XSICEL 2021

Transición energética en la 4ta revolución industrial

Universidad Tecnológica de Pereira

UNIVERSIDAD NACIONAL DE COLOMBIA

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Monitoring system for electrical variables implementing blockchain and python

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Acreditación Institucional de Alta Calidad

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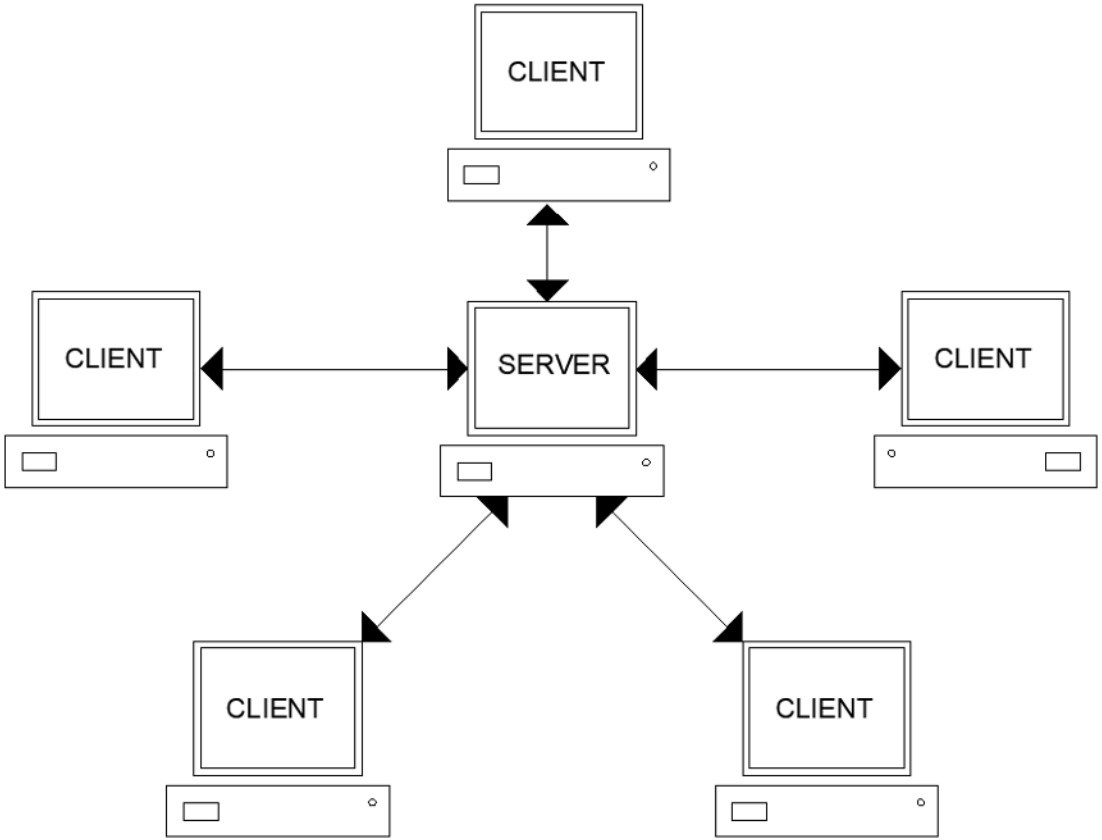

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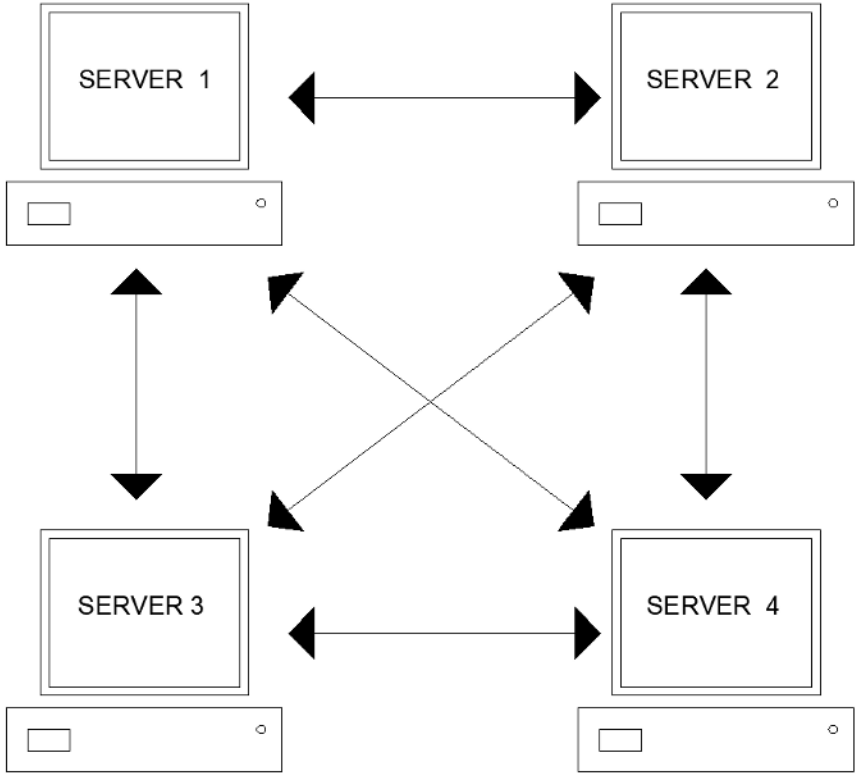

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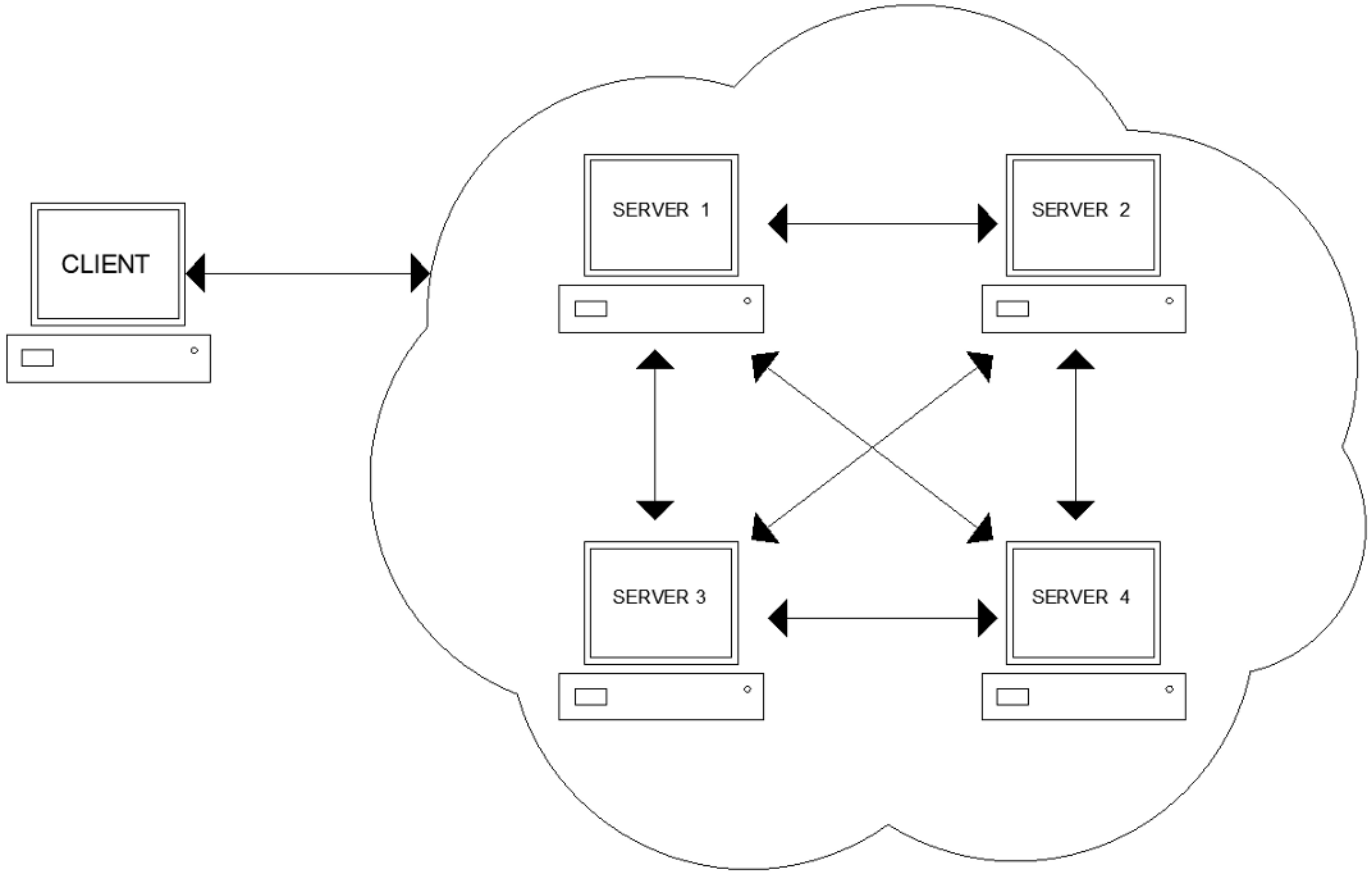

II. Monitoring system for electrical variables implementing blockchain and python

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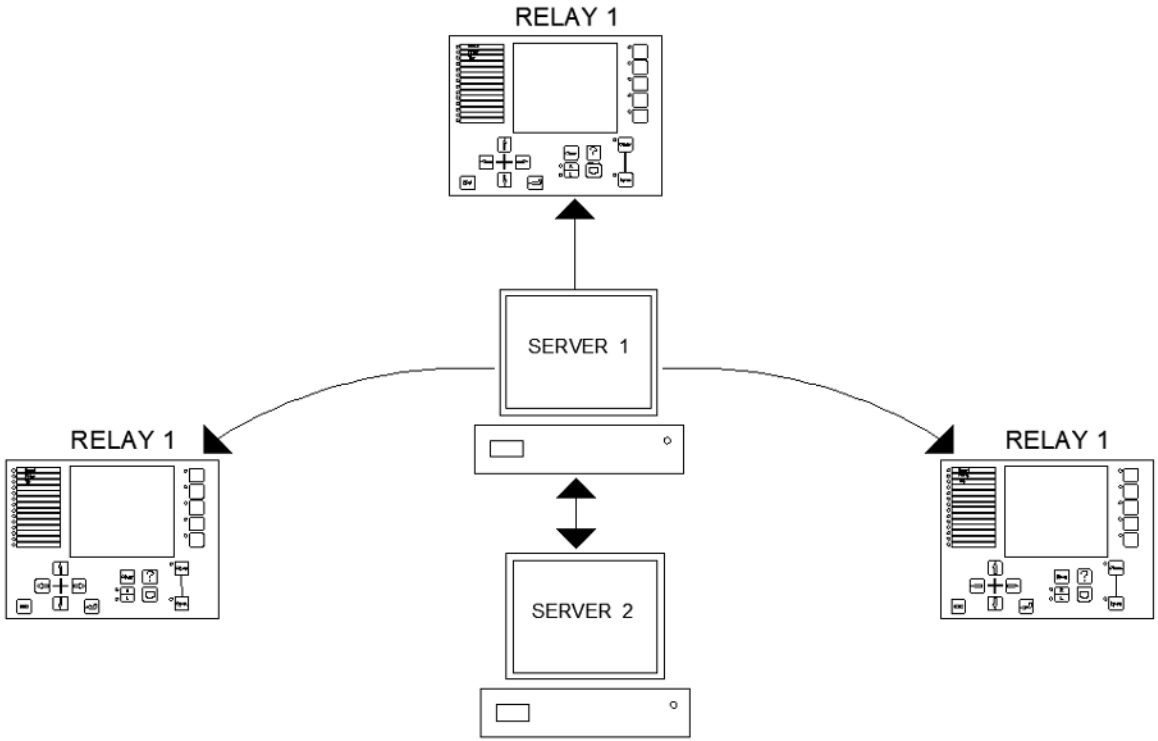

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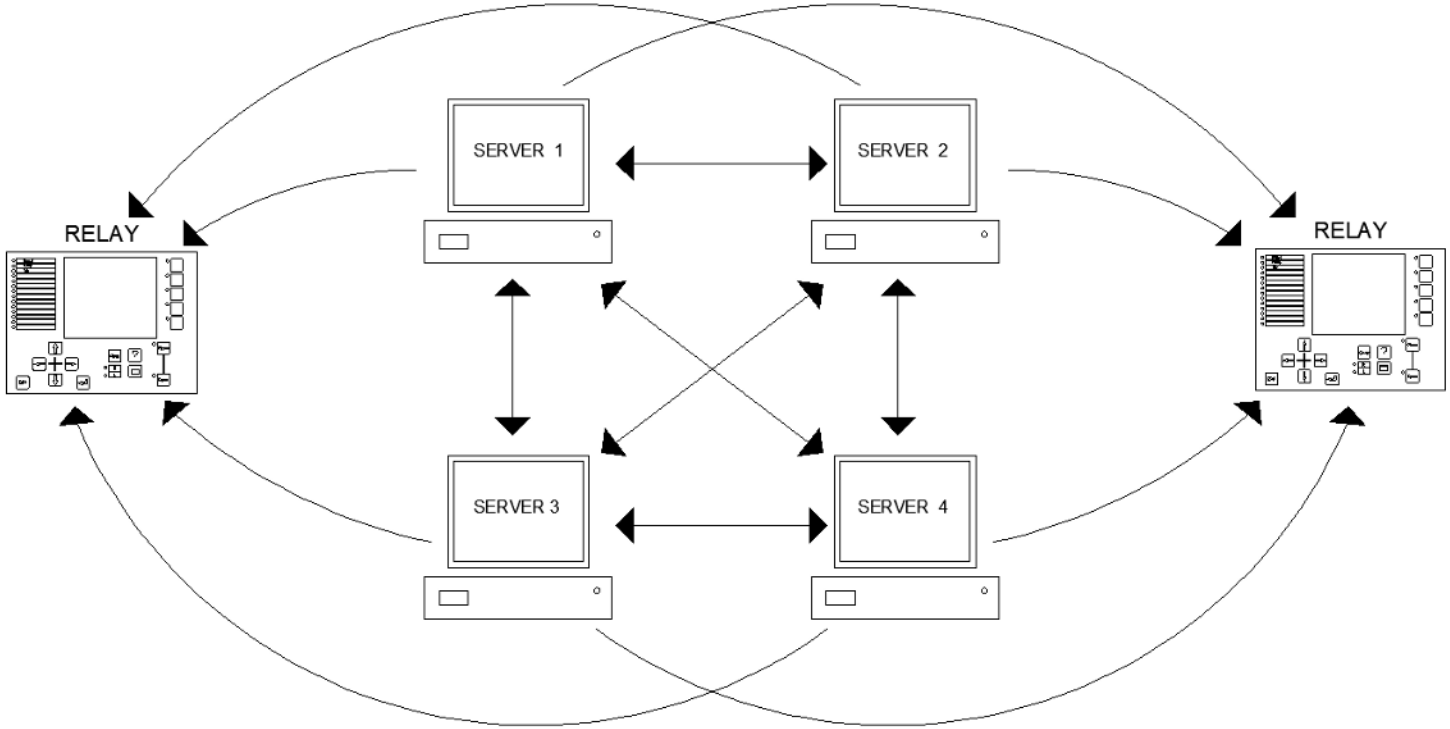

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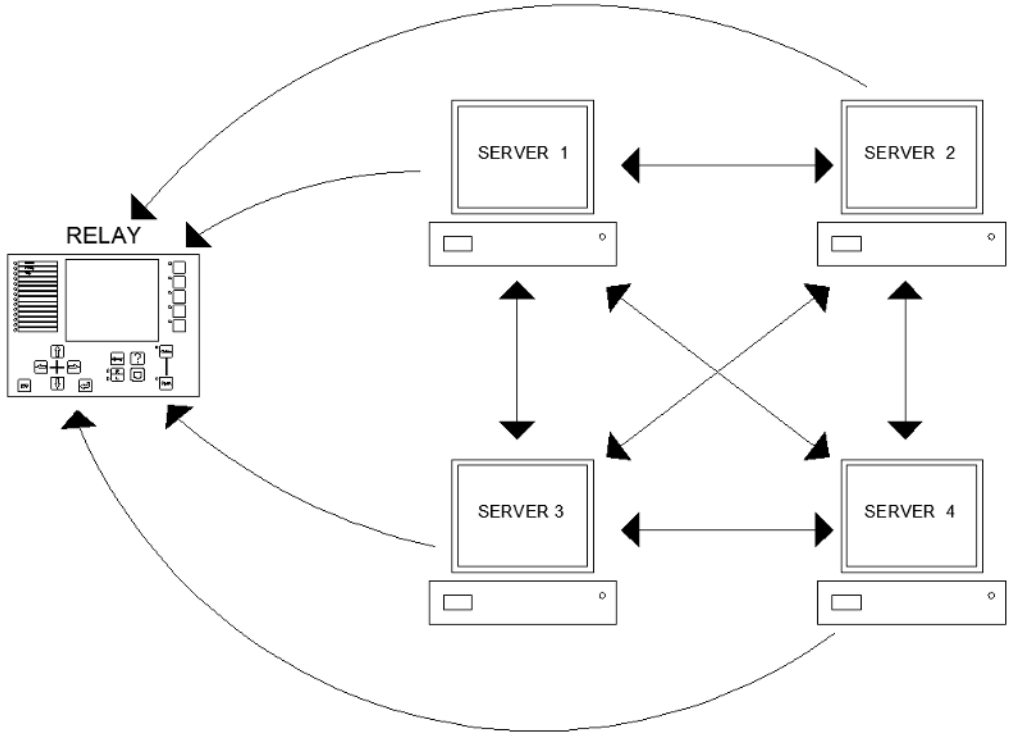


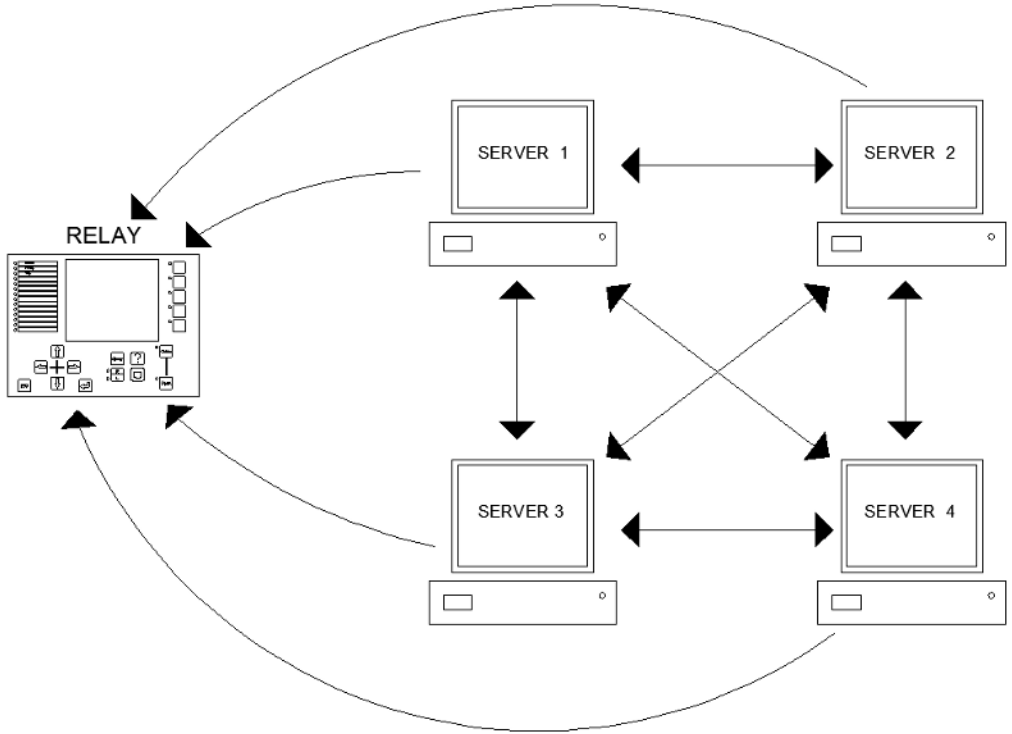
II. Monitoring system for electrical variables implementing blockchain and python

02 10 2021 18 11
Relay 1
Bogotá Electrical Substation - U.D.

Openings caused by faults: 22.0

Time Stamp;28 09 2021 07 01 18;Vab;115.314;Vbc;116.048;Vca;116.293;Ia;26.082;Ib;30.831;Ic;45.186;F;60.158;FP;0.979;P;236.887;Q;57.743
Time Stamp;28 09 2021 07 01 28;Vab;110.69;Vbc;117.149;Vca;112.374;Ia;41.868;Ib;41.825;Ic;26.057;F;59.877;FP;0.715;P;125.543;Q;615.162
Time Stamp;28 09 2021 07 01 38;Vab;114.175;Vbc;117.479;Vca;111.914;Ia;17.894;Ib;32.324;Ic;49.737;F;59.342;FP;0.513;P;595.397;Q;507.482
Time Stamp;28 09 2021 07 01 48;Vab;116.332;Vbc;113.905;Vca;115.683;Ia;44.307;Ib;0.065;Ic;29.083;F;59.067;FP;0.81;P;122.33;Q;486.381
Time Stamp;28 09 2021 07 01 58;Vab;112.672;Vbc;115.69;Vca;109.112;Ia;19.199;Ib;22.847;Ic;1.307;F;59.477;FP;0.998;P;155.695;Q;50.381
Time Stamp;28 09 2021 07 02 08;Vab;110.577;Vbc;112.259;Vca;112.543;Ia;37.693;Ib;12.535;Ic;29.003;F;60.857;FP;0.306;P;175.923;Q;392.21

II. Monitoring system for electrical variables implementing blockchain and python



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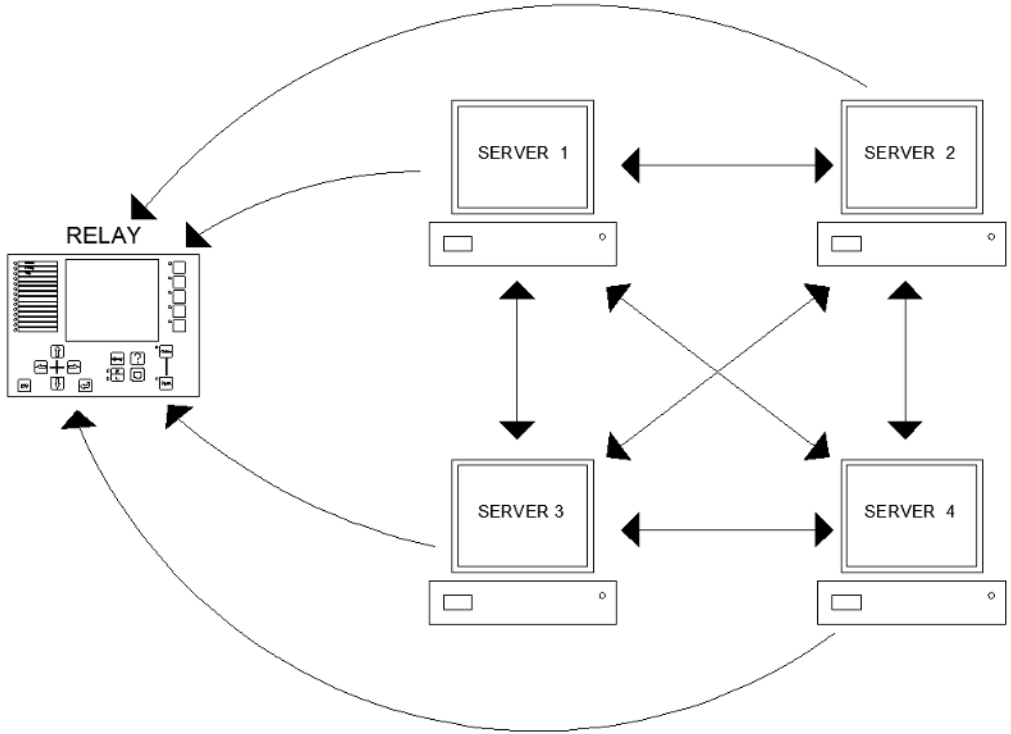


POSTMAN

PYTHON

III. Results


```
    "1_length"  5
    "2_chain"

            "1_Index"  1
            "2_Estampa_de_tiempo"  "2021-09-28 06:58:11.088496"
            "3_proof"  1
            "4_previous_hash"  "0"
            "5_transactions"
                "Bloque Génesis"


            "1_Index"  2
            "2_Estampa_de_tiempo"  "2021-09-28 06:59:30.842493"
            "3_proof"  533
            "4_previous_hash"  "81c5919c6a13b571179148a20f58a82e82f3b3a5a8fa2d75236d67907cc0075b"
            "5_transactions"

"A.Equipo"  "Rele_2"
"B.Servidor"  "Red_BKC_NODO_5006"
"C.Informacion"  "28 09 2021 06 58\nRelay 1\nBogotá Electrical Substation - U.D.\n\n\nOpenings caused by faults:……

            "1_Index"  3
            "2_Estampa_de_tiempo"  "2021-09-28 07:05:50.497756"
            "3_proof"  45293
            "4_previous_hash"  "3aa16b100b31ccd8b287b2cbaa52fb3c6a4426fd24bc22c30fa53a78c755c8e0"
            "5_transactions"

"A.Equipo"  "Rele_1"
"B.Servidor"  "Red_BKC_NODO_5005"
"C.Informacion"  "28 09 2021 07 04\nRelay 1\nBogotá Electrical Substation -
 U.D.\n\n\nOpenings caused by faults: 19.0\n\n\nTime Stamp;28 09 2021 07 04 18;Vab;111.36;Vbc;……
```

III. Results

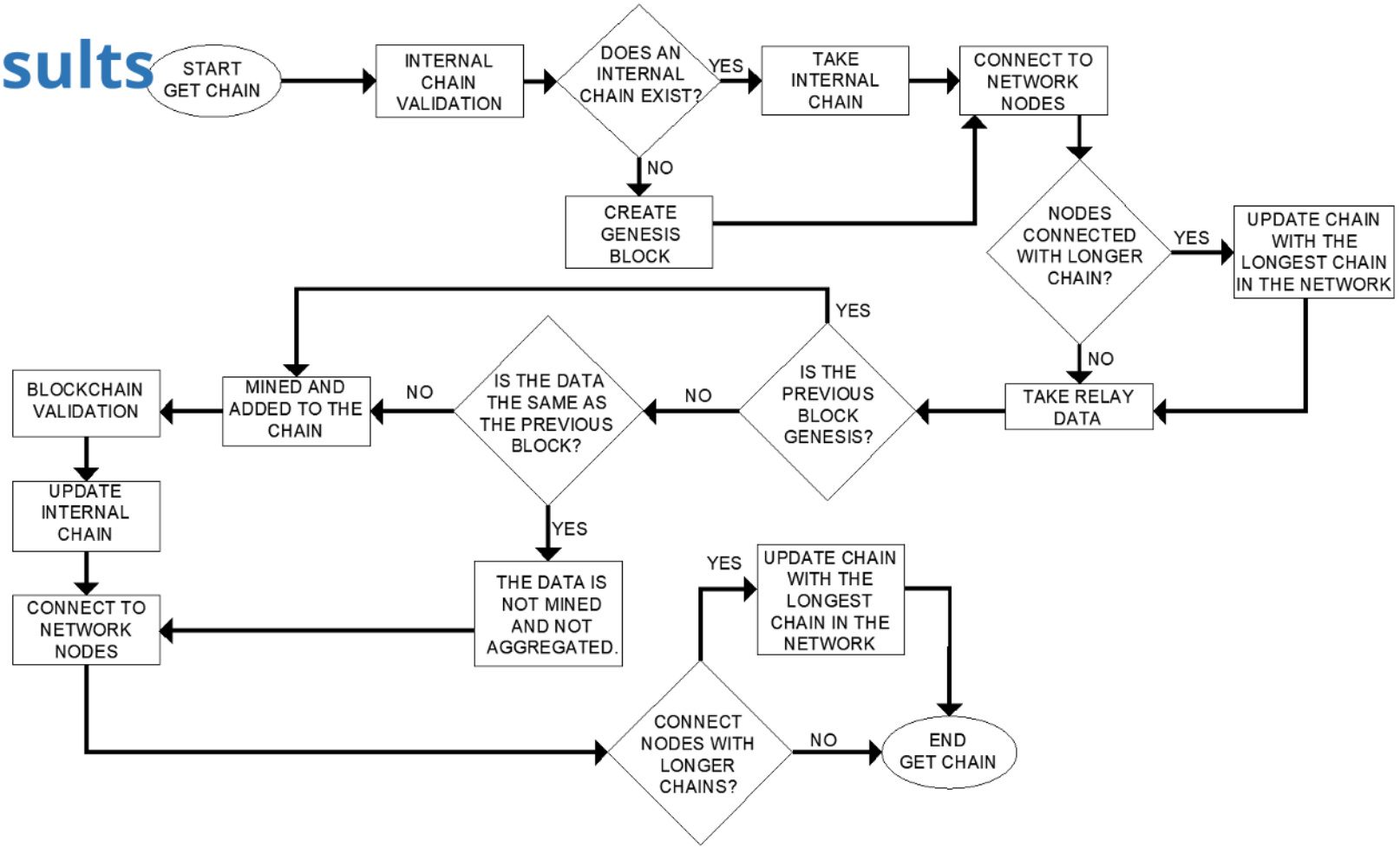

```
            "1_Index"  4
            "2_Estampa_de_tiempo"  "2021-09-28 07:06:37.856713"
            "3_proof"  21391
            "4_previous_hash"  "ffe3b3fa65e271ed1decd3f0dc2841316a77730f1d83c5fbd9f709c6fcb8fc4a"
            "5_transactions"

"A.Equipo"  "Rele_4"
"B.Servidor"  "Red_BKC_NODO_5007"
"C.Informacion"  "28 09 2021 07 05\nRelay 1\nBogotá Electrical Substation  U.D.\n\n\nOpenings caused by faults: 11.0\n\n\nTime Stamp;28 09 2021 07 05
18;Vab;.....

            "1_Index"  5
            "2_Estampa_de_tiempo"  "2021-09-28 07:07:29.874740"
            "3_proof"  8018
            "4_previous_hash"  "a879cb757e25bb1d2fc88c8644bd0bbbd09b4a6d3a41600ed87f566ab3bbb227"
            "5_transactions"

"A.Equipo"  "Rele_1"
"B.Servidor"  "Red_BKC_NODO_5005"
"C.Informacion"  "28 09 2021 07 06\nRelay 1\nBogotá Electrical Substation  U.D.\n\n\nOpenings caused by faults: 8.0\n\n\nTime Stamp;28 09 2021 07 06 1
8.....
```

III. Results


START GET CHAIN
INTERNAL CHAIN VALIDATION
DOES AN INTERNAL CHAIN EXIST?
YES
TAKE INTERNAL CHAIN
CONNECT TO NETWORK NODES
NO
CREATE GENESIS BLOCK
NODES CONNECTED WITH LONGER CHAIN?
YES
UPDATE CHAIN WITH THE LONGEST CHAIN IN THE NETWORK
NO
TAKE RELAY DATA
IS THE PREVIOUS BLOCK GENESIS?
YES
NO
IS THE DATA THE SAME AS THE PREVIOUS BLOCK?
NO
MINED AND ADDED TO THE CHAIN
BLOCKCHAIN VALIDATION
UPDATE INTERNAL CHAIN
CONNECT TO NETWORK NODES
YES
THE DATA IS NOT MINED AND NOT AGGREGATED.
YES
UPDATE CHAIN WITH THE LONGEST CHAIN IN THE NETWORK
CONNECT NODES WITH LONGER CHAINS?
NO
END GET CHAIN

IV. Conclusions

- It develops a blockchain algorithm capable of connecting multiple nodes to the network and decentralizing the held information. In this algorithm, additional equipment, such as a relay, can be contacted. Likewise, the servers connected to the network interrogate the device, collecting information of measurements and events that occurred during the last minute, achieving the capture of such information and adding it to the chain without repetition.

IV. Conclusions

- In addition, it is relevant to highlight the decentralization of the information compared with conventional recording events methods; this allows greater control of the information and much faster and more reliable access by network users to the data stored. In addition, to develop a blockchain with a high amount of equipment, it is recommended to use machines with high processing levels, higher RAMs, and modules that intervene in the information linking process to the equipment with the greater capacity, both in storage and performance. These characteristics allow the algorithm to run smoothly and in the shortest possible time.

IV. Conclusions

- In short, using this type of technology in an environment where information must be transported from the substation to a control center and give orders to the equipment is not recommended since the execution times of the commands can delay the proper system functioning. However, it is advisable to manage it as an extensive decentralized database with few cybersecurity vulnerabilities.

QUESTIONS

THANK S