



API integration with the study control system

API integration with the study control system refers to the process of connecting blockchain technology with the study management system to record and verify applicant information securely and transparently.

Advantages:

- 1. Transparency:** The blockchain provides an immutable and transparent blockchain, which ensures that applicant information is accurate and cannot be altered.
- 2. Security:** Blockchain technology uses advanced cryptography to protect applicant information, reducing the risk of unauthorized access or data loss.
- 3. Immutability:** The blockchain ensures that applicant information is immutable, meaning that once registered, it cannot be modified or deleted.
- 4. Automation:** The integration of the web3 API with the study control system allows automating processes, such as the verification of applicant information, which reduces time and manual effort.

Architecture

The architecture of the API integration with the study control system consists of the following components:

- 1. API:** The API is responsible for interacting with the blockchain and recording applicant information on the blockchain.
- 2. Study control system:** The study control system is responsible for managing applicants' information and verifying their authenticity.
- 3. Integration service:** The integration service is responsible for connecting the API with the study control system and automating the registration and verification processes.

Workflow

The workflow of integrating the web3 API with the study control system is described below:

1. The applicant provides his/her personal information and required documents.
2. The applicant's information is sent to the study control system for verification.
3. The study control system verifies the applicant's information and sends it to the integration service.



4. The integration service uses the API to register the registered applicant's information in the blockchain (This process is done both with the degree and grade registration and with the enrollment process).
5. The API returns the transaction hash to the system which is stored in the database.
6. The integration service returns the result of the transaction to the study control system.
7. The study control system updates the applicant information with the result of the transaction.

Benefits

The integration of the API with the study control system offers several benefits, such as:

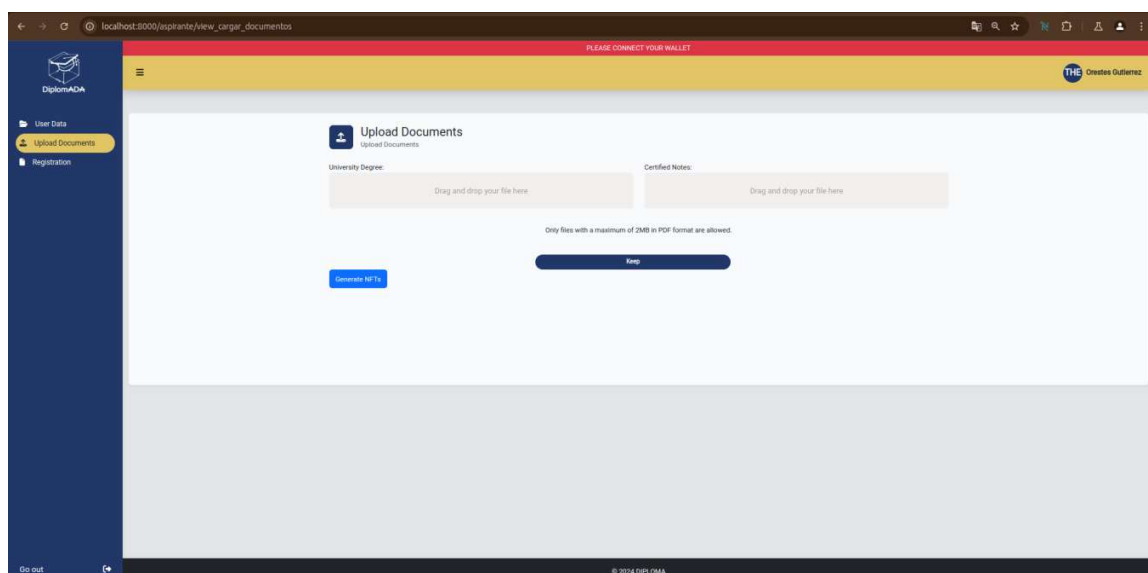
1. improves transparency and security: blockchain provides an immutable and transparent blockchain, which ensures the accuracy and security of applicant information.
2. Reduces time and manual effort: Process automation reduces the time and manual effort required to verify applicant information.

Improved user experience: The integration of the web API3 with the study control system provides a faster and more secure user experience.

In summary, the API integration with the study control system is an innovative solution that combines blockchain technology with the study management system to record and verify applicant information in a secure and transparent way.

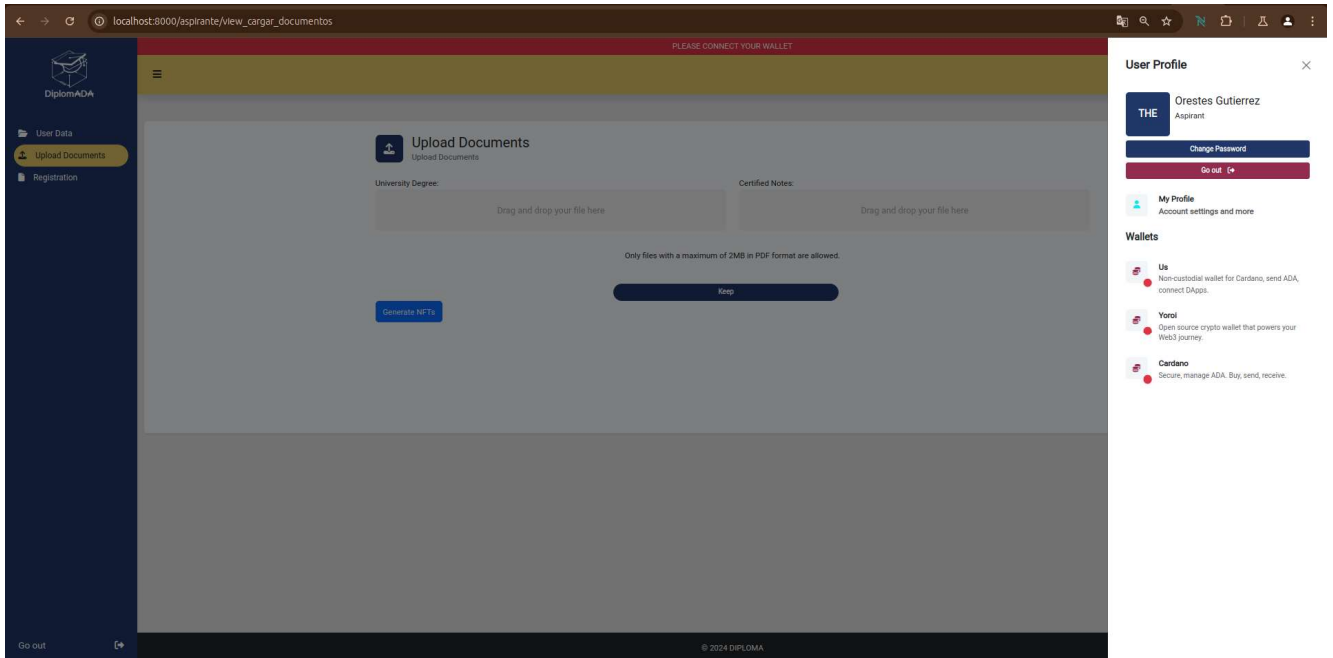
For this, we will show the process of connecting and interacting with the NAMI wallet that will allow us to perform transactions within the platform on blockchain:

NAMI wallet disconnected application.

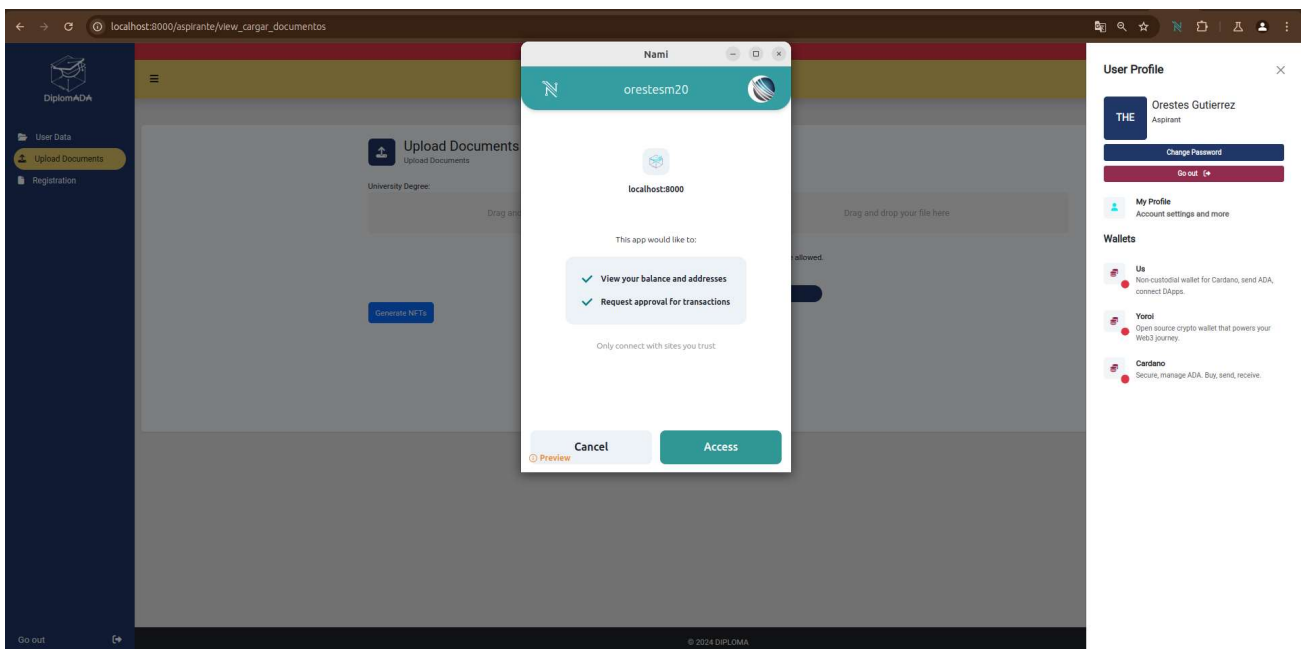




Request for connection to NAMI wallet

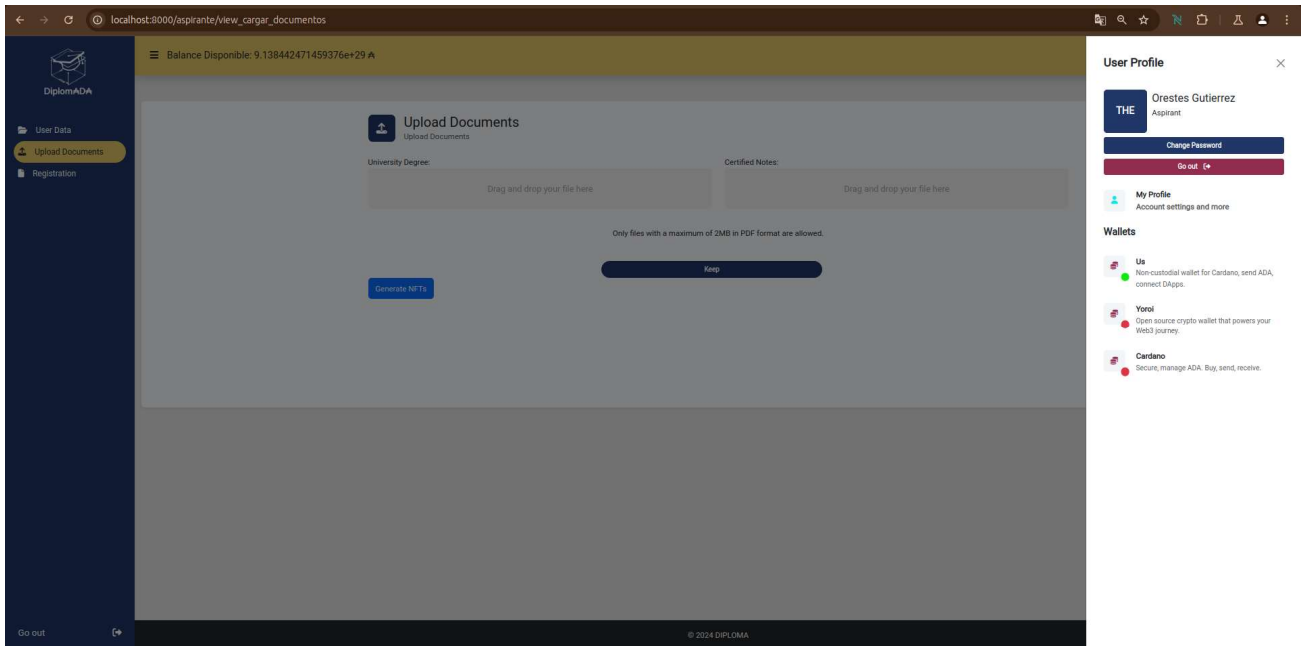


Signature of the wallet connection request





Application connected to NAMI Wallet



NAMI wallet connection function wallet.ts file

At this point the verification of the connection of the system with the wallet is performed, for this the call is made from the web to a LUCID service built in typescript to establish the connection with the NAMI wallet using the CIP30 protocol, the code that performs this verification process will be shown below:

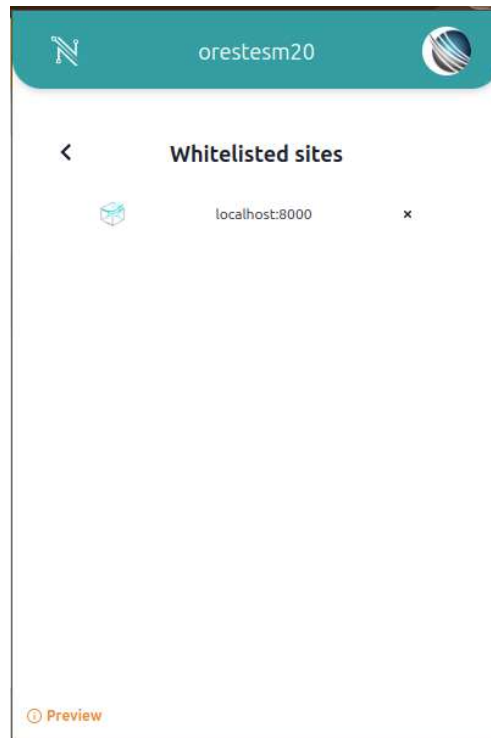
```
import { Blockfrost, Lucid } from '@lucid-evolution/lucid';
```

```
const lucid = await Lucid.new(  
  new Blockfrost(  
    'https://cardano-preview.blockfrost.io/api/v0',  
    'previewztdBFQVDQlFKY3O6TZJgzkZyyqRSu4vj',  
  ),  
  'Preview',  
);
```

```
const api = await window.cardano.nami.enable();  
lucid.selectWallet(api);
```



NAMI Wallet Connection Verification



Code snippet of Diplomada web application integration with API for blockchain registration.

The enrollment process also performs the transaction where all the students' information is recorded at the time of making their enrollment process, this transaction results in the creation of a NFTs and the registration den the blockchain.

The screenshot displays the 'Inscripción' (Enrollment) form within the DiplomADA web application. The interface features a sidebar on the left with navigation options: 'Datos del Usuario', 'Cargar Documentos', and 'Inscripción'. The top bar shows the 'Balance Disponible: 9725.989881 A' and the user's name 'Orestes Gutierrez'. The main form area is titled 'Inscripción' and includes a sub-header 'Usuarios / Formulario de Inscripción'. The form contains several input fields and upload areas:

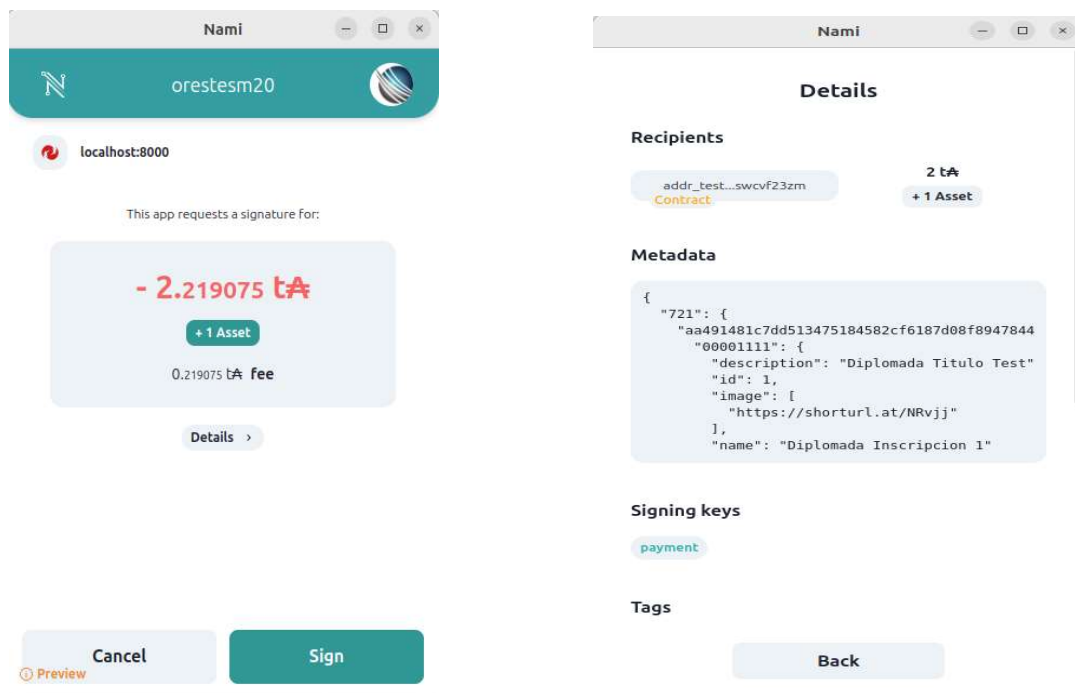
- Otro Teléfono:** A text input field.
- A realizado cursos anteriores?:** A dropdown menu with '- Selecciona -'.
- Foto Tipo Carnet:** An upload area with the text 'Arrastra y suelta tu archivo aquí'.
- Curriculum:** An upload area with the text 'Arrastra y suelta tu archivo aquí'.
- Título de postgrado:** An upload area with the text 'Arrastra y suelta tu archivo aquí'.
- Otros Títulos:** An upload area with the text 'Arrastra y suelta tu archivo aquí'.
- Dirección:** A text input field.
- Curso/Diplomada:** A dropdown menu with '- Selecciona -'.
- Curso Actual:** A dropdown menu with '- Selecciona -'.
- Fotocopia del Documento de Identidad:** An upload area with the text 'Arrastra y suelta tu archivo aquí'.
- Partida de Nacimiento:** An upload area with the text 'Arrastra y suelta tu archivo aquí'.
- Calificaciones de Postgrado:** An upload area with the text 'Arrastra y suelta tu archivo aquí'.
- Nacionalidad:** A dropdown menu with '- Selecciona -'.

At the bottom of the form, there are two buttons: 'Inscripción NFT 1' and 'Inscribir'.



First the registration of each of the fields is performed, this complying with an administrative process to formalize the registration in the system. Once the registration record is saved, we proceed to the creation of the NFTs and the registration in the blockchain of the registration.

Upon requesting the creation of the NFT and the registration in the blockchain, a service is invoked in lucid that allows us to perform the transaction, this service interacts with the NAMI plugin and shows us an interface that allows us to visualize the requested transaction and proceed to sign the process by entering our key in the platform (this is explained in more detail in the audiovisual material).

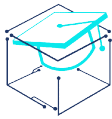


At this point, we proceed to sign the transactions, so the contract creates the NFT and sends the data to the blockchain.

Once the transaction is done, a notification is displayed on the screen, where it indicates that the transaction was successful, at this point the wallet must be checked to verify that the processes were performed, in addition to that, get the transaction verification hashes to check them in a block explorer.

Verifications can be performed using this web address <https://preview.cexplorer.io/> to validate transactions made on the blockchain.

To illustrate this more precisely, we will show a list of applicants where this process has not been performed to establish a benchmark of before and after registration on the blockchain, for them we will log in as Administrator in the system and show the list of applicants.



Sistema de Control de Estudio Diplomada



Lista de Registros

Aspirantes

Estudiantes

Usuarios

Salir

POR FAVOR CONECTA TU WALLET

admin admin

Aspirantes

Aspirantes

FILTROS

ID	Nombre	Apellido	Cédula	Sexo	Dirección	Correo
5	JAIME	CARDENAS	00007777	masculino		bregituboitto-8799@yopmail.com
4	FERNANDA	CAMPOS	00001111	femenino		quolluddeutanno-6581@yopmail.com
3	GONZALO	BALCAZAR	00006666	masculino		heiceceinona-7141@yopmail.com
2	BYRON	CEVALLOS	00004444	femenino		xalozzebredau-1679@yopmail.com
1	Mercedea	Lopez	00003333	femenino		dizeroroinma-4500@yopmail.com

5 Registros encontrados

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As we can see, the list reflects a series of test records made to show the process prior to the creation of the NFTs, this list shows part of the data to be recorded in the blockchain at the time the user performs the transaction.

In the following list we can see the students enrolled in a diploma course, we can also see which of them have completed their enrollment process in blockchain.

Lista de Registros

Aspirantes

Estudiantes

Usuarios

Salir

POR FAVOR CONECTA TU WALLET

admin admin

Estudiantes

Estudiantes

FILTROS

ID	Nombre	Apellido	Cédula	Sexo	Correo	Telefono	Perfil	Transacción Hash
1	Orestes	Gutierrez	18814102	masculino	orestesm20@gmail.com	04122045123	Estudiante	62caaf4d05c58519f1d5e52a7a0d633ce9a9854cebbe64b823e0ef438cc3
2	FERNANDA	CAMPOS	00001111	femenino	quolluddeutanno-6581@yopmail.com	04127777777	Estudiante	1e7e9ac77ce272ec997ffa240d7cc9b255f7e08ac265ed5dd7d291b4a94532
3	GONZALO	BALCAZAR	00006666	masculino	heiceceinona-7141@yopmail.com	04127777777	Estudiante	2809f6482ce3bc3240bdfaf8ceaf1fb6df178c8530571372b1559804cf266b4b
4	JAIME	CARDENAS	00007777	masculino	bregituboitto-8799@yopmail.com	0412333333	Estudiante	43c7b9c845a75357beb6fb8278c683726f3d01bd0f39b78126cfdffdae20b39
5	BYRON	CEVALLOS	00004444	femenino	xalozzebredau-1679@yopmail.com	0212222222	Estudiante	241e9b4ac1c2dbf4d4b27872542cc199e60d4b487710e6e6ccaca6d6b0f

6 Registros encontrados

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Each record shows the transaction performed with the record hash in the blockchain, these records can be validated by the block explorer.

ID	Nombre	Apellido	Cédula	Transacción Hash
1	Orestes	Gutierrez	18814102	62caaf4d05c58515f1d5e52a7a0d633cea9a9854ce8be64b823e60ef438cc3b7
2	FERNANDA	CAMPOS	00001111	1e7e9acf7ce272ec997ffa240d7cc9b255f7e08ac265ed5dd7d291b4a94532d2
3	GONZALO	BALCAZAR	00006666	2809fe482ce3bc3240bdfa8ceaf1fb6df178c8530571372b1559804cf266b4b4
4	JAIME	CARDENAS	00007777	43c7b9c845a75357beb6fb8278c683726f3d01bd0f39b78126cfdfae20b339a
5	BYRON	CEVALLOS	00004444	241a9b4ae1e2dbf4d4b27872542ee1996c60d4b48771c0e6c5ceaea5d6b0f886

To perform this interaction process, the study control system, must be connected through the API by passing the parameters to the smart contract to create the NFT and the blockchain record, this process is invoked under the following code snippet.

```
import {  
  Blockfrost,  
  C,  
  Data,  
  Lucid,  
  MintingPolicy,  
  SpendingValidator,  
  PolicyId,  
  TxHash,  
  fromHex,  
  toHex,  
  Unit,  
  toUnit,  
  fromUnit,  
  Constr,  
  fromText,  
  JSON,  
  WalletApi,  
  Address,  
  OutputDatum,
```




Sistema de Control de Estudio Diplomada



```
Promise,  
} from '@lucid-evolution/lucid';  
import { validatorToAddress, mintingPolicyToId } from '@lucid-evolution/utills';  
import { datos, contratos } from './diplomada.ts';  
  
import { MD_Titulos, ParamsInscripcion, Resultado } from './dadatipos';  
import $ from 'jquery';  
import * as Swal from 'sweetalert';
```

```
$.get('data_inscripcion/', function(data) {  
    datos['nombres'] = data[0]['nombre'];  
    datos['apellidos'] = data[0]['apellido'];  
    datos['cedula'] = data[0]['cedula'];  
    datos['sexo'] = data[0]['sexo'];  
    datos['fecha_nac'] = data[0]['fecha_nac'];  
    datos['direccion'] = data[0]['direccion'];  
    datos['telefono_habitacion'] = data[0]['telefono_habitacion'];  
    datos['telefono_otros'] = data[0]['telefono_otros'];  
    datos['celular'] = data[0]['celular'];  
    datos['correo'] = data[0]['correo'];  
});
```

```
var dummyParams = {  
    nombres: datos['nombres'],  
    apellidos: datos['apellidos'],  
    cedula: datos['cedula'],  
    sexo: datos['sexo'],  
    fecha_nac: datos['fecha_nac'],  
    direccion: datos['direccion'],  
    telefono_habitacion: datos['telefono_habitacion'],  
    telefono_otros: datos['telefono_otros'],  
    celular: datos['celular'],  
    correo: datos['correo'],  
    curso: "Licenciatura en Desarrollo de Aplicaciones en Cardano",  
    url: "https://shorturl.at/NRvjj"  
}
```

```
export const crearInscripcion = async (params: ParamsInscripcion): Promise<Resultado<any>>=> {  
    try {  
        if (cardanoIsEnabled) {  
            if (lucid) {  
                const dadaPM Inscripcion: MintingPolicy = {  
                    type: "PlutusV3",  
                    script: contratos.scripts.pm_inscripcion  
                };  
                const dadaVal Validacion: SpendingValidator = {  
                    type: "PlutusV3",
```



```
script:contratos.scripts.val_verificacion
}
constdadaValDireccion:string=validatorToAddress("Preview",dadaVal_Validacion);
constdireccionEstudiante:Address=awaitlucid.wallet().address();
consttokenName_Inscripcion=dumyParams.cedula;
constnftInscripcion_tokenName=fromText(tokenName_Inscripcion);
constnftInscripcion_pid:PolicyId=mintingPolicyToId(dadaPM_Inscripcion);
constinscripcion_dada:Unit=toUnit(nftInscripcion_pid, nftInscripcion_tokenName);
constinscripcionRedeemer=BigInt(1);
constmintRedeemer=Data.to(inscripcionRedeemer);
constjsonData:MD_Titulos= {
  [nftInscripcion_pid]: {
    [tokenName_Inscripcion]: {
      id:1,
      name:"Diplomada Inscripcion 1",
      image: [params.url],
      description:"Diplomada Titulo Test"
    },
    "datos_estudiante": {
      hash:"fac7b8513f4b985174e88a02ee8165fc",
      nombres: [params.nombres],
      apellidos: [params.apellidos],
      cedula: [params.cedula],
      sexo: [params.sexo],
      fecha_nac: [params.fecha_nac],
      direccion: [params.direccion],
      telefono_habitacion: [params.telefono_habitacion],
      telefono_otros: [params.telefono_otros],
      celular: [params.celular],
      correo: [params.correo],
      curso:"Diplomada en Desarrollo de Aplicaciones en Cardano"
    },
  },
};
constdatum_crudo=Data.to(BigInt(1));
constdatum:OutputDatum= {kind:"inline", value:datum_crudo};
consttx=awaitlucid
.newTx()
.mintAssets({[inscripcion_dada]:BigInt(2)}, mintRedeemer)
.pay.ToAddress(direccionEstudiante, { [inscripcion_dada]:BigInt(1), lovelace: BigInt(2000000)})
.pay.ToContract(dadaValDireccion, datum , { [inscripcion_dada]:BigInt(1), lovelace:
BigInt(2000000)})
.attach.MintingPolicy(dadaPM_Inscripcion)
.attachMetadata("721", jsonData)
.complete();
constsignedTx=awaittx.sign.withWallet().complete();
consttxHash=awaitsignedTx.submit();
```



```
const success = await lucid!.awaitTx(txHash)  
return { type: "ok", data: txHash };  
}
```

```
} catch (error) {  
    if (error instanceof Error) return { type: "error", error: error };  
    return { type: "error", error: new Error(error as string) };  
}  
}
```

At this point, the invocation process includes the call to “crearInscripcion” which is a constant object that defines the parameters that will be registered in the chain. The “Data” object includes all the variables that will be registered in the blockchain, by means of a database query, and then the information is processed to be emptied in a constant called “dummyParams” which is the global object to interact with the “createInscription” information.

The interaction with the Lucid API through blockfrost is done through the following code fragment:

```
import { Blockfrost, Lucid } from '@lucid-evolution/lucid';
```

```
const lucid = await Lucid.new(  
    new Blockfrost(  
        'https://cardano-preview.blockfrost.io/api/v0',  
        'previewztdBFQVDQlFKY3O6TZJgzkZyyqRSu4vj',  
    ),  
    'Preview',  
);
```

```
const api = await window.cardano.nami.enable();  
lucid.selectWallet(api);
```

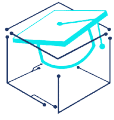
It should be noted that an update was made to the LUCID library “@lucid-evolution/lucid” as a result of the updates to the Cardano nodes.

Conclusion

We can conclude that the process of interacting with the service is fully functional and efficient, which allows us to perform the registration effectively on the blockchain. This is achieved thanks to the use of the Lucid platform and the standard CIP30 protocol as a means of interaction for the creation of the NFTs requested by the application.

In addition, this process allows us to:

- Perform secure and transparent registration on the blockchain.



- Use the Lucid platform to create and manage the NFTs efficiently.
- Leverage the CIP30 protocol to standardize the interaction with the blockchain
- Ensure authenticity and ownership of created NFTs
- Facilitate the creation and exchange of NFTs in a secure and transparent manner.

In summary, the process of interacting with the service is fully functional and allows us to effectively perform registration on the blockchain, using the Lucid platform and the CIP30 protocol as the means of interaction for the creation of the NFTs requested by the application. This allows us to take advantage of blockchain technology to create and manage NFTs in a secure and efficient way.