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Objective: create a smart contract to track universities properly registered by the ministry of education on the blockchain and test it on a local ganache network.

Tools used: Solidity, Ganache, Remix IDE.

DESCRIPTION

It is becoming increasingly difficult to locate illegal universities that offer education services, with this program you can verify that the university where you enroll is properly registered as an institution in your country.

Background of the problem statement:

In many countries around the world, there are illegal universities that are not affiliated with any government educational institution. Many students enroll in these universities unknowingly and, in turn, end up without jobs or the universities are closed after some time, which ruins their career.

An immutable solution, such as Blockchain, is needed where all the faculties of a university are registered as blockchain to ensure that no one can modify any old registration. That same solution should make it possible to ban any university from registering new students in case there is any complaint against that university. Subsequently, the ban would be removed once the university resolved all complaints.

WHAT I WOULD CHANGE?

I would change to the smart contract, the feature that when registering each student, the student provides his unique ETH address to have an identity instead of his name(string), adding it to a mapping of address => students and inside the Student structure add the address and leave the string, example:

From this:

```
25 struct Student{
26     string sName;
27     uint phoneNo;
28     string courseEnrolled;
29 }
30
31 mapping (address => College) colleges; // Mapping a college's address to college
32 mapping (string => Student) students; // Mapping a student's name to student
```

To this:

```
25 struct Student{
26     address sAddress;
27     string sName;
28     uint phoneNo;
29     string courseEnrolled;
30 }
31
32 mapping (address => College) colleges; // Mapping a college's address to college
33 mapping (address => Student) students; // Mapping a student's address to student
```

1. Smart contract deployment

Admin Address (Minister of education): 0xB8Fa92A5d451d7Ee69b368c0c65d411B98101371

Contract address: 0xfE924377877927DecDe4a97679a823e899f41Cd5

Remix IDE

✓

[block:1 txIndex:0]
hash: 0x69c...e17a4

from: 0xB8F...01371 to: DecentralizedUniversity.(constructor) value: 0 wei data: 0x608...00032 logs: 0

Debug

⬆

status	true Transaction mined and execution succeed
transaction hash	0x4051c6485d5025942eb8bffde379f3a4ccb0ff91bc1dab60c82b5631ee6cbbde
from	0xB8Fa92A5d451d7Ee69b368c0c65d411B98101371
to	DecentralizedUniversity.(constructor)
gas	1635931 gas
transaction cost	1635931 gas
input	0x608...00032
decoded input	{}
decoded output	-
logs	[]
val	0 wei

Ganache / TX Hash: 0x4051c6485d5025942eb8bffde379f3a4ccb0ff91bc1dab60c82b5631ee6cbbde


TX HASH		CONTRACT CREATION	
0x4051c6485d5025942eb8bffde379f3a4ccb0ff91bc1dab60c82b5631ee6cbbde			
FROM ADDRESS	CREATED CONTRACT ADDRESS	GAS USED	VALUE
0xB8Fa92A5d451d7Ee69b368c0c65d411B98101371	0xfE924377877927DecDe4a97679a823e899f41Cd5	1635931	0


2. Functions

We have 5 functions that can register new data on the blockchain and 5 functions that only call data from the blockchain (public view returns).

▼

DECENTRALIZEDUNIVERSITY AT 0XFB9...0A7FE (BLOCKCHAIN)





addNewCollege

string collegeName, address add, address cAdmin, string regNo

▼

addNewStude...

address add, string sName, uint256 phoneNo, string courseName

▼

blockCollegeT...

address add

▼

changeStuden...

address add, string sName, string newCourse

▼

unblockColleg...

address add

▼

getNumberOf...

address add

▼

totalNoOfColl...

totalNoOfStud...

viewCollegeD...

address add

▼

viewStudentD...

string sName

▼

3.1 Adding 2 new colleges

3.1.1 Simplilearn university address: 0x3F74280c7f45f443Ed6e5b8470d4aBa85BB50BcD

3.1.2 Simplilearn university cAdmin address: 0x47ee903Ad17Aaa8AA0620C6305432F8bbA176E71

✓

[block:2 txIndex:0] from: 0xB8F...01371 to: DecentralizedUniversity.addNewCollege(string,address,address,string) 0xFE9...41Cd5 value: 0 wei data: 0x76a...0000 logs: 0 hash: 0xff3...6117c

status

true Transaction mined and execution succeed

transaction hash

0x036334861417149bfb631ce1a90f1706fd2f6e16757d5cfb5a33aca71eff01cb

from

0xB8Fa92A5d451d7Ee69b368c0c65d411B98101371

to

DecentralizedUniversity.addNewCollege(string,address,address,string) 0xFE924377877927DecDe4a97679a823e899f41Cd5

gas

153671 gas

transaction cost

153671 gas

input

0x76a...0000

decoded input

{

"string collegeName": "Simplilearn university",

"address add": "0x3F74280c7f45f443Ed6e5b8470d4aBa85BB50BcD",

"address cAdmin": "0x47ee903Ad17Aaa8AA0620C6305432F8bbA176E71",

"string regNo": "001"

}

decoded output

-

logs

[]

val

0 wei

TX Hash: 0x036334861417149bfb631ce1a90f1706fd2f6e16757d5cfb5a33aca71eff01cb

TX HASH				CONTRACT CALL
0x036334861417149bfb631ce1a90f1706fd2f6e16757d5cfb5a33aca71eff01cb				
FROM ADDRESS	TO CONTRACT ADDRESS	GAS USED	VALUE	
0xB8Fa92A5d451d7Ee69b368c0c65d411B98101371	0xFE924377877927DecDe4a97679a823e899f41Cd5	153671	0	

3.1.3 ETH University address: 0xfA8DC2a9aAb9FB50b51809C62C2009237cA04996

3.1.4 ETH university cAdmin address: 0x5c49325463d1f1F68791b820b9a6148eEa76EE77

✓

[block:3 txIndex:0] from: 0xB8F...01371 to: DecentralizedUniversity.addNewCollege(string,address,address,string) 0xF9...41Cd5

value: 0 wei data: 0x76a...0000 logs: 0 hash: 0xdd7...1e83b

status

true Transaction mined and execution succeed

transaction hash

0xaed846c5f8a2e999f58d90e48e5980effc717851be6aa9c0cc85807575884468

from

0xB8Fa92A5d451d7Ee69b368c0c65d411B98101371

to

DecentralizedUniversity.addNewCollege(string,address,address,string) 0xF924377877927DecDe4a97679a823e899f41Cd5

gas

138575 gas

transaction cost

138575 gas

input

0x76a...0000

decoded input

{

"string collegeName": "ETH University",

"address add": "0xfA8DC2a9aAb9FB50b51809C62C2009237cA04996",

"address cAdmin": "0x5c49325463d1f1F68791b820b9a6148eEa76EE77",

"string regNo": "002"

}

decoded output

-

logs

[]

val

0 wei

TX Hash: 0xaed846c5f8a2e999f58d90e48e5980effc717851be6aa9c0cc85807575884468

TX HASH		CONTRACT CALL	
0xaed846c5f8a2e999f58d90e48e5980effc717851be6aa9c0cc85807575884468			
FROM ADDRESS	TO CONTRACT ADDRESS	GAS USED	VALUE
0xB8Fa92A5d451d7Ee69b368c0c65d411B98101371	0xF924377877927DecDe4a97679a823e899f41Cd5	138575	0

4. Adding students to colleges

4.1 Adding student "Santiago" to Simplilearn university

-Simplilearn university address: 0x3F74280c7f45f443Ed6e5b8470d4aBa85BB50BcD








-Simplilearn university cAdmin address: 0x47ee903Ad17Aaa8AA0620C6305432F8bbA176E71



[block:4 txIndex:0] from: 0x47e...76E71

to: DecentralizedUniversity.addNewStudentToCollege(address,string,uint256,string) 0xfE9...41Cd5 value: 0 wei data: 0x566...00000

logs: 0 hash: 0x0a5...72bde

status	true Transaction mined and execution succeed
transaction hash	0x0914261c02cd185c1bdc911b3c5f410448a3a78f1c87a3eed8a2dd89c4d78b9b 
from	0x47ee903Ad17Aaa8AA0620C6305432F8bbA176E71 
to	DecentralizedUniversity.addNewStudentToCollege(address,string,uint256,string) 0xfE924377877927DecDe4a97679a823e899f41Cd5 
gas	130163 gas 
transaction cost	130163 gas 
input	0x566...00000 
decoded input	<div>{ "address add": "0x3F74280c7f45f443Ed6e5b8470d4aBa85BB50BcD", "string sName": "Santiago", "uint256 phoneNo": "934255", "string courseName": "Blockchain Technologies" }</div> 
decoded output	- 
logs	[]  
val	0 wei 


TX HASH: 0x0914261c02cd185c1bdc911b3c5f410448a3a78f1c87a3eed8a2dd89c4d78b9b

TX HASH				CONTRACT CALL	
0x0914261c02cd185c1bdc911b3c5f410448a3a78f1c87a3eed8a2dd89c4d78b9b					
FROM ADDRESS		TO CONTRACT ADDRESS		GAS USED	VALUE
0x47ee903Ad17Aaa8AA0620C6305432F8bbA176E71		0xfE924377877927DecDe4a97679a823e899f41Cd5		130163	0

4.2 Adding student "Juan" to ETH University

ETH University address: 0xfA8DC2a9aAb9FB50b51809C62C2009237cA04996

ETH university cAdmin address: 0x5c49325463d1f1F68791b820b9a6148eEa76EE77



[block:5 txIndex:0] from: 0x5c4...6EE77

to: DecentralizedUniversity.addNewStudentToCollege(address,string,uint256,string) 0xfE9...41Cd5 value: 0 wei data: 0x566...00

logs: 0 hash: 0x9c3...ea8ba

status

true Transaction mined and execution succeed

transaction hash

0x68487866d4d534ae2eb3099d8fe6074d4511bfa6762edc238b129079a9b6b844 


from

0x5c49325463d1f1F68791b820b9a6148eEa76EE77 

to

DecentralizedUniversity.addNewStudentToCollege(address,string,uint256,string)
0xfE924377877927DecDe4a97679a823e899f41Cd5 


gas

114947 gas 

transaction cost

114947 gas 


input

0x566...00000 


decoded input

{
 "address add": "0xfA8DC2a9aAb9FB50b51809C62C2009237cA04996",
 "string sName": "Juan",
 "uint256 phoneNo": "935222",
 "string courseName": "Marketing"
}

decoded output

- 

logs

[]  

val

0 wei 

TX HASH: 0x68487866d4d534ae2eb3099d8fe6074d4511bfa6762edc238b129079a9b6b844

TX HASH

0x68487866d4d534ae2eb3099d8fe6074d4511bfa6762edc238b129079a9b6b844

FROM ADDRESS

0x5c49325463d1f1F68791b820b9a6148eEa76EE77

TO CONTRACT ADDRESS

0xfE924377877927DecDe4a97679a823e899f41Cd5

GAS USED

114947

VALUE







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5.1 Block Simplilearn university from adding new students

- **Admin Address (Minister of education):** 0xB8Fa92A5d451d7Ee69b368c0c65d411B98101371

-Simplilearn university address: 0x3F74280c7f45f443Ed6e5b8470d4aBa85BB50BcD

 [block:6 txIndex:0] from: 0xB8F...01371 to: DecentralizedUniversity.blockCollegeToAddNewStudents(address) 0xFE9...41Cd5
value: 0 wei data: 0xf93...50bcd logs: 0 hash: 0x699...e8c99

status	true Transaction mined and execution succeed
transaction hash	0xd1f90e9540c355fe4741b05ea57a7203e8e958c51ae1a21b61bd1f44451890f9 
from	0xB8Fa92A5d451d7Ee69b368c0c65d411B98101371 
to	DecentralizedUniversity.blockCollegeToAddNewStudents(address) 0xFE924377877927DecDe4a97679a823e899f41Cd5 
gas	29768 gas 
transaction cost	14768 gas 
input	0xf93...50bcd 
decoded input	{ "address add": "0x3F74280c7f45f443Ed6e5b8470d4aBa85BB50BcD" }
decoded output	- 
logs	[]  
val	0 wei 

TX HASH: 0xd1f90e9540c355fe4741b05ea57a7203e8e958c51ae1a21b61bd1f44451890f9

TX HASH

0xd1f90e9540c355fe4741b05ea57a7203e8e958c51ae1a21b61bd1f44451890f9

CONTRACT CALL

FROM ADDRESS

TO CONTRACT ADDRESS

GAS USED

VALUE

0xB8Fa92A5d451d7Ee69b368c0c65d411B98101371

0xfE924377877927DecDe4a97679a823e899f41Cd5


14768










0

6.1 Changing student course Juan, from Marketing to Java course

ETH University address: 0xfA8DC2a9aAb9FB50b51809C62C2009237cA04996

ETH university cAdmin address: 0x5c49325463d1f1F68791b820b9a6148eEa76EE77

 **[block:7 txIndex:0]** from: 0x5c4...6EE77 to: DecentralizedUniversity.changeStudentCourse(address,string,string) 0xfE9...41Cd5
value: 0 wei data: 0xf86...00000 logs: 0 hash: 0x5e2...e28b7

status	true Transaction mined and execution succeed
transaction hash	0x9aa3f38d6ca1e299d33aa2271f2573fc216d652f3251840a7eb65611c8f0fe25 
from	0x5c49325463d1f1F68791b820b9a6148eEa76EE77 
to	DecentralizedUniversity.changeStudentCourse(address,string,string) 0xfE924377877927DecDe4a97679a823e899f41Cd5 
gas	36186 gas 
transaction cost	34788 gas 
input	0xf86...00000 
decoded input	<pre>{ "address add": "0xfA8DC2a9aAb9FB50b51809C62C2009237cA04996", "string sName": "Juan", "string newCourse": "Java course" }</pre> 
decoded output	- 
logs	[]  
val	0 wei 

TX HASH: 0x9aa3f38d6ca1e299d33aa2271f2573fc216d652f3251840a7eb65611c8f0fe25


TX HASH		CONTRACT CALL	
0x9aa3f38d6ca1e299d33aa2271f2573fc216d652f3251840a7eb65611c8f0fe25			
FROM ADDRESS	TO CONTRACT ADDRESS	GAS USED	VALUE
0x5c49325463d1f1F68791b820b9a6148eEa76EE77	0xfE924377877927DecDe4a97679a823e899f41Cd5	34788	0

7.1 Unblocking Simplilearn university from adding new students

- **Admin Address (Minister of education):** 0xB8Fa92A5d451d7Ee69b368c0c65d411B98101371

-Simplilearn university address: 0x3F74280c7f45f443Ed6e5b8470d4aBa85BB50BcD

 [block:8 txIndex:0] from: 0xB8F...01371 to: DecentralizedUniversity.unlockCollegeToAddNewStudents(address) 0xFE9...41Cd5
value: 0 wei data: 0xd22...50bcd logs: 0 hash: 0xc7f...aae85

status	true Transaction mined and execution succeed
transaction hash	0x4f2c204e83c1256ccd81564f64dd6857c6d1c4c8157c9ecef28699feb3f52112 
from	0xB8Fa92A5d451d7Ee69b368c0c65d411B98101371 
to	DecentralizedUniversity.unlockCollegeToAddNewStudents(address) 0xFE924377877927DecDe4a97679a823e899f41Cd5 
gas	44451 gas 
transaction cost	44451 gas 
input	0xd22...50bcd 
decoded input	{ "address add": "0x3F74280c7f45f443Ed6e5b8470d4aBa85BB50BcD" }
decoded output	- 
logs	[]  
val	0 wei 

TX HASH: 0x4f2c204e83c1256ccd81564f64dd6857c6d1c4c8157c9ecef28699feb3f52112

TX HASH		CONTRACT CALL	
0x4f2c204e83c1256ccd81564f64dd6857c6d1c4c8157c9ecef28699feb3f52112			
FROM ADDRESS	TO CONTRACT ADDRESS	GAS USED	VALUE
0xB8Fa92A5d451d7Ee69b368c0c65d411B98101371	0xFE924377877927DecDe4a97679a823e899f41Cd5	44451	0

8.0 Calls **FROM RANDOM WALLET**: 0xf6EA75e2ecfd6457D7968F4cF757bC6084110021

8.1 Call number of students for Simplilearn university: 0x3F74280c7f45f443Ed6e5b8470d4aBa85BB50Bcd

```
CALL [call] from: 0xf6EA75e2ecfd6457D7968F4cF757bC6084110021 to: DecentralizedUniversity.getNumberOfStudentForCollege(address) data: 0xe7d...50bcd

from 0xf6EA75e2ecfd6457D7968F4cF757bC6084110021

to DecentralizedUniversity.getNumberOfStudentForCollege(address) 0xfe924377877927DecDe4a97679a823e899f41Cd5

input 0xe7d...50bcd

decoded input {
  "address add": "0x3F74280c7f45f443Ed6e5b8470d4aBa85BB50Bcd"
}

decoded output {
  "0": "uint256: 1"
}

logs []
```

8.2 Call number of students for ETH University: 0xfA8DC2a9aAb9FB50b51809C62C2009237cA04996

```
CALL [call] from: 0xf6EA75e2ecfd6457D7968F4cF757bC6084110021 to: DecentralizedUniversity.getNumberOfStudentForCollege(address) data: 0xe7d...04996

from 0xf6EA75e2ecfd6457D7968F4cF757bC6084110021

to DecentralizedUniversity.getNumberOfStudentForCollege(address) 0xfe924377877927DecDe4a97679a823e899f41Cd5

input 0xe7d...04996

decoded input {
  "address add": "0xfA8DC2a9aAb9FB50b51809C62C2009237cA04996"
}

decoded output {
  "0": "uint256: 1"
}

logs []
```

8.3 Total number of colleges

```
CALL [call] from: 0xf6EA75e2ecfd6457D7968F4cF757bC6084110021 to: DecentralizedUniversity.totalNoOfColleges() data: 0xd0e...d5e49

from 0xf6EA75e2ecfd6457D7968F4cF757bC6084110021

to DecentralizedUniversity.totalNoOfColleges() 0xfe924377877927DecDe4a97679a823e899f41Cd5

input 0xd0e...d5e49

decoded input {}

decoded output {
  "0": "uint256: 2"
}

logs []
```

8.4 Total number of students

```
CALL [call] from: 0xf6EA75e2ecfd6457D7968F4cF757bC6084110021 to: DecentralizedUniversity.totalNoOfStudents() data: 0xddf...cf599

from 0xf6EA75e2ecfd6457D7968F4cF757bC6084110021

to DecentralizedUniversity.totalNoOfStudents() 0xfE924377877927DecDe4a97679a823e899f41Cd5

input 0xddf...cf599

decoded input {}

decoded output {
  "0": "uint256: 2"
}

logs []
```

8.5 View college details for Simplilearn University: 0x3F74280c7f45f443Ed6e5b8470d4aBa85BB50BcD

(Name, registration number, number of students)

```
viewCollegeD... 0x3F74280c7f45f443Ed6e5b8470d4aBa85BB50BcD
0: string: Simplilearn university
1: string: 001
2: uint256: 1
```

8.6 View college details for ETH university: 0xA8DC2a9aAb9FB50b51809C62C2009237cA04996

(Name, registration number, number of students)

```
0: uint256: 2
viewCollegeD... 0xA8DC2a9aAb9FB50b51809C62C2009237cA04996
0: string: ETH University
1: string: 002
2: uint256: 1
```


8.7 View student details for Santiago

```
viewStudentDetails
sName: Santiago
call
0: string: Santiago
1: uint256: 934255
2: string: Blockchain Technologies
```

8.8 View student details for Juan

viewStudentDetails

sName: Juan



call

0: string: Juan

1: uint256: 935222

2: string: Java course