Mini-workshop

Zilliqa <> XXX

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Agenda

1. Introduction to Zilliqa Network
2. Scilla fundamentals
3. End-to-End Application Development

Introduction to Zilliqa Network

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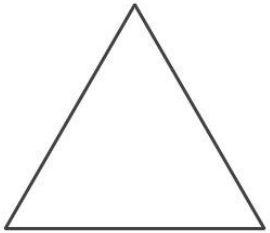
Low Latency Finality
Low Overhead
Small Number of Nodes



Low Latency Finality
High Overhead
Large Number of Nodes

High Latency Finality
Low Overhead
Large Number of Nodes

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What Zilliqa aims to achieve?

1. Reasonable latency for finality (1~2 mins)
2. Low overhead
3. Large number of nodes

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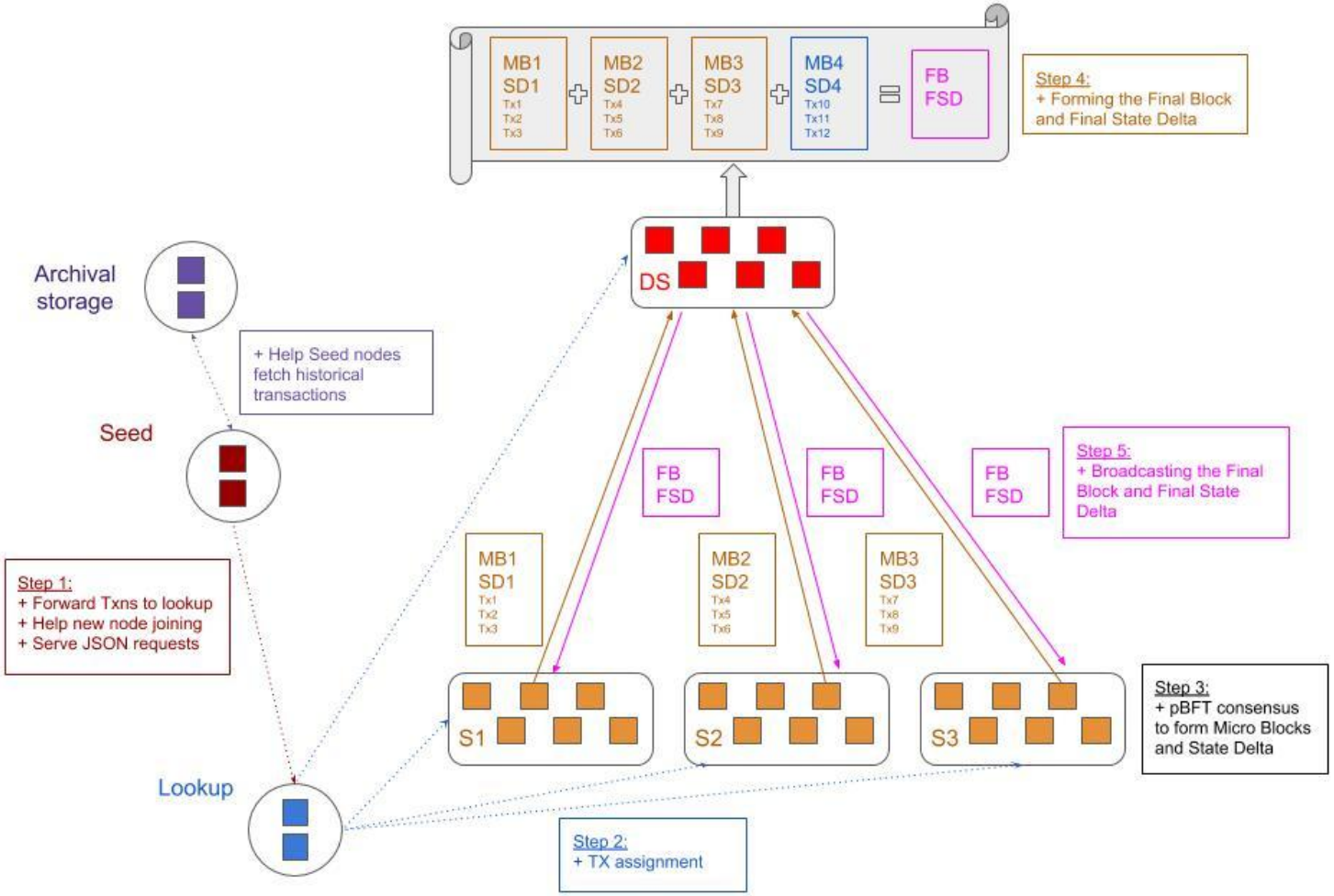
Types of nodes

1. Directory Service (DS) nodes
2. Shard nodes
3. Seed nodes
4. Lookup nodes
5. Archival nodes

Zilliqa's Network Topology



Scilla fundamentals

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Scilla Features

- NON-TURING COMPLETE
- DECIDABLE CONTRACTS

- AMENABLE TO FORMAL VERIFICATION
- CLEAN SEPARATION: COMMUNICATION VS COMPUTATION

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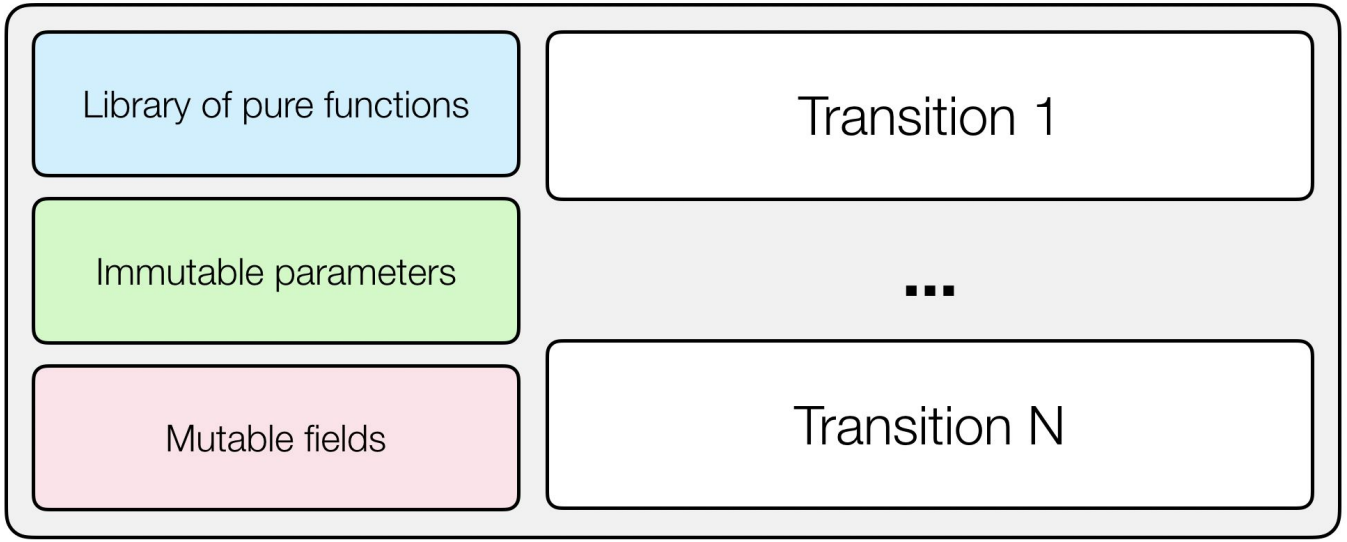
Scilla Basic Structure



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Scilla Basic Structure

```
scilla_version 0

library SampleContract

let one = Uint128 1

contract SampleContract
(owner : ByStr20)

field counter : Uint128 = Uint128 0

transition add ()
    (* Only contract owner can increment by 1 *)
    c <- counter;
    c = builtin add c one;
    counter := c
end
```

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Commonly used types

```
field OptionSample : Option Bool = None

field MapSample : Map ByStr20 Uint128 = Emp ByStr20 Uint128

field AddressSample : ByStr20 = "0x5fC7409B4b41e06e73BA1aA7f3127d93c76bD557"

field UintSample: Uint128 = Uint128 1000

field ListSample : List ByStr20 = let nil_address = Nil {ByStr20} in Cons {ByStr20} _this_address nil_address

field PairSample : Pair ByStr20 Uint128 = Pair {ByStr20 Uint128} _this_address _amount
```

Custom ADTs (Structs on steroids)

```
library Sample_ADT


(* Create a new type that includes sender address, recipient address, and amount sent *)
type Txn_info =
| Info of ByStr20 ByStr20 Uint128
| NoInfo
```

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Fungible token (ERC20) contract

Immutable variables

```
contract FungibleToken
(owner : ByStr20,
total_tokens : Uint128)
```

Mutable variables

```
field balances : Map ByStr20 Uint128
field allowed : Map ByStr20 (Map ByStr20 Uint128)
```

Transitions

```
transition BalanceOf ()
transition TotalSupply ()
transition Transfer (to : ByStr20, tokens : Uint128)
transition TransferFrom (from : ByStr20, to : ByStr20, tokens : Uint128)
transition Approve (spender : ByStr20, tokens : Uint128)
transition Allowance (tokenOwner : ByStr20, spender : ByStr20)
```

End-to-End Application Development

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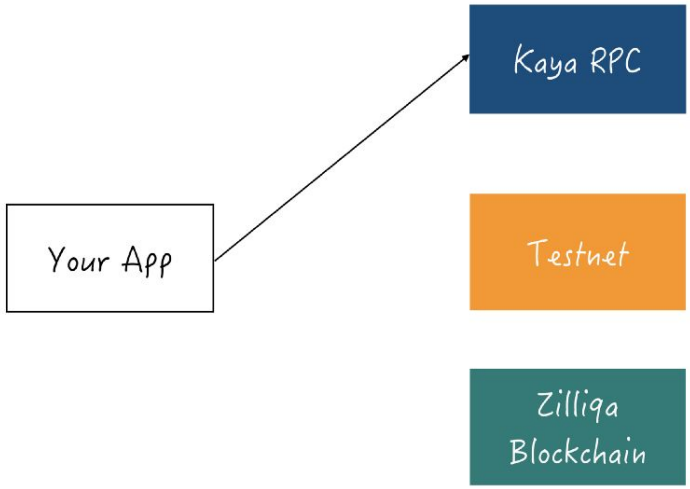
Process: From Conceptualization to Production



Kaya RPC: TestRPC for development and testing

```
edison@edison-zil ~/workspace/master-zilliqa/kaya  hotfix npm run debug:fixtur
es

> kaya-cli@0.2.5 debug:fixtures /Users/edison/workspace/master-zilliqa/kaya
> node src/server.js -f test/account-fixtures.json -v

ZILLIQA KAYA RPC SERVER (ver: 0.2.5)
Server listening on 127.0.0.1:4200
Running from local interpreter
================================================================================
[App.js]         : Bootstrapping from account fixture files: test/account-fixtures.jso
n
[Wallet]         : Valid accounts file
[Wallet]         : 10 wallets bootstrapped from file
Available Accounts
================================================================================
(1) 7bb3b0e8a59f3f61d9bff038f4aeb42cae2ecce8    (1000000 ZILs)  (Nonce: 0)
(2) d90f2e538ce0df89c8273cad3b63ec44a3c4ed82    (1000000 ZILs)  (Nonce: 0)
(3) 381f4008505e940ad7681ec3468a719060caf796    (1000000 ZILs)  (Nonce: 0)
(4) b028055ea3bc78d759d10663da40d171dec992aa    (1000000 ZILs)  (Nonce: 0)
(5) f6dad9e193fa2959a849b81caf9cb6ecde466771    (1000000 ZILs)  (Nonce: 0)
(6) 10200e3da08ee88729469d6eabc055cb225821e7    (1000000 ZILs)  (Nonce: 0)
(7) ac941274c3b6a50203cc5e7939b7dad9f32a0c12    (1000000 ZILs)  (Nonce: 0)
(8) ec902fe17d90203d0bddd943d97b29576ece3177    (1000000 ZILs)  (Nonce: 0)
(9) c2035715831ab100ec42e562ce341b834bed1f4c    (1000000 ZILs)  (Nonce: 0)
(10) 6cd3667ba79310837e33f0aecbe13688a6cbca32   (1000000 ZILs)  (Nonce: 0)

 Private Keys
================================================================================
(1) db11cfa086b92497c8ed5a4cc6edb3a5bfe3a640c43ffb9fc6aa0873c56f2ee3
(2) e53d1c3edaffc7a7bab5418eb836cf75819a82872b4a1a0f1c7fcf5c3e020b89
(3) d96e9eb5b782a80ea153c937fa83e5948485fbfc8b7e7c069d7b914dbc350aba
(4) e7f59a4beb997a02a13e0d5e025b39a6f0adc64d37bb1e6a849a4863b4680411
(5) 589417286a3213dceb37f8f89bd164c3505a4cec9200c61f7c6db13a30a71b45
(6) 5430365143ce0154b682301d0ab7318972219O6a7054bbf5bd83c7663a6cbc40
(7) 1080d2cca18ace8225354ac021f9977404cee46f1d12e9981af8c36322eac1a4
(8) 254d9924fc1dcdca44ce92d80255c6a0bb690f867abde80e626fbfef4d357004
(9) b8fc4e270594d87d3f728d0873a38fb0896ea83bd6f96b4f3c9ff0a29122efe4
(10) b87f4ba7dcd6e60f2cca8352c89904e3993c5b2b0b608d255002edcda6374de4
================================================================================
```

- Easy debugging tool with error traces
- Account management
- Save and resume state
- Supports most of the blockchain RPC calls

https://github.com/Zilliqa/kaya

Or

Npm install -g kaya-cli

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Useful JavaScript functions

package	description	Examples
`@zilliqa-js/core`	Core abstractions and base classes, such as `HTTPProvider` and network logic for interfacing with the Zilliqa JSON-RPC.	none
`@zilliqa-js/account`	Classes for managing accounts and account-related actions.	`Wallet`, `SignTransactions`
`@zilliqa-js/blockchain`	Main interface to the Zilliqa `JSON-RPC`.	`GetBlockchainInfo`, `CreateTransaction`
`@zilliqa-js/contract`	Classes for managing Scilla smart contracts on the Zilliqa blockchain.	`deploy`, `call`, `getState`
`@zilliqa-js/crypto`	Exposes several loosely-coupled cryptographic convenience functions for working with the Zilliqa blockchain and its cryptographic primitives, such as Schnorr signatures.	`generatePrivateKey`, `getAddressFromPrivateKey`
`@zilliqa-js/proto`	Protobuf source files and corresponding generated JS modules.	
`@zilliqa-js/util`	Miscellaneous functions that take care of serialisation/deserialisation and validation.	Verify addresses, private keys, etc

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Getting Started with JS

https://github.com/edisonljh/zilliqajs-starter

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Have interesting ideas? Apply for the innovation grant!


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Challenge (~2 hrs)

- Create a simple Tic-tac-toe Scilla contract that allows Users:
  - To play a single game of TTT
  - Keep track of which player’s turn in the ledger