Blockchain Enabled Pharmaceutical Supply Chain

CSE 528 - Course Project
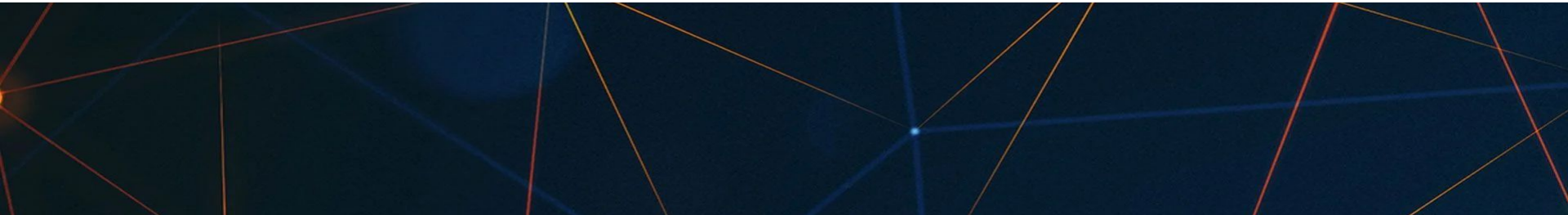
Abhishek Pratap Singh - 2018211

Dhruv Umesh - 2018231

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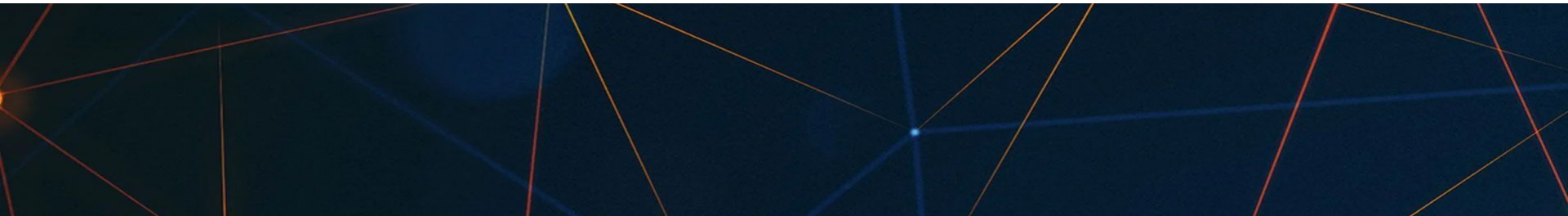 - App Front-End
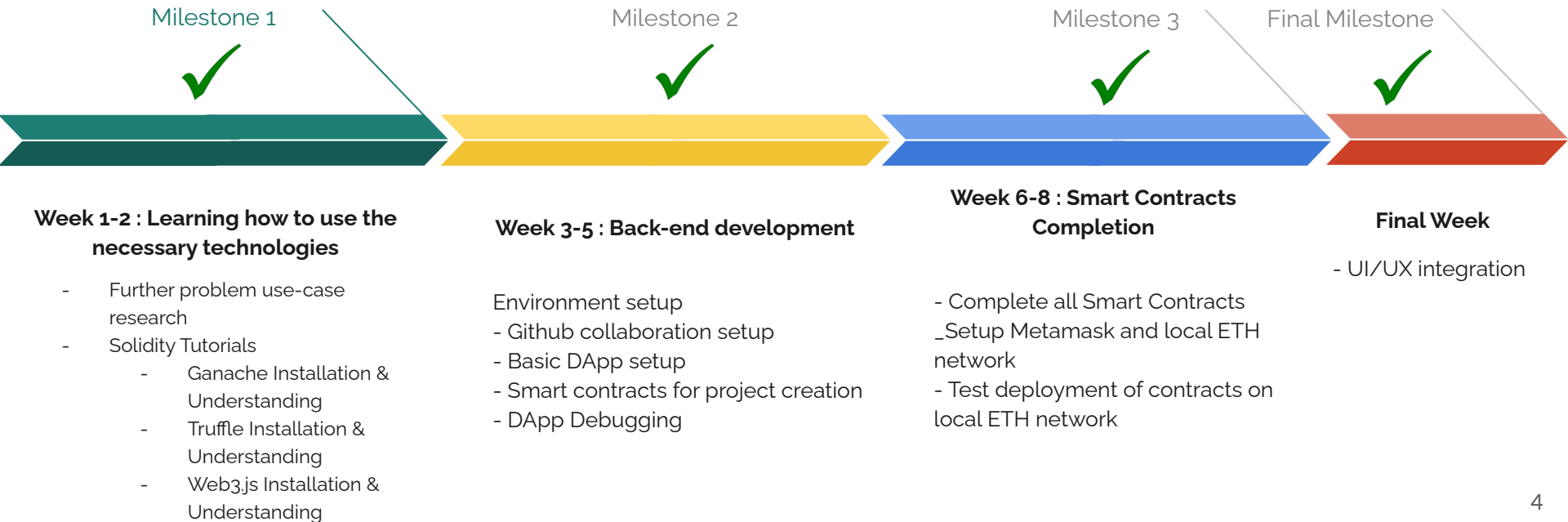- References

Project Abstract

The pharmaceutical industry around the world is in dire need to bolster its ability to track and trace the drugs that are manufactured and shipped to pharmacies and hospitals. The regulations also include tracking medications that are returned by stores and healthcare facilities for resale. In this project, we aim to implement a decentralised, transparent, immutable record keeping system that ensures non-repudiation for a pharmaceutical supply chain.

With the help of a user-friendly front-end, customers can look at the details of the supply chain in real time to make sure they're not cheated. Similarly, we can trace the weak link in the supply chain to find where drugs go missing. This way, we ensure reduced losses and transparency between the customers, pharmaceutical companies and the governing authorities.

Project Milestones

Milestone 1	Milestone 2	Milestone 3	Final Milestone
✔	✔	✔	✔

Week 1-2 : Learning how to use the necessary technologies

- Further problem use-case research
- Solidity Tutorials
    - Ganache Installation & Understanding
    - Truffle Installation & Understanding
    - Web3.js Installation & Understanding

Week 3-5 : Back-end development

Environment setup
- Github collaboration setup
- Basic DApp setup
- Smart contracts for project creation
- DApp Debugging

Week 6-8 : Smart Contracts Completion

- Complete all Smart Contracts
_Setup Metamask and local ETH network
- Test deployment of contracts on local ETH network

Final Week

- UI/UX integration

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Welcome to S&U PharmaChain.

Singh & Umesh Pharmaceutical Supply Chain
Using Ethereum smart contract.

Welcome to S&U PharmaChain.

Singh and Umesh Pharmaceutical Supplychain using Ethereum
smart contract.

Get MetaMask

Log In

Super Admin

Overview

01 API Manufacturer
- Generates a unique code for the drug API (Active Pharmaceutical Ingredient).
- This information is stored on the blockchain.

02 Formulation Manufacturer
- Verifies the API origin.
- Generates a formulation from the information given by the API Manufacturer.
- Stores information about the manufactured drug shipment on blockchain.

03 Wholesaler
- Verifies the origin of the formulation.
- Stores information of the shipment content received and its condition on the blockchain.

04 Pharmacy
- Verifies the origin of the formulation and the condition, quantity and content of the shipment.
- Stores current condition, quantity and content on the blockchain.

05 Patient
- Verifies all information previously stored on blockchain.
- Stores bought drug price, current condition, quantity and content on the blockchain.

- Prevents drug-repackaging
- Checks substitution with fake drugs
- Document location and temperature from QR code attached to the shipment.
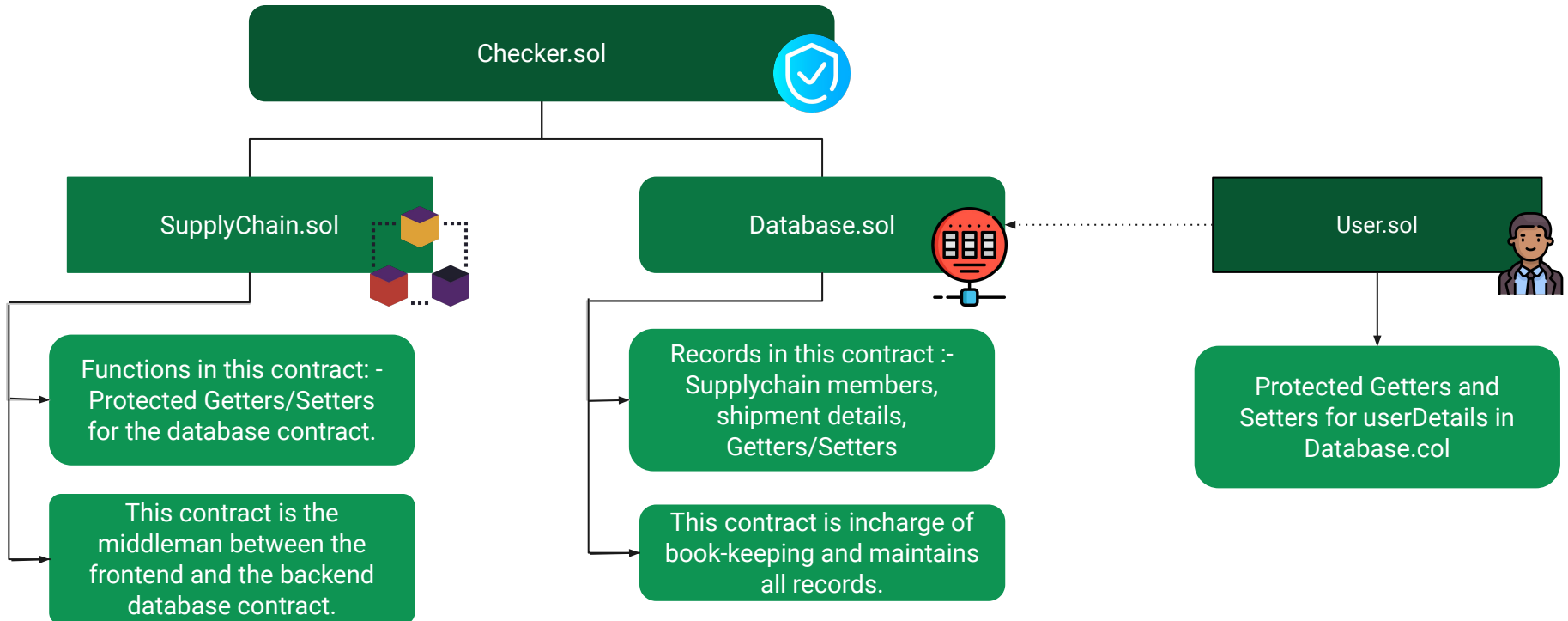
Problem Addressed

- **Tracing of medication through the distribution network**
  - A blockchain based pharma supply chain solution would improve traceability and transparency across the participants and authorities in the supply chain and would ensure better compliance.
- **Curbing counterfeit pharmaceutical circulation**
  - A blockchain based pharma supply chain management track and trace system has a vast potential to tackle this growing illicit industry by tracking the movement of drugs between suppliers, manufacturers, wholesale distributors, pharmacy, hospitals, regulators and logistics.
- **Minimizing drug recall incidences**
  - A blockchain solution can prevent drug recalls or assist targeted recalls due to mislabeling, contamination and failed specifications to provide a more secure and transparent reporting of changes in operating conditions of transported pharmaceutical products.
- **Combat counterfeiting of life-saving specialty drugs**
  - A blockchain based end-to-end traceability of the specialty drugs together with the environmental parameters would enable patients to access the provenance of the specialty medicine's journey from the manufacturer including the environmental conditions, distributors and pharmacy details.

Smart Contracts / Back-End

- The backend is comprised of 4 .sol files
    - Checker.sol
    - Database.sol
    - SupplyChain.sol
    - User.sol
- Checker.sol handles the security through modifiers, ensuring that only users with authorised access can perform certain actions.
- User.Sol provides functions to get and set user details, through the protected modifiers in Database.col.
- Database.sol and SupplyChain.sol both inherit from Checker.sol.

Smart Contracts / Back-End

Checker.sol

SupplyChain.sol

Database.sol

User.sol

Functions in this contract: - Protected Getters/Setters for the database contract.

Records in this contract :- Supplychain members, shipment details, Getters/Setters

Protected Getters and Setters for userDetails in Database.col

This contract is the middleman between the frontend and the backend database contract.

This contract is incharge of book-keeping and maintains all records.
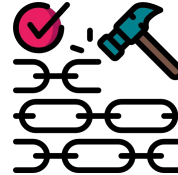
App Front-End

Landing Page

index.html

- Presents the main page of the App.
- Gives user option to download Metamask, Login as user or superadmin.

User Profile Page

user.html

- Shows all users their profiles.
- Each type of user can update their task.
- Each user can see their shipment status on the chain.

Shipment Status Page
view-batch.html

- Shows status of each drug shipment in the supply chain.
- QR code of this page is shared with each user, especially the patients.

Super Admin Page

admin.html

- Page for superadmin.
- Can monitor each shipment status.
- Can add new users.
- Can disable any malicious user.

Thank You.

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Abhishek Pratap Singh - 2018211
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