Preventing Hacks with Security Rules Written in Solidity

```
for oracle price deviations
assertionOraclePrice() external {
orkPreState();
256 prePrice = oracle.price();
orkPostState();
256 postPrice = oracle.price();
256 deviation = (((postPrice > prePric
prePrice : prePrice - postPrice) * 10(

ire(deviation <= 10, "Price deviation
```

Odysseas Lamtzidis, Founder, Phylax Systems

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Solidity

Ethereum

Ethereum introduced Solidity for development

Foundry, Halmos

Expanded Testing

dapptools

Introduced Solidity for testing

Phylax

Introduced Solidity for invariant enforcement at runtime

```
contract ForkTest is Test {
    // the identifiers of the forks
    uint256 mainnetFork;
    uint256 optimismFork;

    //Access variables from .env file via vm.envString("varname")
    //Replace ALCHEMY_KEY by your alchemy key or Etherscan key, change RPC url if need
    //inside your .env file e.g:
    //MAINNET_RPC_URL = 'https://eth-mainnet.g.alchemy.com/v2/ALCHEMY_KEY'
    //string MAINNET_RPC_URL = vm.envString("MAINNET_RPC_URL");
    //string OPTIMISM_RPC_URL = vm.envString("OPTIMISM_RPC_URL");

    // create two _different_ forks during setup
    function setUp() public {
        mainnetFork = vm.createFork(MAINNET_RPC_URL);
        optimismFork = vm.createFork(OPTIMISM_RPC_URL);
    }

    // demonstrate fork ids are unique
    function testForkIdDiffer() public {
        assert(mainnetFork != optimismFork);
    }
}
```

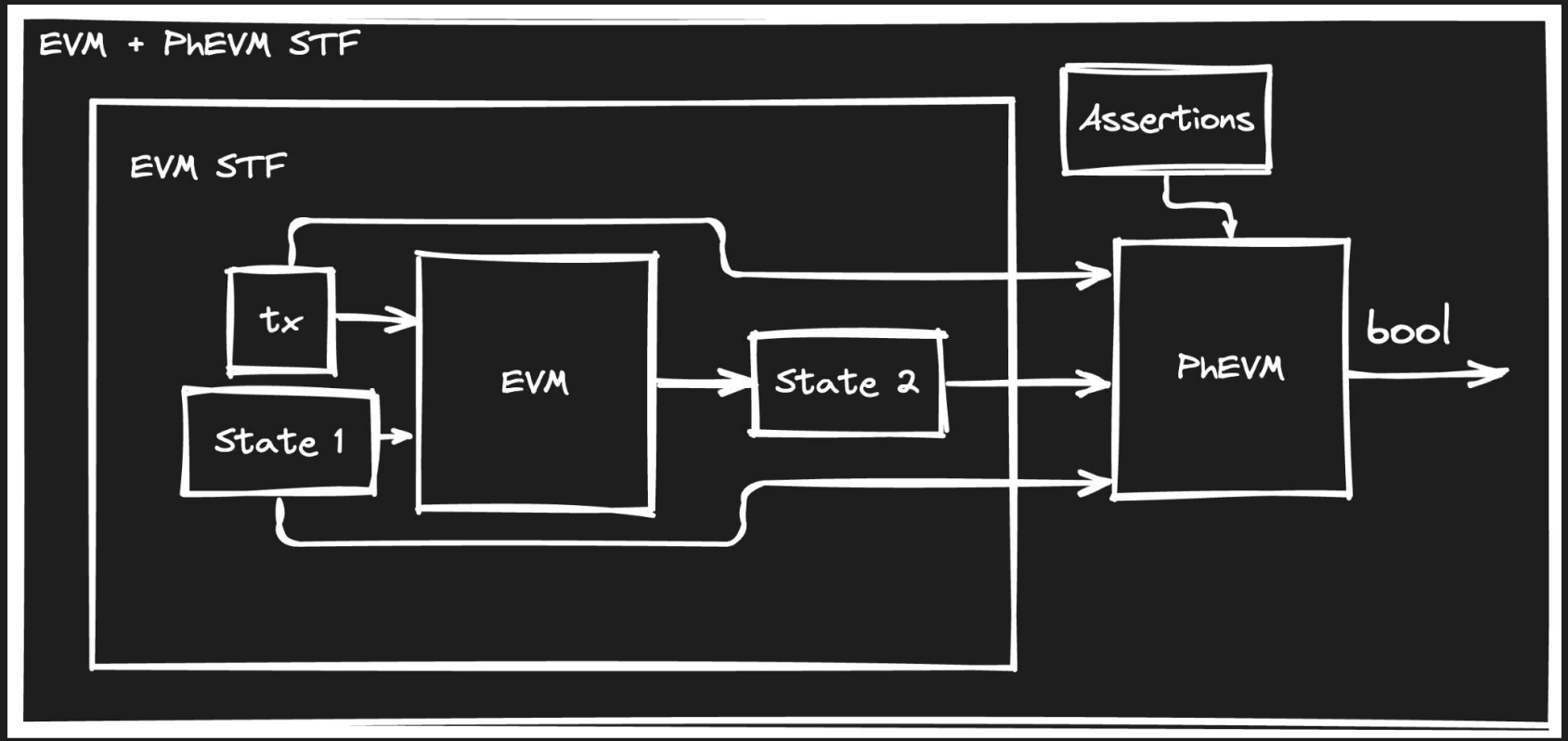
A fork test

```
forge test --fork-url
<your_rpc_url>
--fork-block-number 1
```

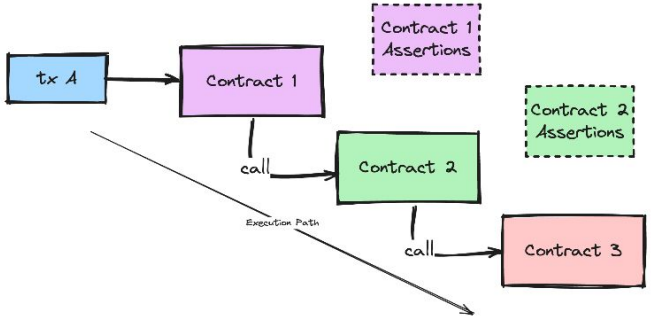
```
n=1
while [ $count -le 5 ]; do
  forge test --fork-url <your_rpc_url>
--fork-block-number n
  ((n++))
done
```

It’s a lame alert, but with great devex

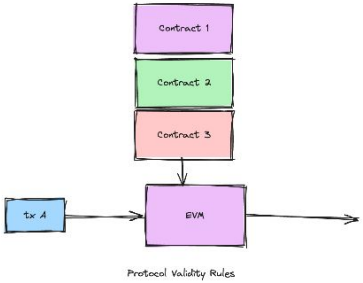
Alerts are lame, they are not preventative


EVM + PhEVM STF
EVM STF
tx
State 1
EVM
State 2
Assertions
PhEVM
bool

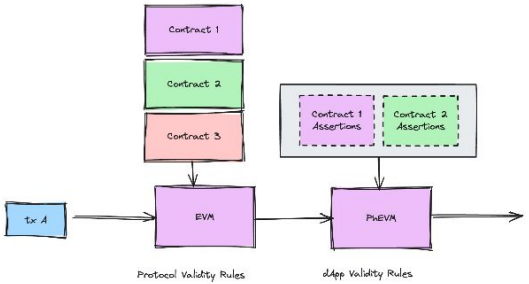
Different Transactions now have Different Validity Rules



BEFORE



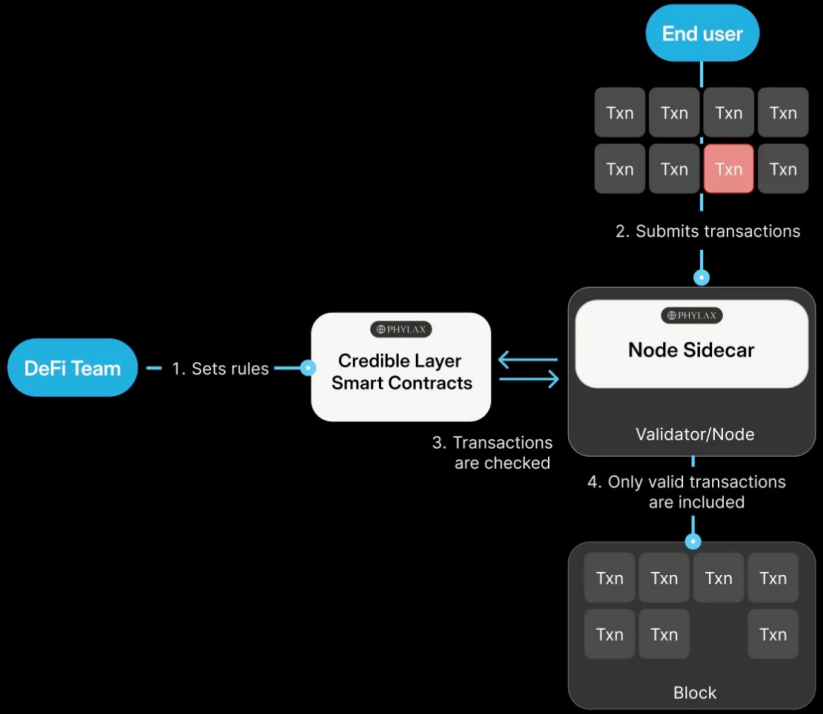
AFTER



Assertions are atomic, read-only EVM computations

They express the “what”
not the “how”

Lazily-executed fuzz test,
where the inputs are
generated by real users


End user
Txn
Txn
Txn
Txn
Txn
Txn
Txn
Txn
2. Submits transactions
PHYLAX
Node Sidecar
Validator/Node
DeFi Team
1. Sets rules
PHYLAX
Credible Layer
Smart Contracts
3. Transactions
are checked
4. Only valid transactions
are included
Txn
Txn
Txn
Txn
Txn
Txn
Txn
Block

If a user express an invariant as an Assertion, then we prevent hacks!

Balancer Hack

```
for (uint256 j = 0; j < uniquePoolIds.length; j++) {
    (address poolAddress, ) = IVault(vault).getPool(uniquePoolIds[j]);

    // Check rate before and after the batchSwap
    ph.forkPreCall(callInput.id);
    uint256 preRate = IRateProvider(poolAddress).getRate();

    ph.forkPostCall(callInput.id);
    uint256 postRate = IRateProvider(poolAddress).getRate();

    uint256 rateChangeMultiplier = (postRate * 1e18) / preRate;

    // Revert if rate changed by more than 3x
    require(
        rateChangeMultiplier ≤ MAX_RATE_CHANGE_MULTIPLIER &&
        rateChangeMultiplier ≥ MIN_RATE_CHANGE_MULTIPLIER,
        "BatchSwap: Extreme pool rate manipulation detected"
    );
}
```

Hereustic or Invariant?

Either works!

Let’s solve security so crypto can win.

Twitter: @odysseas_eth, Telegram: odyslam

to learn more check: **docs.phylax.systems**