BCDV1013 Blockchain Platforms

Assignment #2

Demonstrate your ability to use Solana CLI with Solana Devnet

- Create a file system wallet on Solana Devnet.
- Airdrop the wallet some SOL tokens.
- Create a second file system wallet.
- Transfer some SOL from Wallet 1 to Wallet 2.
- Create a staking account funded from Wallet 1.
- Delegate your SOL tokens in the staking account to any validator.

1) **Create the project folder**

```
C:\Windows\System32\cmd.exe

Microsoft Windows [Version 10.0.22000.832]
(c) Microsoft Corporation. All rights reserved.

C:\BCDV1011>mkdir solana

C:\BCDV1011>cd solana

C:\BCDV1011\solana>mkdir my-solana-wallet

C:\BCDV1011\solana>cd my-solana-wallet

C:\BCDV1011\solana\my-solana-wallet>
```

2) **Create a file system wallet on Solana Devnet.**
   https://docs.solana.com/wallet-guide/file-system-wallet

   command: solana-keygen new --outfile my-keypair.json

```
C:\BCDV1011\solana\my-solana-wallet>solana-keygen new --outfile my-keypair.json
Generating a new keypair

For added security, enter a BIP39 passphrase

NOTE! This passphrase improves security of the recovery seed phrase NOT the
keypair file itself, which is stored as insecure plain text

BIP39 Passphrase (empty for none):

Wrote new keypair to my-keypair.json
================================================================================
pubkey: 7HGozXonTAi4HWoTEHgbqypoWwJWZwMAYZfyS1NYGwFX
================================================================================
Save this seed phrase and your BIP39 passphrase to recover your new keypair:
legend ring property laptop brand rocket orbit distance plate cancel pitch consider
================================================================================

C:\BCDV1011\solana\my-solana-wallet>
```

3) To display its public key, run:

command: solana-keygen pubkey my-keypair.json

```
C:\BCDV1011\solana\my-solana-wallet>solana-keygen pubkey my-keypair.json
7HGozXonTAi4HWoTEHgbqypoWwJWZwMAYZfyS1NYGwFX
```

It will output a string of characters, such as:

7HGozXonTAi4HWoTEHgbqypoWwJWZwMAYZfyS1NYGwFX

This is the public key corresponding to the keypair in `my-keypair.json`. The public key of the keypair file is your *wallet* address.

4) Verify your Address against your Keypair file

https://docs.solana.com/wallet-guide/file-system-wallet#verify-your-address-against-your-keypair-file

command: solana-keygen verify 7HGozXonTAi4HWoTEHgbqypoWwJWZwMAYZfyS1NYGwFX my-keypair.json

To verify you hold the private key for a given address, use `solana-keygen verify`:

```
C:\BCDV1011\solana\my-solana-wallet>solana-keygen verify 7HGozXonTAi4HWoTEHgbqypoWwJWZwMAYZfyS1NYGwFX my-keypair.json
Verification for public key: 7HGozXonTAi4HWoTEHgbqypoWwJWZwMAYZfyS1NYGwFX: Success
```

solana-keygen verify 7HGozXonTAi4HWoTEHgbqypoWwJWZwMAYZfyS1NYGwFX my-keypair.json

The command will output "Success" if the given address matches the one in your keypair file, and "Failed" otherwise.

5) Airdrop the wallet some SOL tokens.

https://docs.solana.com/cli/transfer-tokens

Airdrop some tokens to get started

First, *airdrop* yourself some play tokens on the devnet.

command: solana airdrop 2 7HGozXonTAi4HWoTEHgbqypoWwJWZwMAYZfyS1NYGwFX --url https://api.devnet.solana.com

```
C:\BCDV1011\solana\my-solana-wallet>solana airdrop 2 7HGozXonTAi4HWoTEHgbqypoWwJWZwMAYZfyS1NYGwFX --url https://api.devnet.solana.com
Requesting airdrop of 2 SOL

Signature: 5gYLJdhchEBWfZBrBiWP6oDikPYdBnGVoQPHV9uEVkkFkp5PPKtTSUYpGcJ9E8LF1zSPu7d1okW7yTXdubB4153R

2 SOL
```

Confirm the airdrop was successful by checking the account's balance.

command: <mark>solana balance 7HGozXonTAi4HWoTEHgbqypoWwJWZwMAYZfyS1NYGwFX --url https://api.devnet.solana.com</mark>

```
C:\BCDV1011\solana\my-solana-wallet>solana balance 7HGozXonTAi4HWoTEHgbqypoWwJWZwMAYZfyS1NYGwFX --url https://api.devnet.solana.com
2 SOL
```

<mark>6) Create a second file system wallet.</mark>

We will need a new address to receive our tokens. Create a second keypair and record its pubkey:

Create another folder for the second wallet:

```
C:\BCDV1011\solana\my-solana-wallet>cd ..

C:\BCDV1011\solana>mkdir to-solana-wallet

C:\BCDV1011\solana>cd to-solana-wallet

C:\BCDV1011\solana\to-solana-wallet>_
```

Create the second file system wallet on Solana Devnet.

C:\BCDV1011\solana\to-solana-wallet><mark>solana-keygen new --outfile to-keypair.json</mark>

```
C:\BCDV1011\solana\to-solana-wallet>solana-keygen new --outfile to-keypair.json
Generating a new keypair

For added security, enter a BIP39 passphrase

NOTE! This passphrase improves security of the recovery seed phrase NOT the
keypair file itself, which is stored as insecure plain text

BIP39 Passphrase (empty for none):

Wrote new keypair to to-keypair.json
================================================================================
pubkey: A3LUrr2ZTQ5H8Haorhu3Z8ReHLDf914CBQhJkmQbAcd7
================================================================================
Save this seed phrase and your BIP39 passphrase to recover your new keypair:
unlock sun tortoise finger alien volcano dragon glove spatial smile title salute
================================================================================
```

Second wallet public key:

pubkey: A3LUrr2ZTQ5H8Haorhu3Z8ReHLDf914CBQhJkmQbAcd7

    https://docs.solana.com/cli/transfer-tokens

Verify the second account:

solana-keygen verify A3LUrr2ZTQ5H8Haorhu3Z8ReHLDf914CBQhJkmQbAcd7 to-keypair.json

```
C:\BCDV1011\solana\to-solana-wallet>solana-keygen verify A3LUrr2ZTQ5H8Haorhu3Z8ReHLDf914CBQhJkmQbAcd7 to-keypair.json
Verification for public key: A3LUrr2ZTQ5H8Haorhu3Z8ReHLDf914CBQhJkmQbAcd7: Success
```

Get balance of the second account:

solana balance A3LUrr2ZTQ5H8Haorhu3Z8ReHLDf914CBQhJkmQbAcd7 --url
https://api.devnet.solana.com

```
C:\BCDV1011\solana\to-solana-wallet>solana balance A3LUrr2ZTQ5H8Haorhu3Z8ReHLDf914CBQhJkmQbAcd7 --url https://api.devnet.solana.com
0 SOL
```

Now, transfer some SOL from Wallet 1 to Wallet 2

command: solana transfer --from my-keypair.json
A3LUrr2ZTQ5H8Haorhu3Z8ReHLDf914CBQhJkmQbAcd7 0.5 --allow-unfunded-recipient --url
https://api.devnet.solana.com --fee-payer my-keypair.json

```
C:\BCDV1011\solana\my-solana-wallet>solana transfer --from my-keypair.json A3LUrr2ZTQ5H8Haorhu3Z8ReHLDf914CBQhJkmQbAcd7 0.5
--allow-unfunded-recipient --url https://api.devnet.solana.com --fee-payer my-keypair.json

Signature: 2hKsUiYQngw4GxbH1cpsUxuFbMDSdfkrQkHQjCBZ8CL7ZwjsHnN4DhBciFFWfAsWKcDGqd2KvnkSSHAsRqDmKqYu
```

Check the balance of both accounts:

```
C:\BCDV1011\solana\my-solana-wallet>solana balance 7HGozXonTAi4HWoTEHgbqypoWwJWZwMAYZfyS1NYGwFX --url
 https://api.devnet.solana.com
1.499995 SOL

C:\BCDV1011\solana\my-solana-wallet>solana balance A3LUrr2ZTQ5H8Haorhu3Z8ReHLDf914CBQhJkmQbAcd7 --url
 https://api.devnet.solana.com
0.5 SOL
```

    https://docs.solana.com/cli/delegate-stake

To delegate stake, you will need to transfer some tokens into a stake account. To create an account, you will need a keypair. Its public key will be used as the stake account address.

command: solana-keygen new --no-passphrase -o stake-account.json

```
C:\BCDV1011\solana\my-solana-wallet>solana-keygen new --no-passphrase -o stake_account.json
Generating a new keypair
Wrote new keypair to stake_account.json
================================================================
pubkey: Bz5mPEjuEj4AjdcYpo7Q62Zy8CPJ2pJEN97pDUWFk5RH
================================================================
Save this seed phrase to recover your new keypair:
join funny cousin kangaroo scatter forget toss reason tribe possible gather book
================================================================
```

The output will contain the public key after the text `pubkey`:

pubkey: Bz5mPEjuEj4AjdcYpo7Q62Zy8CPJ2pJEN97pDUWFk5RH

command: solana create-stake-account --from my-keypair.json stake_account.json 0.5 --stake-authority my-keypair.json --withdraw-authority my-keypair.json --fee-payer my-keypair.json

```
C:\BCDV1011\solana\my-solana-wallet>solana create-stake-account --from my-keypair.json stake_account.json 0.5
--stake-authority my-keypair.json --withdraw-authority my-keypair.json --fee-payer my-keypair.json

Signature: 5tkJeBpfjvYuC6kc5zyswYaYsmLeTfGbnS7XedVaRdGgGXtLvcAiMAvWA2HEsEz2u3NFS2MVTgovd1P9bLax75Wc
```

View the stake account with the `solana stake-account` command:

solana\my-solana-wallet>**solana stake-account stake_account.json**

```
C:\BCDV1011\solana\my-solana-wallet>solana stake-account stake_account.json
Balance: 0.5 SOL
Rent Exempt Reserve: 0.00228288 SOL
Stake account is undelegated
Stake Authority: 7HGozXonTAi4HWoTEHgbqypoWwJWZwMAYZfyS1NYGwFX
Withdraw Authority: 7HGozXonTAi4HWoTEHgbqypoWwJWZwMAYZfyS1NYGwFX
```

Also, you can check the balance of your first account after staking to stake account.json:

**solana balance 7HGozXonTAi4HWoTEHgbqypoWwJWZwMAYZfyS1NYGwFX --url
https://api.devnet.solana.com**

```
C:\BCDV1011\solana\my-solana-wallet>solana balance 7HGozXonTAi4HWoTEHgbqypoWwJWZwMAYZfyS1NYGwFX --url https://api.devnet.solana.com
0.999985 SOL
```

9) <mark>Delegate your SOL tokens in the staking account to any validator.</mark>
   https://docs.solana.com/cli/delegate-stake#delegate-stake

To delegate your stake to a validator, you will need its vote account address. Find it by querying the cluster for the list of all validators and their vote accounts with the `solana validators` command:

```
C:\BCDV1011\solana\my-solana-wallet>solana validators
 Identity                                     Vote Account                                   Commission Last Vote           Root Slot        Skip Rate  Credits  Version   Active
Stake
 4eneXCLcHRxF4MUUkYqim7zvHnPzkkWNsFRNUgsEsKFU  CRCYwDpCUv2Uaqau934fquPNb3SXXUM4PKoaLRpVMTe5  100%  151126088 (-13)  151126035 ( -8)    -        276856  1.10.31        0
.000000000 SOL (0.00%)
! S5X3uY8Fg6EUrgXWoVdwwQeUPPj2AqJCMbTutvG6swm  jxt4fpdcgFYbHWKDCawW632ErXdnyTwvrWzWPMxYPPf    1%         -               -             -             0  unknown        0
.009282880 SOL (0.00%)
! AVn878QC1ufcB6Q2Ywq3FCW3qQ9i9dVr6J3qa2LT6PKY  9TXpjyRf54ZSKKF9Pztxw7AxbFk7eheYThNWM7KeJX8d  100%  130344162       130344116          -             0  unknown        0
.043473920 SOL (0.00%)
! Df98oW3M2urbNPgeq4QNbyQqT8tnaqa5jCuQfVojbHZH  CzQumNfTV6DJZRkAFk8FpABgDnoJ7aJnssm6S6toYZD4  100%  149341679       149341648          -             0  1.11.3         0
.500000000 SOL (0.00%)
! 2FeApjK7R64nF1adgeSXFURvAYdSgfciSr9j5TeuVMVW  J4HALVN1EgZwmXXk156ztfuVS3SpDnCXoKEKmqY6PKud  100%  150350415       150350378          -             0  unknown        0
.997717120 SOL (0.00%)
! AuDp3dXCot4Te1WTNErQvUNE3xgqnwnuHWGYLNchTRtC  8WgeFAHU1S2EqLpdat3JGuiJiT1Se6yQS8b3y2MAA36g  100%  136241770       136241728          -             0  unknown        0
.997717120 SOL (0.00%)
! GLJ9c37PbMMBmkNBDXDPDAirVZGjgkk3dw6Kjn8gcbn1  3AtpCNBwXQ1v3HRT39t718U2kjJjG9TUgdi85UUq8DrA  100%  145911655       145911602          -             0  unknown        0
.997717120 SOL (0.00%)
! hNvzwj7PZEVx4R1ML5uHEThA4tJB3cpdYj6vbne1QYL  HxtBFTNZApkqNa79XaCJ7LZb1oqzSKp633YeRd7RqUMV  100%      -               -             -             0  unknown        1
.178478387 SOL (0.00%)
! H9j39GJxdUy9evvUW1csVhtYFBCAW3Soi5HUVSkUZVrH  GqXvQrLZQLwzMFqGjGRBmdCyuztXcaAAgfbSND7qjJMB  100%  61951755        61951724           -             0  unknown        1
.217478387 SOL (0.00%)
! 74vtGFh4ATs8gywoCm43s3qdGV5xBBA5YakQGdQxiXyj  982uGyVXKTRDh7JVSjiK1cd6aaGkTLeNBn1PYpawS3uH  100%  62204608        62204577           -             0  unknown        1
.232401458 SOL (0.00%)
! 9G7cXAgW6NedC7Be33b1mRHdQt3rV3vRK8iWvwQmmHRb  GxKoV3wtwyoeZARTEPaab1WieAUNXHS7VJwUSDmRjCq1  100%  96340413        96340382           -             0  unknown        1
.275195507 SOL (0.00%)
! C4y4VFx5KjcaSwfxyibKTeYV3k4ynebP13KC38NzSsbg  E5Rzs97VXVGU7MpYzgX4soz2acmfF2oFcjMTCo6KPCuK  100%  118364664       118364627          -             0  unknown        1
.372912627 SOL (0.00%)
! 2xG1HNtGyJU7toexYdZZmXUnkb1Sf9fuNPtUycieKqDu  AopDQcWXyZTK4V7wCsq54eiQyawshtmJPU89iKGP9tv8  100%  138671999       138671962          -             0  1.9.17         1
.500000000 SOL (0.00%)
! GazuKKoQsevtL8qk7VpdVnHC2fwuhG8xEpQN7xvpN2mN  96bkZndLhCqzuuhcSoBG6WiG6ZwCChFBHcFpqj9VoATe  100%  55984945        55984914           -             0  unknown        1
.675195507 SOL (0.00%)
! 7dXQpr8sd8hxygaMTu3P8U9jkFhaERXMojfsorGtXKbX  FLRkStZ1KT1RDGvHq83EkzZPjaiqTFL2fJzxaDJzY7pe  100%  74468368        74468337           -             0  unknown        1
.775195507 SOL (0.00%)
! FgfMA5sFF4UDyQBoyWWiztkBHt6K7v54HfVJR3oqw4rY  9HsHeqsNy14ozRqppAThN4pBfVUV14gAvoJBh9c1MgUA  100%  89275666        89275629           -             0  unknown        1
```

....

```
Active Stake: 169790791.431999713 SOL
Current Stake: 152025483.740040123 SOL (89.54%)
Delinquent Stake: 17765307.691959579 SOL (10.46%)

Stake By Version:
1.10.21   -     0 current validators ( 0.00%),   1 delinquent validators ( 0.00%)
1.10.25   -     1 current validators ( 0.00%)
1.10.26   -     0 current validators ( 0.00%),   1 delinquent validators ( 0.00%)
1.10.30   -     2 current validators (22.39%)
1.10.31   -     3 current validators ( 0.00%),   1 delinquent validators ( 0.00%)
1.10.32   -     4 current validators (67.15%)
1.11.3    -     0 current validators ( 0.00%),   1 delinquent validators ( 0.00%)
1.9.17    -     0 current validators ( 0.00%),   1 delinquent validators ( 0.00%)
1.9.25    -     0 current validators ( 0.00%),   1 delinquent validators ( 0.00%)
unknown   -     0 current validators ( 0.00%), 216 delinquent validators (10.46%)
```

The first column of each row contains the validator's identity and the second is the vote account address. Choose a validator and use its vote account address in `solana delegate-stake`:

<mark>**Then Delegate Stake**</mark>

command: <mark>solana delegate-stake --stake-authority my-keypair.json Bz5mPEjuEj4AjdcYpo7Q62Zy8CPJ2pJEN97pDUWFk5RH vgcDar2pryHvMgPkKaZfh8pQy4BJxv7SpwUG7zinWjG --fee-payer my-keypair.json</mark>

```
C:\BCDV1011\solana\my-solana-wallet>solana delegate-stake --stake-authority my-keypair.json Bz5mPEjuEj4AjdcYpo7Q62Zy8CPJ2pJEN97pDUWFk5RH
 vgcDar2pryHvMgPkKaZfh8pQy4BJxv7SpwUG7zinWjG --fee-payer my-keypair.json

Signature: 4p2specoYMqDy2GtGsVyGQnDX1pduZUTFYo4EbcwfkRTEYPMpbkS8CX8Lk8cEgbTJTy12Dj8YzYgxbg222sqC9Q1
```

Check the balance of staking account:

```
C:\BCDV1011\solana\my-solana-wallet>solana balance Bz5mPEjuEj4AjdcYpo7Q62Zy8CPJ2pJEN97pDUWFk5RH
0.5 SOL
```

After delegating stake, use `solana stake-account` to observe the changes to the stake account:

command: solana stake-account Bz5mPEjuEj4AjdcYpo7Q62Zy8CPJ2pJEN97pDUWFk5RH

You will see new fields "**Delegated Stake**" and "**Delegated Vote Account Address**" in the output.
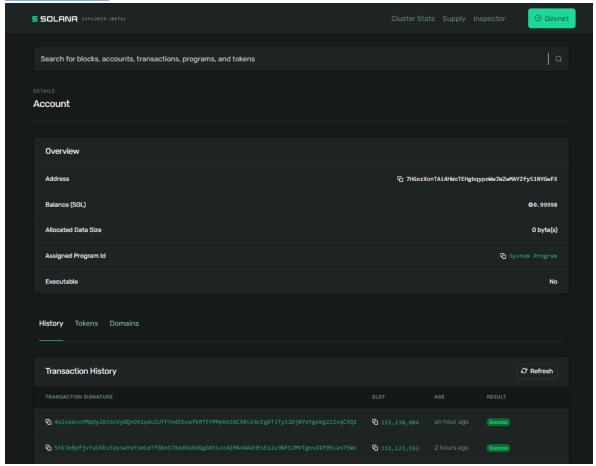
```
C:\BCDV1011\solana\my-solana-wallet>solana stake-account Bz5mPEjuEj4AjdcYpo7Q62Zy8CPJ2pJEN97pDUWFk5RH
Balance: 0.5 SOL
Rent Exempt Reserve: 0.00228288 SOL
Delegated Stake: 0.49771712 SOL
Active Stake: 0 SOL
Activating Stake: 0.49771712 SOL
Stake activates starting from epoch: 349
Delegated Vote Account Address: vgcDar2pryHvMgPkKaZfh8pQy4BJxv7SpwUG7zinWjG
Stake Authority: 7HGozXonTAi4HWoTEHgbqypoWwJWZwMAYZfyS1NYGwFX
Withdraw Authority: 7HGozXonTAi4HWoTEHgbqypoWwJWZwMAYZfyS1NYGwFX
```

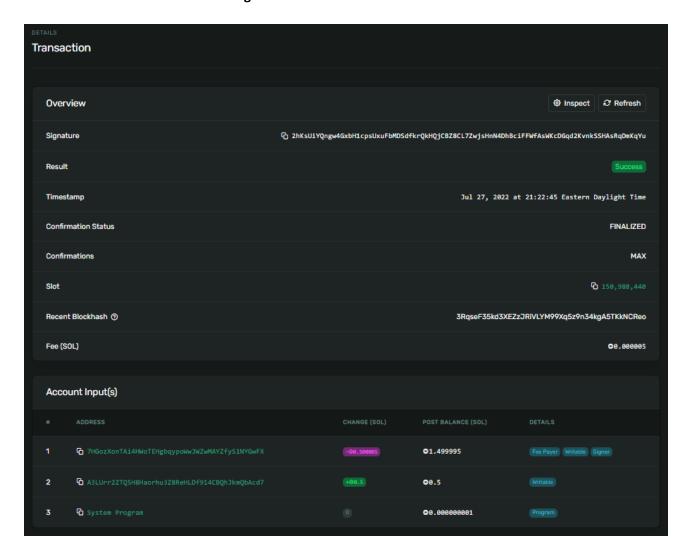**Overview and check accounts and transactions on the Solana devnet explorer:**

https://explorer.solana.com/?cluster=devnet

1. **View account 1:**
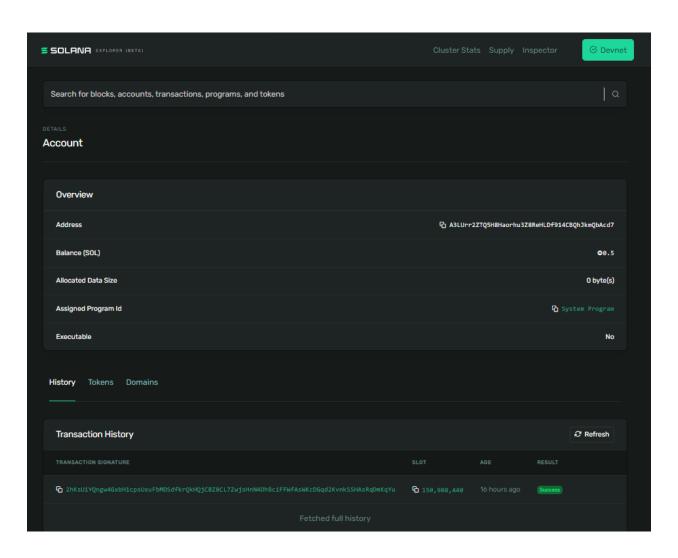   https://explorer.solana.com/address/7HGozXonTAi4HWoTEHgbqypoWwJWZwMAYZfyS1NYGwFX?cluster=devnet

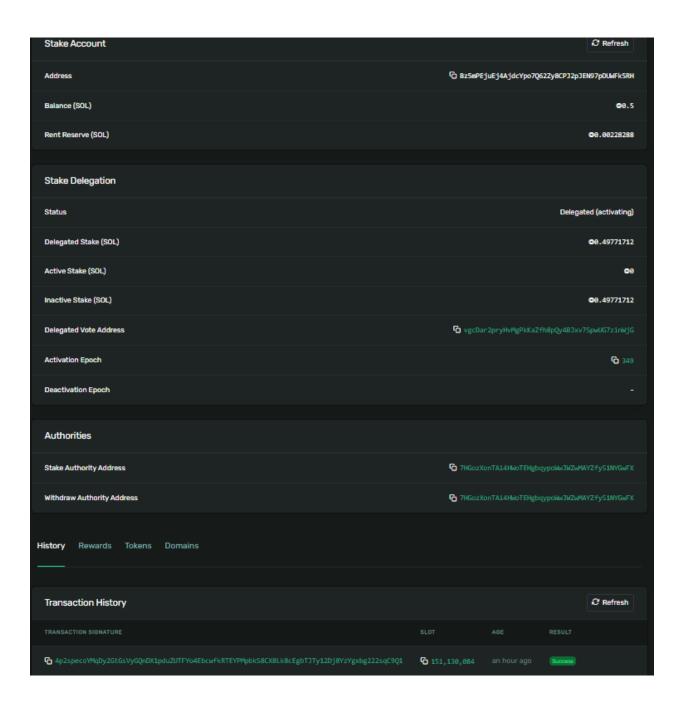**2. A transaction that shows transferring 0.5 sol from account-1 to account-2:**

DETAILS

Transaction

Overview

⚙ Inspect   ⟳ Refresh

Signature	⎘ 2hKsUiYQngw4GxbH1cpsUxuFbMDSdfkrQkHQjCBZ8CL7ZwjsHnN4DhBciFFWfAsWKcDGqd2KvnkSSHAsRqDmKqYu
Result	Success
Timestamp	Jul 27, 2022 at 21:22:45 Eastern Daylight Time
Confirmation Status	FINALIZED
Confirmations	MAX
Slot	⎘ 150,988,440
Recent Blockhash ⑦	3RqseF35kd3XEZzJRiVLYM99Xq5z9n34kgA5TKkNCReo
Fee (SOL)	◎0.000005

Account Input(s)

#	ADDRESS	CHANGE (SOL)	POST BALANCE (SOL)	DETAILS
1	⎘ 7HGozXonTAi4HWoTEHgbqypoWwJWZwMAYZfyS1NYGwFX	−0.500005	◎1.499995	Fee Payer Writable Signer
2	⎘ A3LUrr2ZTQ5H8Haorhu3Z8ReHLDf914CBQhJkmQbAcd7	+0.5	◎0.5	Writable
3	⎘ System Program	0	◎0.000000001	Program

3. **View account 2:**
    https://explorer.solana.com/address/A3LUrr2ZTQ5H8Haorhu3Z8ReHLDf914CBQhJkmQbAcd7?cluster=devnet

4) View stake-account:

https://explorer.solana.com/address/Bz5mPEjuEj4AjdcYpo7Q62Zy8CPJ2pJEN97pDUWFk5RH?cluster=devnet

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