomqvist/marlowe-py
- C# and more: projectcatalyst.io/funds/10/f10-developer-ecosystem-the-evolution/marlowe-runtime-sdks#about

Marlowe Runtime



Blockchain interaction

- Creation

```
1    await runtimeLifecycle.contracts.createContract({ contract, tags });
```

- Execution

```
1    const depositRequest = {inputs: [deposit]};
2    await runtimeLifecycle.contracts.applyInputs(contractId, depositRequest)
```

Marlowe and Your Dev Team

- Marlowe itself is small, safe and easy to learn
- Marlowe can be used from any programming language (Go, Rust, C#, Python, TypeScript)
- Marlowe blockchain interaction is provided through simple REST API

Marlowe and Your Bussines

- Low entry / prototyping cost
- Quick delivery - when problem fits Marlowe
- Easy to develop - UTxO agnostic, REST, online tools.
- Easy to maintain - no deep dev expertise required

DApps Prototypes

- Vesting app: vesting-preprod.scdev.aws.iohkdev.io
- Marlowe Runner: preprod.runner.marlowe.iohk.io
- Marlowe Scanner: marlowescan.com
- Workshop DApp: github.com/paluh/marlowe-workshop-dapp

Thank you

What are Smart Contracts?

Smart Contract

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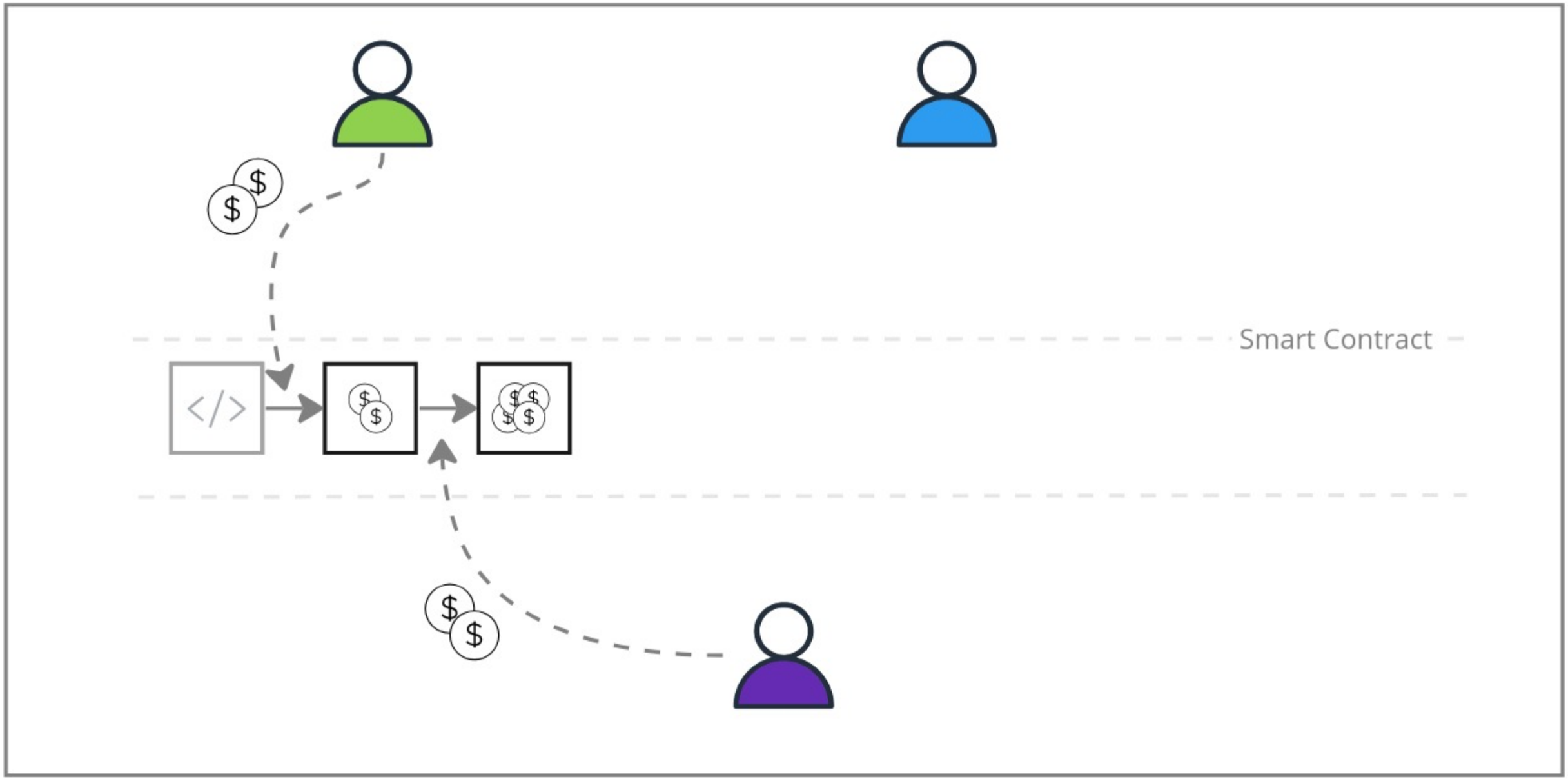

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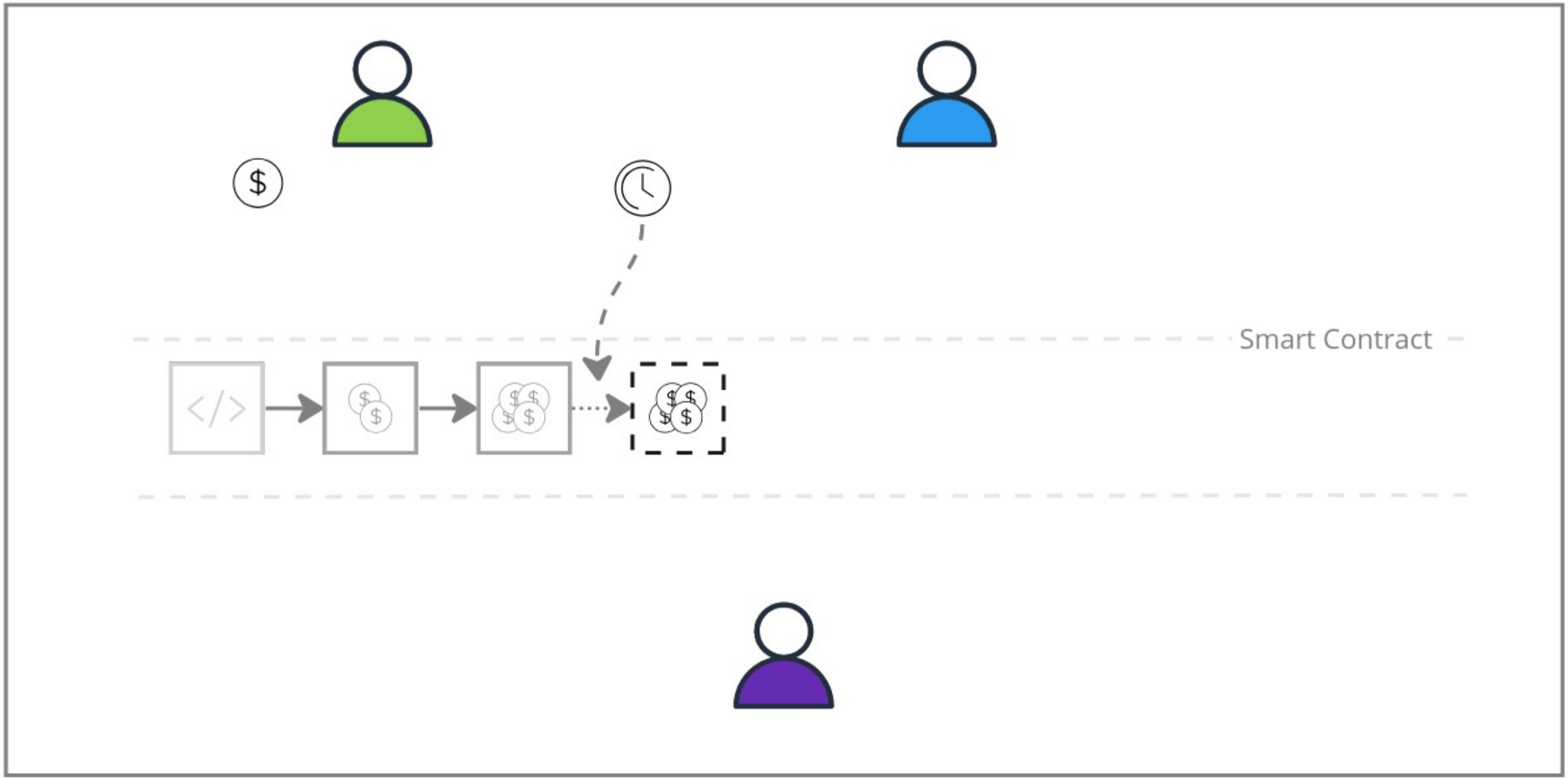

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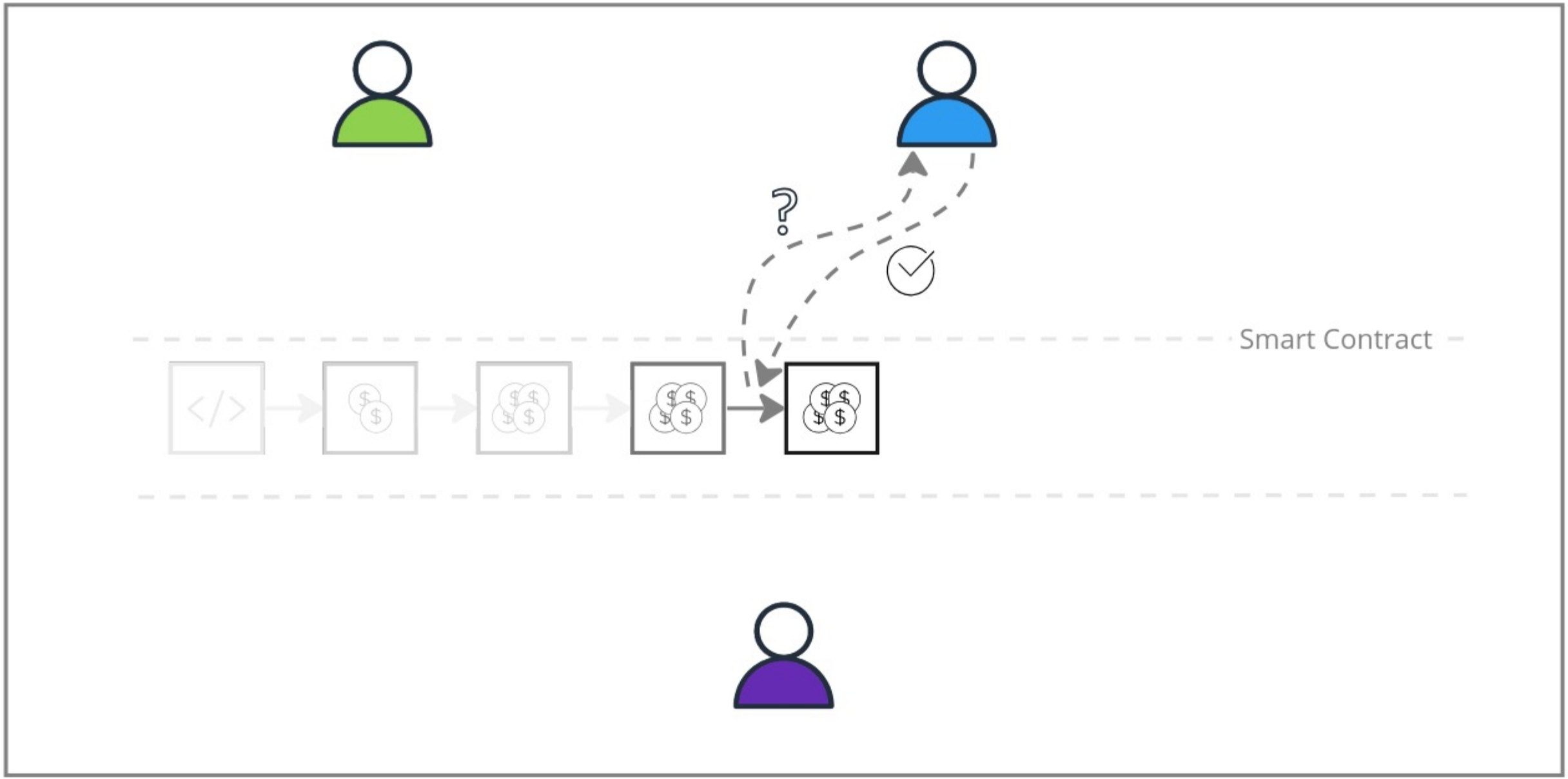

Example: "On-Chain Betting"

Smart Contract

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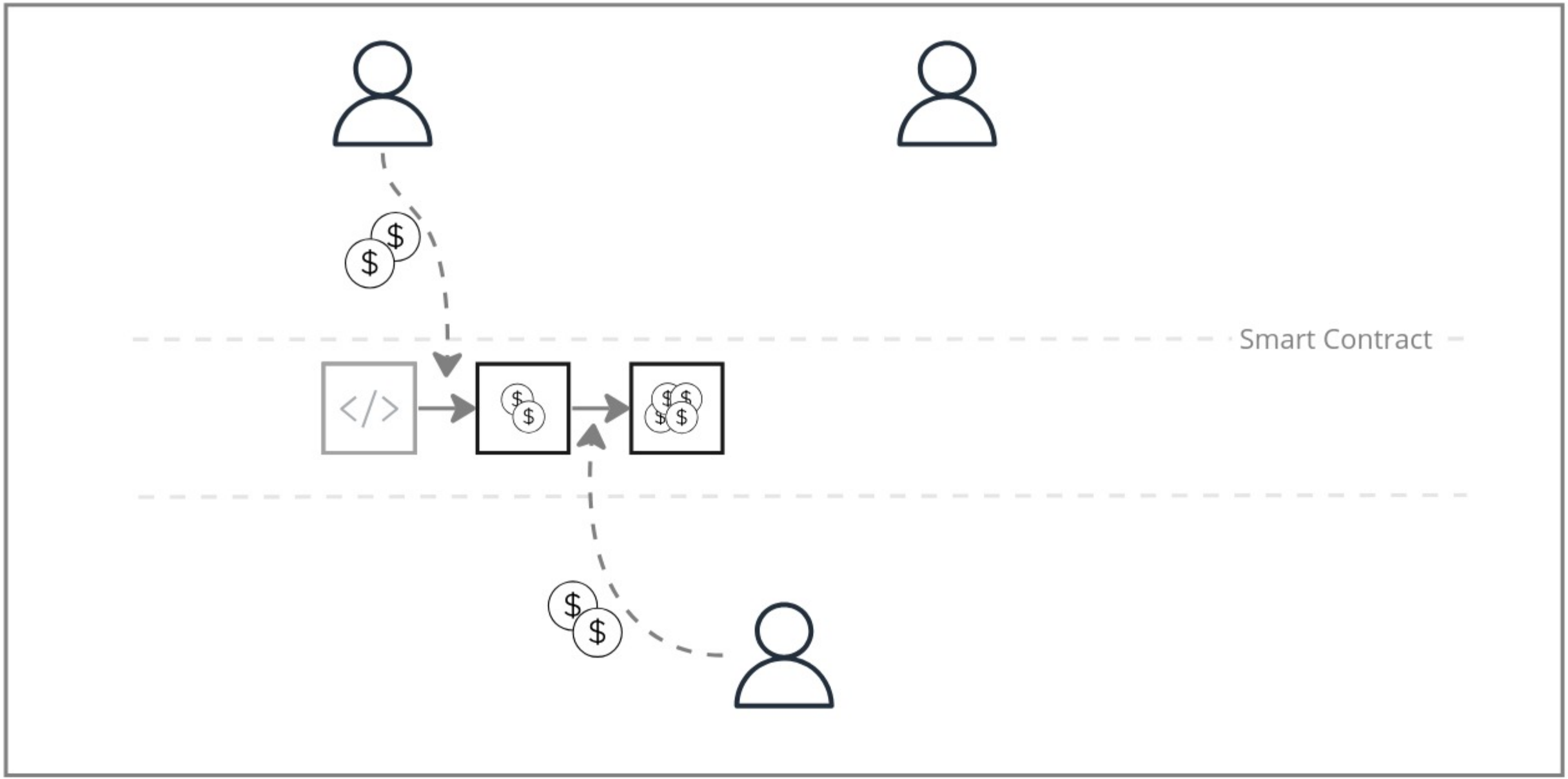

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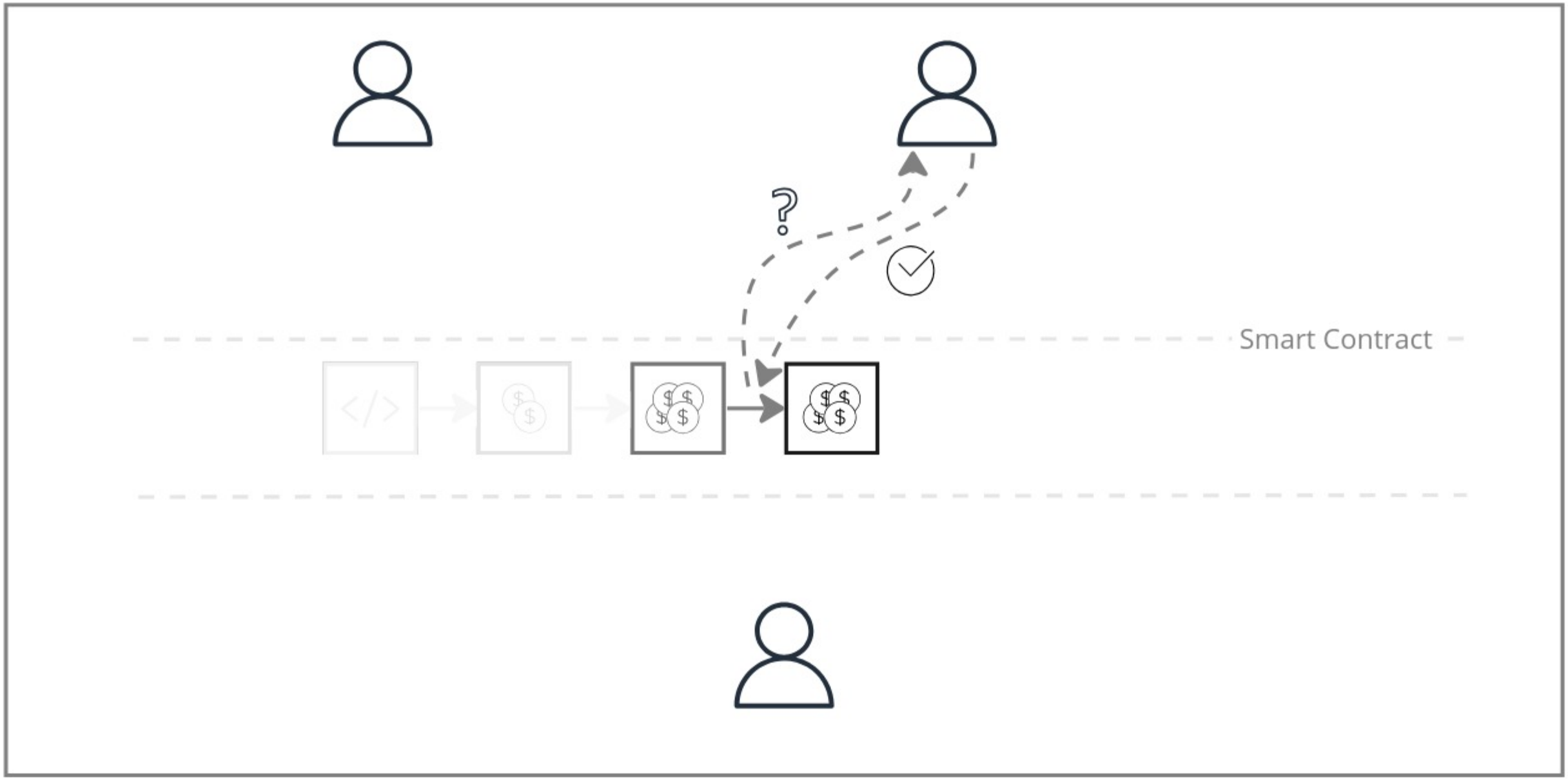
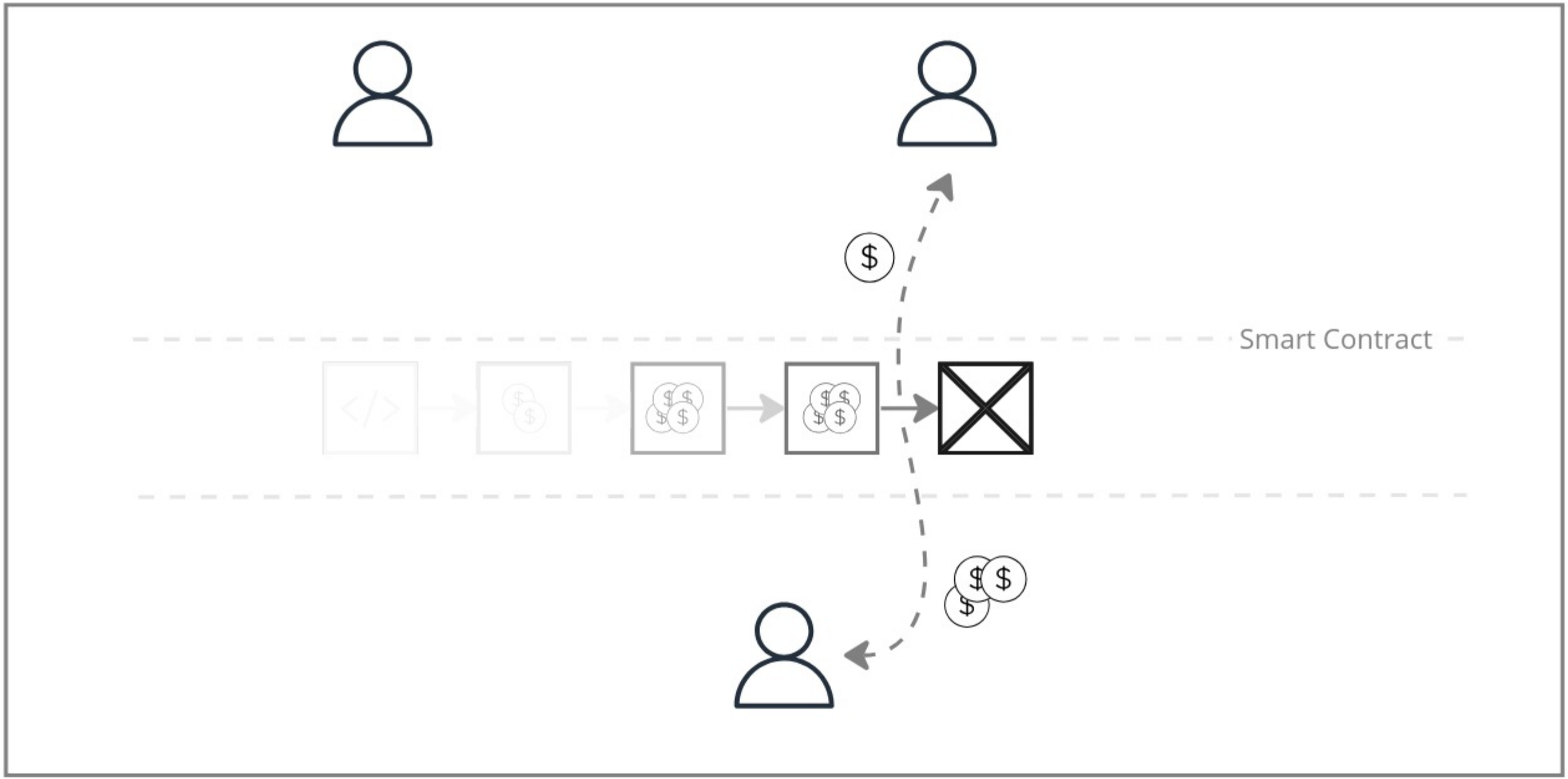


Example: "On-Chain Betting"



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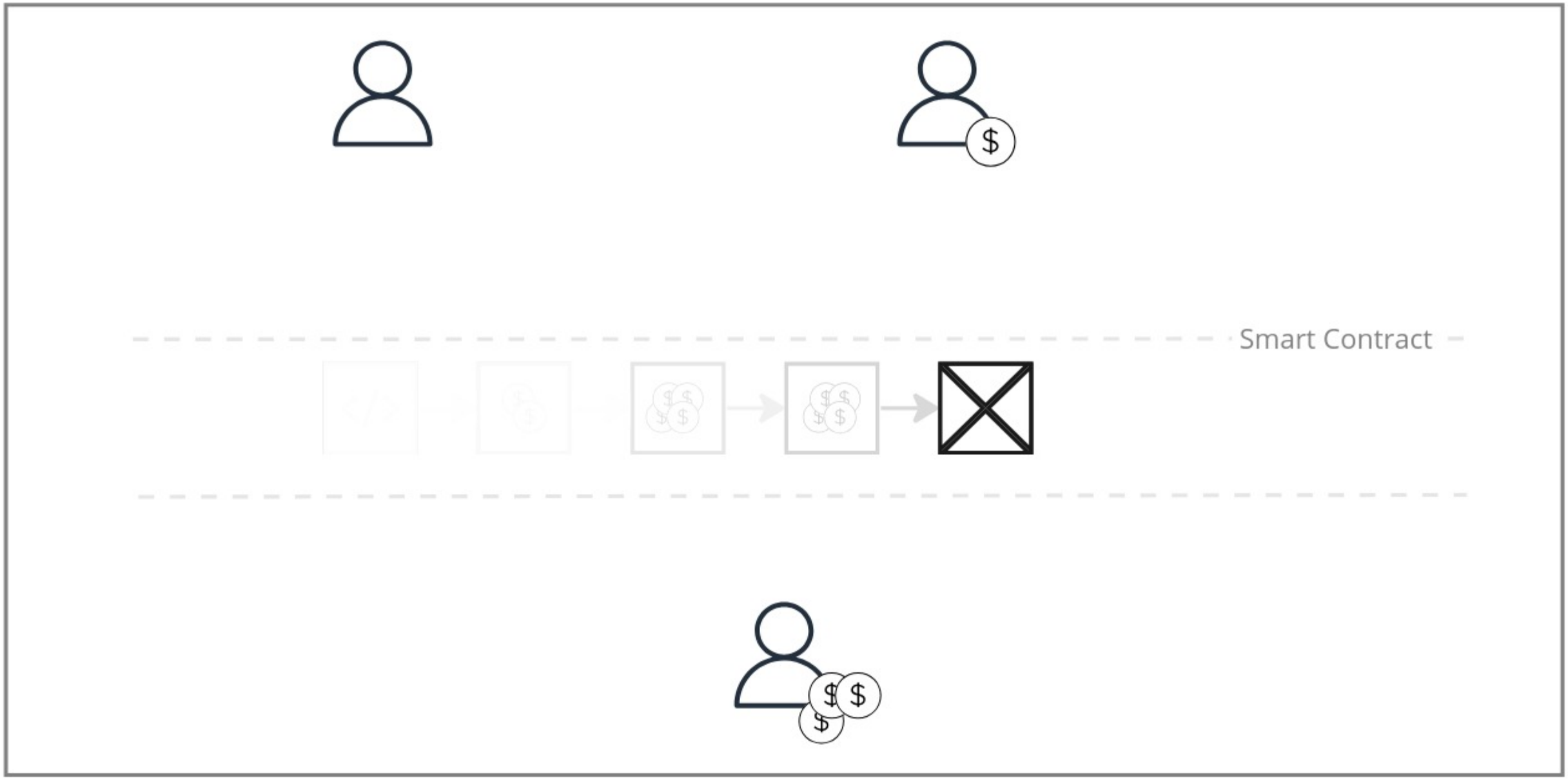
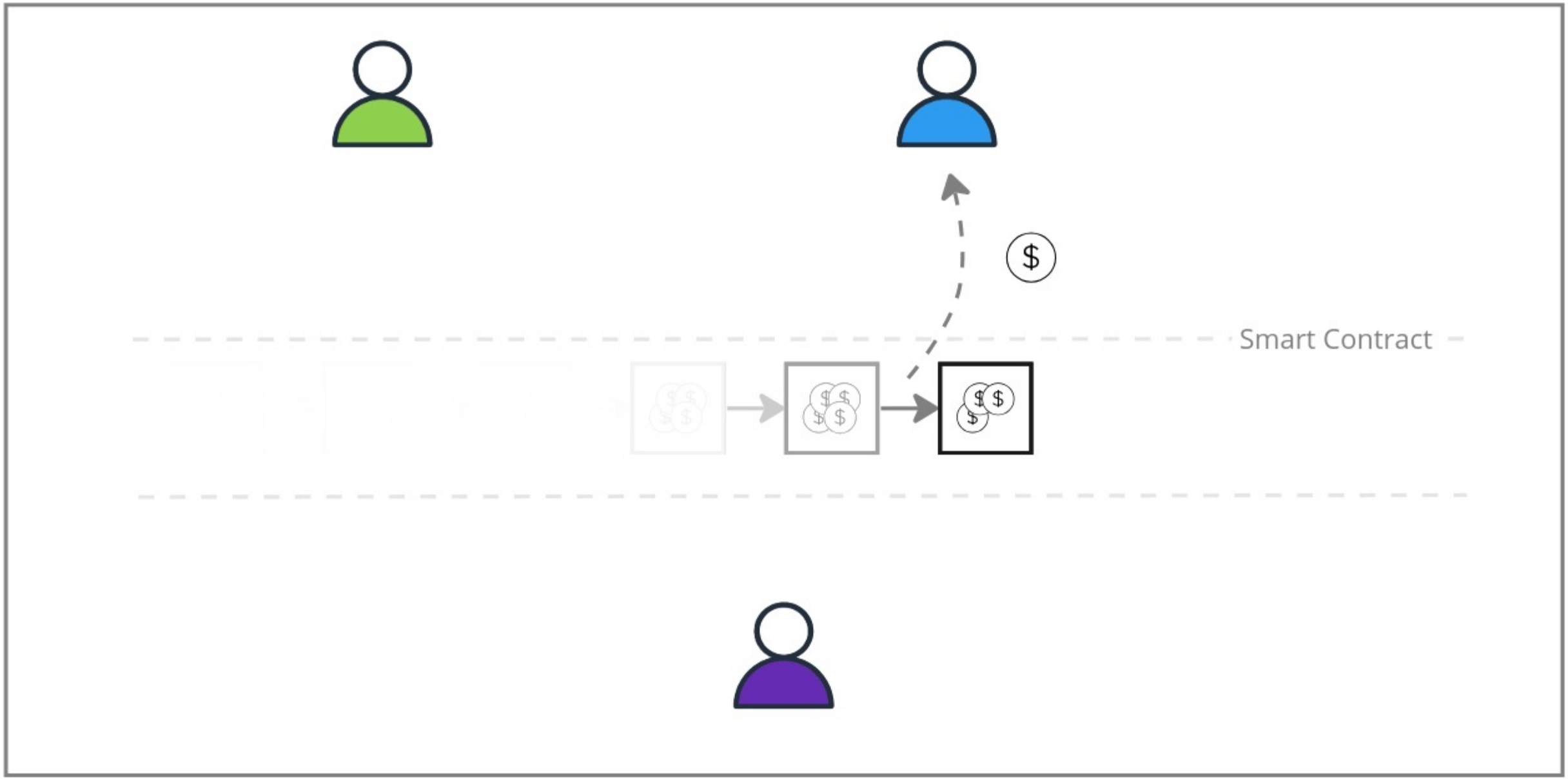
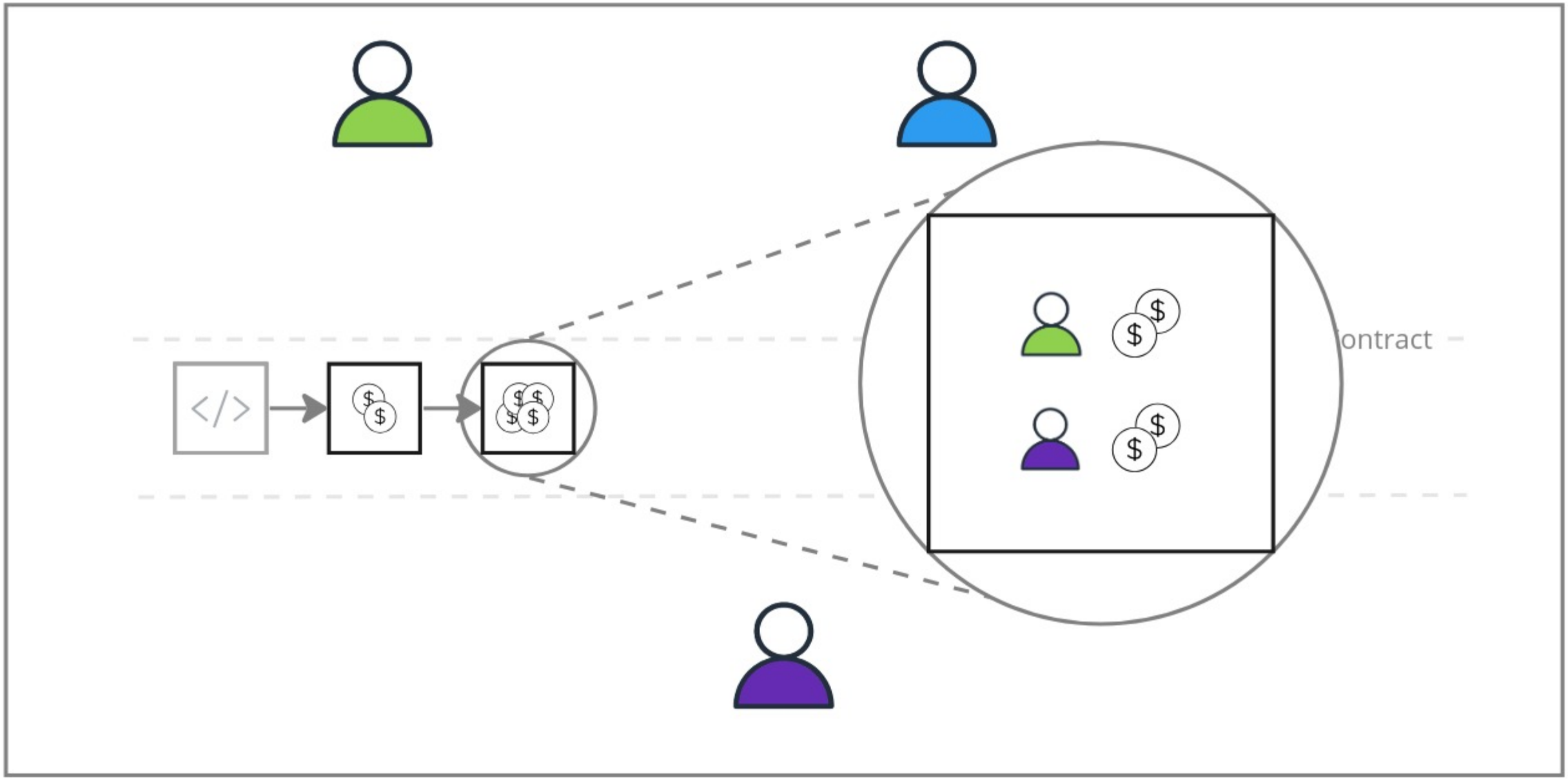


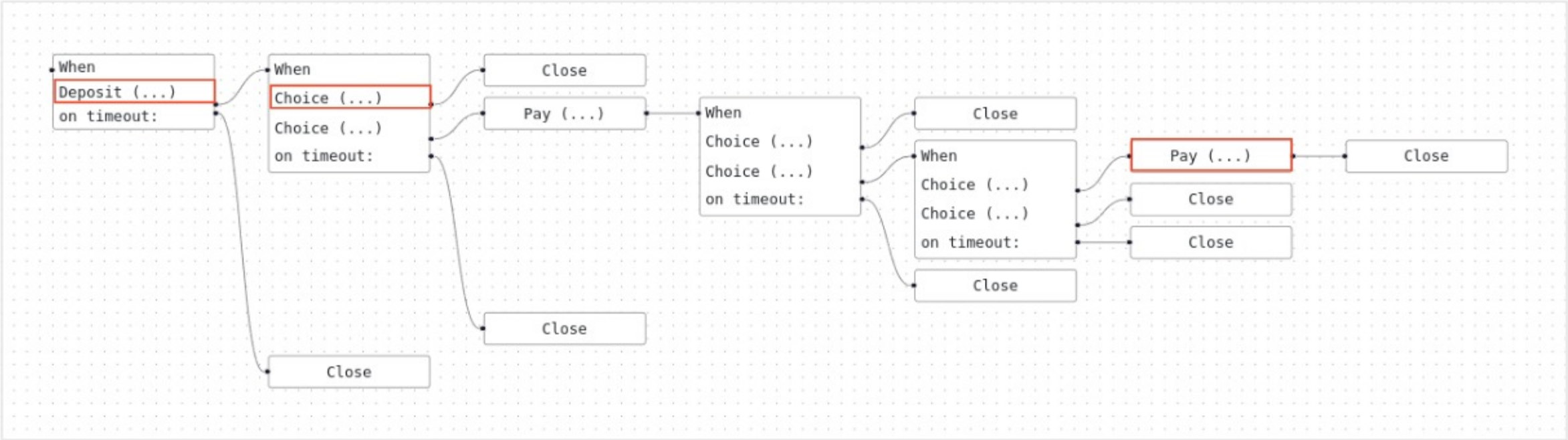
What are Smart Contracts?



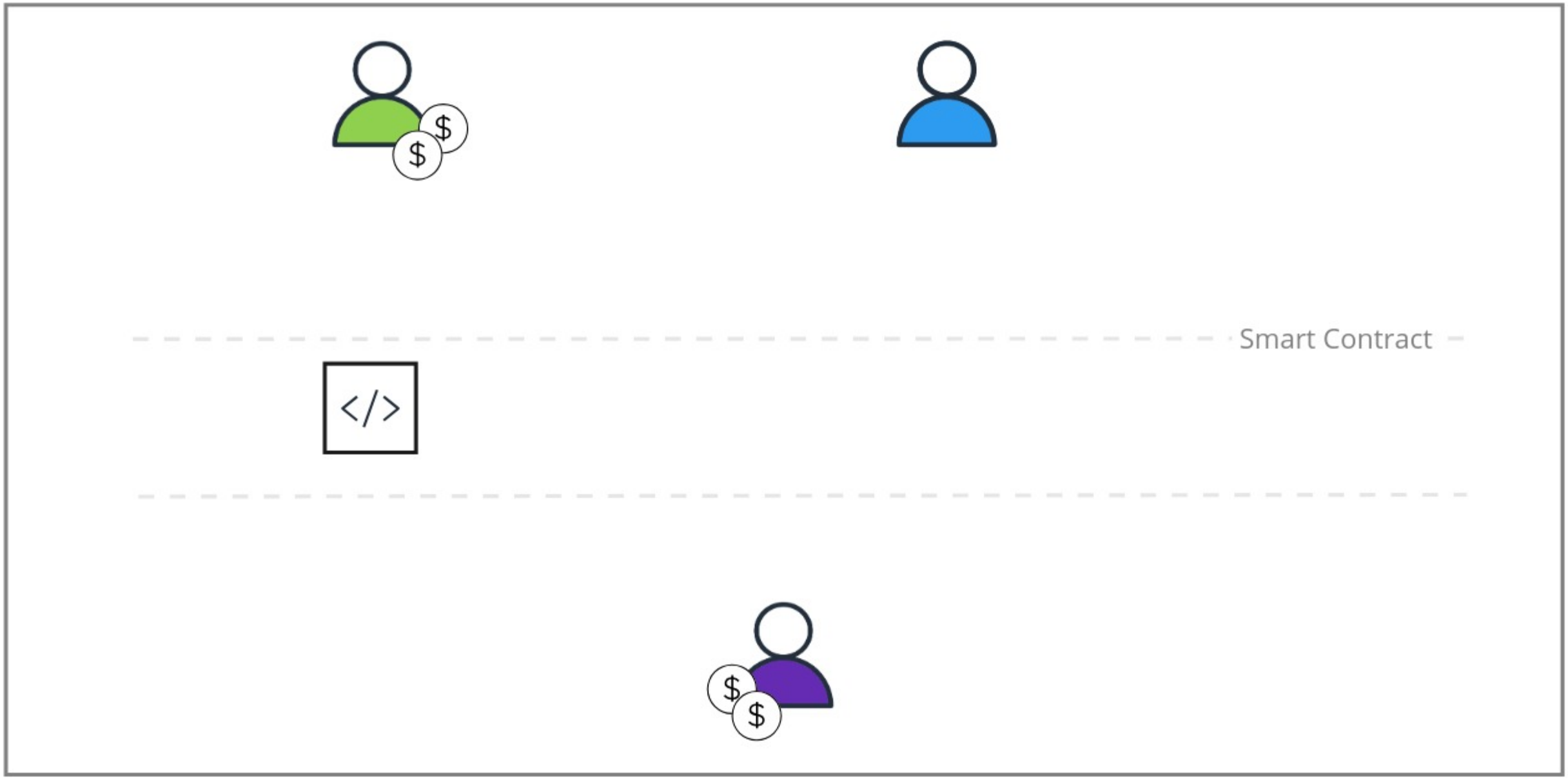
What are Smart Contracts?



Anatomy of Marlowe



"Deposit" Locks The Assets



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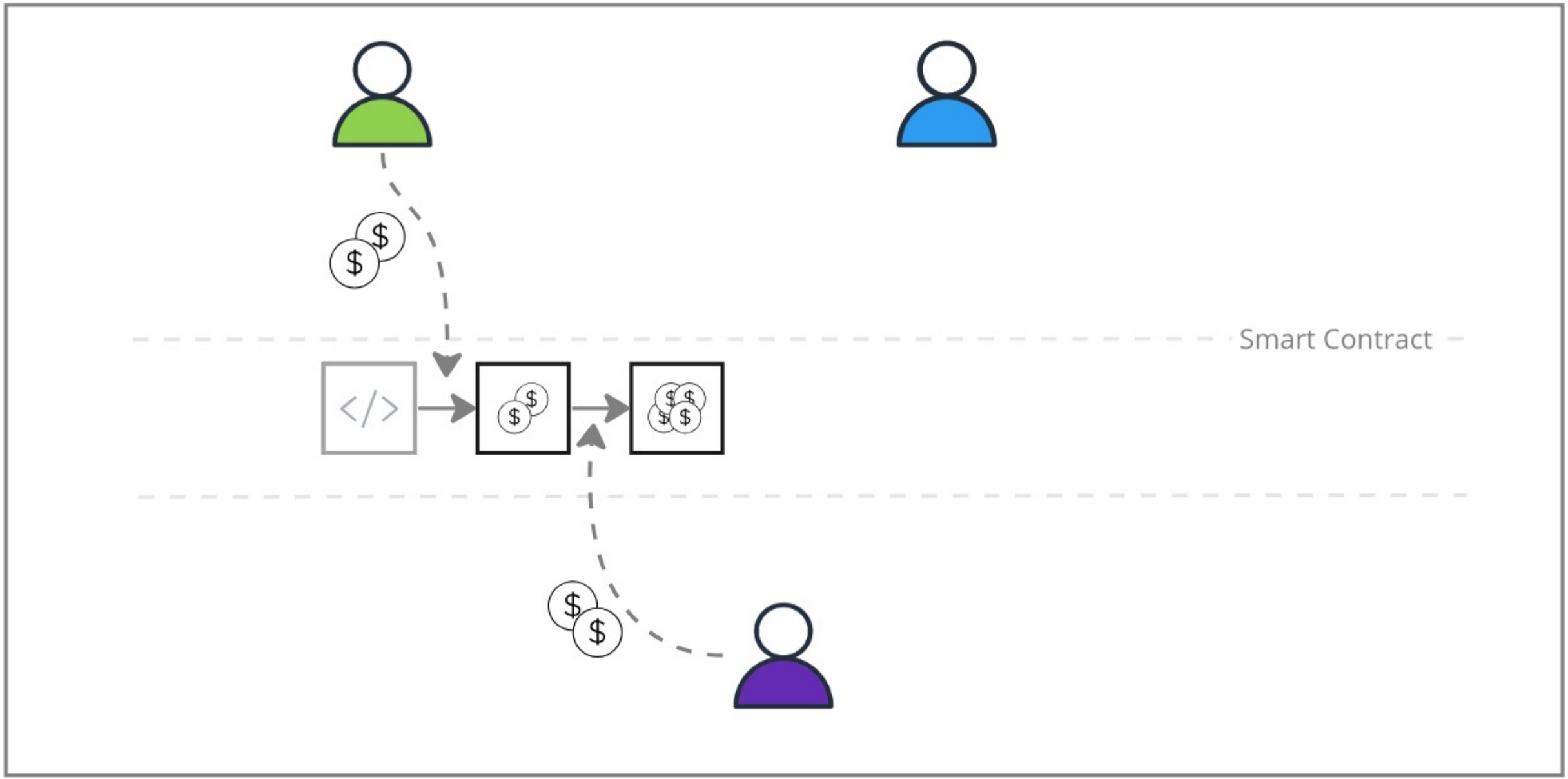
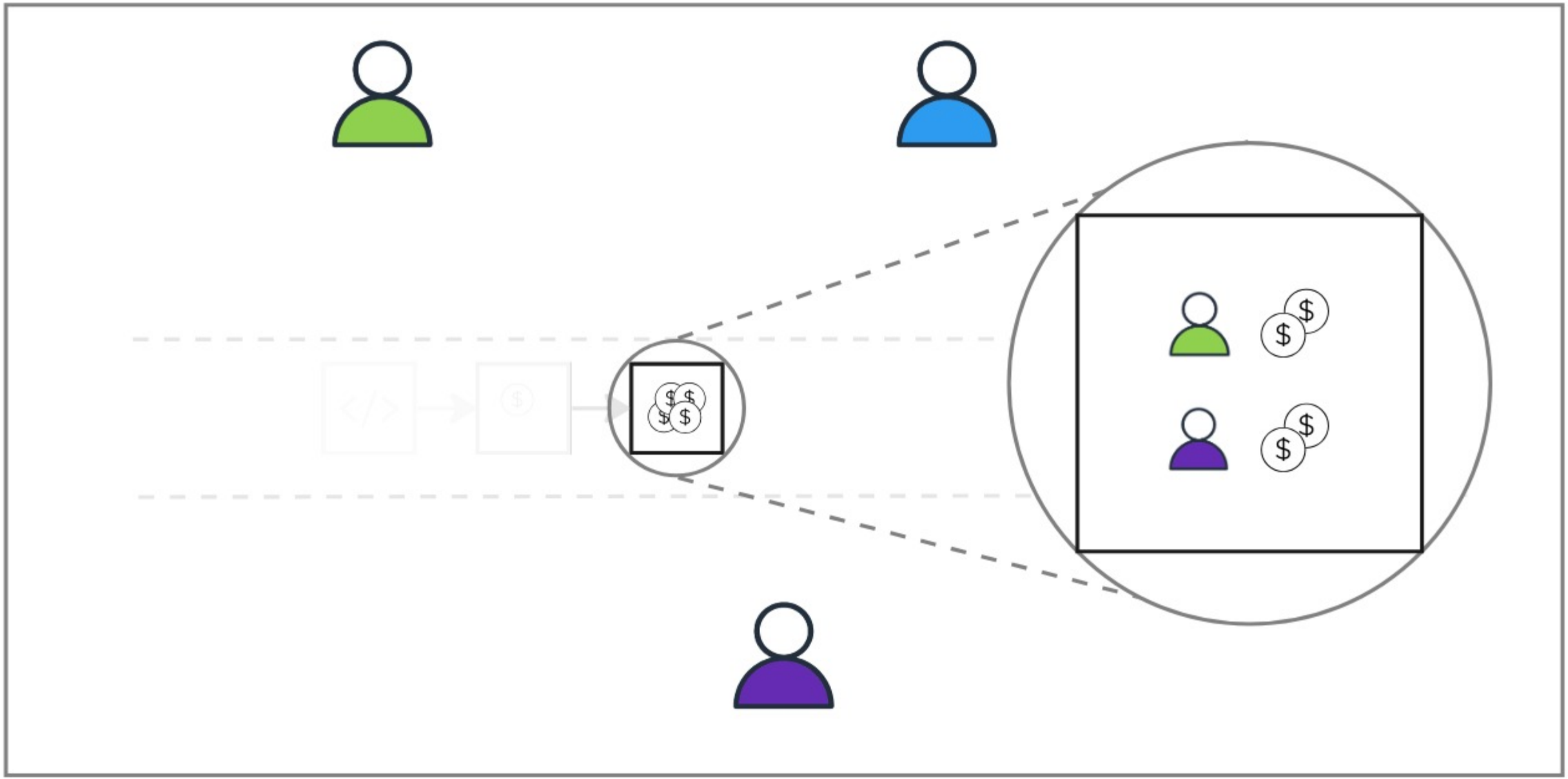


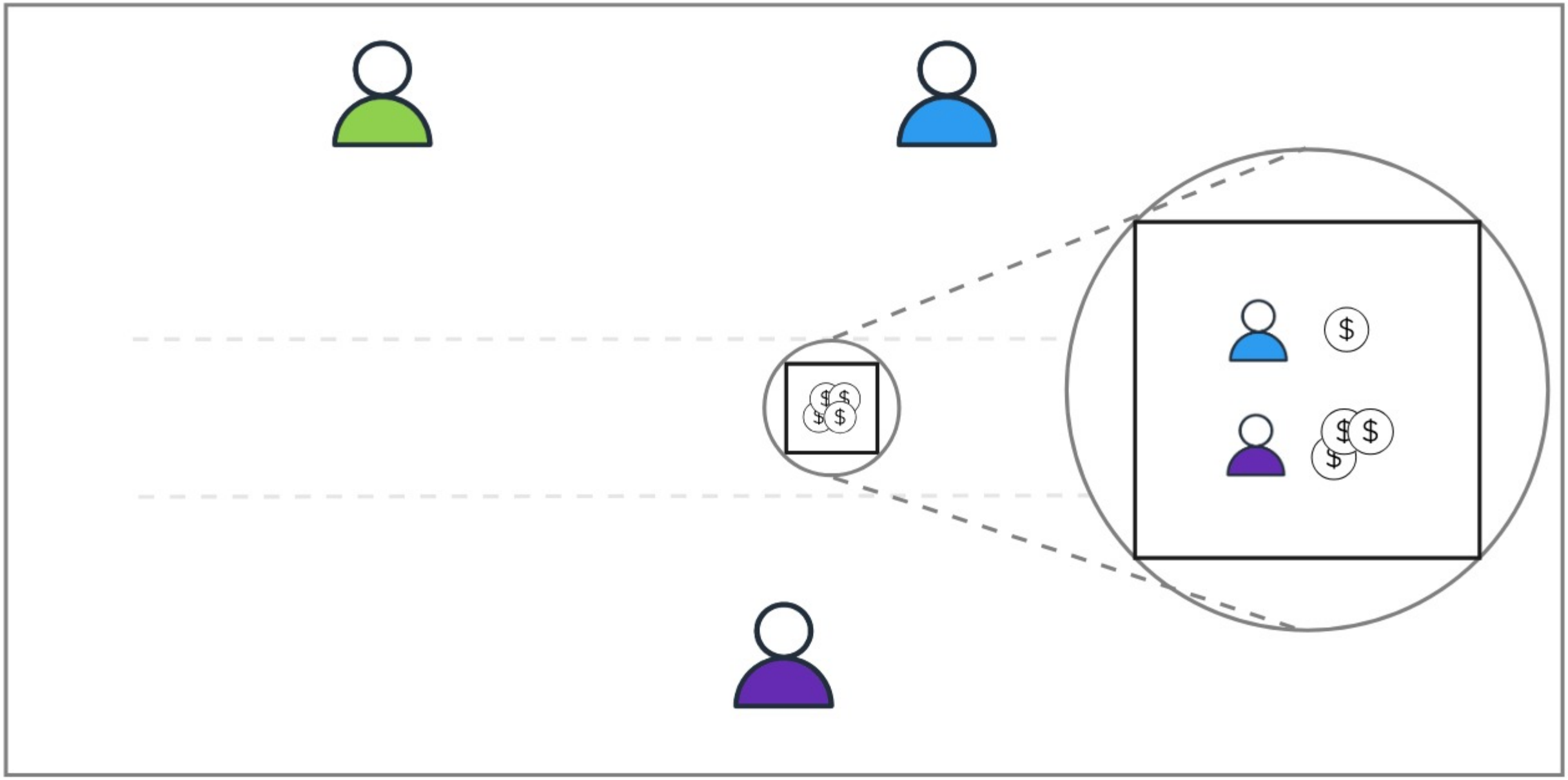
"Deposit" Locks The Assets



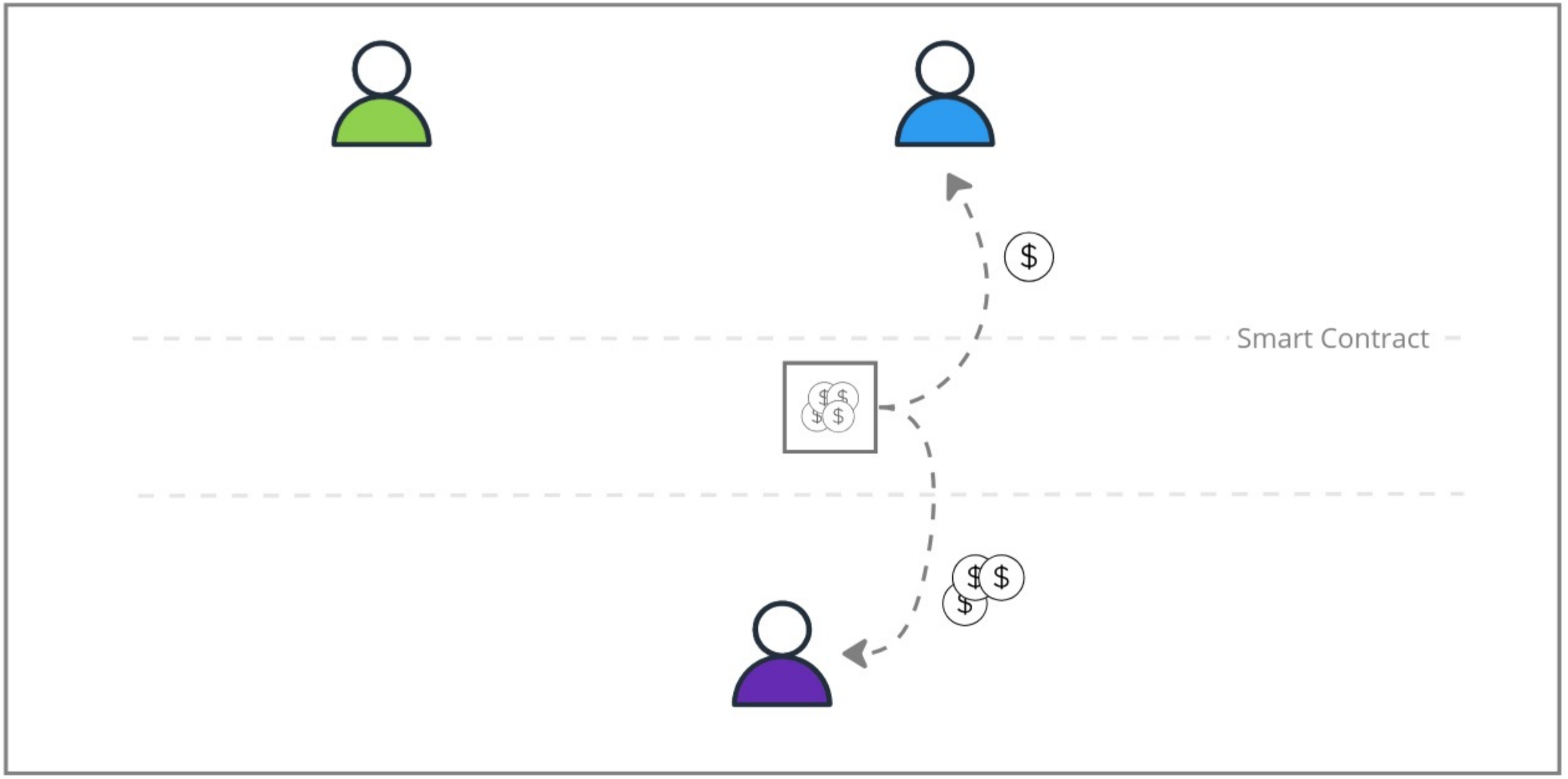
"Close" Releases The Assets

- When we reach "Close" contract releases remaining assets
- The assets are paid out according to account state

"Close" Releases The Assets



"Close" Releases The Assets



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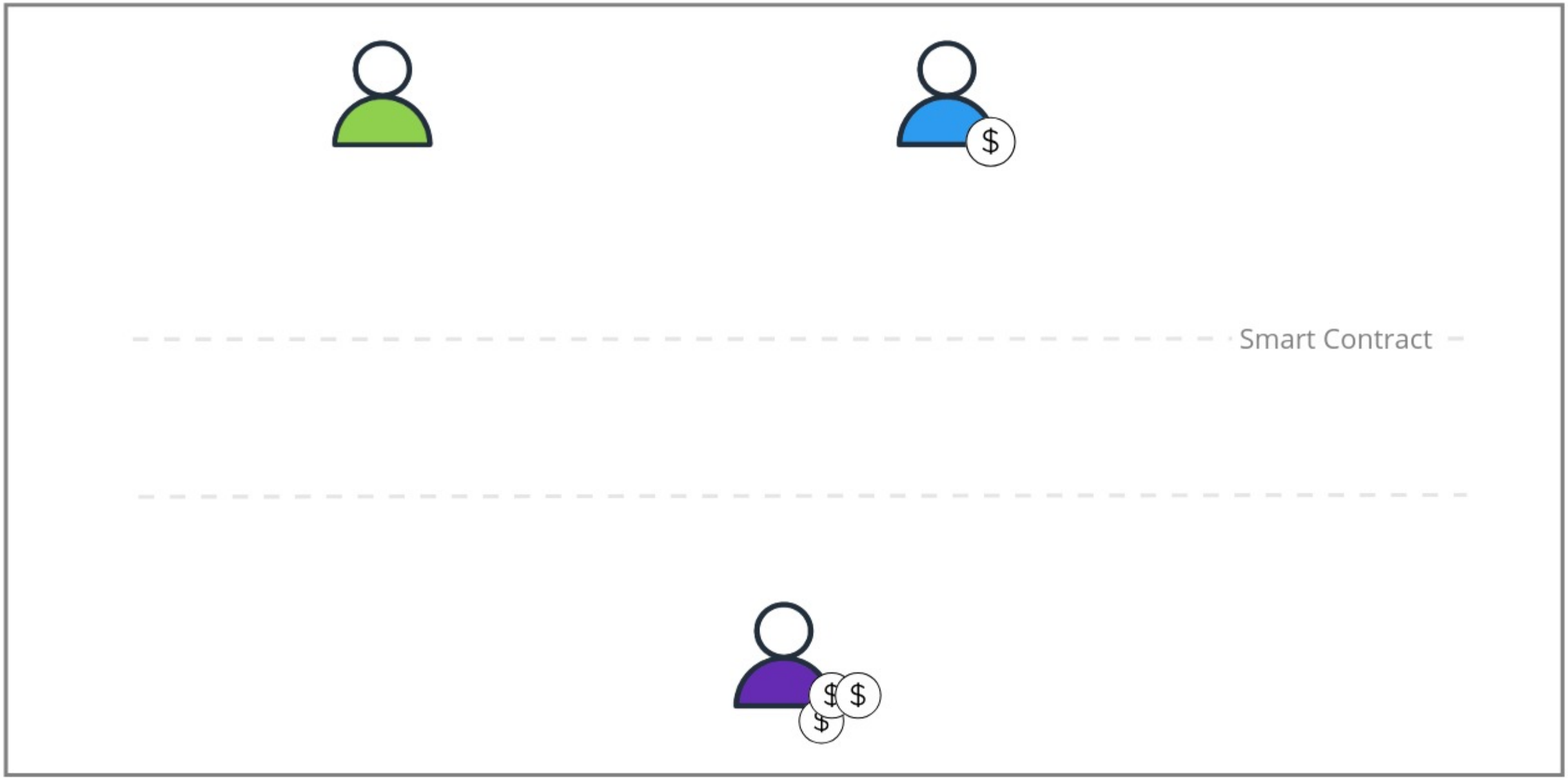
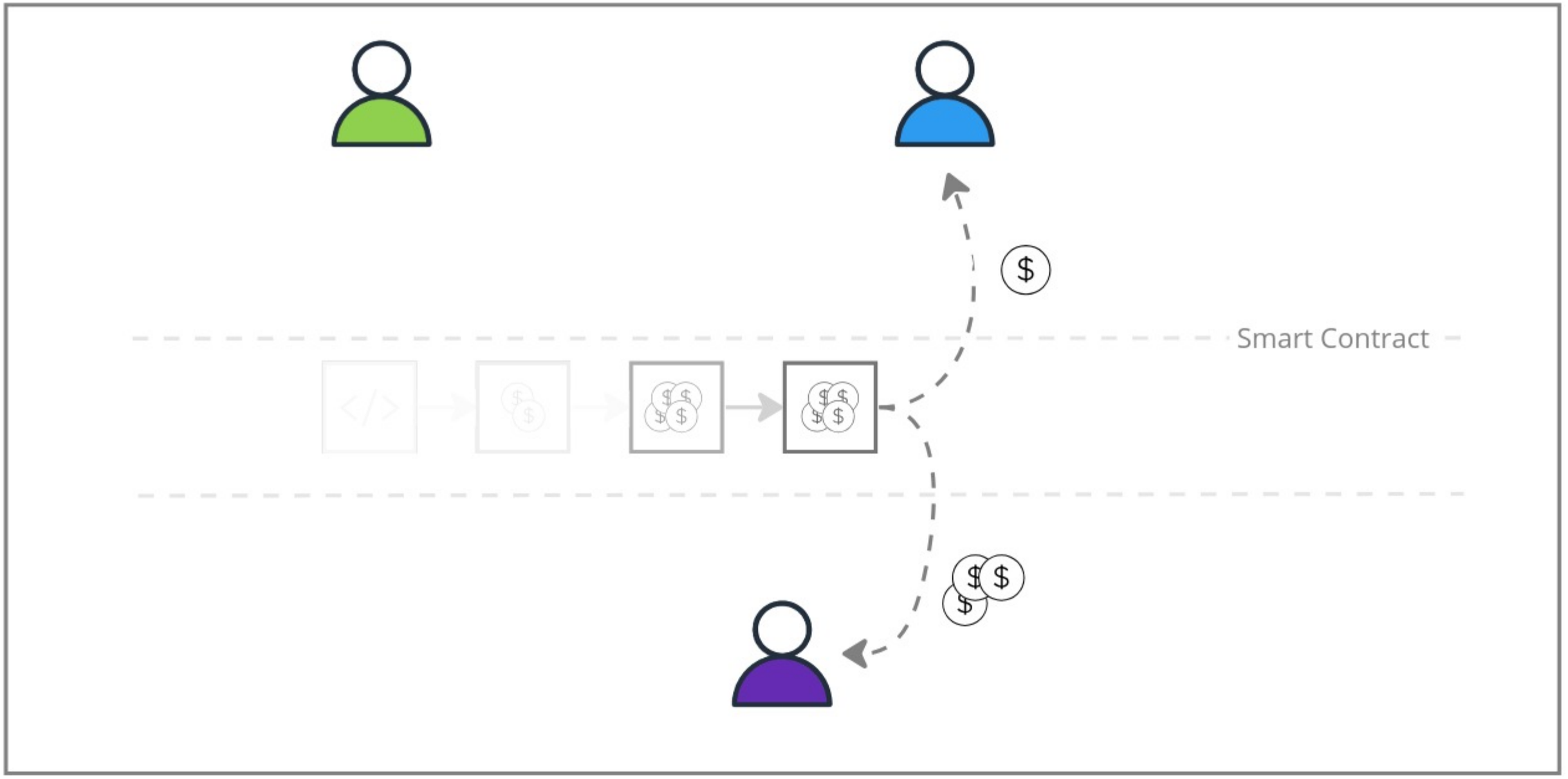


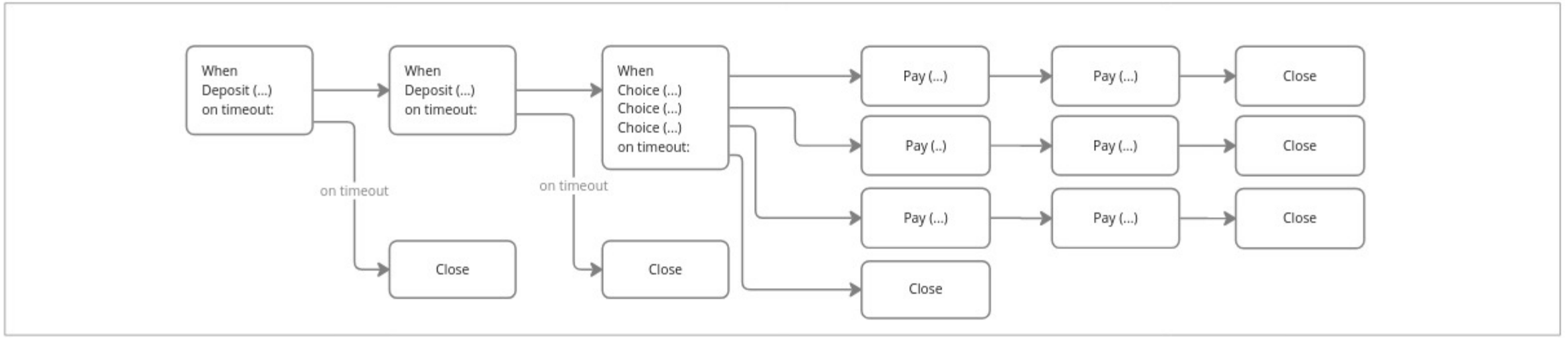
Example: "On-Chain Betting"



On-Chain Betting Benefits

- No up front deposits / account charging etc.
- Predictable cash flow
- Global reaching service
- Everything is transparent
- Arbiter (oracle) is the only trusted party in this setup
- Arbiter has reputation (whole business) at stake

Example: "On-Chain Betting"



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