



Decentralized Healthcare Network Platform

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Introduction

In today's digitalized healthcare environment, keeping the best outcomes for patients at the center of all activity increasingly depends on the smart use of medical data. But still majority of the medical records are still used as hard copies.

In alternative approaches electronic healthcare records are kept in centralized system, which is very insecure and prone to single point of failure. On this paper we have designed a decentralized platform architecture to bring all healthcare services under single roof with state of the art blockchain based security.

Motivation

Health data from many sources, such as electronic medical records and imaging databases, is growing exponentially, making it challenging to combine data for optimal decision making. We have designed this network platform to keep healthcare services up to date with the most cutting-edge technology and to give the finest support and infrastructure to make treatments more accessible.

SCOPE of the Project

Primary objective of this project is to make healthcare related services efficient and secure. In order to get there, we need to solve couple of secondary objectives. Such as –

- User to get hospital services, ambulance services, pharmaceuticals services and all other healthcare related stuff through a single platform.
- Platform to be accessible through app or website from anywhere in the world.
- Platform to be very secure as these medical records require utmost privacy.
- User to be able to share or give certain access permission or revoke to any other parties as they please.
- Hospitals to have their own management services maintained and easily maintainable including their internal users with their own database access and control.

Methodology

In order to achieve our goal we have divided our main architecture into five different modules of services on a single scalable decentralized infrastructure.

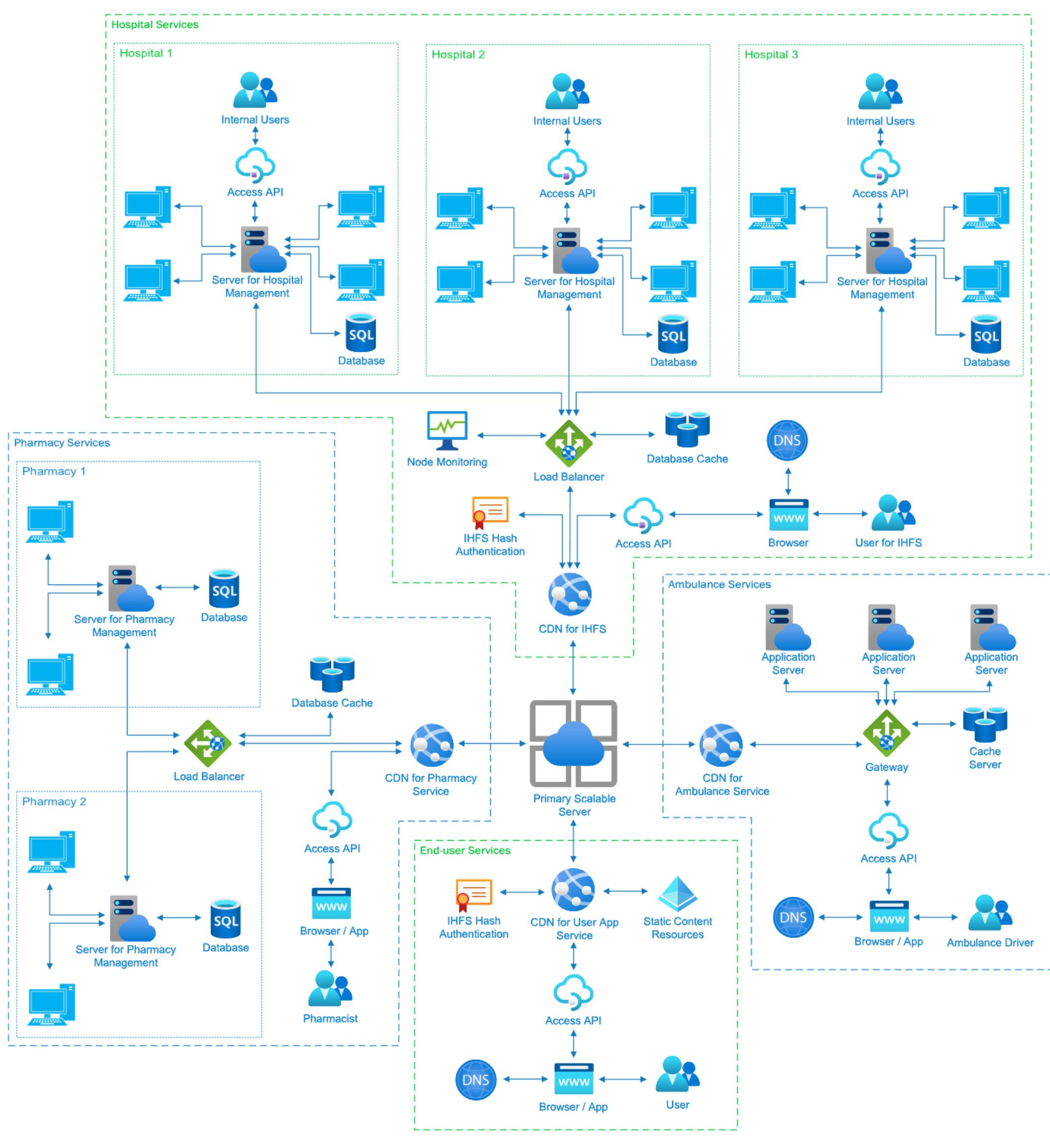
End-user Services: User can get connected to all the other services through mobile or web application for world wide access.

Hospital Internal Network: Intranetworking for Hospital Management and storage nodes for primary decentralized system for the whole platform.

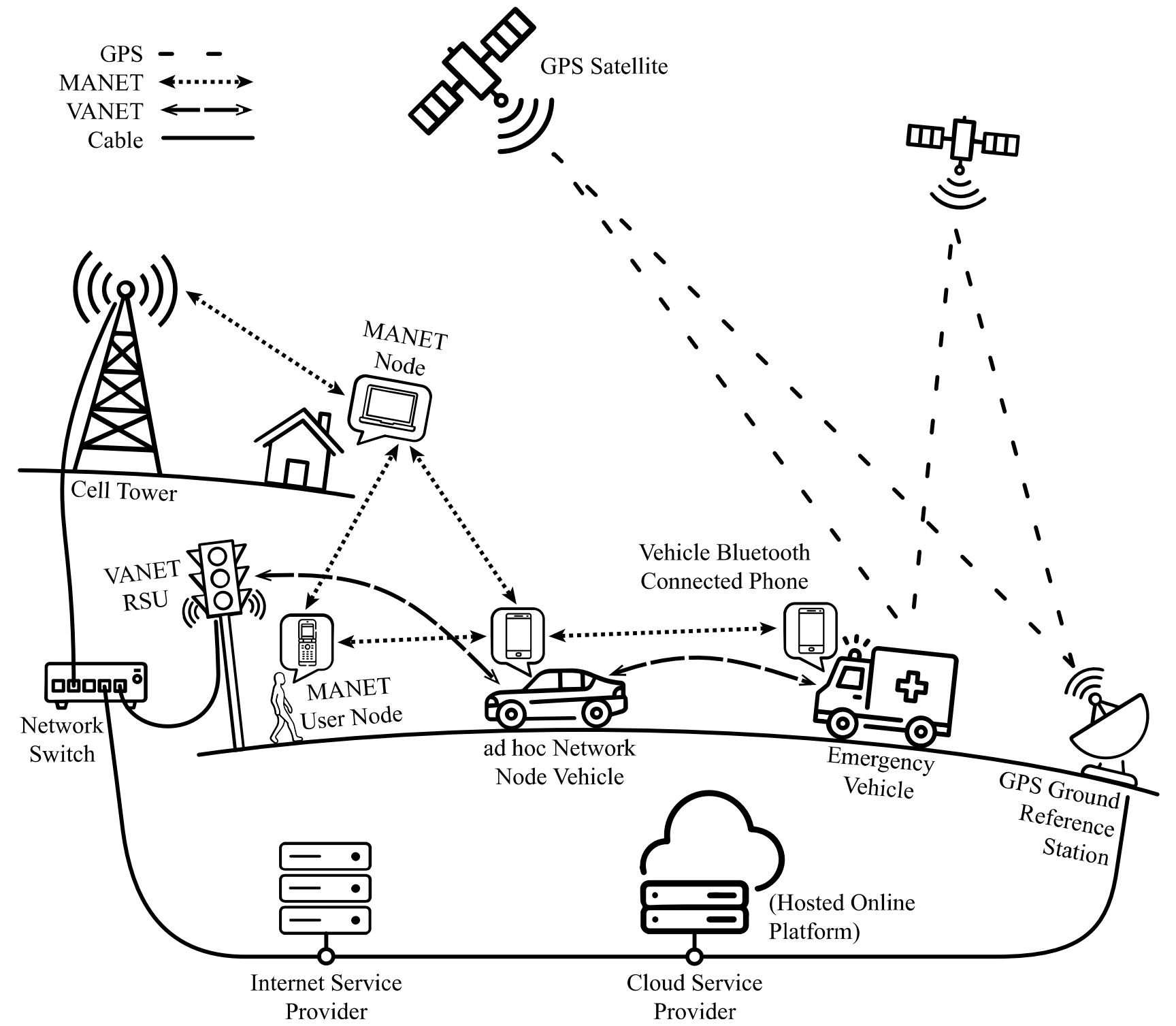
Pharmaceutical Services: Direct patient's authenticated prescription and hospital supply access with inventory Management and online shopping services.

Ambulance Services: Response to Emergency Calls with ad-hoc networking.

Data Storage and Maintenance: Blockchain based secure decentralized storage with node monitoring and automatic backup.



Our proposed InterHospital File System (IHFS) is a state of the art decentralized storage solution proprietarily designed for healthcare infrastructure. Here a registered user can upload their encrypted medical records and it will be stored permanently in the blockchain, distributed among the storage nodes. User will have full access over the data and can authenticate, share or revoke access of their prescription or records to the doctors or pharmacy in the system.



There are a range of route planning solutions available in daily usage. When it comes to emergency circumstances, speed and efficiency are more important than luxury.

For providing a real-time mechanism to our ambulance services we have proposed ad-hoc networking connection for fast and accurate route planning based on MANET and a subset of MANET called VANET on top of the existing structure of GPS for the road environment free of geo related constraints.

Results

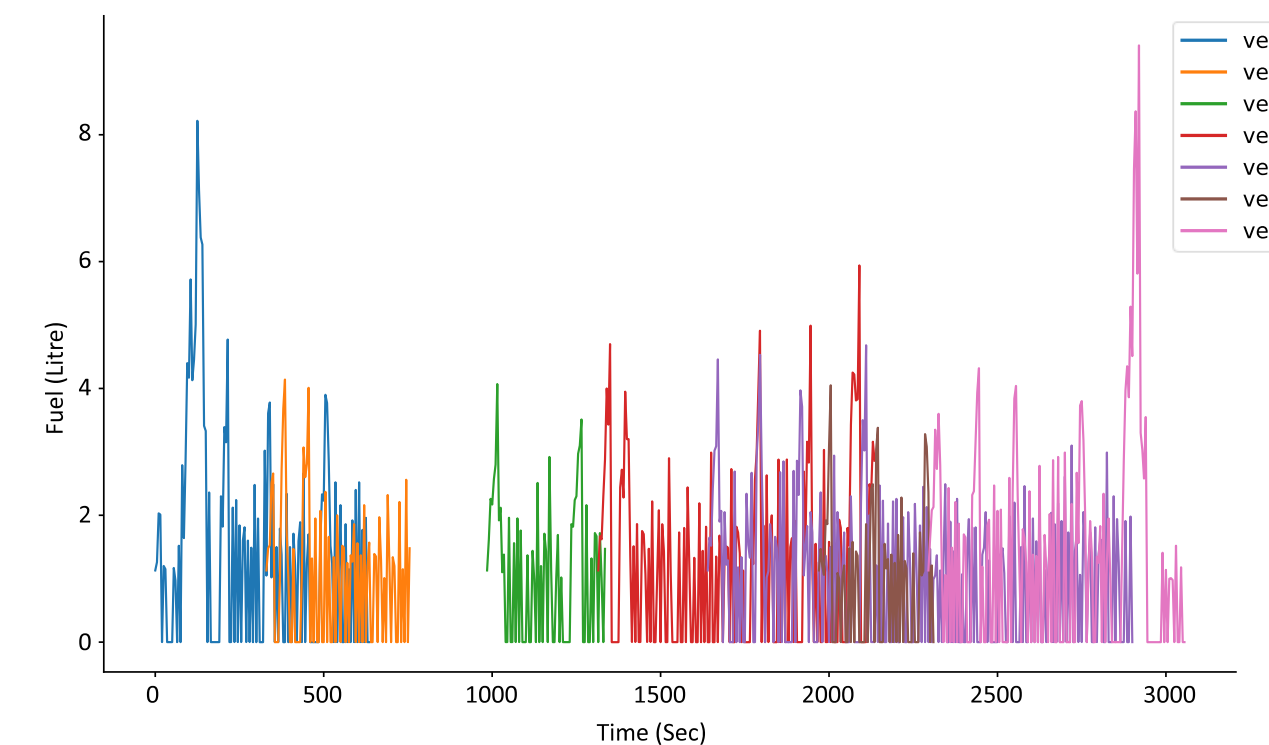
We have implemented a prototype of our proposed network platform using Django and it worked as expected. Individual module have their own separate apps and they are all integrated with full scalability.

But for the ambulance part it is rather challenging to execute such a massive decentralized ad-hoc network as prototype. That is why we have used simulation.

Throughout the simulation, seven vehicles were sent at varying time intervals, including a non-peak hour

break to disable the local ad hoc connection and utilize GPS and V2I communications alone.

By comparing these results to those of previous research, we can see that our performance was comparable. And all these time our ambulances had good internet connection.



Conclusion

On this project we have built a totally decentralized system in which data is saved in our designed proprietary file system called IHFS, which is entirely protected using state of the art blockchain technology. This prevents any form of data integrity related issues from occurring and also very secure.

We have developed a route planning system for ambulance services that is both efficient and quick. Once the whole service is up and running with a small number of subscriber hospitals, the database-related tasks will become entirely self-sustaining, and it will monitor all occurrences, including backups, on a continuous basis. It also uses hospitals' current system as well as the extremely popular smartphone infrastructure which will connect all the healthcare services.

References

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