Adding Validator Nodes to a Hyperledger Besu IBFT 2.0 Network

This document outlines the steps to add validator nodes to a running Hyperledger Besu IBFT 2.0 network. IBFT 2.0 is a consensus mechanism that provides a fault-tolerant, highly available, and secure blockchain network.

Prerequisites

Before adding validator nodes to the network, ensure you have the following:

- A running Hyperledger Besu IBFT 2.0 network with at least one validator node.
- Access to the Hyperledger Besu CLI (Command Line Interface) on the validator nodes.
- A list of validator nodes' enode URLs that you want to add to the network.

Step 1: Create Directories

On each new validator node, create a directory to store the Hyperledger Besu data:

```
mkdir -p ~/besu-validator/data
```

Create a directory to store the Hyperledger Besu configuration files:

```
mkdir -p ~/besu-validator/config
```

Step 2: Generate Node Keys

On each new validator node, use the Hyperledger Besu CLI to generate a new node key:

```
besu operator generate-node-key --to=data/nodeKey
```

This command will generate a new node key and store it in the data/nodeKey file within the besu-validator directory.

Step 3: Update the IBFT 2.0 Configuration

Create an ibftConfigFile.json file in the ~/besu-validator/config directory. The file should include the initial validator nodes' enode URLs and the new validator nodes' enode URLs. The format should be as follows:

```
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  "config": {
    "chainId": 262,
    "constantinoplefixblock": 0,
    "ibft2": {
      "blockperiodseconds": 2,
      "epochlength": 30000,
      "requesttimeoutseconds": 10,
      "blockreward": "920000000000000000"
    },
    "transitions": {
      "ibft2": [
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          "block": 15000001,
          "blockperiodseconds": 2,
          "epochlength": 30000,
          "requesttimeoutseconds": 10,
          "blockreward": "960000000000000000"
        },
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          "block": 30000001,
          "blockperiodseconds": 2,
          "epochlength": 30000,
          "requesttimeoutseconds": 10,
          "blockreward": "1200000000000000000"
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          "blockperiodseconds": 2,
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          "requesttimeoutseconds": 10,
          "blockreward": "1270000000000000000"
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          "requesttimeoutseconds": 10,
          "blockreward": "1230000000000000000"
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          "blockperiodseconds": 2,
          "epochlength": 30000,
          "requesttimeoutseconds": 10,
          "blockreward": "1120000000000000000"
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          "blockperiodseconds": 2,
          "epochlength": 30000,
          "requesttimeoutseconds": 10,
          "blockreward": "950000000000000000"
        },
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          "blockperiodseconds": 2,
          "epochlength": 30000,
          "requesttimeoutseconds": 10,
          "blockreward": "800000000000000000"
        },
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          "blockperiodseconds": 2,
          "epochlength": 30000,
          "requesttimeoutseconds": 10,
          "blockreward": "680000000000000000"
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        },
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          "blockperiodseconds": 2,
          "epochlength": 30000,
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          "blockreward": "0"
        }
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    }
  },
  "nonce": "0x0",
  "timestamp": "0x0",
  "extraData":
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  "difficulty": "0x1",
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"0xdd428aa8b761c7b98635aea0b7e5b8b8dbbe14ea"
      }
    }
  }
}
```

Replace <chain_id> with your network's chain ID and <extra_data> with the RLP-encoded list of initial validator nodes' and new validator nodes' enode URLs.

Update the existing validator nodes' configuration files with the new validator nodes' enode URLs.

Step 4: Start the New Validator Nodes

On each new validator node, start Hyperledger Besu with the following command:

```
besu --data-path=~/besu-validator/data \
--genesis-file=~/besu-validator/config/ibftConfigFile.json \
--rpc-http-enabled --rpc-http-api=ETH,NET,IBFT \
--host-allowlist="*" \
--rpc-http-cors-origins="all" \
--network-id=<network_id> \
--p2p-host=<node_ip_address> \
--p2p-port=<p2p_port> \
--rpc-http-host=<rpc_host> \
--rpc-http-port=<rpc_port> \
--min-gas-price=0 \
--sync-mode=FAST
```

Replace <network_id> with your network's ID, <node_ip_address> with the new validator node's IP address, <p2p_port> with the new validator node's P2P port, <rpc_host> with the new validator node's RPC host, and <rpc_port> with the new validator node's RPC port.

This command starts the new validator node and connects it to the IBFT 2.0 network.

Step 5: Propose New Validators

On an existing validator node, propose each new validator node using the following command:

```
besu --rpc-http-enabled --rpc-http-api=ETH,NET,IBFT rpc-ibft_proposeValidatorVote
<new_validator_enode_url> true
```

Replace <new_validator_enode_url> with the new validator node's enode URL. This command proposes the new validator node to join the network.

Repeat this step for each new validator node you want to add to the network.

Check the current validator list to ensure the new validator nodes have been added:

```
besu --rpc-http-enabled --rpc-http-api=ETH,NET,IBFT rpc-ibft_getValidatorsByBlockNumber "latest"
```

This command retrieves the current validator list for the latest block. Verify that the new validator nodes' enode URLs appear in the list.

Once the new validator nodes have been added, they will participate in the consensus process and start validating new blocks.

Conclusion

You have now successfully added new validator nodes to a running Hyperledger Besu IBFT 2.0 network. These validator nodes will participate in the consensus process, helping to maintain a fault-tolerant, highly available, and secure blockchain network.

Adding Validator Nodes to a Hyperledger Besu IBFT 2.0 Network Using APIs

This document outlines the steps to add validator nodes to a running Hyperledger Besu IBFT 2.0 network using APIs. IBFT 2.0 is a consensus mechanism that provides a fault-tolerant, highly available, and secure blockchain network.

Prerequisites

Before adding validator nodes to the network, ensure you have the following:

- A running Hyperledger Besu IBFT 2.0 network with at least one validator node.
- Access to the Hyperledger Besu CLI (Command Line Interface) on the validator nodes.
- A list of validator nodes' enode URLs that you want to add to the network.
- A tool to send HTTP requests, such as curl or Postman.

Step 1: Set up the New Validator Nodes

Follow steps 1-4 from the previous document to set up the new validator nodes and start them.

Step 2: Propose New Validators Using the IBFT 2.0 API

On an existing validator node, propose each new validator node using an HTTP request:

```
curl -X POST -H "Content-Type: application/json" --data
'{"jsonrpc":"2.0","method":"ibft_proposeValidatorVote","params":["<new_validator_enode_url>",
true],"id":1}' http://<rpc_host>:<rpc_port>
```

Replace <new_validator_enode_url> with the new validator node's enode URL, <rpc_host> with the existing validator node's RPC host, and <rpc_port> with the existing validator node's RPC port. This request proposes the new validator node to join the network.

Repeat this step for each new validator node you want to add to the network.

Check the current validator list to ensure the new validator nodes have been added using an HTTP request:

```
curl -X POST -H "Content-Type: application/json" --data
'{"jsonrpc":"2.0","method":"ibft_getValidatorsByBlockNumber","params":["latest"],"id":1}'
http://<rpc_host>:<rpc_port>
```

Replace <rpc_host> with the existing validator node's RPC host and <rpc_port> with the existing validator node's RPC port. This request retrieves the current validator list for the latest block. Verify that the new validator nodes' enode URLs appear in the list.

Once the new validator nodes have been added, they will participate in the consensus process and start validating new blocks.

Conclusion

You have now successfully added new validator nodes to a running Hyperledger Besu IBFT 2.0 network using APIs. These validator nodes will participate in the consensus process, helping to maintain a fault-tolerant, highly available, and secure blockchain network.