

Building a Secure Inter-institutional Data Sharing Platform with Blockchain



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Agenda

1. Problem
2. Motivation
3. Sub projects
4. Blockchain
5. Front-End Website

Problem

How can we make peer to peer data sharing more accessible and secure on a broader scale that is less resource intensive?

Solution

Use an open source, permissions based data sharing network and website with blockchain technology: Hyperledger Fabric.

Motivation

Create a more efficient method of sharing medical data

Use blockchain-based framework rather than cloud-based

Provide a clean interface for requesting and authenticating data

How this project is divided

Front-end Interface:

Website

Back-end Applications:

Blockchain

Blockchain

Distributed Ledger

- Each organization on the network holds one instance of the ledger

Consensus Protocol

- Contract between organizations
- Shared responsibility



Why Hyperledger Fabric?

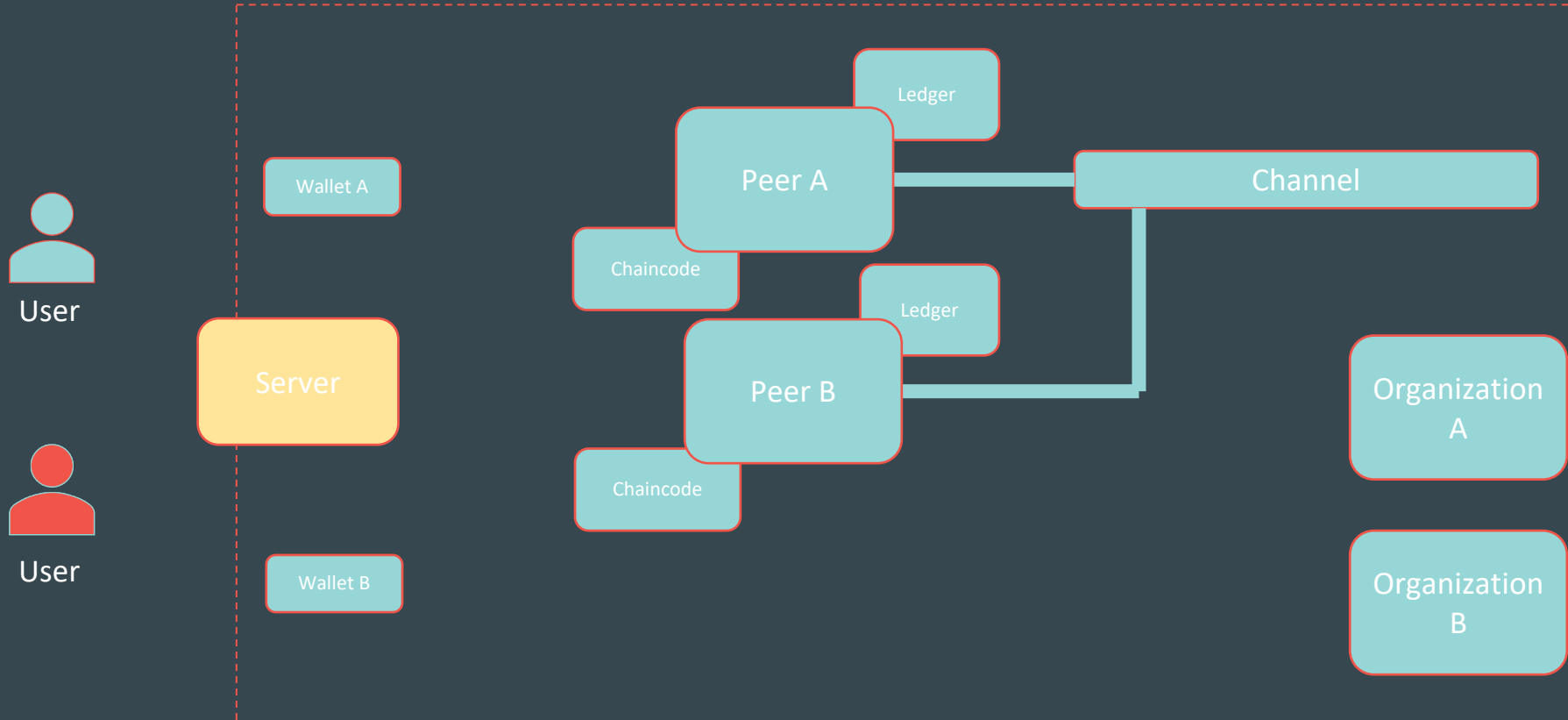
Permissioned

- Extra security by controlling access

Customizable

- Not just for financial data

A Basic Blockchain Network



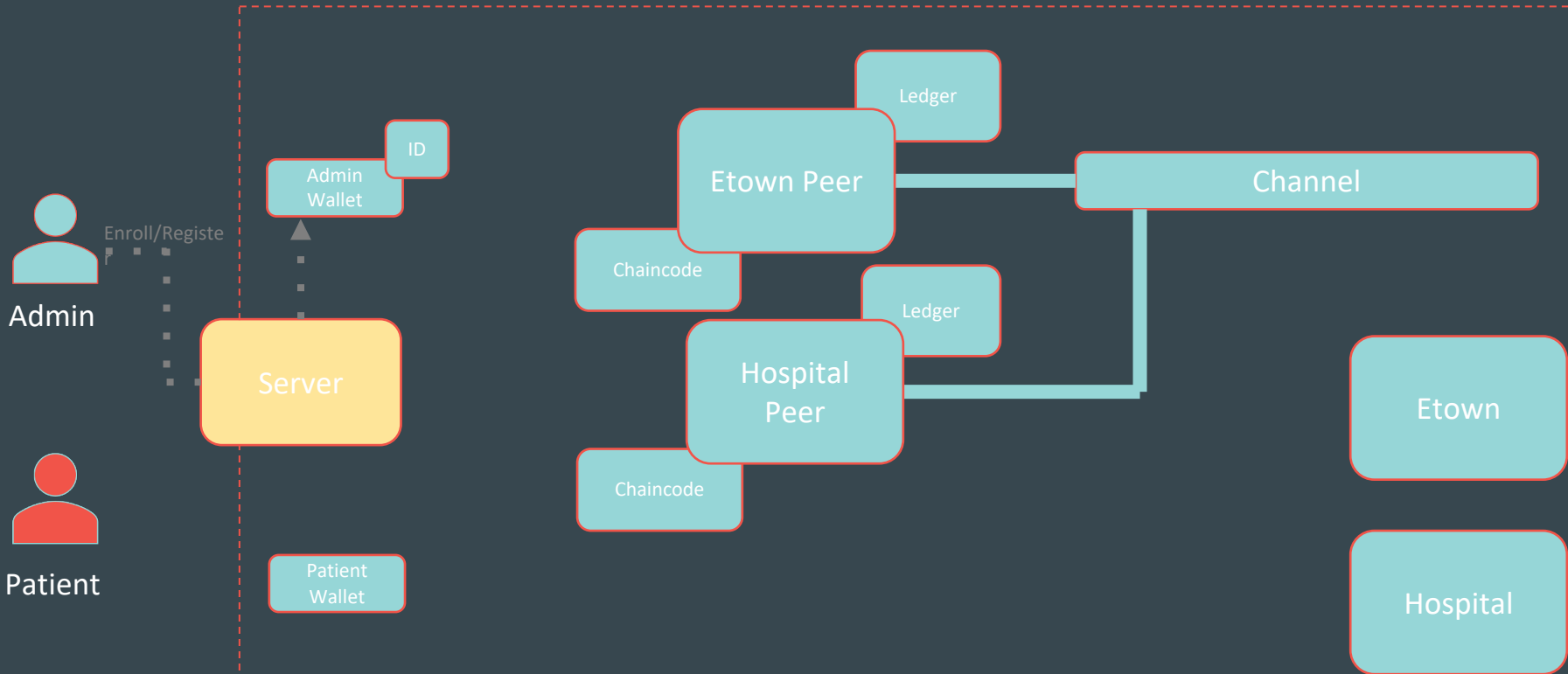
Current status...

1. Hyperledger Fabric setup

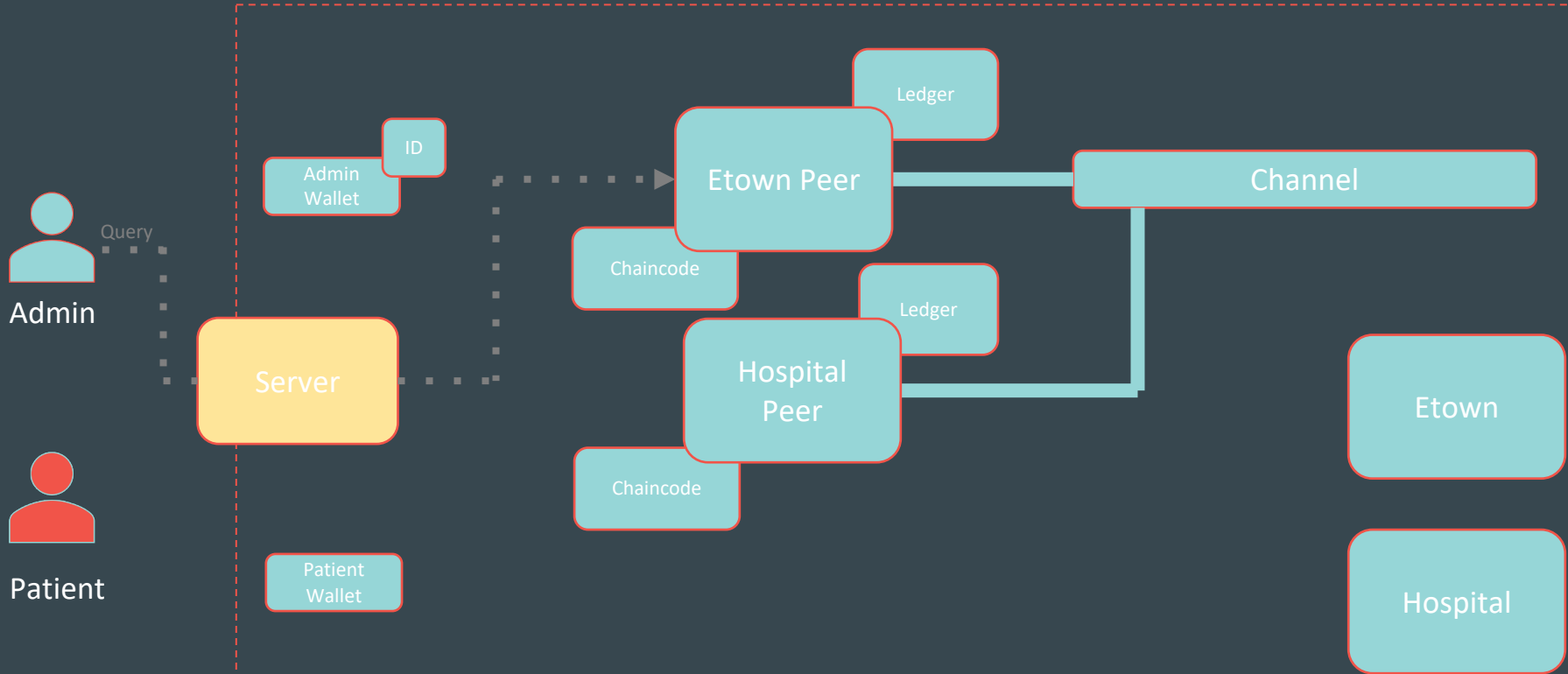
1. Chaincode application that uses medical patient data

```
etown@etown-OptiPlex-780:~/scarp/SCARP2020-Blockchain/jeff/fabric-samples/fabcar/javascript$ node enrollAdmin.js
Wallet path: /home/etown/scarp/SCARP2020-Blockchain/jeff/fabric-samples/fabcar/javascript/wallet
Successfully enrolled admin user "admin" and imported it into the wallet
```

```
etown@etown-OptiPlex-780:~/scarp/SCARP2020-Blockchain/jeff/fabric-samples/fabcar/javascript$ node registerUser.js
Wallet path: /home/etown/scarp/SCARP2020-Blockchain/jeff/fabric-samples/fabcar/javascript/wallet
Successfully registered and enrolled admin user "appUser" and imported it into the wallet
```

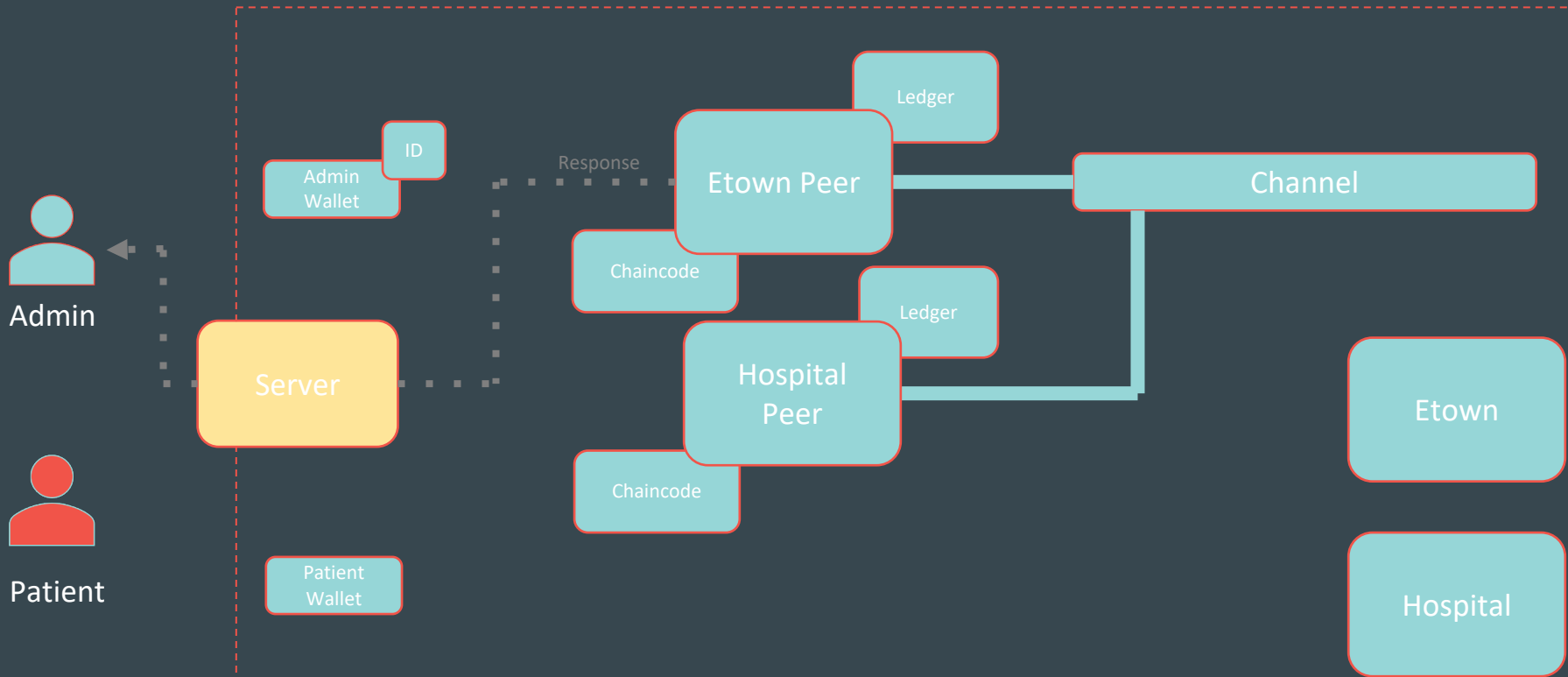


```
etown@etown-OptiPlex-780:~/scarp/SCARP2020-Blockchain/jeff/fabric-samples/fabcar/javascript$ node query.js
```

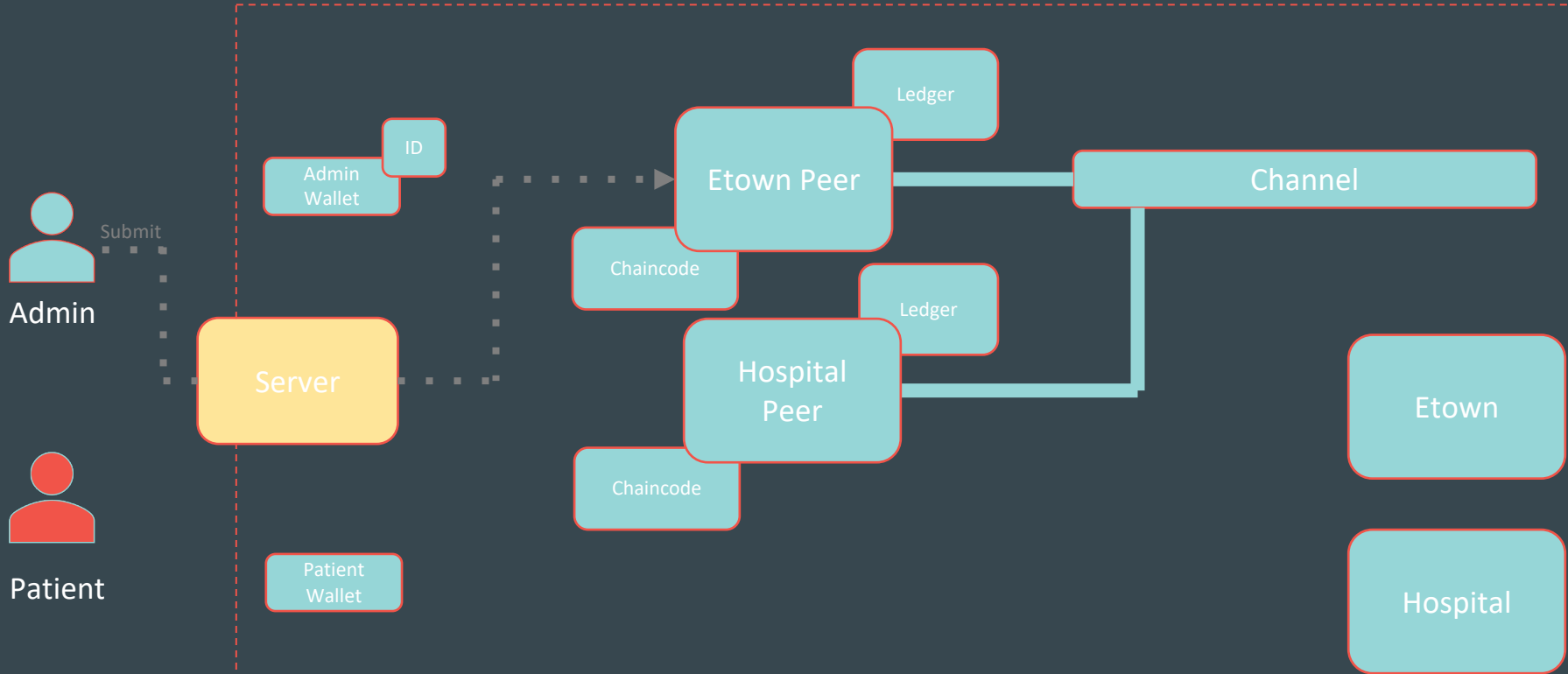


```
etown@etown-OptiPlex-780:~/scarp/SCARP2020-Blockchain/jeff/fabric-samples/fabcar/javascript$ node query.js
Wallet path: /home/etown/scarp/SCARP2020-Blockchain/jeff/fabric-samples/fabcar/javascript/wallet
Transaction has been evaluated, result is: [{"Key": "PAT0", "Record": {"docType": "patient", "hospital": "14 days", "icu": "7 days", "vasopressor": "6 days", "ventilator": "8 days"}}]
```

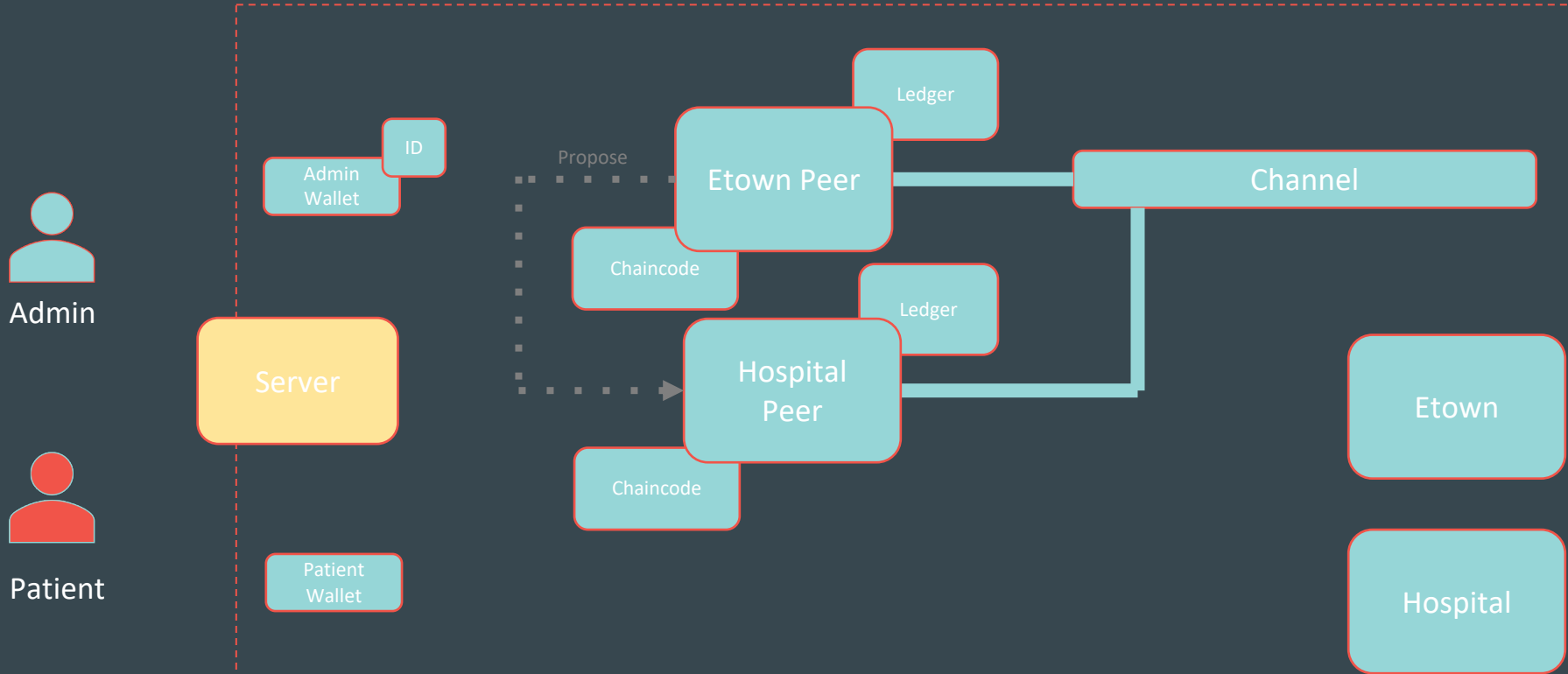
Patient



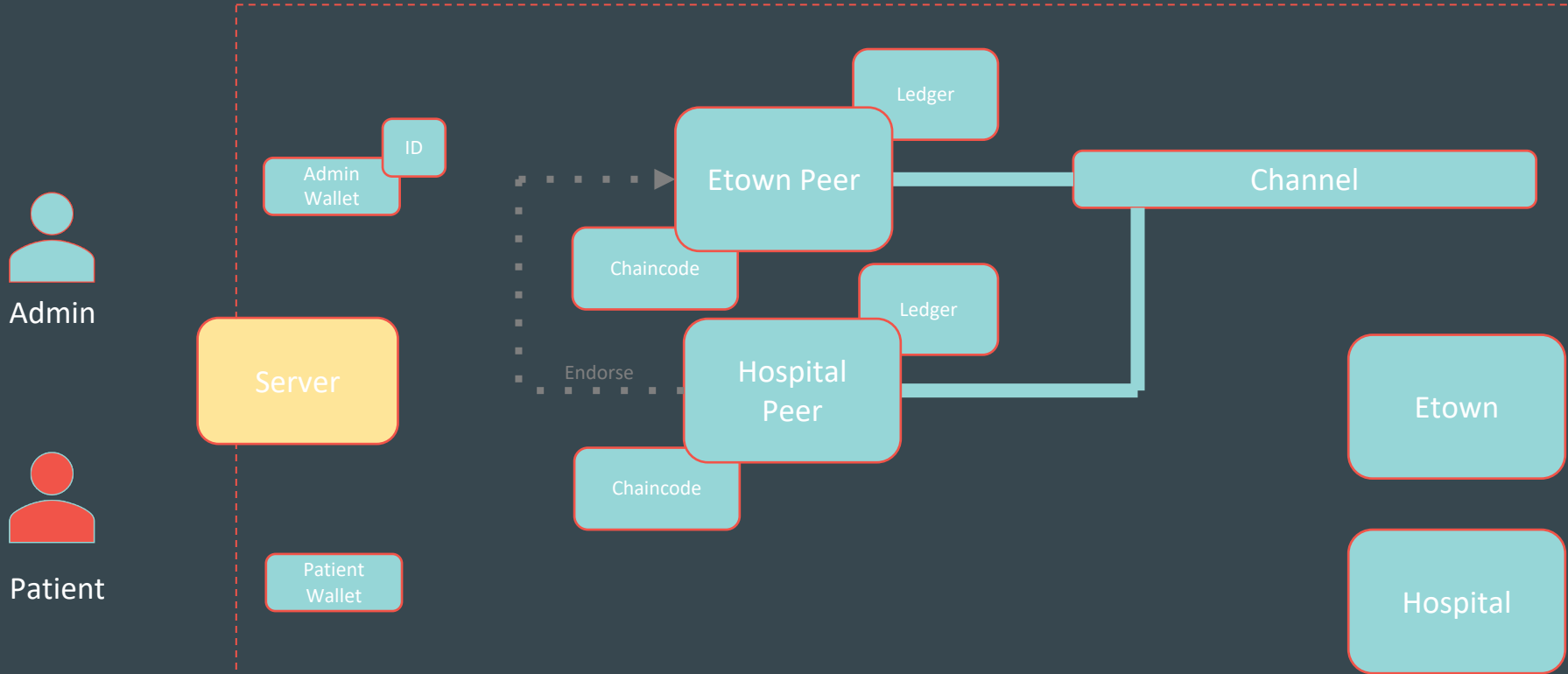
```
etown@etown-OptiPlex-780:~/scarp/SCARP2020-Blockchain/jeff/fabric-samples/fabcar/javascript$ node invoke.js
```



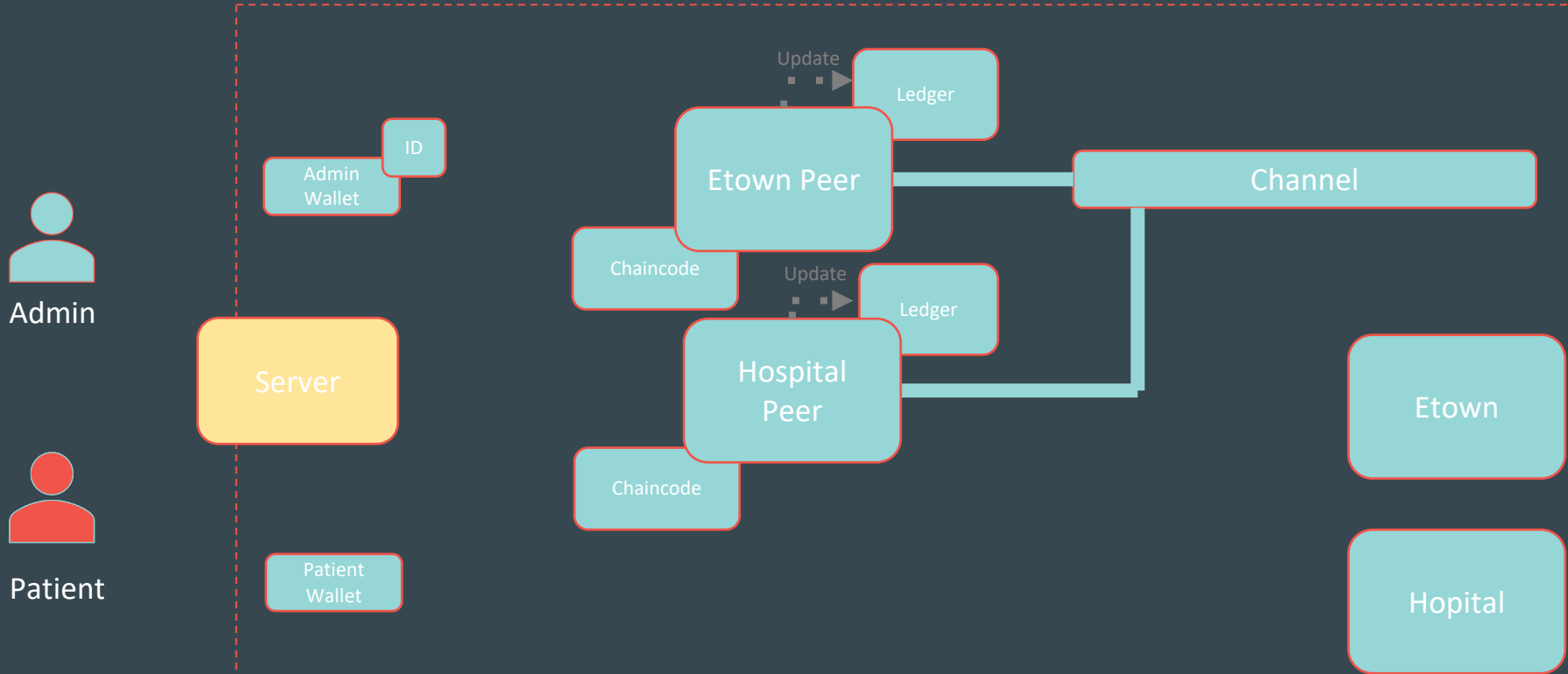
```
etown@etown-OptiPlex-780:~/scarp/SCARP2020-Blockchain/jeff/fabric-samples/fabcar/javascript$ node invoke.js
```



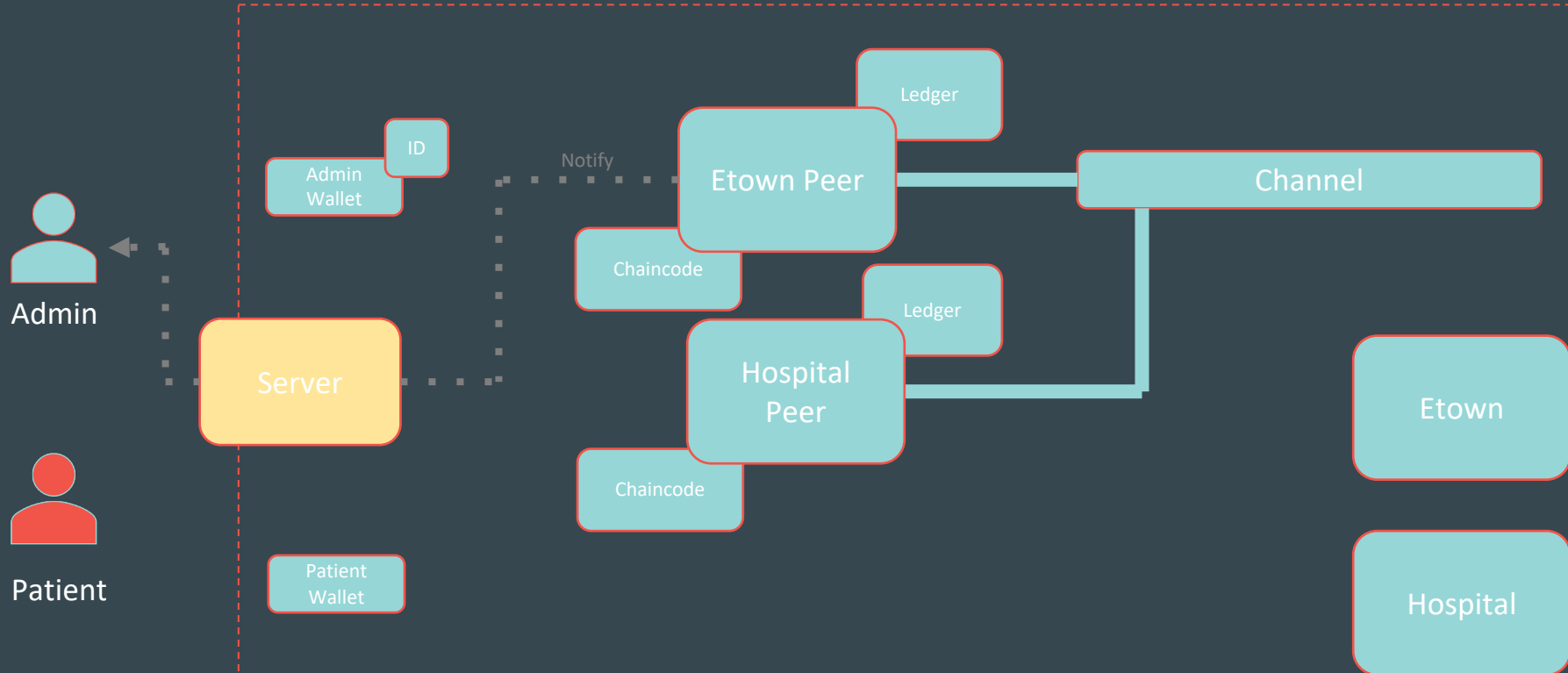
```
etown@etown-OptiPlex-780:~/scarp/SCARP2020-Blockchain/jeff/fabric-samples/fabcar/javascript$ node invoke.js
```



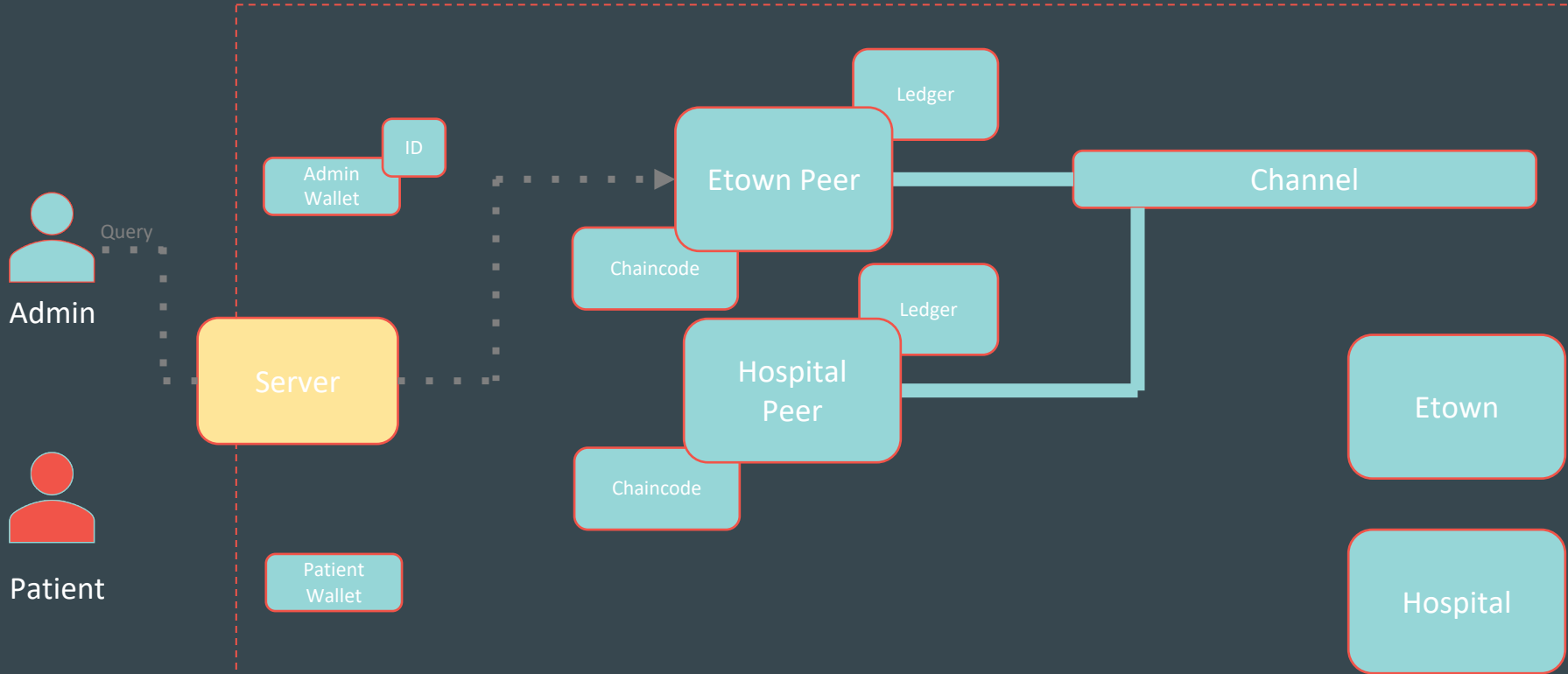

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etown@etown-OptiPlex-780:~/scarp/SCARP2020-Blockchain/jeff/fabric-samples/fabcar/javascript$ node invoke.js
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etown@etown-OptiPlex-780:~/scarp/SCARP2020-Blockchain/jeff/fabric-samples/fabcar/javascript$ node invoke.js
Wallet path: /home/etown/scarp/SCARP2020-Blockchain/jeff/fabric-samples/fabcar/javascript/wallet
Transaction has been submitted
```

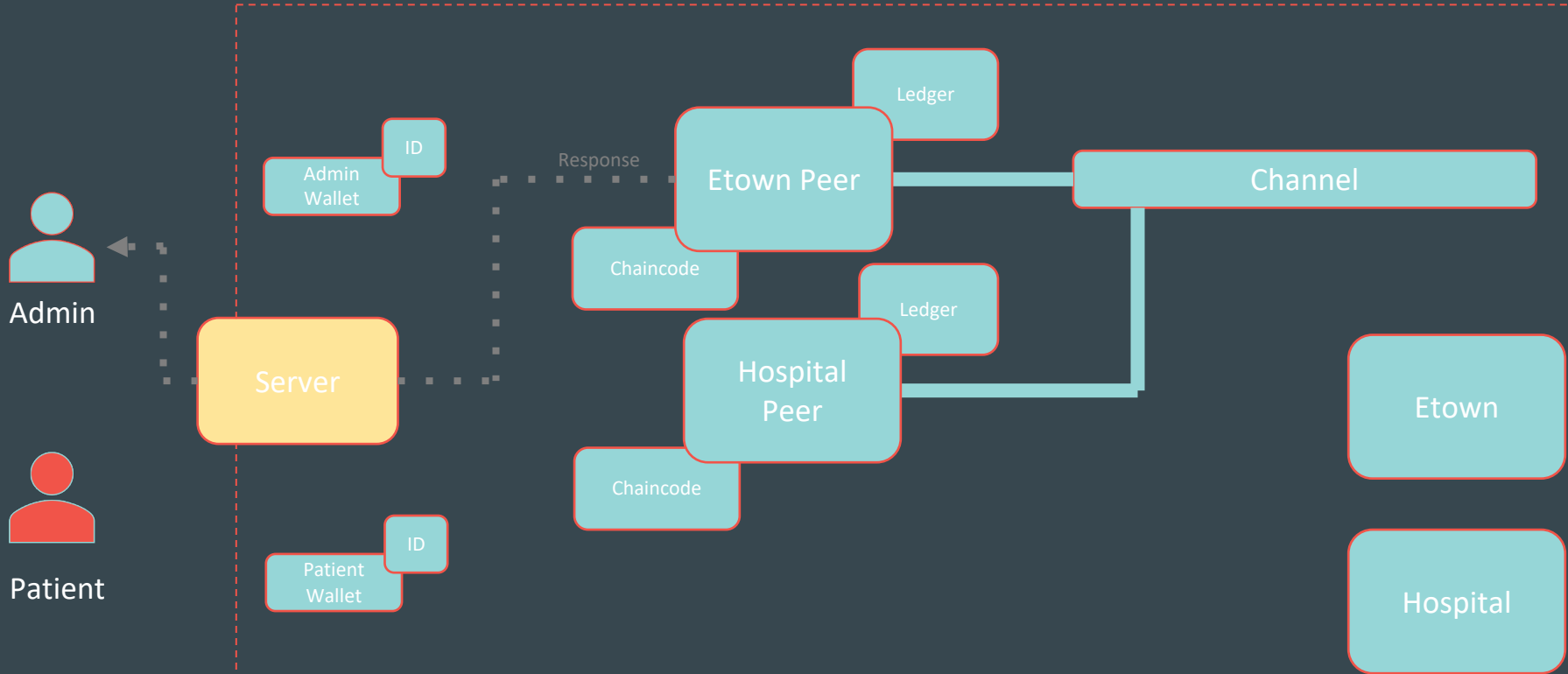


```
etown@etown-OptiPlex-780:~/scarp/SCARP2020-Blockchain/jeff/fabric-samples/fabcar/javascript$ node query.js
```



```
etown@etown-OptiPlex-780:~/scarp/SCARP2020-Blockchain/jeff/fabric-samples/fabcar/javascript$ node query.js
Wallet path: /home/etown/scarp/SCARP2020-Blockchain/jeff/fabric-samples/fabcar/javascript/wallet
Transaction has been evaluated, result is: [{"Key": "PAT0", "Record": {"docType": "patient", "hospital": "14 days", "icu": "7 days", "vasopressor": "6 days", "ventilator": "8 days"}}, {"Key": "PAT1", "Record": {"docType": "patient", "hospital": "10 days", "icu": "5 days", "vasopressor": "2 days", "venti
```

Patients

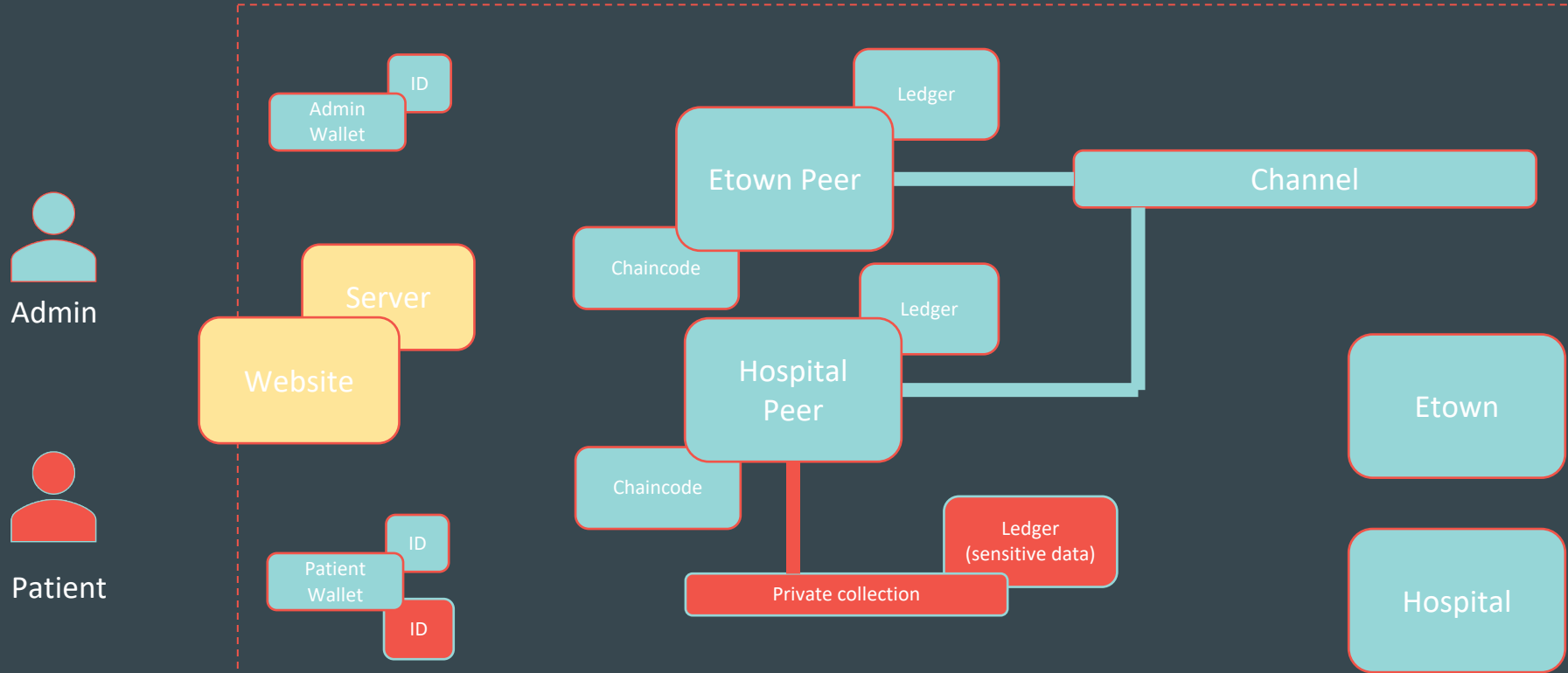


Next...

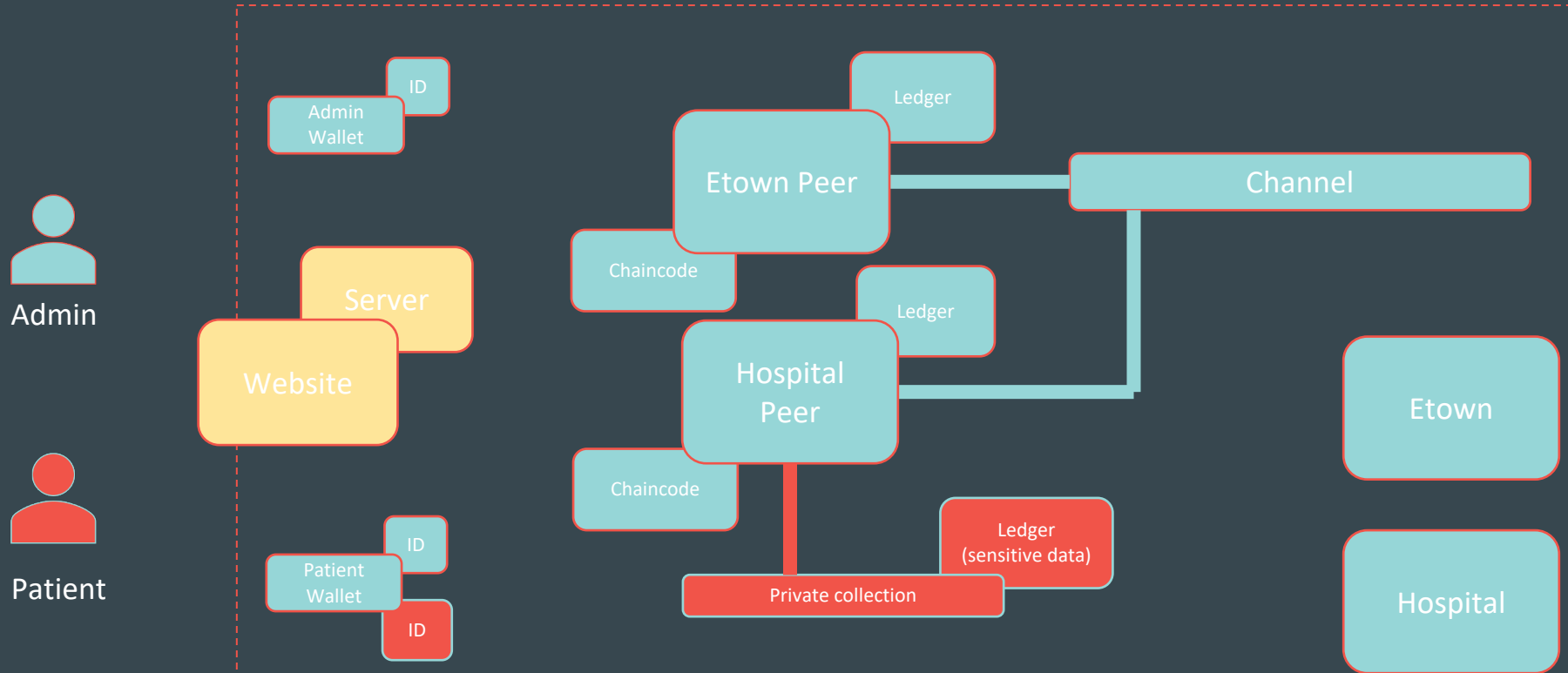
1. Connect server applications to user interface website

1. Add private data layer to network

Private Data Sharing with Blockchain Network



Private Data Sharing with Blockchain Network



Front-End Interface

Software



python™

django

Why this software is helpful?

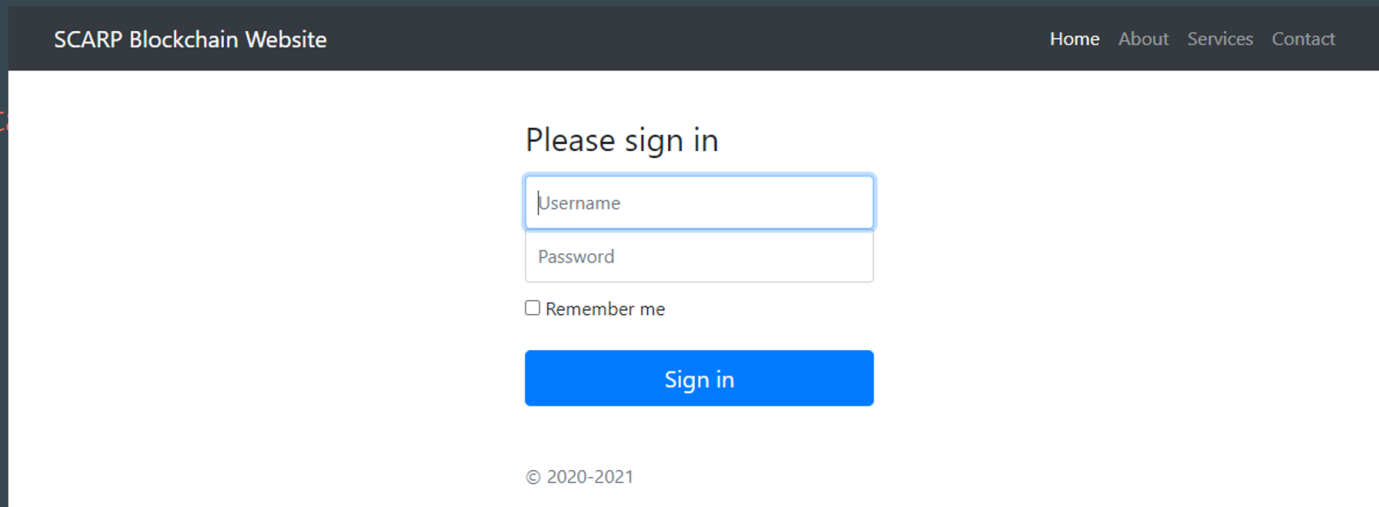
**Who are the users of this
website?**

Front-End Interface

Aspects of the current website:

Login

Display Data



The screenshot shows the front-end interface of the SCARP Blockchain Website. The page has a dark header with the site name and navigation links. The main content area is white and features a login form with the following elements:

- Header: SCARP Blockchain Website
- Navigation: Home, About, Services, Contact
- Title: Please sign in
- Username input field
- Password input field
- Remember me checkbox
- Sign in button
- Footer: © 2020-2021

DEMONSTRATION

<http://127.0.0.1:8000/>

Next...

1. Display User's Data
1. Implement Role Based Access Control
 - a. Require Access to a Specific Dataset
 - b. Grant Access to a Specific User
1. Upload Data
1. Share Data

1. Display User's Data

2. Implement Role Based Access Control

3. Upload/Share Data