PRACTICAL: 4

AIM:

Block.one: Creating a Multi Node EOSIO Blockchain

THEORY:

EOSIO is a high-performance, open-source blockchain platform designed for building and deploying decentralized applications (dApps). It supports smart contracts and offers near-instant transaction processing with minimal fees. The EOSIO ecosystem relies on several key components like nodeos, cleos, and keosd to manage blockchain operations.

In a **single-node blockchain**, all operations—block production, validation, and transactions—are handled by a single instance of nodeos. While this setup is useful for development or testing, it doesn't reflect how real-world blockchains operate, which typically involve **multiple interconnected nodes** to ensure **redundancy**, **consensus**, and **fault tolerance**.

A **multi-node EOSIO blockchain** replicates the behavior of a decentralized network. Each node can serve a different role—such as a block producer, peer, or API endpoint—and they communicate through peer-to-peer (P2P) protocols.

Key Components in EOSIO

- **nodeos**: The core daemon that runs an EOSIO node. It can produce blocks, validate transactions, and store blockchain data.

- **cleos**: A command-line tool used to interact with the blockchain. It allows developers to create accounts, deploy smart contracts, and transfer tokens.

- **keosd**: The wallet daemon that securely manages private keys needed for signing transactions.

System Contracts

EOSIO uses **system smart contracts** to manage core functionalities such as:

- **eosio.bios**: Helps with initial blockchain bootstrapping.

- **eosio.token**: Manages token creation and transfers.

- **eosio.system**: Implements governance rules like voting and staking.

Deploying a multi-node blockchain is essential for understanding how decentralized networks function. It provides:

- **Redundancy**: If one node fails, others continue operating.

- **Scalability**: Load can be distributed across nodes.

- **Security**: Multiple nodes make the system harder to compromise.

- **Realistic Testing**: It simulates a real blockchain environment with inter-node communication.

CODE:

```
•   sudo apt update
•   curl -LO https://github.com/eosio/eos/releases/download/v2.1.0/eosio_2.1.0-1-ubuntu-
    20.04_amd64.deb
•   sudo apt install ./eosio_2.1.0-1-ubuntu-20.04_amd64.deb
•   nodeos –version
•   cleos version client
•   keosd -v
•   keosd --unlock-timeout 999999999 &
•   cleos wallet create --file my_wallet_password
•   cleos wallet list
•   cleos wallet open
•   cleos wallet unlock <my_wallet_password
•   cleos wallet import --private-key
    5KQwrPbwdL6PhXujxW37FSSQZ1JiwsST4cqQzDeyXtP79zkvFD3
•   sudo apt install build-essential
•   curl -LO https://github.com/eosio/eosio.cdt/releases/download/v1.8.1/eosio.cdt_1.8.1-1-
    ubuntu-18.04_amd64.deb
•   sudo apt install ./eosio.cdt_1.8.1-1-ubuntu-18.04_amd64.deb
•   eosio-cpp –version
•   sudo apt install cmake
•   git clone https://github.com/EOSIO/eosio.contracts.git \   --branch release/1.9.x --single-
    branch
•   cd eosio.contracts
•   ./build.sh -e /usr/opt/eosio/2.1.0 -c /usr/opt/eosio.cdt/1.8.1
•   cd ~
•   git clone https://github.com/EOSIO/eos.git \
•   --branch release/2.1.x --single-branch
•   cd eos/contracts/contracts/eosio.boot
•   cmake .
•   make
•   cd ~
•   mkdir nodes
•   cat >nodes/genesis.json
•   cat nodes/genesis.json
•   mkdir nodes/00-boot
•   tail -f nodes/00-boot/00.log
•   cleos get account eosio
•   cleos create account eosio eosio.bpay
    EOS6MRyAjQq8ud7hVNYcfnVPJqcVpscN5So8BhtHuGYqET5GDW5CV
•   cleos create account eosio eosio.msig
    EOS6MRyAjQq8ud7hVNYcfnVPJqcVpscN5So8BhtHuGYqET5GDW5CV
•   cleos create account eosio eosio.names
    EOS6MRyAjQq8ud7hVNYcfnVPJqcVpscN5So8BhtHuGYqET5GDW5CV
```

- cleos create account eosio eosio.ram
  EOS6MRyAjQq8ud7hVNYcfnVPJqcVpscN5So8BhtHuGYqET5GDW5CV
- cleos create account eosio eosio.ramfee
  EOS6MRyAjQq8ud7hVNYcfnVPJqcVpscN5So8BhtHuGYqET5GDW5CV
- cleos create account eosio eosio.saving
  EOS6MRyAjQq8ud7hVNYcfnVPJqcVpscN5So8BhtHuGYqET5GDW5CV
- cleos create account eosio eosio.stake
  EOS6MRyAjQq8ud7hVNYcfnVPJqcVpscN5So8BhtHuGYqET5GDW5CV
- cleos create account eosio eosio.token
  EOS6MRyAjQq8ud7hVNYcfnVPJqcVpscN5So8BhtHuGYqET5GDW5CV
- cleos create account eosio eosio.vpay
  EOS6MRyAjQq8ud7hVNYcfnVPJqcVpscN5So8BhtHuGYqET5GDW5CV
- cleos create account eosio eosio.rex
  EOS6MRyAjQq8ud7hVNYcfnVPJqcVpscN5So8BhtHuGYqET5GDW5CV
- cleos set contract eosio.token ~/eosio.contracts/build/contracts/eosio.token/
- cleos set contract eosio.msig ~/eosio.contracts/build/contracts/eosio.msig/
- cleos push action eosio.token create '["eosio", "10000000000.0000 SYS"]' -p eosio.token
- cleos push action eosio.token issue '["eosio", "1000000000.0000 SYS", "memo"]' -p eosio
- sudo apt install jq
- curl -X POST http://127.0.0.1:8888/v1/producer/get_supported_protocol_features -d
  '{"exclude_disabled": false, "exclude_unactivatable": false}' | jq | more
- curl -X POST http://127.0.0.1:8888/v1/producer/schedule_protocol_feature_activations -d
  '{"protocol_features_to_activate":
  ["0ec7e080177b2c02b278d5088611686b49d739925a92d9bfcacd7fc6b74053bd"]}'
- cleos set contract eosio ~/eos/contracts/contracts/eosio.boot/
- # KV_DATABASE
- cleos push action eosio activate
  '["825ee6288fb1373eab1b5187ec2f04f6eacb39cb3a97f356a07c91622dd61d16"]' -p eosio
- # ACTION_RETURN_VALUE
- cleos push action eosio activate
  '["c3a6138c5061cf291310887c0b5c71fcaffeab90d5deb50d3b9e687cead45071"]' -p eosio
- # CONFIGURABLE_WASM_LIMITS
- cleos push action eosio activate
  '["bf61537fd21c61a60e542a5d66c3f6a78da0589336868307f94a82bccea84e88"]' -p eosio
- # BLOCKCHAIN_PARAMETERS
- cleos push action eosio activate
  '["5443fcf88330c586bc0e5f3dee10e7f63c76c00249c87fe4fbf7f38c082006b4"]' -p eosio
- # GET_SENDER
- cleos push action eosio activate
  '["f0af56d2c5a48d60a4a5b5c903edfb7db3a736a94ed589d0b797df33ff9d3e1d"]' -p eosio
- # FORWARD_SETCODE
- cleos push action eosio activate
  '["2652f5f96006294109b3dd0bbde63693f55324af452b799ee137a81a905eed25"]' -p eosio
- # ONLY_BILL_FIRST_AUTHORIZER
- cleos push action eosio activate
  '["8ba52fe7a3956c5cd3a656a3174b931d3bb2abb45578befc59f283ecd816a405"]' -p eosio
- # RESTRICT_ACTION_TO_SELF
- cleos push action eosio activate
  '["ad9e3d8f650687709fd68f4b90b41f7d825a365b02c23a636cef88ac2ac00c43"]' -p eosio

- # DISALLOW_EMPTY_PRODUCER_SCHEDULE
- cleos push action eosio activate '["68dcaa34c0517d19666e6b33add67351d8c5f69e999ca1e37931bc410a297428"]' -p eosio
- # FIX_LINKAUTH_RESTRICTION
- cleos push action eosio activate '["e0fb64b1085cc5538970158d05a009c24e276fb94e1a0bf6a528b48fbc4ff526"]' -p eosio
- # REPLACE_DEFERRED
- cleos push action eosio activate '["ef43112c6543b88db2283a2e077278c315ae2c84719a8b25f25cc88565fbea99"]' -p eosio
- # NO_DUPLICATE_DEFERRED_ID
- cleos push action eosio activate '["4a90c00d55454dc5b059055ca213579c6ea856967712a56017487886a4d4cc0f"]' -p eosio
- # ONLY_LINK_TO_EXISTING_PERMISSION
- cleos push action eosio activate '["1a99a59d87e06e09ec5b028a9cbb7749b4a5ad8819004365d02dc4379a8b7241"]' -p eosio
- # RAM_RESTRICTIONS
- cleos push action eosio activate '["4e7bf348da00a945489b2a681749eb56f5de00b900014e137ddae39f48f69d67"]' -p eosio
- # WEBAUTHN_KEY
- cleos push action eosio activate '["4fca8bd82bbd181e714e283f83e1b45d95ca5af40fb89ad3977b653c448f78c2"]' -p eosio
- # WTMSIG_BLOCK_SIGNATURES
- cleos push action eosio activate '["299dcb6af692324b899b39f16d5a530a33062804e41f09dc97e9f156b4476707"]' -p eosio
- cleos set contract eosio ~/eosio.contracts/build/contracts/eosio.system/
- cleos push action eosio setpriv '["eosio.msig", 1]' -p eosio
- cleos push action eosio init '["0", "4,SYS"]' -p eosio
- cleos wallet import --private-key 5KLGj1HGRWbk5xNmoKfrcrQHXvcVJBPdAckoiJgFftXSJjLPp7b
- cleos wallet import --private-key 5K6qk1KaCYYWX86UhAfUsbMwhGPUqrqHrZEQDjs9ekP5j6LgHUu
- cleos wallet import --private-key 5JCStvbRgUZ6hjyfUiUaxt5iU3HP6zC1kwx3W7SweaEGvs4EPfQ
- cleos wallet import --private-key 5JJjaKnAb9KM2vkkJDgrYXoeUEdGgWtB5WK1a38wrmKnS3KtkS6
- cleos system newaccount --transfer eosio producer.one EOS8imf2TDq6FKtLZ8mvXPWcd6EF2rQwo8zKdLNzsbU9EiMSt9Lwz --stake-net "50000000.0000 SYS" --stake-cpu "50000000.0000 SYS" --buy-ram-kbytes 8192
- cleos system newaccount --transfer eosio producer.two EOS7Ef4kuyTbXbtSPP5Bgethvo6pbitpuEz2RMWhXb8LXxEgcR7MC --stake-net "50000000.0000 SYS" --stake-cpu "50000000.0000 SYS" --buy-ram-kbytes 8192
- cleos system newaccount --transfer eosio produc.three EOS5n442Qz4yVc4LbdPCDnxNSseAiUCrNjRxAfPhUvM8tWS5svid6 --stake-net "50000000.0000 SYS" --stake-cpu "50000000.0000 SYS" --buy-ram-kbytes 8192
- cleos system newaccount --transfer eosio produce.four EOS5y3Tm1czTCia3o3JidVKmC78J9gRQU8qHjmRjFxTyhh2vxvF5d --stake-net "50000000.0000 SYS" --stake-cpu "50000000.0000 SYS" --buy-ram-kbytes 8192
- cleos system regproducer producer.one EOS8imf2TDq6FKtLZ8mvXPWcd6EF2rQwo8zKdLNzsbU9EiMSt9Lwz

https://producer.one.com/EOS8imf2TDq6FKtLZ8mvXPWcd6EF2rQwo8zKdLNzsbU9EiMSt9Lwz

- cleos system regproducer producer.two
EOS7Ef4kuyTbXbtSPP5Bgethvo6pbitpuEz2RMWhXb8LXxEgcR7MC
https://producer.two.com/EOS7Ef4kuyTbXbtSPP5Bgethvo6pbitpuEz2RMWhXb8LXxEgcR7MC
- cleos system regproducer produc.three
EOS5n442Qz4yVc4LbdPCDnxNSseAiUCrNjRxAfPhUvM8tWS5svid6
https://produc.three.com/EOS5n442Qz4yVc4LbdPCDnxNSseAiUCrNjRxAfPhUvM8tWS5svid6
- cleos system regproducer produce.four
EOS5y3Tm1czTCia3o3JidVKmC78J9gRQU8qHjmRjFxTyhh2vxvF5d
https://produce.four.com/EOS5y3Tm1czTCia3o3JidVKmC78J9gRQU8qHjmRjFxTyhh2vxvF5d
- cleos system listproducers
- mkdir nodes/01-node nodes/02-node nodes/03-node nodes/04-node
- nodeos \
- --plugin eosio::http_plugin --plugin eosio::chain_api_plugin --plugin eosio::chain_plugin --plugin eosio::producer_api_plugin --plugin eosio::producer_plugin --plugin eosio::history_plugin --plugin eosio::history_api_plugin --plugin eosio::net_api_plugin \
- --contracts-console \
- --max-transaction-time=200 \
- --chain-state-db-size-mb 1024 \
- --enable-stale-production \
- --producer-name producer.one \
- --genesis-json ~/nodes/genesis.json \
- --blocks-dir ~/nodes/01-node/blocks \
- --config-dir ~/nodes/01-node \
- --data-dir ~/nodes/01-node \
- --http-server-address 127.0.0.1:8889 \
- --p2p-listen-endpoint 127.0.0.1:9877 \
- --signature-provider
EOS8imf2TDq6FKtLZ8mvXPWcd6EF2rQwo8zKdLNzsbU9EiMSt9Lwz=KEY:5KLGj1HGRWbk5xNmoKfrcrQHXvcVJBPdAckoiJgFftXSJjLPp7b \
- --p2p-peer-address 127.0.0.1:9876 \
- >>~/nodes/01-node/01.log 2>&1 &
- cat nodes/01-node/01.log | grep :9876 -C 3
- nodeos \
- --plugin eosio::http_plugin --plugin eosio::chain_api_plugin --plugin eosio::chain_plugin --plugin eosio::producer_api_plugin --plugin eosio::producer_plugin --plugin eosio::history_plugin --plugin eosio::history_api_plugin --plugin eosio::net_api_plugin \
- --contracts-console \
- --max-transaction-time=200 \
- --chain-state-db-size-mb 1024 \
- --enable-stale-production \
- --producer-name producer.two \
- --genesis-json ~/nodes/genesis.json \
- --blocks-dir ~/nodes/02-node/blocks \
- --config-dir ~/nodes/02-node \

- --data-dir ~/nodes/02-node \
- --http-server-address 127.0.0.1:8890 \
- --p2p-listen-endpoint 127.0.0.1:9878 \
- --signature-provider
  EOS7Ef4kuyTbXbtSPP5Bgethvo6pbitpuEz2RMWhXb8LXxEgcR7MC=KEY:5K6qk1KaCY
  YWX86UhAfUsbMwhGPUqrqHrZEQDjs9ekP5j6LgHUu \
- --p2p-peer-address 127.0.0.1:9876 \
- --p2p-peer-address 127.0.0.1:9877 \
- >>~/nodes/02-node/02.log 2>&1 &
- cat nodes/02-node/02.log | grep :9877 -C 3
- nodeos \
- --plugin eosio::http_plugin --plugin eosio::chain_api_plugin --plugin eosio::chain_plugin --plugin eosio::producer_api_plugin --plugin eosio::producer_plugin --plugin eosio::history_plugin --plugin eosio::history_api_plugin --plugin eosio::net_api_plugin \
- --contracts-console \
- --max-transaction-time=200 \
- --chain-state-db-size-mb 1024 \
- --enable-stale-production \
- --producer-name produc.three \
- --genesis-json ~/nodes/genesis.json \
- --blocks-dir ~/nodes/03-node/blocks \
- --config-dir ~/nodes/03-node \
- --data-dir ~/nodes/03-node \
- --http-server-address 127.0.0.1:8891 \
- --p2p-listen-endpoint 127.0.0.1:9879 \
- --signature-provider
  EOS5n442Qz4yVc4LbdPCDnxNSseAiUCrNjRxAfPhUvM8tWS5svid6=KEY:5JCStvbRgU
  Z6hjyfUiUaxt5iU3HP6zC1kwx3W7SweaEGvs4EPfQ \
- --p2p-peer-address 127.0.0.1:9876 \
- --p2p-peer-address 127.0.0.1:9877 \
- --p2p-peer-address 127.0.0.1:9878 \
- >>~/nodes/03-node/03.log 2>&1 &
- cat nodes/03-node/03.log | grep :9878 -C 3
- nodeos \
- --plugin eosio::http_plugin --plugin eosio::chain_api_plugin --plugin eosio::chain_plugin --plugin eosio::producer_api_plugin --plugin eosio::producer_plugin --plugin eosio::history_plugin --plugin eosio::history_api_plugin --plugin eosio::net_api_plugin \
- --contracts-console \
- --max-transaction-time=200 \
- --chain-state-db-size-mb 1024 \
- --enable-stale-production \
- --producer-name produce.four \
- --genesis-json ~/nodes/genesis.json \
- --blocks-dir ~/nodes/04-node/blocks \
- --config-dir ~/nodes/04-node \
- --data-dir ~/nodes/04-node \
- --http-server-address 127.0.0.1:8892 \
- --p2p-listen-endpoint 127.0.0.1:9880 \

- --signature-provider
  EOS5y3Tm1czTCia3o3JidVKmC78J9gRQU8qHjmRjFxTyhh2vxvF5d=KEY:5JJjaKnAb9K
  M2vkkJDgrYXoeUEdGgWtB5WK1a38wrmKnS3KtkS6 \
- --p2p-peer-address 127.0.0.1:9876 \
- --p2p-peer-address 127.0.0.1:9877 \
- --p2p-peer-address 127.0.0.1:9878 \
- --p2p-peer-address 127.0.0.1:9879 \
- >>~/nodes/04-node/04.log 2>&1 &
- cat nodes/04-node/04.log | grep :9879 -C 3
- cleos system voteproducer prods producer.one producer.one producer.two produc.three produce.four
- cleos system voteproducer prods producer.two producer.two produc.three produce.four
- cleos system voteproducer prods produc.three produc.three produce.four
- cleos system voteproducer prods produce.four produce.four
- cleos system listproducers
- tail -f nodes/01-node/01.log | grep Produced
- tail -f nodes/00-boot/00.log | grep Produced
- cleos get account eosio
- cleos push action eosio updateauth '{"account": "eosio", "permission": "owner", "parent": "", "auth": {"threshold": 1, "keys": [], "waits": [], "accounts": [{"weight": 1, "permission": {"actor": "eosio.prods", "permission": "active"}}]}}' -p eosio@owner
- cleos push action eosio updateauth '{"account": "eosio", "permission": "active", "parent": "owner", "auth": {"threshold": 1, "keys": [], "waits": [], "accounts": [{"weight": 1, "permission": {"actor": "eosio.prods", "permission": "active"}}]}}' -p eosio@active
- cleos get account eosio
- cleos push action eosio updateauth '{"account": "eosio.bpay", "permission": "owner", "parent": "", "auth": {"threshold": 1, "keys": [], "waits": [], "accounts": [{"weight": 1, "permission": {"actor": "eosio", "permission": "active"}}]}}' -p eosio.bpay@owner
- cleos push action eosio updateauth '{"account": "eosio.bpay", "permission": "active", "parent": "owner", "auth": {"threshold": 1, "keys": [], "waits": [], "accounts": [{"weight": 1, "permission": {"actor": "eosio", "permission": "active"}}]}}' -p eosio.bpay@active
- cleos push action eosio updateauth '{"account": "eosio.msig", "permission": "owner", "parent": "", "auth": {"threshold": 1, "keys": [], "waits": [], "accounts": [{"weight": 1, "permission": {"actor": "eosio", "permission": "active"}}]}}' -p eosio.msig@owner
- cleos push action eosio updateauth '{"account": "eosio.msig", "permission": "active", "parent": "owner", "auth": {"threshold": 1, "keys": [], "waits": [], "accounts": [{"weight": 1, "permission": {"actor": "eosio", "permission": "active"}}]}}' -p eosio.msig@active
- cleos push action eosio updateauth '{"account": "eosio.names", "permission": "owner", "parent": "", "auth": {"threshold": 1, "keys": [], "waits": [], "accounts": [{"weight": 1, "permission": {"actor": "eosio", "permission": "active"}}]}}' -p eosio.names@owner
- cleos push action eosio updateauth '{"account": "eosio.names", "permission": "active", "parent": "owner", "auth": {"threshold": 1, "keys": [], "waits": [], "accounts": [{"weight": 1, "permission": {"actor": "eosio", "permission": "active"}}]}}' -p eosio.names@active
- cleos push action eosio updateauth '{"account": "eosio.ram", "permission": "owner", "parent": "", "auth": {"threshold": 1, "keys": [], "waits": [], "accounts": [{"weight": 1, "permission": {"actor": "eosio", "permission": "active"}}]}}' -p eosio.ram@owner
- cleos push action eosio updateauth '{"account": "eosio.ram", "permission": "active", "parent": "owner", "auth": {"threshold": 1, "keys": [], "waits": [], "accounts": [{"weight": 1, "permission": {"actor": "eosio", "permission": "active"}}]}}' -p eosio.ram@active

- cleos push action eosio updateauth '{"account": "eosio.ramfee", "permission": "owner", "parent": "", "auth": {"threshold": 1, "keys": [], "waits": [], "accounts": [{"weight": 1, "permission": {"actor": "eosio", "permission": "active"}}]}}' -p eosio.ramfee@owner
- cleos push action eosio updateauth '{"account": "eosio.ramfee", "permission": "active", "parent": "owner", "auth": {"threshold": 1, "keys": [], "waits": [], "accounts": [{"weight": 1, "permission": {"actor": "eosio", "permission": "active"}}]}}' -p eosio.ramfee@active
- cleos push action eosio updateauth '{"account": "eosio.saving", "permission": "owner", "parent": "", "auth": {"threshold": 1, "keys": [], "waits": [], "accounts": [{"weight": 1, "permission": {"actor": "eosio", "permission": "active"}}]}}' -p eosio.saving@owner
- cleos push action eosio updateauth '{"account": "eosio.saving", "permission": "active", "parent": "owner", "auth": {"threshold": 1, "keys": [], "waits": [], "accounts": [{"weight": 1, "permission": {"actor": "eosio", "permission": "active"}}]}}' -p eosio.saving@active
- cleos push action eosio updateauth '{"account": "eosio.stake", "permission": "owner", "parent": "", "auth": {"threshold": 1, "keys": [], "waits": [], "accounts": [{"weight": 1, "permission": {"actor": "eosio", "permission": "active"}}]}}' -p eosio.stake@owner
- cleos push action eosio updateauth '{"account": "eosio.stake", "permission": "active", "parent": "owner", "auth": {"threshold": 1, "keys": [], "waits": [], "accounts": [{"weight": 1, "permission": {"actor": "eosio", "permission": "active"}}]}}' -p eosio.stake@active
- cleos push action eosio updateauth '{"account": "eosio.token", "permission": "owner", "parent": "", "auth": {"threshold": 1, "keys": [], "waits": [], "accounts": [{"weight": 1, "permission": {"actor": "eosio", "permission": "active"}}]}}' -p eosio.token@owner
- cleos push action eosio updateauth '{"account": "eosio.token", "permission": "active", "parent": "owner", "auth": {"threshold": 1, "keys": [], "waits": [], "accounts": [{"weight": 1, "permission": {"actor": "eosio", "permission": "active"}}]}}' -p eosio.token@active
- cleos push action eosio updateauth '{"account": "eosio.vpay", "permission": "owner", "parent": "", "auth": {"threshold": 1, "keys": [], "waits": [], "accounts": [{"weight": 1, "permission": {"actor": "eosio", "permission": "active"}}]}}' -p eosio.vpay@owner
- cleos push action eosio updateauth '{"account": "eosio.vpay", "permission": "active", "parent": "owner", "auth": {"threshold": 1, "keys": [], "waits": [], "accounts": [{"weight": 1, "permission": {"actor": "eosio", "permission": "active"}}]}}' -p eosio.vpay@active
- cleos push action eosio updateauth '{"account": "eosio.rex", "permission": "owner", "parent": "", "auth": {"threshold": 1, "keys": [], "waits": [], "accounts": [{"weight": 1, "permission": {"actor": "eosio", "permission": "active"}}]}}' -p eosio.rex@owner
- cleos push action eosio updateauth '{"account": "eosio.rex", "permission": "active", "parent": "owner", "auth": {"threshold": 1, "keys": [], "waits": [], "accounts": [{"weight": 1, "permission": {"actor": "eosio", "permission": "active"}}]}}' -p eosio.rex@active
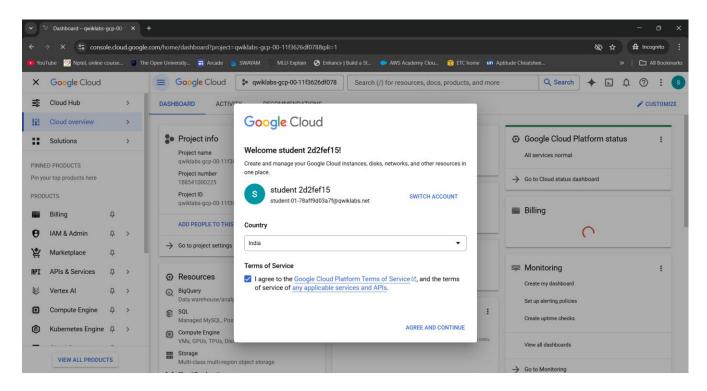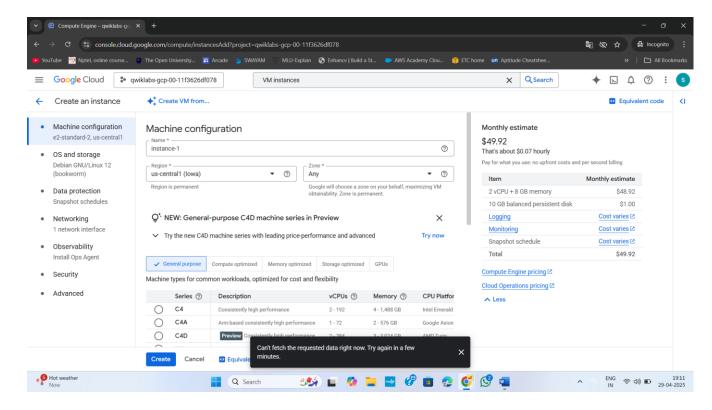
OUTPUT:
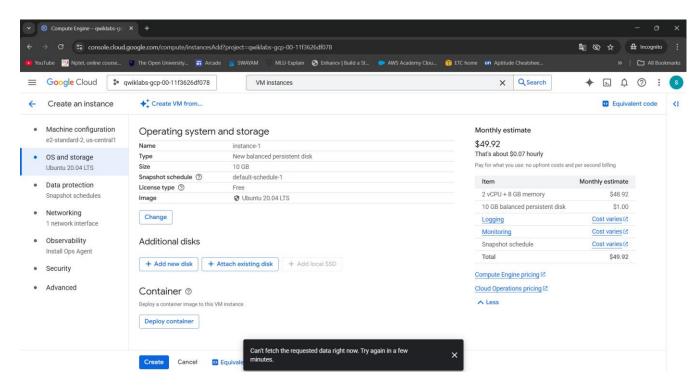

Figure 1:Start Lab

Figure 2:Create a VM instance
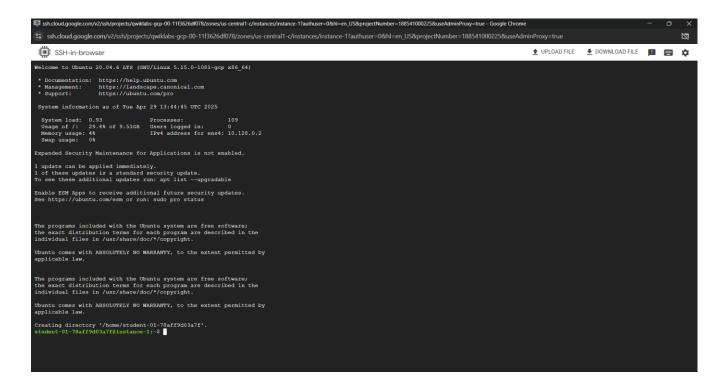
Figure 3:Change operating system to Linux

Figure 4:Connect VM with SSH

```
Building dependency tree
Reading state information... Done
7 packages can be upgraded. Run 'apt list --upgradable' to see them.
student-01-78aff9d03a7f@instance-1:~$ curl -LO https://github.com/eosio/eos/releases/download/v2.1.0/eosio_2.1.0-1-ubuntu-20.04_amd64.deb
  % Total    % Received % Xferd  Average Speed   Time    Time     Time  Current
                                 Dload  Upload   Total   Spent    Left  Speed
  0     0    0     0    0     0      0      0 --:--:-- --:--:-- --:--:--     0
100 33.6M  100 33.6M    0     0  45.0M      0 --:--:-- --:--:-- --:--:-- 45.0M
student-01-78aff9d03a7f@instance-1:~$ sudo apt install ./eosio_2.1.0-1-ubuntu-20.04_amd64.deb
Reading package lists... Done
Building dependency tree
Reading state information... Done
Note, selecting 'eosio' instead of './eosio_2.1.0-1-ubuntu-20.04_amd64.deb'
The following additional packages will be installed:
  libpq5 libtinfo5
The following NEW packages will be installed:
  eosio libpq5 libtinfo5
0 upgraded, 3 newly installed, 0 to remove and 7 not upgraded.
Need to get 201 kB/35.4 MB of archives.
After this operation, 952 kB of additional disk space will be used.
Do you want to continue? [Y/n] Y
Get:1 http://us-central1.gce.archive.ubuntu.com/ubuntu focal-updates/universe amd64 libtinfo5 amd64 6.2-0ubuntu2.1 [83.4 kB]
Get:2 http://us-central1.gce.archive.ubuntu.com/ubuntu focal-updates/main amd64 libpq5 amd64 12.22-0ubuntu0.20.04.2 [118 kB]
Get:3 /home/student-01-78aff9d03a7f/eosio_2.1.0-1-ubuntu-20.04_amd64.deb eosio amd64 2.1.0-1 [35.2 MB]
Fetched 201 kB in 0s (588 kB/s)
Selecting previously unselected package libtinfo5:amd64.
(Reading database ... 62498 files and directories currently installed.)
Preparing to unpack .../libtinfo5_6.2-0ubuntu2.1_amd64.deb ...
Unpacking libtinfo5:amd64 (6.2-0ubuntu2.1) ...
Selecting previously unselected package libpq5:amd64.
Preparing to unpack .../libpq5_12.22-0ubuntu0.20.04.2_amd64.deb ...
Unpacking libpq5:amd64 (12.22-0ubuntu0.20.04.2) ...
Selecting previously unselected package eosio.
Preparing to unpack .../eosio_2.1.0-1-ubuntu-20.04_amd64.deb ...
Unpacking eosio (2.1.0-1) ...
Setting up libpq5:amd64 (12.22-0ubuntu0.20.04.2) ...
Setting up libtinfo5:amd64 (6.2-0ubuntu2.1) ...
Setting up eosio (2.1.0-1) ...
Processing triggers for libc-bin (2.31-0ubuntu9.17) ...
student-01-78aff9d03a7f@instance-1:~$ nodeos --version
v2.1.0
student-01-78aff9d03a7f@instance-1:~$ cleos version client
v2.1.0
student-01-78aff9d03a7f@instance-1:~$ keosd -v
v2.1.0
student-01-78aff9d03a7f@instance-1:~$
```

Figure 5:Install the EOSIO platform

```
student-01-78aff9d03a7f@instance-1:~$ keosd --unlock-timeout 999999999 &
[1] 2962
student-01-78aff9d03a7f@instance-1:~$ info  2025-04-29T13:46:48.759 keosd     wallet_plugin.cpp:38         plugin_initialize    ] initializing wallet plugin
info  2025-04-29T13:46:48.759 keosd     wallet_api_plugin.cpp:84     plugin_startup       ] starting wallet_api_plugin
info  2025-04-29T13:46:48.759 keosd     http_plugin.cpp:983          add_handler          ] add api url: /v1/wallet/create
info  2025-04-29T13:46:48.759 keosd     http_plugin.cpp:983          add_handler          ] add api url: /v1/wallet/create_key
info  2025-04-29T13:46:48.759 keosd     http_plugin.cpp:983          add_handler          ] add api url: /v1/wallet/get_public_keys
info  2025-04-29T13:46:48.759 keosd     http_plugin.cpp:983          add_handler          ] add api url: /v1/wallet/import_key
info  2025-04-29T13:46:48.759 keosd     http_plugin.cpp:983          add_handler          ] add api url: /v1/wallet/list_keys
info  2025-04-29T13:46:48.759 keosd     http_plugin.cpp:983          add_handler          ] add api url: /v1/wallet/list_wallets
info  2025-04-29T13:46:48.759 keosd     http_plugin.cpp:983          add_handler          ] add api url: /v1/wallet/lock
info  2025-04-29T13:46:48.759 keosd     http_plugin.cpp:983          add_handler          ] add api url: /v1/wallet/lock_all
info  2025-04-29T13:46:48.759 keosd     http_plugin.cpp:983          add_handler          ] add api url: /v1/wallet/open
info  2025-04-29T13:46:48.760 keosd     http_plugin.cpp:983          add_handler          ] add api url: /v1/wallet/remove_key
info  2025-04-29T13:46:48.760 keosd     http_plugin.cpp:983          add_handler          ] add api url: /v1/wallet/set_timeout
info  2025-04-29T13:46:48.760 keosd     http_plugin.cpp:983          add_handler          ] add api url: /v1/wallet/sign_digest
info  2025-04-29T13:46:48.760 keosd     http_plugin.cpp:983          add_handler          ] add api url: /v1/wallet/sign_transaction
info  2025-04-29T13:46:48.760 keosd     http_plugin.cpp:983          add_handler          ] add api url: /v1/wallet/unlock
info  2025-04-29T13:46:48.760 keosd     http_plugin.cpp:983          add_handler          ] add api url: /v1/node/get_supported_apis

student-01-78aff9d03a7f@instance-1:~$ cleos wallet create --file my_wallet_password
warn  2025-04-29T13:47:03.607 keosd     wallet.cpp:218               save_wallet_file     ] saving wallet to file /home/student-01-78aff9d03a7f/eosio-wallet/./default.wallet
Creating wallet: default
Save password to use in the future to unlock this wallet.
Without password imported keys will not be retrievable.
saving password to my_wallet_password
student-01-78aff9d03a7f@instance-1:~$ cleos wallet list
Wallets:
[
  "default *"
]
student-01-78aff9d03a7f@instance-1:~$
```

Figure 6:Create a default wallet

```
student-01-78aff9d03a7f@instance-1:~$ cleos wallet open
Opened: default
student-01-78aff9d03a7f@instance-1:~$ cleos wallet unlock <my_wallet_password
password: Unlocked: default
student-01-78aff9d03a7f@instance-1:~$ cleos wallet import --private-key 5KQwrPbwdL6PhXujxW37FSSQ21JiwsST4cqQzDeyXtP79zkvFD3
warn  2025-04-29T13:48:38.274 keosd     wallet.cpp:218               save_wallet_file     ] saving wallet to file /home/student-01-78aff9d03a7f/eosio-wallet/./default.wallet
imported private key for: EOS6MRyAjQq8ud7hVNYcfnVPJqcVpscN5So8BhtHuGYqET5GDW5CV
student-01-78aff9d03a7f@instance-1:~$
```

Figure 7:Add the private key of the EOSIO system account to the wallet

Figure 8: Install the EOSIO Contract Development Toolkit (CDT)

Figure 9:Install CMake
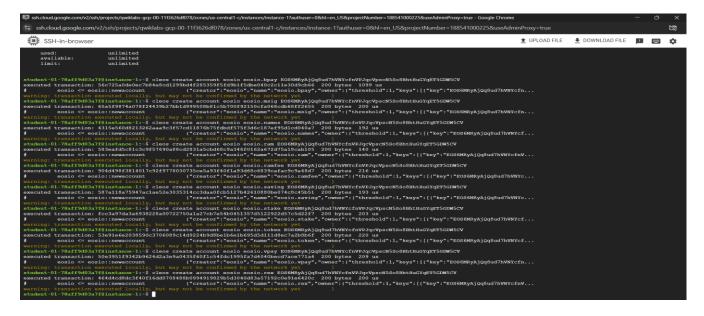

Figure 10:Build the system contracts and eosio.boot

Figure 11:Start the boot node and create system accounts

Figure 12:Deploy the eosio.token, eosio.msig contracts, and create/issue the SYS token

Figure 13: Command sends an HTTP POST request to the get_supported_protocol_features endpoint provided by the Producer API plugin
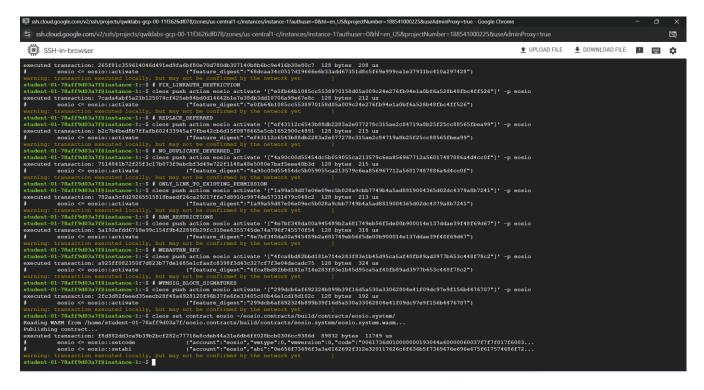
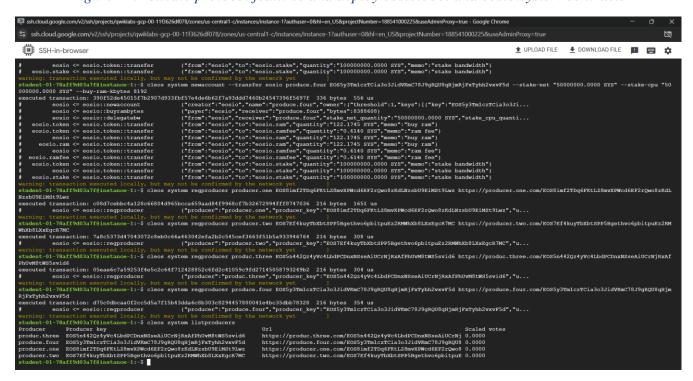*Figure 14:Activate protocol features and deploy eosio.boot and eosio.system contracts*

Figure 15:Create the block producer accounts

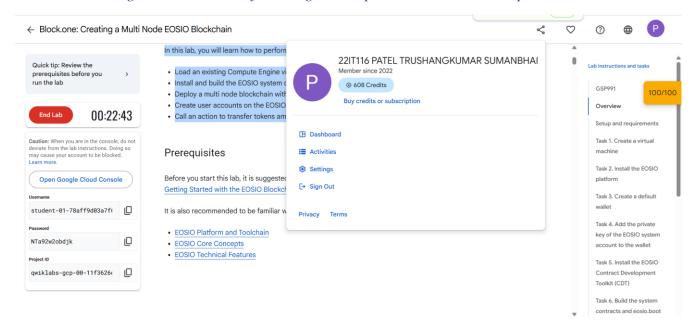*Figure 16:Transition from single-node producer to multi-node producers*

Figure 17:End Lab

LATEST APPLICATIONS:

- Decentralized Finance (DeFi)
- Supply Chain Management
- Digital Identity Verification
- Digital Voting
- Gaming and NFTs

LEARNING OUTCOME:

In this practical, I learned how to deploy a multi-node EOSIO blockchain network and connect nodes using peer-to-peer settings. I managed system contracts, created user accounts, and performed token transfers. I also gained hands-on experience with EOSIO tools like cleos and nodeos, deepening my understanding of decentralized blockchain infrastructures.

REFERENCES:

1. https://www.cloudskillsboost.google/focuses/23108?