Usage Instructions

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Introduction to FHIR

Fast Healthcare Interoperability Resources (FHIR) is gaining popularity around the globe as the standard healthcare data exchange.

- FHIR is also mandated in the US through the 21st Century Cures Act HHS final rule.
- AWS's Open-Source Interoperability team led by Mr. Angus McAllister developed a new open-source project, FHIR Works on AWS, that can help accelerate the use of FHIR in customer solutions.
- AWS expects health companies and services providers to be able to quickly deploy FHIRWorks on top of existing systems to become compliant and leverage the advantages of healthcare data standardization.
- FHIR solutions like FHIRWorks will help improve population health, digital health measures, precision medicine initiatives, better care coordination, efficiency improvement and event driven healthcare.

Cost and Pricing

Exafluence does not charge for this product, the charges will be applicable based on the usage of AWS and MongoDB services.

Pre-Requisites & Configuration

1. Login to AWS console with your username and password.
2. The user should be added to security policy (Secret key and access key)
3. Make sure you are in the preferred region us-east-1

S3 bucket

i. Click on S3 bucket service in AWS console
ii. Click on create bucket
iii. Give a bucket name and click on create.Eg: Bucketname - awscft
iv. Once the bucket is created successfully, Create a folder for storing sparklogs
v. Eg: spark Logs is the folder name Inside this path all the logs files will be stored.
vi. All the CVS files will be storing automatically inside the bucket with name SparkEMR/CsvSource
vii. (Note: No need of creating a folder for CSV files)
viii. Click on create folder Eg: awsfhir
ix. Inside the folder (awsfhir) upload the master-stack.yaml
(Note: Which is downloaded from marketplace CFT deployment template)

Secrets Manager

1. Go to Secrets Manager in AWS console.
2. click on secrets and create a new secret by clicking **store a** new secret.
   i. Select other type for secret and add give key/value as
   Key:
   1. MongoAtlasURIAS ,
   2.MongoAtlasURIDB
   (**Note**: Naming should be given as mentioned above)

1. **Value**:
mongodb+srv://username:password@clustername.opswijr.mongodb.net/oauthUsers
2. **Value**:
mongodb+srv://username:password@clustername.opswijr.mongodb.net/

(Note: oauthUsers is the collection name it has to be given the same)

ii. Click on Next
iii. Give the secret name Eg: AwsSecrets
iv. Click on next and review the data and click on store
v. Successfully creation of secrets is completed.

4. Check if previous CFT deployment's **DynamoDB** tables exist delete them.
i. Go to DynamoDB service in AWS console and delete the tables related to CFT deployment process of FHIR.

5. Create or use an existing PEM file.

i. To create a new PEM file, Open EC2 instance
ii. Under network & Security click on key Pairs
iii. Click on Create Key Pair
   a) Enter key pair name
   b) Select RSA for key pair type
   c) The private key file format is .pem
   d) Click on create key pair, Key pair is successfully created.

6. Make sure you have **at least 2 available Elastic IPs** in the selected region.

Cloud Formation Delivery

1. Search for Cloud Formation service in AWS console

i. Click on **create stack** with new resources (standard).
   a) Under Prepare template choose **Template is ready**
   b) Template source is Amazon S3 URL
   c) Under Amazon S3 URL
      i. Go to your S3 bucket, open master-stack.yaml file copy the object URL of **master-stack.yaml**

2. Click on next.

3. Under Specify the stack details
   i. Give the Stack name. Eg: awscft
   ii. Fill the Parameters as follows

A) Basic configurations

i. Environment name: dev (pre defined)
ii. Availability Zones : Choose us-east-1a & us-east-1b
iii. SSH Key name: PEM File name (note: Pre-requisites point-no: 7)

B) VPC network configurations

i. Number of Availability Zones: 2

- **Pre defined values:**
  i. VPCCIDR: 10.0.0.0/16
  ii. PrivateSubnet1CIDR: 10.0.0.0/19
  iii. PrivateSubnet2CIDR: 10.0.32.0/19
  iv. PrivateSubnet3CIDR: 10.0.64.0/19

v. PublicSubnet1CIDR: 10.0.128.0/20
vi. PublicSubnet2CIDR: 10.0.144.0/20
vii. PublicSubnet3CIDR: 10.0.160.0/20

C) Container Configurations

i. EMRPEMFILE: PEM file name (note: Pre-requisites point-no: 7)
ii. APPS3AWSREGION: us-east-1
iii. APPS3PATH: SparkEMR/CsvSource
(**note**: value should be given same; refer Pre-requisites point-no 4)

iv. APPS3BUCKETNAME: Give the S3 bucket name
(**note**: refer Pre-requisites point 4)

v. APPS3SPARKLOGSPATH: Give the URL of SparkLogs
(**note**: Copy the S3 URI from S3 bucket under sparklogs)

vi. Database SecretID: AwsSecrets
(**note**: refer Pre-requisites Point-no 5)

vii. Database ASSecretID:MongoAtlasURIAS [Id of MongoDB connections]
(**note**: refer Pre-requisites point-no 5)

viii. DatabaseDBSecretID:MongoAtlasURIDB [Id of MongoDB connections]
(**note**: refer Pre-requisites point-no 5)

- **Pre defined values:**

ix. Database name: AwsFhirWorks
x. APPS3SPARKJARPATH:s3://exf-aws-marketplace/aws-fhirworks-cft/0.1.0/artifacts/SparkDataProcEMR-0.1.0.jar
xi. LoadSampleData: true
xii. S3BucketName: exf-aws-marketplace
xiii. S3BucketRegion: us-east-1
xiv. S3KeyPrefix: aws-fhirworks-cft/0.1.0/

4. Click on **next**

5. Configure stack options page will appear and click on **NEXT.**

6. At last Review page opens, check all the parameters that you have filled and **acknowledge** the check boxes and click on **submit**.

7. A main stack followed by 5 nested stacks will be created. Once all the stacks got created successfully, The CFT Deployment gets completed.

Pre-Deployment checks

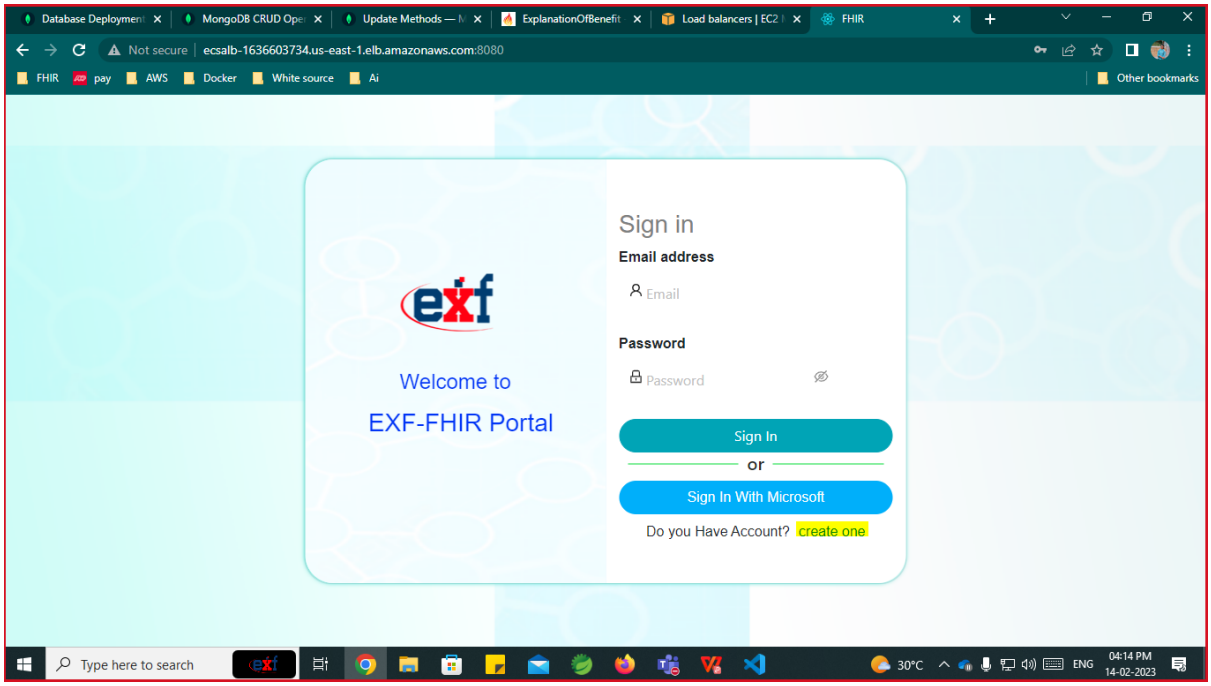
1. Enable **cors** through **API Gateway**
   a) Open API Gateway
   b) Click on dev-fhir-service
   c) Click on Actions and Enable CORS for all the methods
   d) Finally click on Deploy API and choose **dev** in Deployment stage and save.

2. Frontend ALB URL
   a) Go to Ec2 instance
   b) Click on **Load Balancers**
   c) Copy the DNS name and give port-no: 8080
   (**Format**: DNSname:port-no).

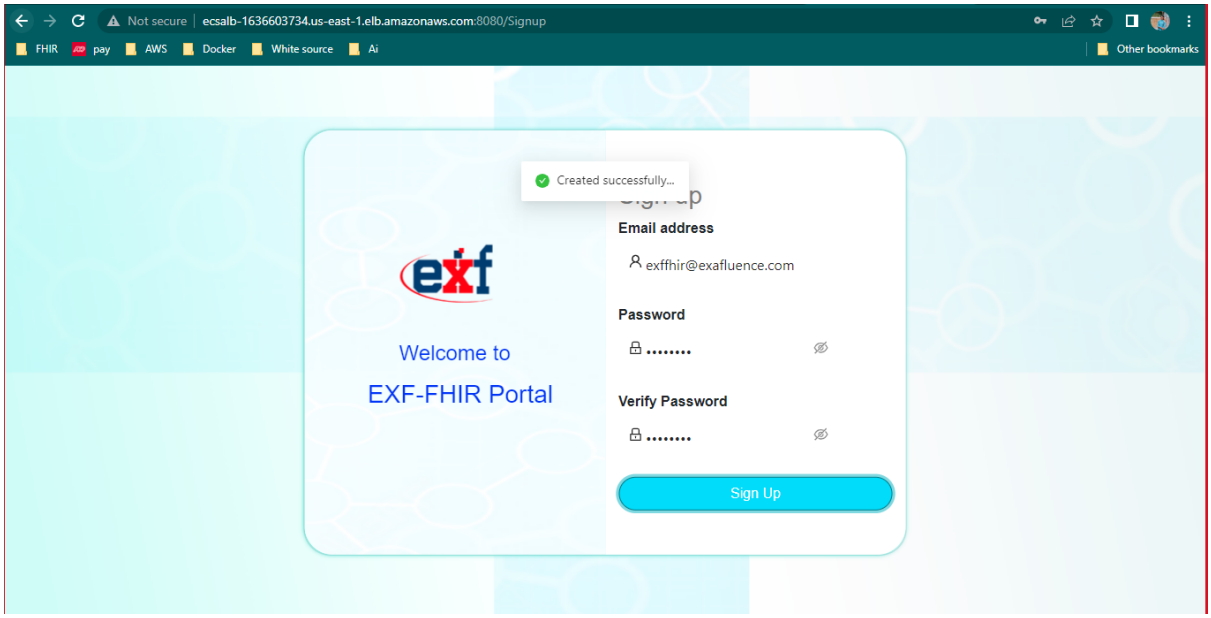
Application Usage:

Start EXF-FHIR Portal:

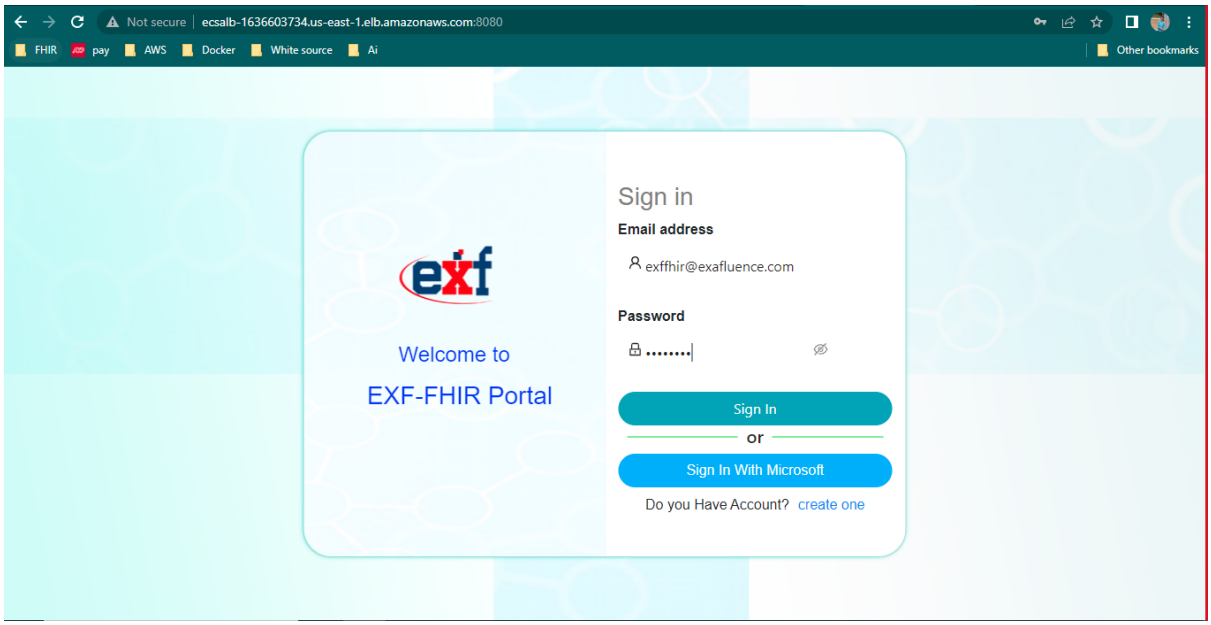
Step 1: Open EXF-FHIR Portal , If new user Click on create one and create an account using Email address and Password.



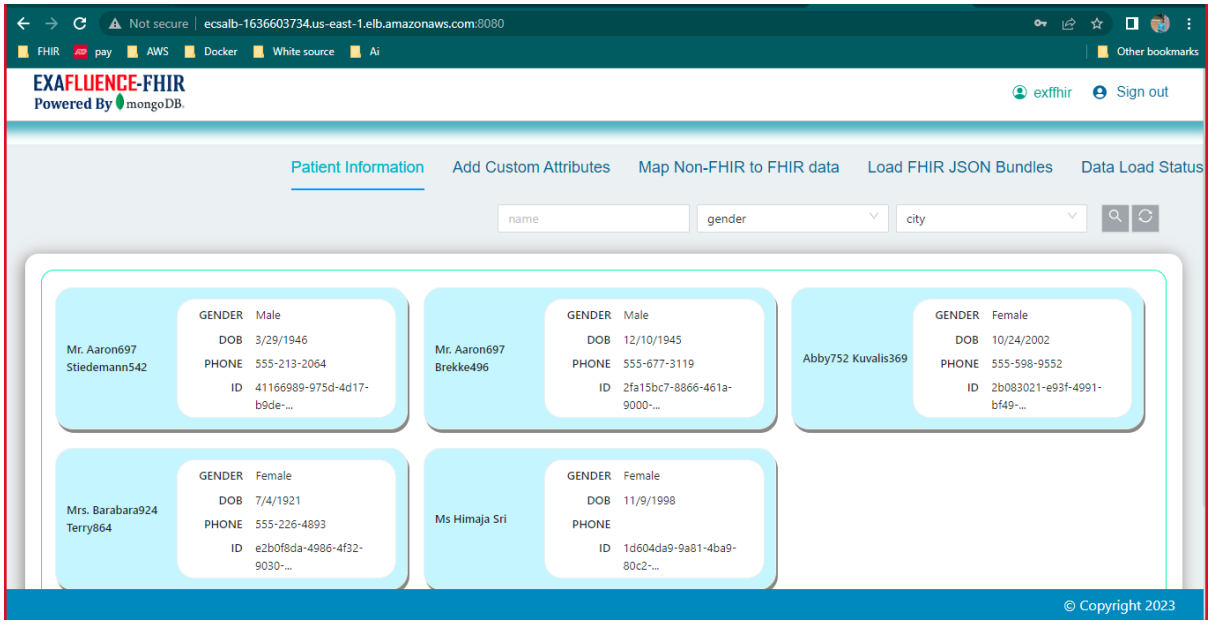
Step 2: Once the user is created with respective Email and Password click on Sign up, Then the user is created successfully.



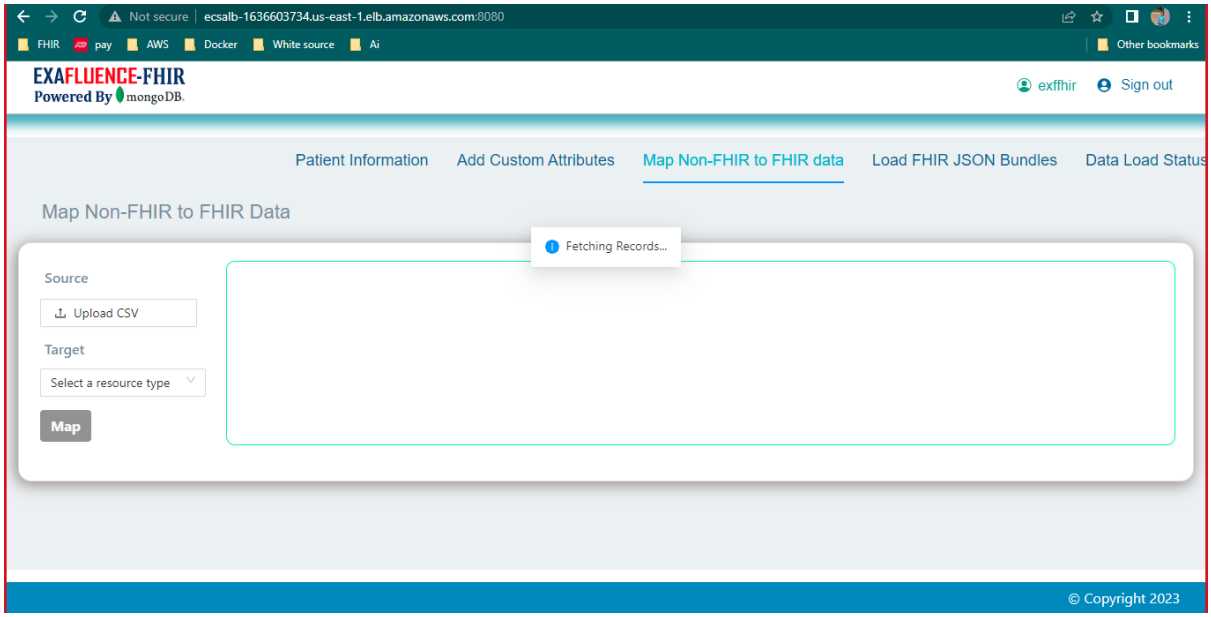
Step 3: Now go to Sign-in page and login with the respective credentials.



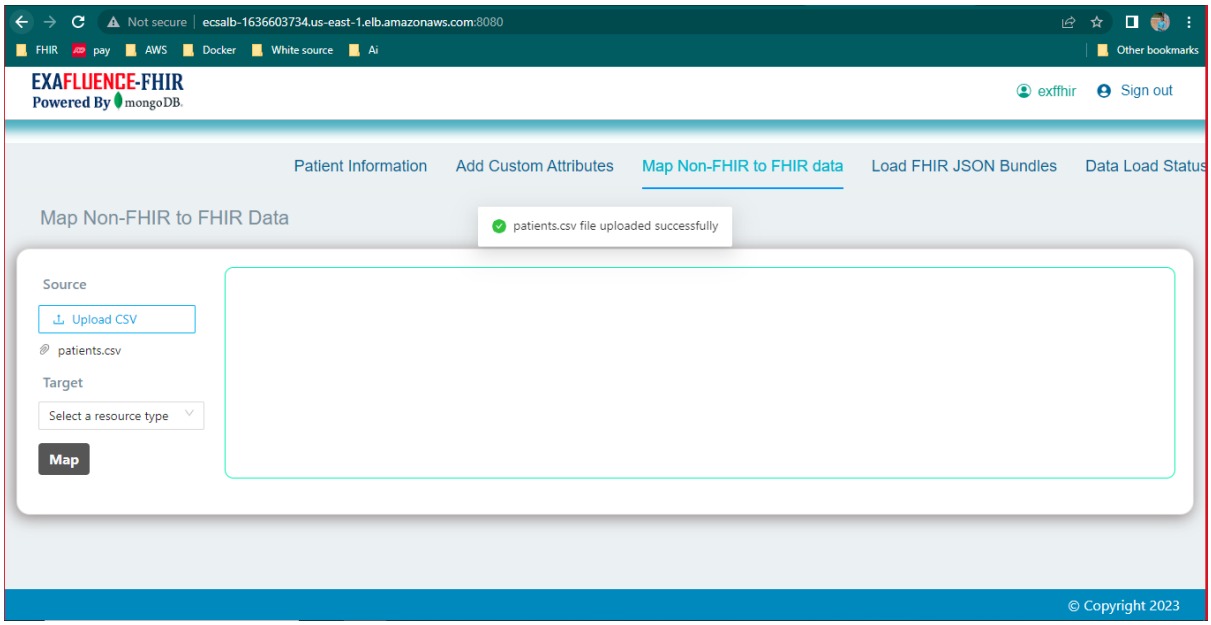
Step 4: Once the user logged in the EXF-FHIR portal opens.



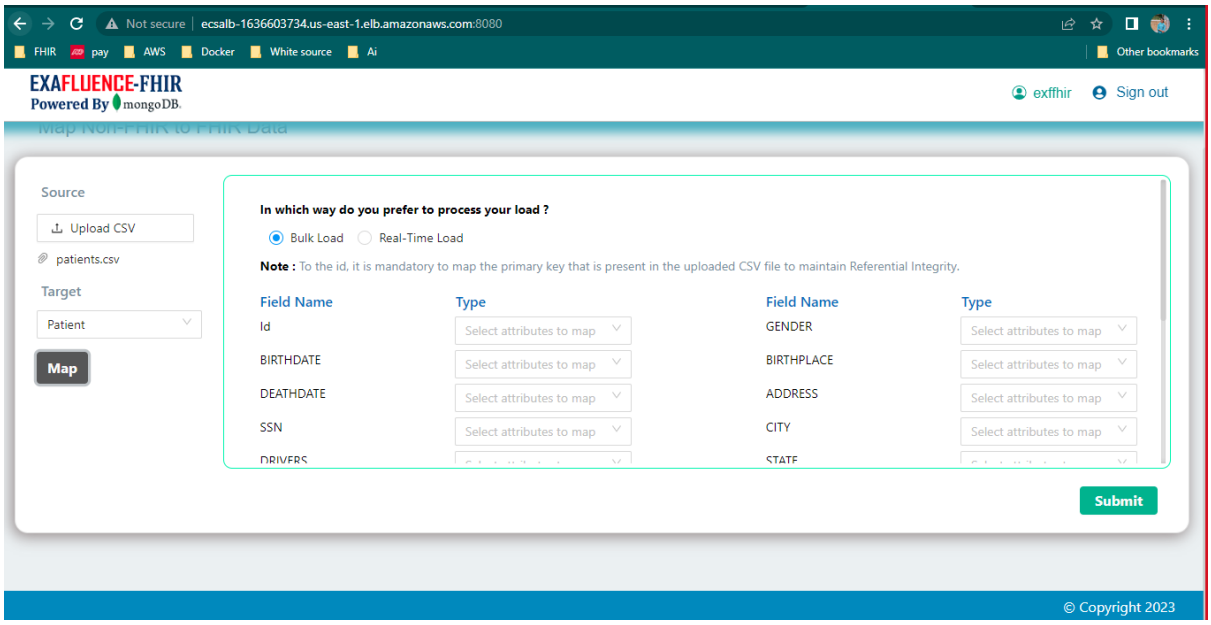
Step 5: Open Non-FHIR to FHIR data, to map the spark data and click on Upload CSV.



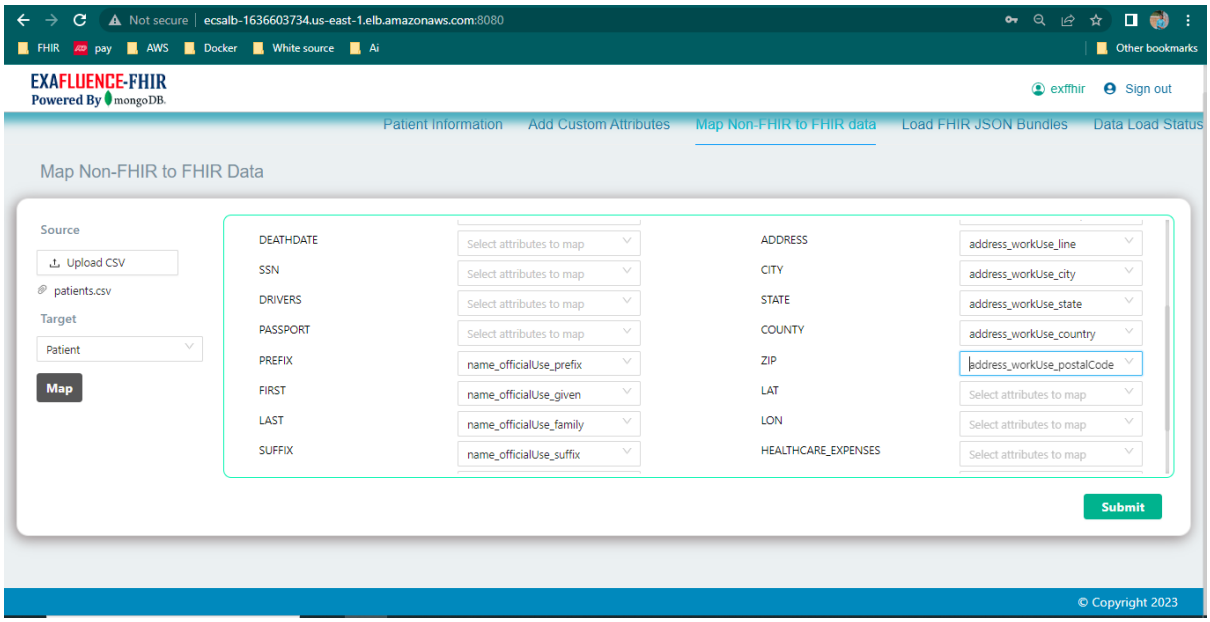
Step 6: Select the respective resource CSV source file(Patient) once uploaded a pop up will appear with message file uploaded successfully. Then select the Target based on source file and click on Map.



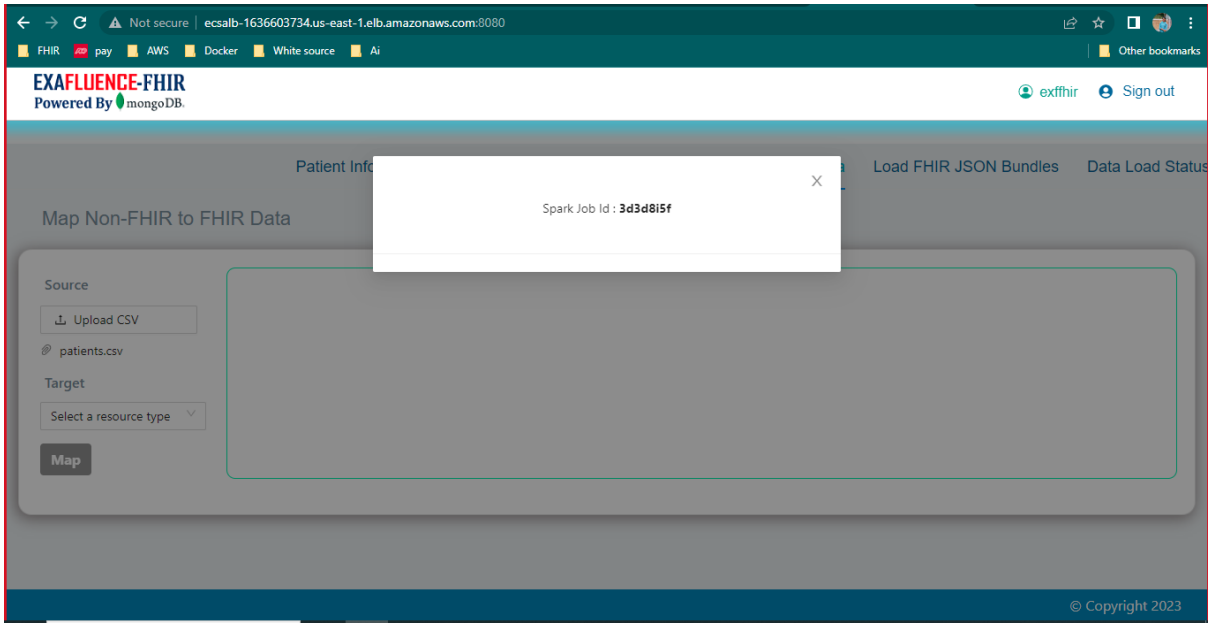
Step 7: After clicking on Map then select bulk load for loading the data and select the type based on field name.



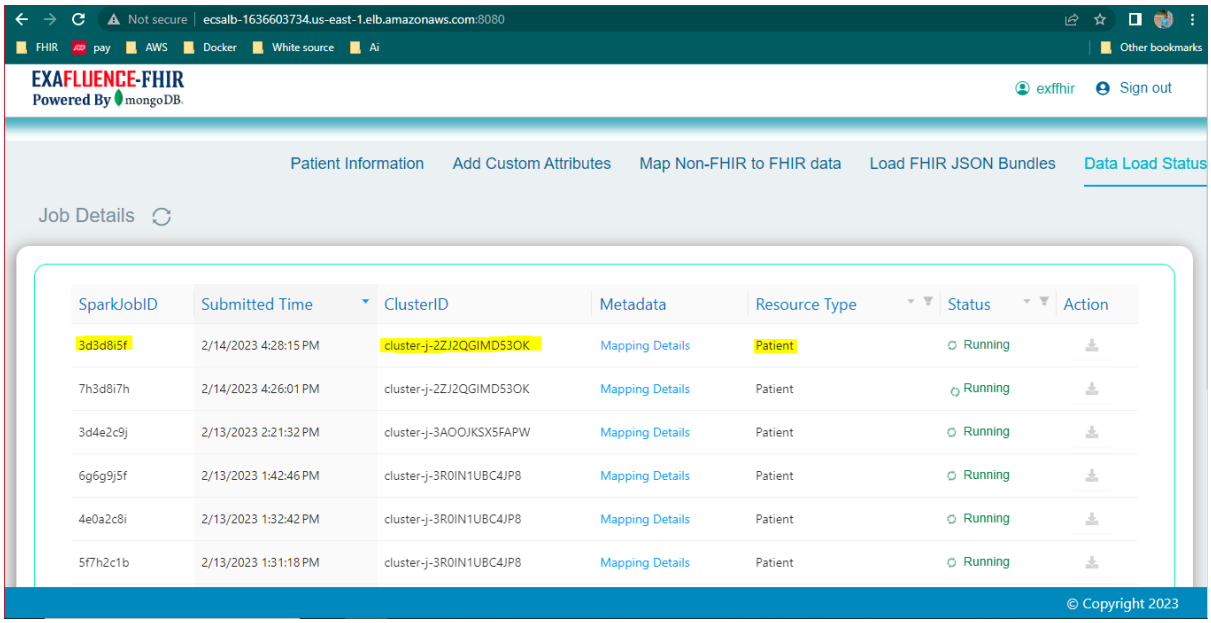
Make sure you select **Official Use** for the Name, Identifier, etc. For Address choose **Work Use** type.



Step 8: Click on submit, If the process is success then it will pop with unique Spark Job Id.



Step 9: Now to check the Job details go to Data Load Status, this shows all the data related to spark submissions.



Step 10: Finally the data related to the resource(patient) will be now visible in Patient Information.