

PRACTICAL: 5

AIM:

Block.one: Getting Started with The EOSIO Blockchain

THEORY:

EOSIO is a next-generation blockchain platform designed to support scalable, secure, and high-performance decentralized applications (dApps). Developed by Block.one, EOSIO features a unique consensus mechanism called Delegated Proof of Stake (DPoS), enabling high transaction throughput and low latency, which makes it ideal for enterprise-grade applications.

An EOSIO blockchain is a deterministic state machine that stores transactions in cryptographically linked blocks. Each new block references the hash of the previous block, making the chain immutable and tamper-proof. EOSIO supports smart contracts and is designed to be flexible and modular.

EOSIO uses DPoS to achieve consensus. In this model:

- Stakeholders vote to elect block producers (delegates).
- These producers are responsible for validating transactions and producing blocks.
- The model ensures decentralization while maintaining high performance and fast block times.

Accounts and Wallets

- An **account** in EOSIO is a named identity that interacts with the blockchain by sending or receiving actions and transactions.
- Each account is associated with a set of **public/private keys**.
- A **wallet** securely stores these keys and is required to sign blockchain transactions.
- Permissions can be configured hierarchically, allowing fine-grained control over account actions.

Node Types

- **nodeos**: The core daemon of an EOSIO node that processes blockchain data.
- **keosd**: The wallet manager responsible for managing keys and signing transactions.
- **cleos**: A command-line interface tool used to interact with nodeos and keosd.

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
- nodeos -e -p eosio --plugin eosio::chain_api_plugin --plugin eosio::history_api_plugin --contracts-console >> nodeos.log 2>&1 &
- tail -f nodeos.log
- cleos wallet create --name my_wallet --file my_wallet_password
- cat my_wallet_password
- cleos wallet list
- cleos wallet open --name my_wallet
- cleos wallet unlock --name my_wallet --password YOUR_PASSWORD
- cleos wallet import --name my_wallet --private-key
5KQwrPbwdL6PhXujxW37FSSQZ1JiwsST4cqQzDeyXtP79zkvFD3
- curl -LO https://github.com/eosio/eosio.cdt/releases/download/v1.8.1/eosio.cdt_1.8.1-1-ubuntu-20.04_amd64.deb
- sudo apt install ./eosio.cdt_1.8.1-1-ubuntu-20.04_amd64.deb
- eosio-cpp --version
- cleos wallet open --name my_wallet
- export wallet_password=\$(cat my_wallet_password)
- echo \$wallet_password
- cleos wallet unlock --name my_wallet --password \$wallet_password
- cleos create key --file my_keypair1
- cat my_keypair1
- cleos wallet import --name my_wallet --private-key YOUR_PRIVATE_KEY
- cleos create account eosio bob YOUR_PUBLIC_KEY

OUTPUT:

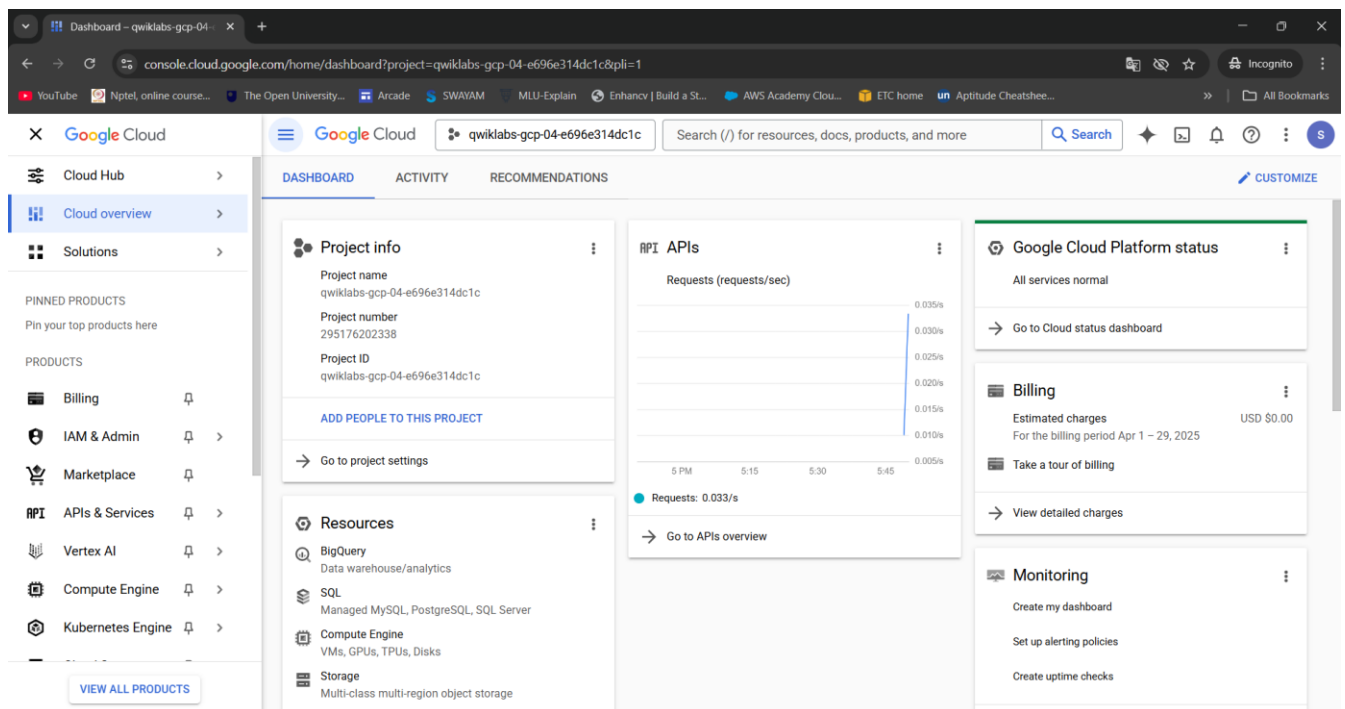


Figure 1: Start the Lab

Machine configuration

Name *
my-vm-1

Region *
us-east1 (South Carolina)

Zone *
us-east1-c

Region is permanent Zone is permanent

NEW: General-purpose C4D machine series in Preview

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☒ General purpose ☐ Compute optimized ☐ Memory optimized ☐ Storage optimized ☐ GPUs

Machine types for common workloads, optimized for cost and flexibility

Series	Description	vCPUs	Memory	CPU Platform
<input type="radio"/> C4	Consistently high performance	2 - 192	4 - 1,488 GB	Intel Emerald
<input type="radio"/> C4A	Arm-based consistently high performance	1 - 72	2 - 576 GB	Google Axion
<input checked="" type="radio"/> C4D	Consistently high performance	2 - 384	3 - 3,024 GB	AMD Turin
<input type="radio"/> N4	Flexible & cost-optimized	2 - 80	4 - 640 GB	Intel Emerald

[Create](#) [Cancel](#) [Equivalent code](#)

Monthly estimate
\$49.92
That's about \$0.07 hourly
Pay for what you use: no upfront costs and per second billing

Item	Monthly estimate
2 vCPU + 8 GB memory	\$48.92
10 GB balanced persistent disk	\$1.00
Logging	Cost varies
Monitoring	Cost varies
Snapshot schedule	Cost varies
Total	\$49.92

[Compute Engine pricing](#)
[Cloud Operations pricing](#)
[Less](#)

Figure 2: Create an instance

Operating system and storage

Name my-vm-1

Type New balanced persistent disk

Size 10 GB

Snapshot schedule default-schedule-1

License type Free

Image Ubuntu 20.04 LTS

[Change](#)

Additional disks

[+ Add new disk](#) [+ Attach existing disk](#) [+ Add local SSD](#)

Container

Deploy a container image to this VM instance

[Deploy container](#)

[Create](#) [Cancel](#) [Equivalent code](#)

Monthly estimate
\$49.92
That's about \$0.07 hourly
Pay for what you use: no upfront costs and per second billing

Item	Monthly estimate
2 vCPU + 8 GB memory	\$48.92
10 GB balanced persistent disk	\$1.00
Logging	Cost varies
Monitoring	Cost varies
Snapshot schedule	Cost varies
Total	\$49.92

[Compute Engine pricing](#)
[Cloud Operations pricing](#)
[Less](#)

Figure 3: Change operating system to linux

```

ssh.cloud.google.com/v2/ssh/projects/qwiklabs-gcp-04-e696e314dc1c/zones/us-east1-c/instances/my-vm-1?authuser=0&hl=en_US&projectNumber=295176202338&useAdminProxy=true - Google Chrome
ssh.cloud.google.com/v2/ssh/projects/qwiklabs-gcp-04-e696e314dc1c/zones/us-east1-c/instances/my-vm-1?authuser=0&hl=en_US&projectNumber=295176202338&useAdminProxy=true

SSH-in-browser
[+] UPLOAD FILE [+] DOWNLOAD FILE [?] [x] [g]

Welcome to Ubuntu 20.04.6 LTS (GNU/Linux 5.15.0-1081-gcp x86_64)

 * Documentation:  https://help.ubuntu.com
 * Management:    https://landscape.canonical.com
 * Support:       https://ubuntu.com/pro

System information as of Tue Apr 29 12:26:07 UTC 2025

System load:  0.5          Processes:      112
Usage of /:   29.4% of 9.51GB Users logged in:  0
Memory usage: 4%          IPv4 address for ens4: 10.142.0.2
Swap usage:   0%

Expanded Security Maintenance for Applications is not enabled.

1 update can be applied immediately.
1 of these updates is a standard security update.
to see these additional updates run: apt list --upgradable

Enable ESM Apps to receive additional future security updates.
See https://ubuntu.com/esm or run: sudo pro status

The programs included with the Ubuntu system are free software;
the exact distribution terms for each program are described in the
individual files in /usr/share/doc/*/copyright.

Ubuntu comes with ABSOLUTELY NO WARRANTY, to the extent permitted by
applicable law.

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applicable law.

Creating directory '/home/student-01-a2f6be18d40f'.
student-01-a2f6be18d40f@my-vm-1:~$

```

Figure 4: Click SSH for my-vm-1

```

ssh.cloud.google.com/v2/ssh/projects/qwiklabs-gcp-04-e696e314dc1c/zones/us-east1-c/instances/my-vm-1?authuser=0&hl=en_US&projectNumber=295176202338&useAdminProxy=true - Google Chrome
ssh.cloud.google.com/v2/ssh/projects/qwiklabs-gcp-04-e696e314dc1c/zones/us-east1-c/instances/my-vm-1?authuser=0&hl=en_US&projectNumber=295176202338&useAdminProxy=true

SSH-in-browser
[+] UPLOAD FILE [+] DOWNLOAD FILE [?] [x] [g]

Building dependency tree
Reading state information... Done
1 package can be upgraded. Run 'apt list --upgradable' to see it.
student-01-a2f6be18d40f@my-vm-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 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
100 33.6M 100 33.6M 0 0 47.0M 0 --:--:-- --:--:-- --:--:-- 47.0M
student-01-a2f6be18d40f@my-vm-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 1 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-east1.gce.archive.ubuntu.com/ubuntu focal-updates/universe amd64 libtinfo5 amd64 6.2-0ubuntu2.1 [83.4 kB]
Get:2 http://us-east1.gce.archive.ubuntu.com/ubuntu focal-updates/main amd64 libpq5 amd64 12.22-0ubuntu0.20.04.2 [118 kB]
Get:3 /home/student-01-a2f6be18d40f/eosio_2.1.0-1-ubuntu-20.04_amd64.deb eosio amd64 2.1.0-1 [35.2 MB]
Fetched 201 kB in 0s (582 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-a2f6be18d40f@my-vm-1:~$ nodeos --version
v2.1.0
student-01-a2f6be18d40f@my-vm-1:~$ cleos version client
v2.1.0
student-01-a2f6be18d40f@my-vm-1:~$ keosd -v
v2.1.0
student-01-a2f6be18d40f@my-vm-1:~$

```

Figure 5: Install the EOSIO platform

```

student-01-a2f6be18d40f@my-vm-1:~$ nodeos --plugin eosio:chain_api_plugin --plugin eosio:history_api_plugin --contracts-console >> nodeos.log 2>&1 &
[1] 2838
student-01-a2f6be18d40f@my-vm-1:~$ tail -f nodeos.log
info 2025-04-29T12:29:12.400 nodeos producer_plugin.cpp:2333 produce_block ] Produced block 436017b16d0f7090... #24 @ 2025-04-29T12:29:12.500 signed by eosio [txs: 0, lib: 23, c
nfirm: 0]
info 2025-04-29T12:29:12.900 nodeos producer_plugin.cpp:2333 produce_block ] Produced block cecd480d97d2e025... #25 @ 2025-04-29T12:29:13.000 signed by eosio [txs: 0, lib: 24, c
nfirm: 0]
info 2025-04-29T12:29:13.400 nodeos producer_plugin.cpp:2333 produce_block ] Produced block 636bd650acea458a... #26 @ 2025-04-29T12:29:13.500 signed by eosio [txs: 0, lib: 25, c
nfirm: 0]
info 2025-04-29T12:29:13.900 nodeos producer_plugin.cpp:2333 produce_block ] Produced block d8fc174af57de756... #27 @ 2025-04-29T12:29:14.000 signed by eosio [txs: 0, lib: 26, c
nfirm: 0]
info 2025-04-29T12:29:14.400 nodeos producer_plugin.cpp:2333 produce_block ] Produced block af0bfb0cf202ec2... #28 @ 2025-04-29T12:29:14.500 signed by eosio [txs: 0, lib: 27, c
nfirm: 0]
info 2025-04-29T12:29:14.900 nodeos producer_plugin.cpp:2333 produce_block ] Produced block 9d92d3c8fa499159... #29 @ 2025-04-29T12:29:15.000 signed by eosio [txs: 0, lib: 28, c
nfirm: 0]
info 2025-04-29T12:29:15.400 nodeos producer_plugin.cpp:2333 produce_block ] Produced block 244c098fe5a5a1e... #30 @ 2025-04-29T12:29:15.500 signed by eosio [txs: 0, lib: 29, c
nfirm: 0]
info 2025-04-29T12:29:15.900 nodeos producer_plugin.cpp:2333 produce_block ] Produced block 123d4f353d9c1853... #31 @ 2025-04-29T12:29:16.000 signed by eosio [txs: 0, lib: 30, c
nfirm: 0]
info 2025-04-29T12:29:16.400 nodeos producer_plugin.cpp:2333 produce_block ] Produced block 020f2c38ee279aea... #32 @ 2025-04-29T12:29:16.500 signed by eosio [txs: 0, lib: 31, c
nfirm: 0]
info 2025-04-29T12:29:16.900 nodeos producer_plugin.cpp:2333 produce_block ] Produced block 51099030652f932f... #33 @ 2025-04-29T12:29:17.000 signed by eosio [txs: 0, lib: 32, c
nfirm: 0]
info 2025-04-29T12:29:17.300 nodeos producer_plugin.cpp:2333 produce_block ] Produced block aad925a4d67f63b... #34 @ 2025-04-29T12:29:17.500 signed by eosio [txs: 0, lib: 33, c
nfirm: 0]
info 2025-04-29T12:29:17.700 nodeos producer_plugin.cpp:2333 produce_block ] Produced block a285f4c93ac04d3d... #35 @ 2025-04-29T12:29:18.000 signed by eosio [txs: 0, lib: 34, c
nfirm: 0]
info 2025-04-29T12:29:18.100 nodeos producer_plugin.cpp:2333 produce_block ] Produced block 5cf7372caf54f2e... #36 @ 2025-04-29T12:29:18.500 signed by eosio [txs: 0, lib: 35, c
nfirm: 0]
info 2025-04-29T12:29:18.900 nodeos producer_plugin.cpp:2333 produce_block ] Produced block 9982becad3cbbaf... #37 @ 2025-04-29T12:29:19.000 signed by eosio [txs: 0, lib: 36, c
nfirm: 0]
info 2025-04-29T12:29:19.400 nodeos producer_plugin.cpp:2333 produce_block ] Produced block b204fd23c23f813e... #38 @ 2025-04-29T12:29:19.500 signed by eosio [txs: 0, lib: 37, c
nfirm: 0]
info 2025-04-29T12:29:19.900 nodeos producer_plugin.cpp:2333 produce_block ] Produced block 001587a8792fd897... #39 @ 2025-04-29T12:29:20.000 signed by eosio [txs: 0, lib: 38, c
nfirm: 0]
info 2025-04-29T12:29:20.400 nodeos producer_plugin.cpp:2333 produce_block ] Produced block a759a7eeaf43b30ab... #40 @ 2025-04-29T12:29:20.500 signed by eosio [txs: 0, lib: 39, c
nfirm: 0]
info 2025-04-29T12:29:20.900 nodeos producer_plugin.cpp:2333 produce_block ] Produced block 494c6e086731d649... #41 @ 2025-04-29T12:29:21.000 signed by eosio [txs: 0, lib: 40, c
nfirm: 0]
info 2025-04-29T12:29:21.400 nodeos producer_plugin.cpp:2333 produce_block ] Produced block c384ec7aa4b1d44... #42 @ 2025-04-29T12:29:21.500 signed by eosio [txs: 0, lib: 41, c
nfirm: 0]
info 2025-04-29T12:29:21.900 nodeos producer_plugin.cpp:2333 produce_block ] Produced block 5e1016e96576e1c4... #43 @ 2025-04-29T12:29:22.000 signed by eosio [txs: 0, lib: 42, c
nfirm: 0]
info 2025-04-29T12:29:22.400 nodeos producer_plugin.cpp:2333 produce_block ] Produced block ac8b96829e9c6eb7c... #44 @ 2025-04-29T12:29:22.500 signed by eosio [txs: 0, lib: 43, c
nfirm: 0]
info 2025-04-29T12:29:22.900 nodeos producer_plugin.cpp:2333 produce_block ] Produced block 2f064a57c5c3ff22... #45 @ 2025-04-29T12:29:23.000 signed by eosio [txs: 0, lib: 44, c

```

Figure 6: Run a local single node blockchain

```

nfirm: 0]
^C
student-01-a2f6be18d40f@my-vm-1:~$ cleos wallet create --name my_wallet --file my_wallet_password
"/usr/opt/eosio/2.1.0/bin/keosd" launched
Creating wallet: my_wallet
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-a2f6be18d40f@my-vm-1:~$ cat my_wallet_password
PWSKE9cACATNxxcKCSWdQfW7pyTSSfqs998McJ732tT7dIm86Ax
student-01-a2f6be18d40f@my-vm-1:~$ cleos wallet list
Wallets:
[
  "my_wallet"
]
student-01-a2f6be18d40f@my-vm-1:~$

```

Figure 7: Create wallet

```

student-01-a2f6be18d40f@my-vm-1:~$ cleos wallet open --name my_wallet
Opened: my_wallet
student-01-a2f6be18d40f@my-vm-1:~$ nano my_wallet_password
student-01-a2f6be18d40f@my-vm-1:~$ cleos wallet unlock --name my_wallet --password PWSKE9cACATNxxcKCSWdQfW7pyTSSfqs998McJ732tT7dIm86Ax
Unlocked: my_wallet
student-01-a2f6be18d40f@my-vm-1:~$ cleos wallet import --name my_wallet --private-key 5KQwrPbwdL6PhuujxN37fSSQZlJiwst4cqQzDeyXtP79zkvFD3
Imported private key for: EOS6MRyAJQg8ud7hVbYcfvN2JqcVpcW5S08BhtHucYgET5C6W5CV
student-01-a2f6be18d40f@my-vm-1:~$

```

Figure 8: Add the EOSIO system account private key to the new wallet

```

student-01-a2f6be18d40f@my-vm-1:~$ curl -LO https://github.com/eosio/eosio.cdt/releases/download/v1.8.1/eosio.cdt_1.8.1-1-ubuntu-20.04_amd64.deb
% Total % Received % Xferd Average Speed Time Time Current
Dload Upload Total Spent Left Speed
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
100 120M 100 120M 0 0 50.3M 0 0:00:02 0:00:02 -- -- 60.7M
student-01-a2f6be18d40f@my-vm-1:~$ sudo apt install ./eosio.cdt_1.8.1-1-ubuntu-20.04_amd64.deb
Reading package lists... Done
Building dependency tree
Reading state information... Done
Note, selecting 'eosio.cdt' instead of './eosio.cdt_1.8.1-1-ubuntu-20.04_amd64.deb'
The following NEW packages will be installed:
  eosio.cdt
0 upgraded, 1 newly installed, 0 to remove and 1 not upgraded.
Need to get 0 B/127 MB of archives.
After this operation, 0 B of additional disk space will be used.
Get:1 /home/student-01-a2f6be18d40f/eosio.cdt_1.8.1-1-ubuntu-20.04_amd64.deb eosio.cdt amd64 1.8.1-1 [127 MB]
Selecting previously unselected package eosio.cdt.
(Reading database ... 62545 files and directories currently installed.)
Preparing to unpack ./eosio.cdt_1.8.1-1-ubuntu-20.04_amd64.deb ...
Unpacking eosio.cdt (1.8.1-1) ...
Setting up eosio.cdt (1.8.1-1) ...
student-01-a2f6be18d40f@my-vm-1:~$ eosio-cpp --version
eosio-cpp version 1.8.1
student-01-a2f6be18d40f@my-vm-1:~$

```

Figure 9: Install the EOSIO Contract Development Toolkit (CDT)

```

student-01-a2f6be18d40f8my-vm-1:~$ cleos wallet open --name my_wallet
Opened: my_wallet
student-01-a2f6be18d40f8my-vm-1:~$ export wallet_password=$(cat /dev/urandom | fold -n 32 | tr -dc 'a-z0-9' | fold -w 32 | xargs echo)
student-01-a2f6be18d40f8my-vm-1:~$ echo $wallet_password
rW5R3DcCA7uaxc5W6d0f7py2sfqg99dMc73zt7dne6Gax
student-01-a2f6be18d40f8my-vm-1:~$ cleos wallet unlock --name my_wallet --password $wallet_password
Unlocked: my_wallet
student-01-a2f6be18d40f8my-vm-1:~$ cleos create key --file my_keypair1
saving keys to my_keypair1
student-01-a2f6be18d40f8my-vm-1:~$ cat my_keypair1
Private key: 5J3Bh4nabnc7rv2lt7yaPSenu3d8k7Z9hF65Jnt9qbC1A2aJf3i
Public key: EOS7jBxjRdHTHcz6uwov1KByDgble3h74D3U53JMbNwK6bQJJsDrt
student-01-a2f6be18d40f8my-vm-1:~$ cleos wallet import --name my_wallet --private-key EOS7jBxjRdHTHcz6uwov1KByDgble3h74D3U53JMbNwK6bQJJsDrt
Error 3010003: Invalid private key
Private key should be encoded in base58 WIF
Error Details:
Invalid private key
student-01-a2f6be18d40f8my-vm-1:~$ cleos wallet import --name my_wallet --private-key 5J3Bh4nabnc7rv2lt7yaPSenu3d8k7Z9hF65Jnt9qbC1A2aJf3i
imported private key for: EOS7jBxjRdHTHcz6uwov1KByDgble3h74D3U53JMbNwK6bQJJsDrt
student-01-a2f6be18d40f8my-vm-1:~$ cleos create account eosio bob EOS7jBxjRdHTHcz6uwov1KByDgble3h74D3U53JMbNwK6bQJJsDrt
executed transaction: 46ace5155acbff0fad520d71f765c3eaa1601a36ccf40d0fb5d38d2ad9df4de 200 bytes 322 us
eosio <- eosio::newaccount ("creator":"eosio","name":"bob","owner":{"threshold":1,"keys":["key":"EOS7jBxjRdHTHcz6uwov1KByDgble3h74D3U53JMbNwK6bQJJsDrt"}
warning: transaction executed locally, but may not be confirmed by the network yet
student-01-a2f6be18d40f8my-vm-1:~$

```

Figure 10: Create a blockchain account

The screenshot displays the Google Cloud Skills Boost lab interface. At the top, there's a navigation bar with the lab title 'Block.one: Getting Started with The EOSIO Blockchain'. Below this, a 'Congratulations!' message is shown. To the left, there's a 'Quick tip' and a 'Caution' section. The main content area includes 'Next steps / learn more' with links to 'Block.one on the Google Cloud Marketplace', 'Learn more about the EOSIO platform', 'Get certified with Block.one training', and 'Training and Certification for EOSIO'. Below this is the 'Google Cloud training and certification' section. On the right, a user profile for '22IT116 PATEL TRUSHANGKUMAR SUMANBHAI' is shown with 609 credits. The lab progress bar is at 100/100.

Figure 11: End Lab

LATEST APPLICATIONS:

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

LEARNING OUTCOME:

In this practical, I learned how to set up a single-node blockchain, manage wallets and keys, and create blockchain accounts. I also gained an understanding of consensus mechanisms like DPoS. Additionally, I was introduced to smart contract development tools, which will help me in real-world blockchain application development.

REFERENCES:

1. <https://www.cloudskillsboost.google/focuses/18269>