An Efficient Cloud Based Approach for Decentralized DNS System

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Problem Statement

We propose a solution which is cloud based and decentralized. This advantages of cloud based approach with services like(e.g AWS) include

- **Resource Pooling and Elasticity**
- **On-Demand & Self Services**
- **QoS (Quality of Service)**

The Cloud Service could be private entities or large TLD (Top Level Domain) companies.

Proposed Approach

Pruning Algorithm

The list of Trusted Entities are listed in a tree structure. We employ the **Alpha-Beta Pruning** which is adversarial graph search algorithm to identify the nearest and best trusted entity for the user.

Need for Alpha-Beta Pruning

- Faster record fetching for the local DNS servers.
- Minimizes the latency and erases the need of finding a best match trusted server.

The algorithm takes into account the following:

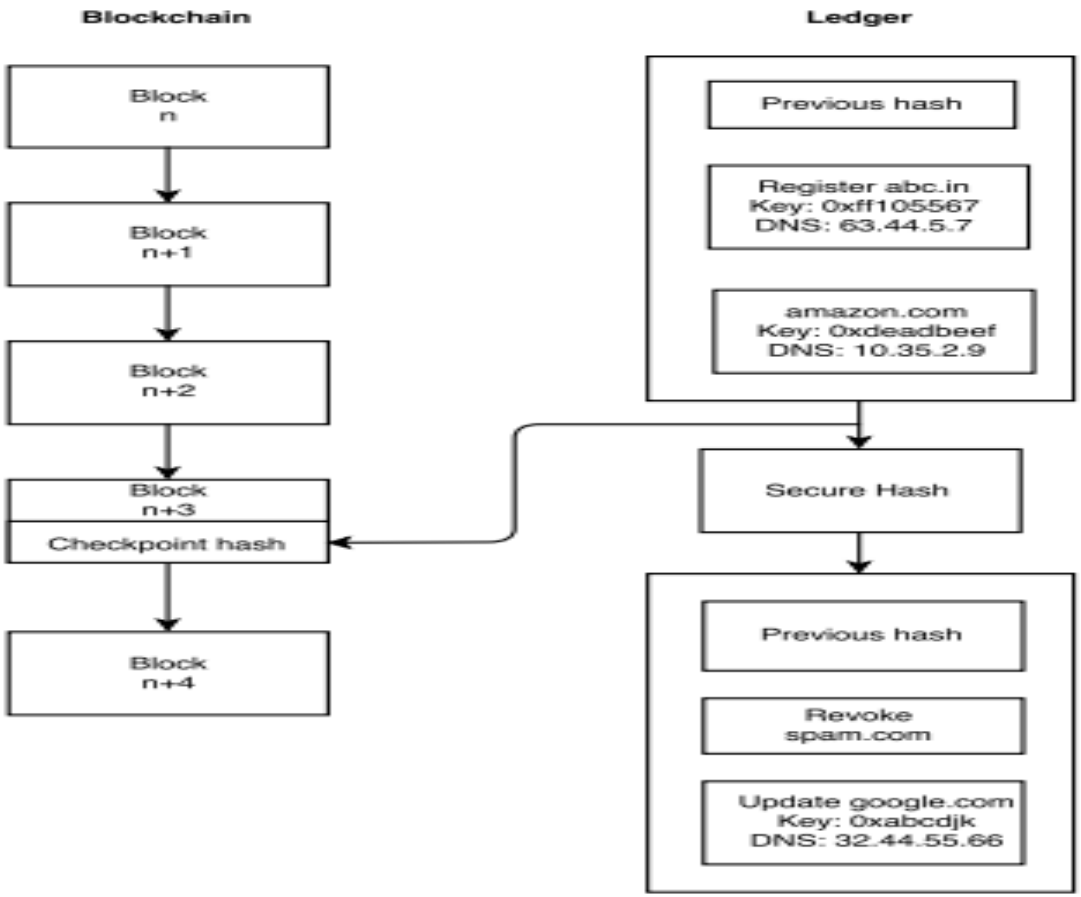
- Geographic Location
- Latency

The pseudo-code for the above Algorithm is shown below:

```
function BestDataCenter(listOfDataCenters) returns the best data center
state inputs:
requestTime , responseTime , serviceTime
for each dataCenter in ListOfDataCentres do
        if len of ClosestDataCenter[] > 1:
            Find bestResponseTime()
        else Find Lowest Latency()
end
return mostSuitableDataCenter
```

Proposed Approach (cont'd)

DNS BlockChain with Ledger



Achieved Results

BlockChain (Adding records)

```
File  Edit  View  Search  Terminal  Help
sin9yt@l0n3w0lf:~/Documents/Project/blockchain$ ./blockchain
Select the Operation you want to perform
1.Register domain
2.Update Record
3.Revoke Record
1
Enter the data in the following format
[1]Domain Name
[2]Key
[3]DNS Records(IP)
pesitbsc.com
0xab4893hah
162.34.5.1
Operation Succesful.
Domain Registered!
sin9yt@l0n3w0lf:~/Documents/Project/blockchain$
```

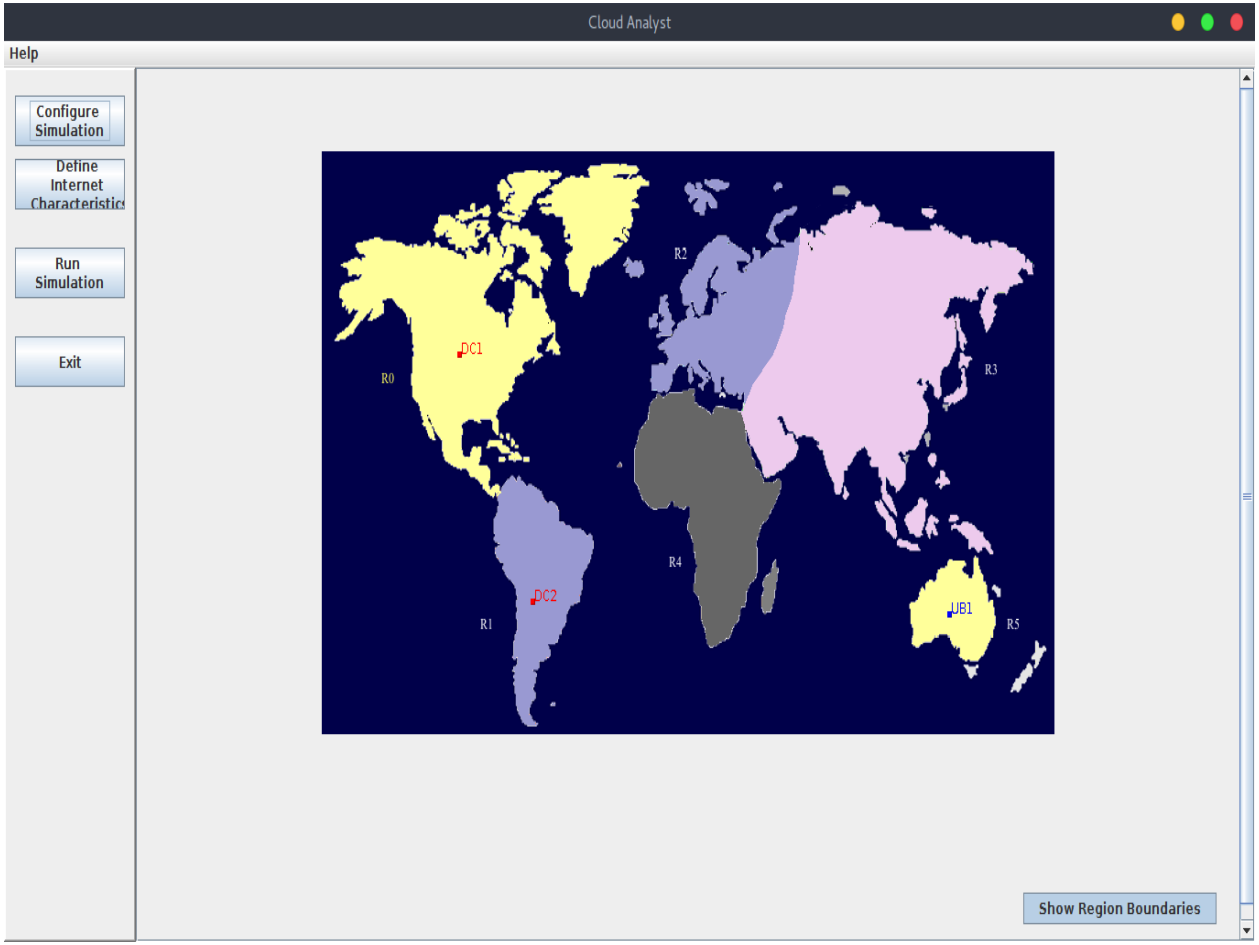
Achieved Results

Ledger

```
File  Edit  View  Search  Terminal  Help

height...... 5
magic....... d5e8a97f
version..... 1
timestamp... 1488902864 (16:07:44 03/07/2017)
prevhash.... 38c975134ce342440d4e29afc76925544b6d9ebcdcb287775fbfc51622021bde
blockhash... 7a04aaeb56ec45aa04f7cc85c35db4cf117a3607fb59373c271712275a915bae
datalen..... 31
data........
                a.com
                0x1387937
                1.1.1.1

--------------------------------------------------------------------------------

height...... 6
magic....... d5e8a97f
version..... 1
timestamp... 1488946192 (04:09:52 03/08/2017)
prevhash.... 7a04aaeb56ec45aa04f7cc85c35db4cf117a3607fb59373c271712275a915bae
blockhash... 241d99ed6ae14a79c70fe776bad62eeeaeed99ddd39c08083793b641ca24d2e1
datalen..... 43
data........
                pesitbsc.com
                0xab4893hah
                162.34.5.1

--------------------------------------------------------------------------------
```

Achieved Results

Cloud Simulation: 2 DataCenter , 2 Users



Achieved Results

Cloud Simulation: 2 DataCenter , 2 Users (Results)

Simulation Results

Overall Response Time Summary

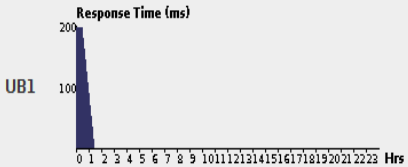
	Average (ms)	Minimum (ms)	Maximum (ms)
Overall Response Time:	200.07	158.06	246.12
Data Center Processing Time:	0.10	0.00	0.11

Export Results

Response Time By Region

Userbase	Avg (ms)	Min (ms)	Max (ms)
UB1	200.074	158.059	246.115

User Base Hourly Average Response Times



Data Center Request Servicing Times

Data Center	Avg (ms)	Min (ms)	Max (ms)
DC1	0.101	0.019	0.114
DC2	0	0	0

Data Center Hourly Average Processing Times

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Achieved Results

Cloud Simulation: 2 DataCenter , 2 Users (Terminal Results)

```
File  Edit  View  Search  Terminal  Help
sin9yt@l0n3w0lf:~/Downloads/cloud_analyst/jars$ java -jar cloudanalyst.jar
simulation time =3600000.0ms
Starting Simulation...
Initialising...
Creating new broker DC1-Broker
0.0 Creating new user base UB1
0.0 Creating new user base UB2
Starting GridSim version 4.2
Entities started.
Starting user base 9 UB2
Starting user base 7 UB1
Starting broker 6 name=DC1-Broker
Starting internet 11
5.0: DC1-Broker: Cloud Resource List received with 1 resource(s)
5.0: DC1-Broker: Trying to Create VM #0
5.0: DC1-Broker: Trying to Create VM #1
5.0: DC1-Broker: Trying to Create VM #2
5.0: DC1-Broker: Trying to Create VM #3
5.0: DC1-Broker: Trying to Create VM #4
Gathering simulation data.
UB2 finalizing. Messages sent:649, Received:649
Got response for 700623 but it seems to be completed.
UB1 finalizing. Messages sent:631, Received:631
UB1 requests sent=6058 , received=6058
DC1-Broker finalizing, submitted cloudlets=1280 processing cloudlets=0 ,allRequestsProcessed=122
45
UB2 requests sent=6187 , received=6187
Simulation completed.
```

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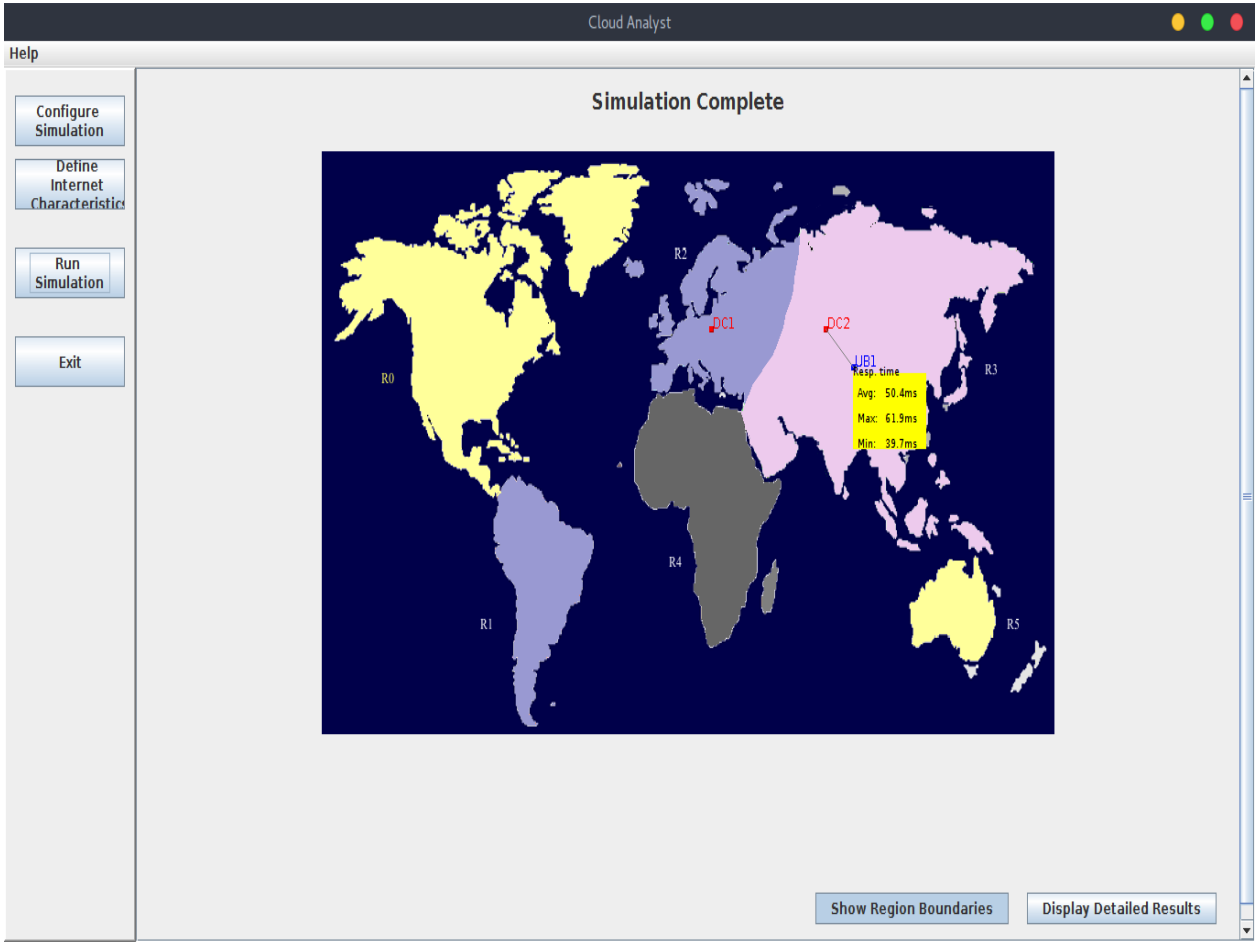
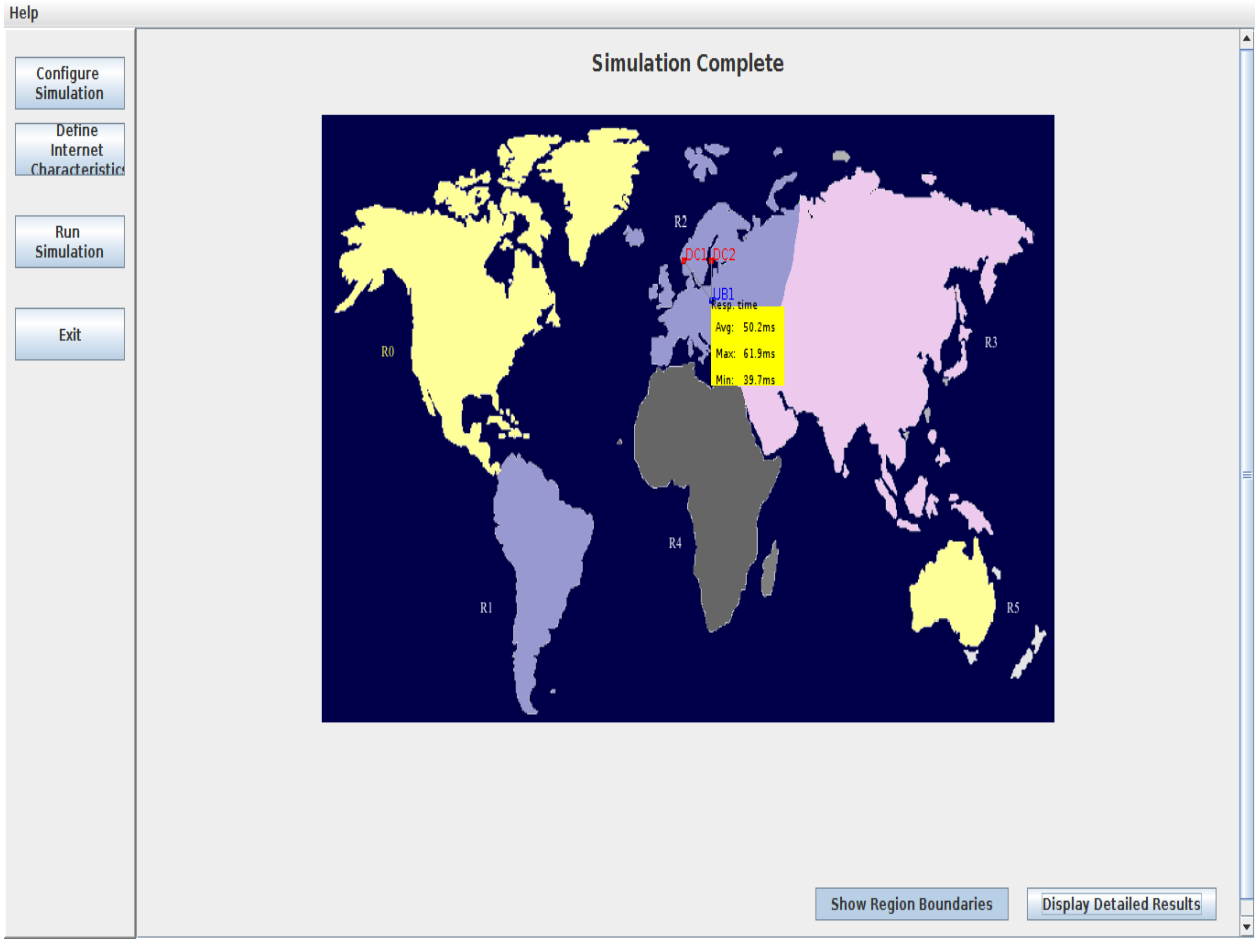
Achieved Results

Cloud Simulation: 2 DataCenter , 1 Near Users



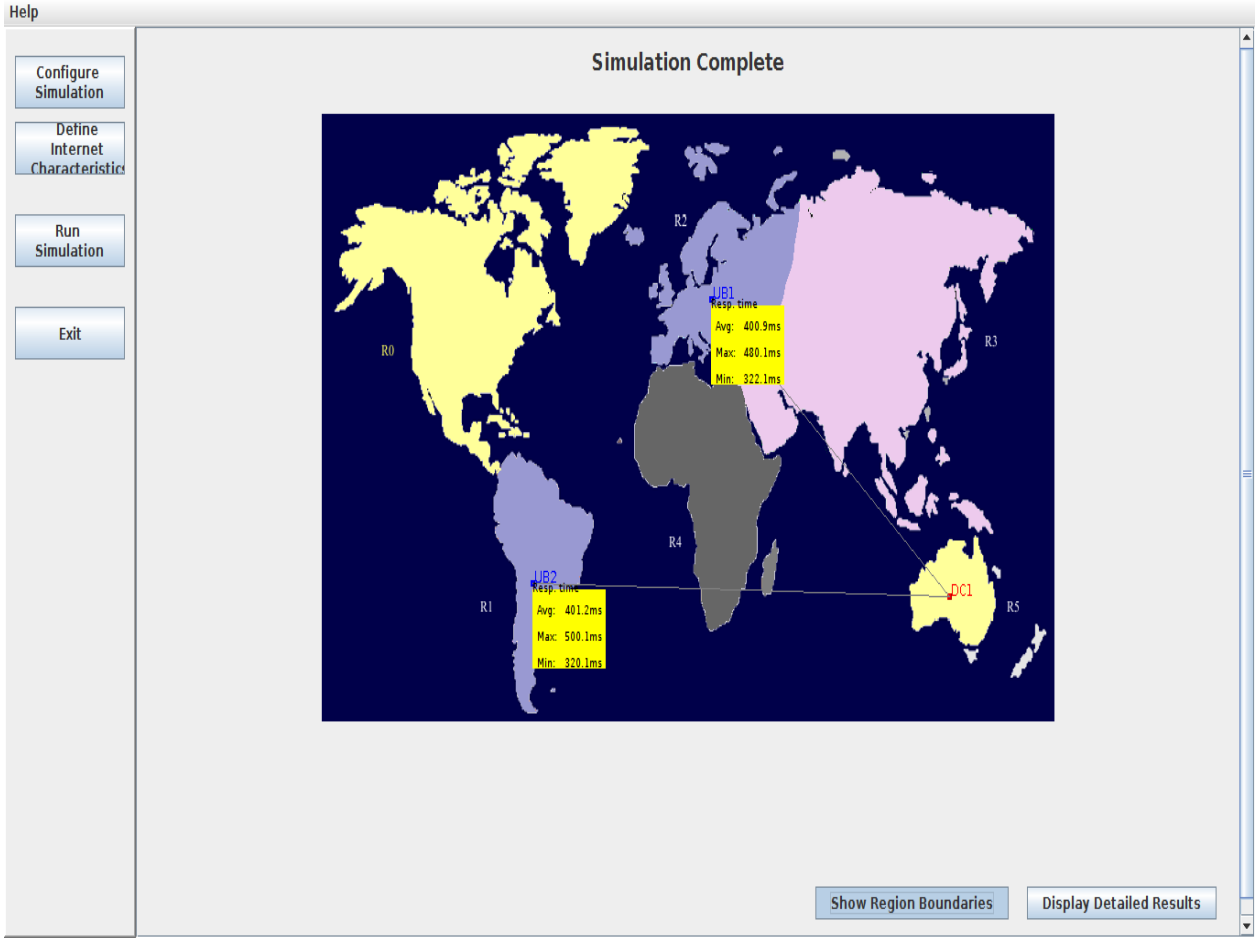
Achieved Results

Cloud Simulation: 2 DataCenter , 2 Users (Same Location)



Achieved Results

Cloud Simulation: 1 DataCenter , 2 Users



Project Plan

Phase-I (25%) Deadline: 23rd Jan - 10th Feb

- Building of Blockchain with inputs

Phase-II (50%) Deadline: 12th Feb - 19th Feb

- Building of VM, Datacenter, Users using CloudSim
- Calculation of Parameters such as latency, Resource Usage.

Phase-III (75%) Deadline: 2nd Mar - 15th Mar

- Determination of the best Center using parameters determined above
- Integration of Blockchain with server to resolve queries (50%)

Phase-IV (100%) Deadline: 15th Mar - 31st Mar

- Integration of Blockchain with server to resolve queries (50%)
- Testing and Validation

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Conclusion

The main contribution in our project is to solve the problem of centralized DNS system using cloud based infrastructure.

Bibiliography

- **Francesca Musiani**,A Decentralized Domain Name System? User-Controlled Infrastructure as Alternative Internet Governance,MA:The MIT Press.
- **Harry Kalodner, Miles Carlsten, Paul Ellenbogen, Joseph Bonneau, Arvind Narayanan**,An empirical study of Namecoin and lessons for decentralized namespace design, Princeton University.
- **Aaron Wright,Primavera De Filippi**,Decentralized blockchain technology and the rise of lex cryptographia, intGovt Forum.

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