# **1. Architecture**

# **2. Requirement**

# You can refer to Solana documentation to define what server specification that you need to run solana validator <https://docs.solana.com/running-validator/validator-reqs>

- Based on my experience for setting up solana validator, i recommend HW on AWS as follow:

* CPU
  + 16 vCPU or more
  + 2.8GHz, or faster
  + AVX2 instruction support
  + Support for AVX512 is helpful
* RAM
  + 256GB is suggested
  + Tried on 128GB, Out-of-Memory error occurs
* DISK
  + OS: 100GB, gp2 is OK
  + Validator’s data: 2TB, gp3, 3k IOPS, 250 MB/S throughput, or higher

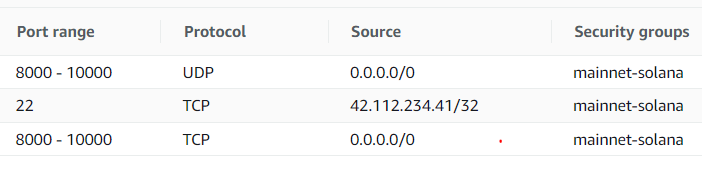
- Suggest r5.8xlarge instance type on AWS, with 2 EBS 1TB gp3 for validator’s data

# **3. Setup**

## **3.1 Prepare aws environment**

* **Create Security Group** for Solana traffic: *mainnet-solana*

Inbound Rule:



**\* 42.112.234.41/32 is IP address of administrator who manage this server**

* **Launch EC2 server**:
  + AMI: Ubuntu Server 20.04 LTS (HVM), SSD Volume Type
  + Type: r5.8xlarge
  + EBS for OS: 100G General purpose SSD
  + EBS for validator data: gp3 - 1TB - 6000 IOPS - 1000MB/s
  + Security Group: *mainnet-solana (3.1)*

## ***3.2* Setting OS**

* **Mount EBS** (1TB) to validator’s data directory, login to server and run:
  + An EBS For: ledger directory: **/mnt/sol/ledge**
  + An EBS For: account directory: **/mnt/accounts/data**

|  |
| --- |
| #create Ledger validator’s data directory:  *sudo mkdir /mnt/sol*  # show disk *sudo lsblk -f*  *nvme1n1*  *nvme0n1*  *└─nvme0n1p1 ext4 cloudimg-rootfs e8070c31-bfee-4314-a151-d1332dc23486 93.8G 3% /*  # Format disk  *sudo mkfs -t xfs /dev/nvme1n1*  #check UUID of disk  *sudo lsblk -o +UUID*  *nvme1n1 ba6adb41-389b-4b0f-b8bf-3e4b62d0b69d*  *# Mount, add this line to bottom of /etc/fstab file*  *sudo vi /etc/fstab*  *LABEL=cloudimg-rootfs / ext4 defaults,discard 0 1*  *# Mount solana validator data, add these lines:*  *UUID=ba6adb41-389b-4b0f-b8bf-3e4b62d0b69d /mnt/sol xfs defaults,nofail 0 2*  *mount -a # run this command to complete*    # Verify  *ubuntu@ip-172-20-38-137:~$ df -h*  *Filesystem Size Used Avail Use% Mounted on*  */dev/root 97G 3.1G 94G 4% /*  */dev/nvme1n1 2.0T 270G 1.7T 14% /mnt/sol* |

\* SAME way for mount EBS to **/mnt/accounts**

**RESULTS**:

|  |
| --- |
| ubuntu@ip-172-20-41-40:/mnt$ df -h  Filesystem Size Used Avail Use% Mounted on  /dev/root 97G 2.4G 95G 3% /  /dev/nvme1n1 600G 39G 562G 7% /mnt/accounts  /dev/nvme2n1 600G 166G 434G 28% /mnt/sol |

* **Tuning OS manually:**

##### Increase UDP buffers

|  |
| --- |
| *sudo bash -c "cat >/etc/sysctl.d/20-solana-udp-buffers.conf <<EOF*  *# Increase UDP buffer size*  *net.core.rmem\_default = 134217728*  *net.core.rmem\_max = 134217728*  *net.core.wmem\_default = 134217728*  *net.core.wmem\_max = 134217728*  *EOF"*  *sudo sysctl -p /etc/sysctl.d/20-solana-udp-buffers.conf* |

* **Increased files limit**

|  |
| --- |
| *sudo bash -c "cat >/etc/sysctl.d/20-solana-mmaps.conf <<EOF*  *# Increase memory mapped files limit*  *vm.max\_map\_count = 1000000*  *EOF"*  *sudo sysctl -p /etc/sysctl.d/20-solana-mmaps.conf*  *# Add this file to bottom of /etc/systemd/system.conf*  DefaultLimitNOFILE=1000000  *sudo systemctl daemon-reload* |

### Close all open sessions (log out then, in again) ###

**- Installing solana CLI:**

|  |
| --- |
| sudo su - ubuntu  sh -c "$(curl -sSfL [https://release.solana.com/v1.6.25/install](https://release.solana.com/v1.7.12/install))"  # export PATH environment to ~/.bashrc, add to bottom of file:  export PATH="/home/ubuntu/.local/share/solana/install/active\_release/bin:$PATH"  export SOLANA\_METRICS\_CONFIG="host=https://metrics.solana.com:8086,db=mainnet-beta,u=mainnet-beta\_write,p=password" |

- **Setup solana-sys-tuner:**

*vi /etc/systemd/system/solana-sys-tuner.service*

|  |
| --- |
| *[Unit]*  *Description=solana-sys-tuner*  *After=network.target*  *[Service]*  *Type=simple*  *Restart=on-failure*  *RestartSec=1*  *LogRateLimitIntervalSec=0*  *ExecStart=/home/ubuntu/.local/share/solana/install/active\_release/bin/solana-sys-tuner --user ubuntu*  *[Install]*  *WantedBy=multi-user.target* |

*sudo systemctl enable solana-sys-tuner*

*sudo systemctl start solana-sys-tuner*

*sudo systemctl restart solana-sys-tuner*

*sudo systemctl status solana-sys-tuner*

## **3.3 Starting Validator**

**- Choosing a cluster:**

|  |
| --- |
| *#choose mainnet cluster, run command:*  *solana config set --url* [*https://api.mainnet-beta.solana.com*](https://api.mainnet-beta.solana.com/)  *# verify: sure config is applied*  *solana config get*  *# verify that your node able to reachable to cluster*  *solana transaction-count*  *29397788659 # return*  *# Confirm your node able to join the gossip network*  *solana-gossip spy --entrypoint entrypoint.mainnet-beta.solana.com:8001*  *IP Address |Age(ms)| Node identifier | Version |Gossip| TPU |TPUfwd| TVU |TVUfwd|Repair|ServeR|ShredVer*  *------------------+-------+----------------------------------------------+---------+------+------+------+------+------+------+------+--------*  *34.228.168.242 me| 1905 | E33PVwkW8yTQhS9YM4EqRKzi4HWnt8WRDmnsikYP9yMS | 1.7.12 | 8009 | none | none | none | none | none | none | 0* |

***- Create an identity keypair for your validator:***

*Create an identity keypair for your validator by running:*

|  |
| --- |
| *solana-keygen new -o /mnt/sol/validator-keypair.json* |

*View identity public key:*

|  |
| --- |
| *solana-keygen pubkey /mnt/sol/validator-keypair.json* |

*Set the solana configuration:*

|  |
| --- |
| *solana config set --keypair /mnt/sol/validator-keypair.json*  *solana config get # To show current configuration* |

***NOTE:******Check validator identity address, then transfer 1-5 SOL into this address account.***

***When you create vote account, you need ~0.03 SOL for fee charger***

**- Create Vote Account:**

Create a vote-account keypair:

|  |
| --- |
| solana-keygen new -o /mnt/sol/vote-account-keypair.json |

Create your vote account on the blockchain:

|  |
| --- |
| solana create-vote-account /mnt/sol/vote-account-keypair.json /mnt/sol/validator-keypair.json --commission 10 |

View your vote account information:

|  |
| --- |
| solana vote-account /mnt/sol/vote-account-keypair.json  # Return:  Account Balance: 0.02685864 SOL  Validator Identity: Bo3s3ZZZJaqdXguBzTsPEHHkUmXPumRF1udBjnZyGXHh  Vote Authority: {226: "Bo3s3ZZZJaqdXguBzTsPEHHkUmXPumRF1udBjnZyGXHh"}  Withdraw Authority: Bo3s3ZZZJaqdXguBzTsPEHHkUmXPumRF1udBjnZyGXHh  Commission: 10% |

**- Create bash file for starting validator:**

*vi /mnt/sol/validator.sh*

|  |
| --- |
| #!/bin/bash  exec solana-validator \  --identity /mnt/sol/validator-keypair.json \  --vote-account /mnt/sol/vote-account-keypair.json \  --rpc-port 8899 \  --private-rpc \  --dynamic-port-range 8000-8010 \  --ledger /mnt/sol/ledger \  --accounts /mnt/accounts/data \  --log /home/ubuntu/solana-validator.log \  --entrypoint entrypoint.mainnet-beta.solana.com:8001 \  --entrypoint entrypoint2.mainnet-beta.solana.com:8001 \  --entrypoint entrypoint3.mainnet-beta.solana.com:8001 \  --entrypoint entrypoint4.mainnet-beta.solana.com:8001 \  --entrypoint entrypoint5.mainnet-beta.solana.com:8001 \  --no-port-check \  --snapshot-compression none \  --limit-ledger-size \  --wal-recovery-mode skip\_any\_corrupted\_record |

*chmod +x /mnt/sol/validator.sh*

**- Create systemd file service** for managing solana validator service:

*vi /etc/systemd/system/sol.service*

|  |
| --- |
| [Unit]  Description=Solana Validator  After=network.target Wants=solana-sys-tuner.service  StartLimitIntervalSec=0  [Service]  Type=simple  Restart=always  RestartSec=1  User=ubuntu  LimitNOFILE=1000000  LogRateLimitIntervalSec=0  Environment="PATH=/usr/bin:/usr/local/bin:/usr/local/sbin:/home/ubuntu/.local/share/solana/install/active\_release/bin"  ExecStart=/mnt/sol/validator.sh  [Install]  WantedBy=multi-user.target |

**- Enable and start solana validator service:**

|  |
| --- |
| sudo systemctl enable sol  sudo systemctl start sol  sudo systemctl status sol |

- Verify that installation is ok:

|  |
| --- |
| sudo systemctl status sol # status is running and has no abnormal thing  # checking log:  tail -f -n 100 /mnt/sol/solana-validator.log # has no error occurs |

## 

## **3.4 Verify your validator up**

To delegate SOL to your validator node, your node must catch up to SOLANA MAINET CLUSTER. It may take some time to catch up after your validator starts.

Use the **catchup command** to monitor your validator:

|  |
| --- |
| solana catchup /mnt/sol/validator-keypair.json  Bo3s3ZZZJaqdXguBzTsPEHHkUmXPumRF1udBjnZyGXHh has caught up (us:97944767 them:97944767) |

- When your validator catch up, you can explore your node on public websites:

<https://solanabeach.io/validator>

<https://www.validators.app/validators>

# **4. Staking**

**NOTE: To do this step, step 3.4 must be done (validator is running and catch up)**

Based on your SOL wallet, the wallet will provide steps to create a stake account and do the delegation. Refer to: <https://docs.solana.com/staking> (How do I stake my SOL tokens?)

- To demonstrate, I will create a file system stake account, and delegate stake into vote account:

Create a staking keypair:

|  |
| --- |
| solana-keygen new -o /mnt/sol/validator-stake-keypair.json |

Create Stake account:

|  |
| --- |
| solana create-stake-account /mnt/sol/validator-stake-keypair.json 1 # Transfer 1 SOL into stake account for demo. |

Stake your SOL token into vote account address:

|  |
| --- |
| solana delegate-stake /mnt/sol/validator-stake-keypair.json /mnt/sol/vote-account-keypair.json |

View your stake account:

|  |
| --- |
| solana stake-account /mnt/sol/validator-stake-keypair.json  Balance: 1 SOL  Rent Exempt Reserve: 0.00228288 SOL  Delegated Stake: 0.99771712 SOL  Active Stake: 0 SOL  Activating Stake: 0.99771712 SOL # that is SOL token will be delegated into vote account  Stake activates starting from epoch: 226  Delegated Vote Account Address: HwC6mKFj23wRYeoqjx5p94FKuRKyzfCPmx2wAV3AAR3t  Stake Authority: Bo3s3ZZZJaqdXguBzTsPEHHkUmXPumRF1udBjnZyGXHh  Withdraw Authority: Bo3s3ZZZJaqdXguBzTsPEHHkUmXPumRF1udBjnZyGXHh |

# 5. Update Solana

**Stop service**

sudo systemctl stop solana-sys-tuner

sudo systemctl stop sol

**Download release**

sh -c "$(curl -sSfL <https://release.solana.com/v1.8.5/install>)"

cd /home/ubuntu/.local/share/solana

**Start service**

sudo systemctl start solana-sys-tuner

sudo systemctl start sol