

# SOLANA SMART CONTRACTS





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formerly Java developer  
interest in distributed systems

# WORKSHOP

<https://bit.ly/chkp-solana>

github @ chainkeepers/20220605\_solana\_contracts



It's  SOLANA

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**DON'T HAVE TO WORRY ABOUT BUGS**



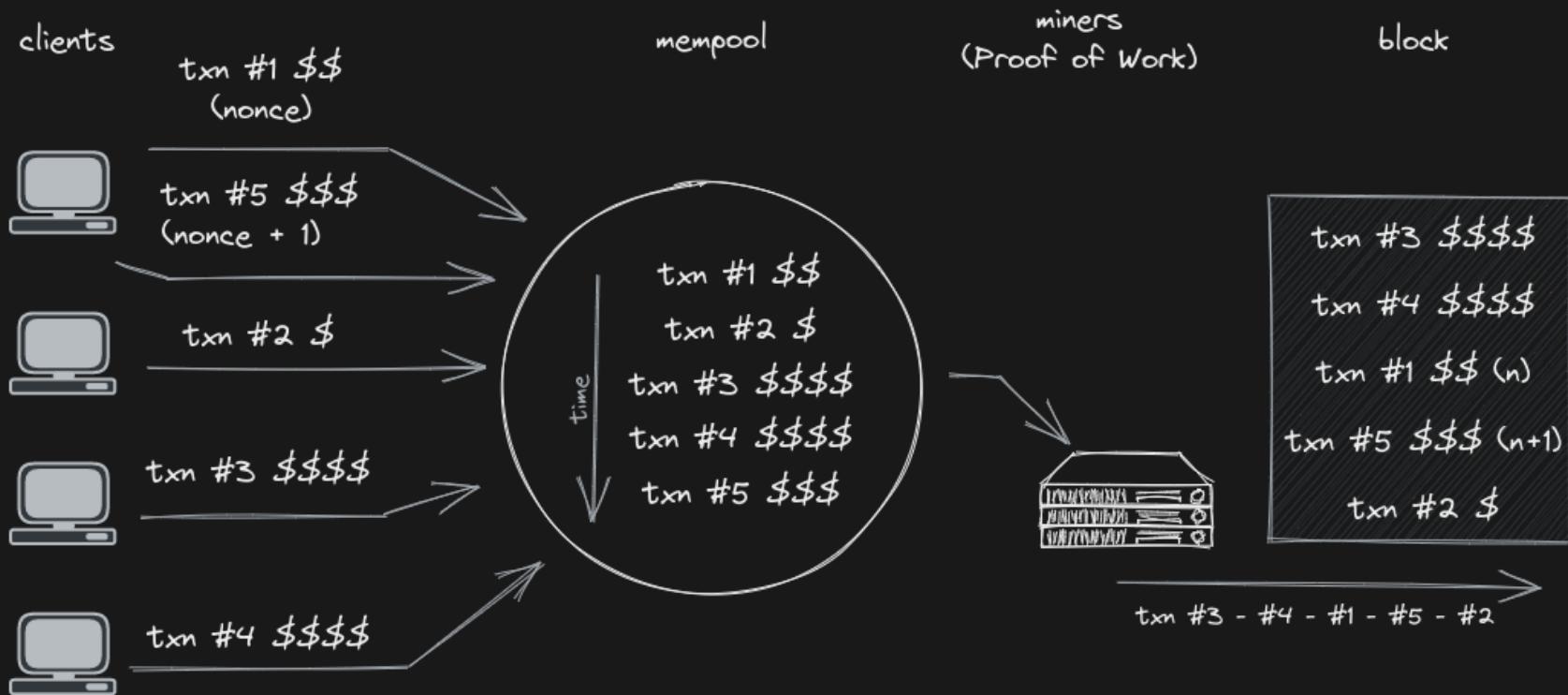
**IF YOU CAN JUST RESTART THE BLOCKCHAIN**

# AGENDA

1. Ethereum recap
2. Ethereum smart contract
3. Solana blockchain overview
4. Solana smart contract

# ETHEREUM RECAP

- transactions placed in mempool
- processing based on fees
- serial smart contract processing



# CODING TIME

memegenerator.net

etherium

# ETHEREUM SMART CONTRACTS

- data owned by contract  
(key-value store, LevelDB in Geth)
- difficult to upgrade when deployed
- usually Solidity programming language
- straightforward to work with



# 8 CORE INNOVATIONS

What Makes Solana The Web-Scale Blockchain

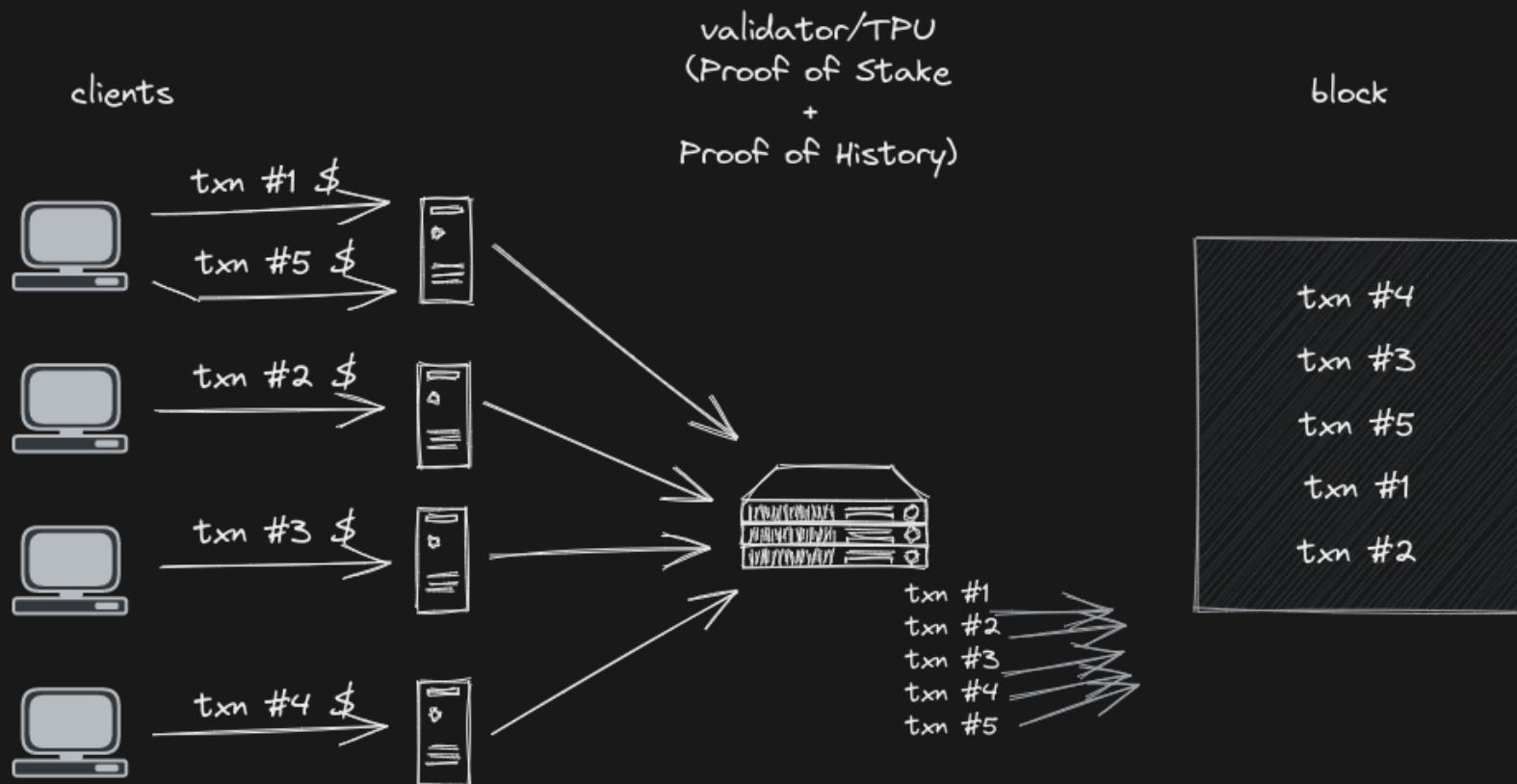


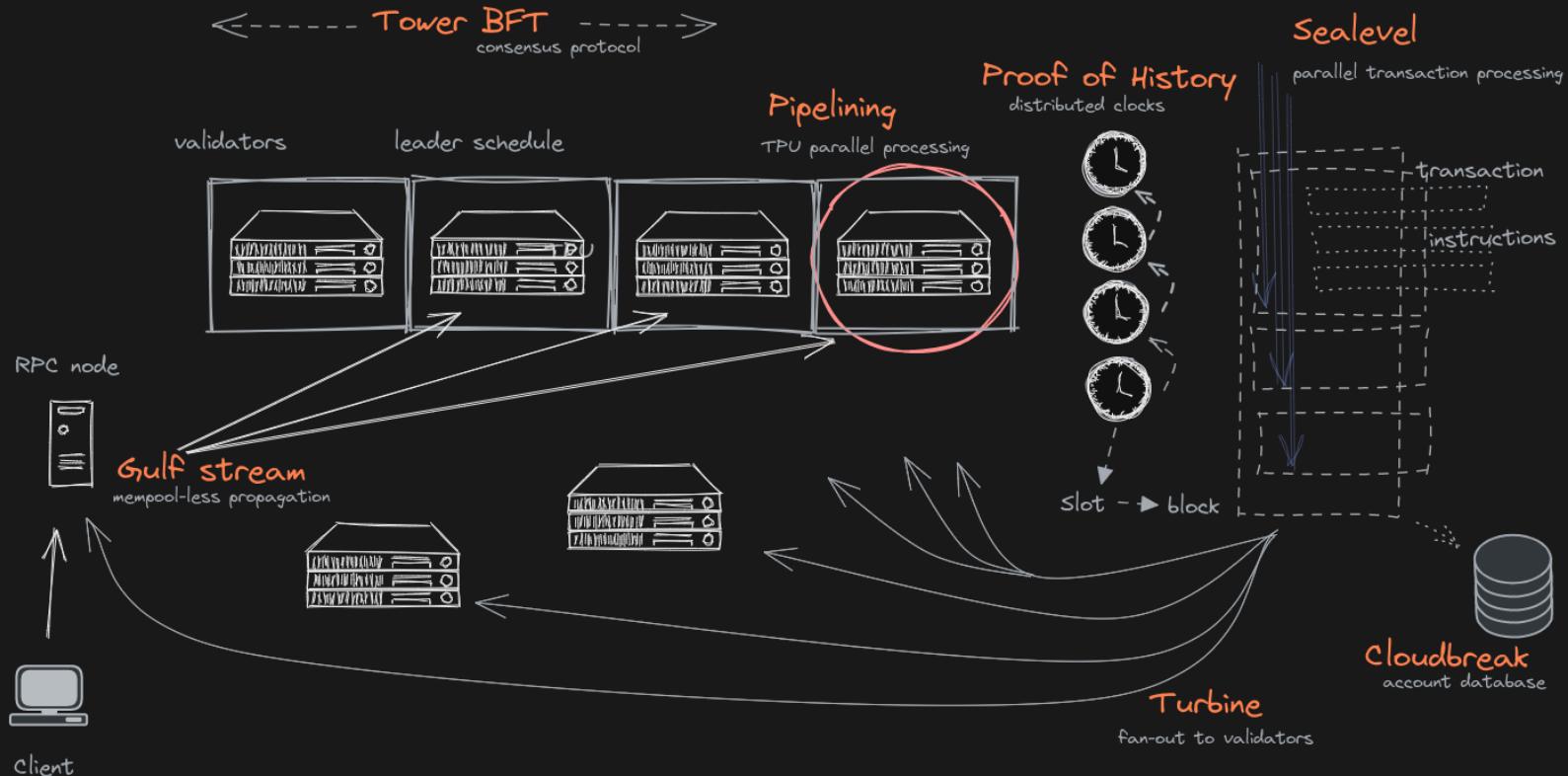
8 INNOVATIONS

8 Innovations that Make Solana the First Web-Scale Blockchain; Anatoly Yakovenko (2019)

# 8 CORE INNOVATIONS

- Proof of History (PoH) – clock before consensus
- Tower BFT – a PoH-optimized version of PBFT
- Turbine – a block propagation protocol
- Gulf Stream – Mempool-less transaction forwarding protocol
- Sealevel – Parallel smart contracts run-time
- Pipelining – a Txn Processing Unit for validation optimization
- Cloudbreak – Horizontally-Scaled Accounts Database
- Archivers – Distributed ledger storage





# PROGRAMMING MODEL

- Accounts
- Transactions
- Runtime
- Calling Between Programs

Solana Documentation: Programming Model

# ACCOUNTS

- everything is an account, everything is a program
- address, balance, owner, data
- rent paid for data storage

```
$ solana-keygen new -o /tmp/keypair.json  
>> HDjNVY5sVjfs8vUwBBXXhMu7j72EaEFcjiJW3ozBKZds  
$ solana transfer $(solana-keygen pubkey /tmp/keypair.json) 10
```



Address	<a href="#">HDjNVY5sVjfs8vUwBBXXhMu7j72EaEFcjiJW3ozBKZds</a>
Balance (SOL)	① 10
Allocated Data Size	0 byte(s)
Assigned Program Id	<a href="#">System Program</a>
Executable	No

# TRANSACTIONS

- formed by instructions
- price in number of signatures (0.000005)
- transaction size to fit MTU (1232 bytes)
- contains blockhash (valid for 150 blocks)

```
$ solana transfer $(solana-keygen pubkey /tmp/keypair.json) 10  
>> Signature: Ha3dQSwryhD2tXyf9VKPWNz xv3fXCB66NtjGx2hd5KegSrcx...
```



Signature	vLUJTTNVoYbnQaoEGHQfWrX12PNYuUvA6nVteuyK36BSn7XcCY9fdDDCKV7FTiZ8PUH7fnS76CEcQ1D1jy39K8J
Result	<span>Success</span>
Timestamp	May 31, 2022 at 19:34:05 Central European Summer Time
Confirmation Status	FINALIZED
Confirmations	MAX
Slot	92,220
Recent Blockhash	9oQToHCAkvSC4xvAVPu o4cxqPTMCVzykYPQWFFMP9ifq
Fee (SOL)	0.000005

## Account Input(s)

#	ADDRESS	CHANGE (SOL)	POST BALANCE (SOL)	DETAILS
1	CUuLjSEx7q3AB3sRGn3sMJBsSNTmULwowMGUh6NdsxQD	-@10.000005	@500,000,007.8403973	Fee Payer Writable Signer
2	HDjNVY5sVjfs8vUwBBXXhMu7j72EaEFcjiJW3ozBKZds	+@10	@30	Writable
3	System Program	0	@0.000000001	Program



## #1 System Program: Transfer

[Raw](#)

Program

[System Program](#)

From Address

[CUuLjSEx7q3AB3sRGn3sMJBsSNTmULwowMGUh6NdsxQD](#)

To Address

[HDjNVY5sVjf8vUwBBXhMu7j72EaEFcjiJW3ozBKZds](#)

Transfer Amount (SOL)

① 10

## Program Instruction Logs

#1 System Program Instruction ↴

> Program returned success

# RUNTIME

- accounts announced beforehand
- computational time limited

```
instructions = [
    TransactionInstruction(
        keys=[

            AccountMeta(
                is_signer=False, is_writable=False, pubkey=account.group_address
            ),
            AccountMeta(is_signer=False, is_writable=True, pubkey=account.address),
            AccountMeta(is_signer=True, is_writable=False, pubkey=wallet.address),
            AccountMeta(
                is_signer=False,
                is_writable=True,
                pubkey=perp_market_details.address,
            ),
            AccountMeta(
                is_signer=False, is_writable=True, pubkey=perp_market_details.bids
            ),
            AccountMeta(
                is_signer=False, is_writable=True, pubkey=perp_market_details.asks
            ),
        ],
        program_id=context.mango_program_address,
        data=data,
    )
]

return CombinableInstructions(signers=[], instructions=instructions)
```

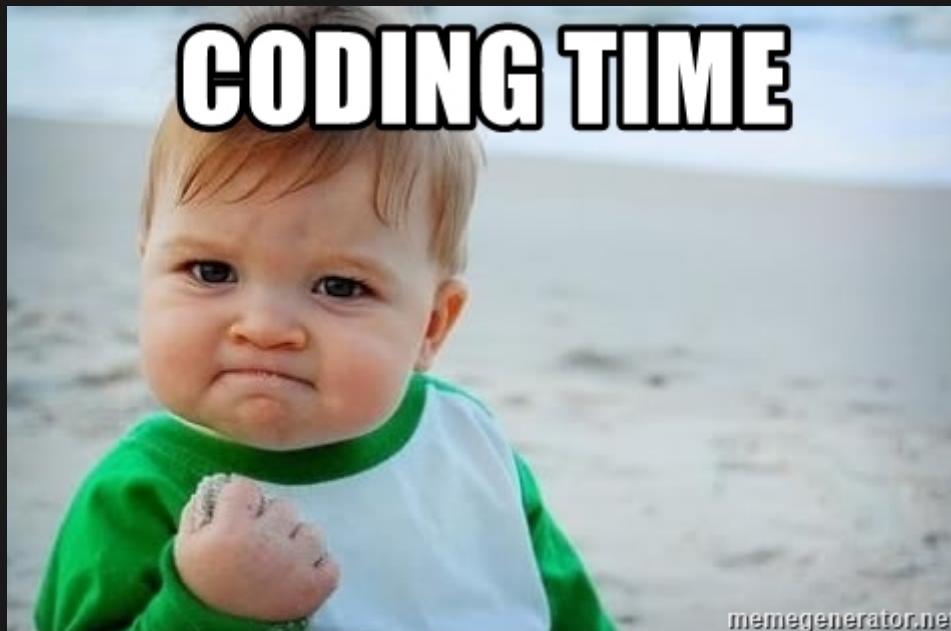
return CombinableInstructions(signers[], instructionsInstructions)

Sola

# SOLANA SMART CONTRACT

- Rust programming language
- Anchor framework

# CODING TIME



memegenerator.net



# SOLANA RECAP

- blockhash to send transaction
- account - balance, owner, data
- Rust + Anchor



Q & A