SOMAIYA VIDYAVIHAR UNIVERSITY
K J Somaiya College Of Engineering

Department of Electronics and Telecommunication Engineering

Final Year Project

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Hierarchical Distributed Ledger for Ensuring Reliable & Authentic data Collection in IoT with a Peer to Peer Ethereum Blockchain Network

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Introduction &
Problem statement

Entities & System
Architecture

Implementation

Decentralized
Web App

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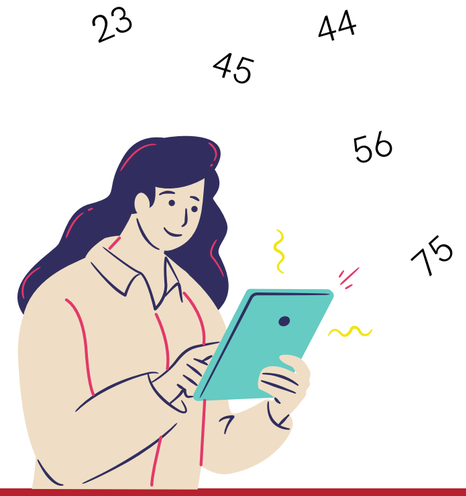
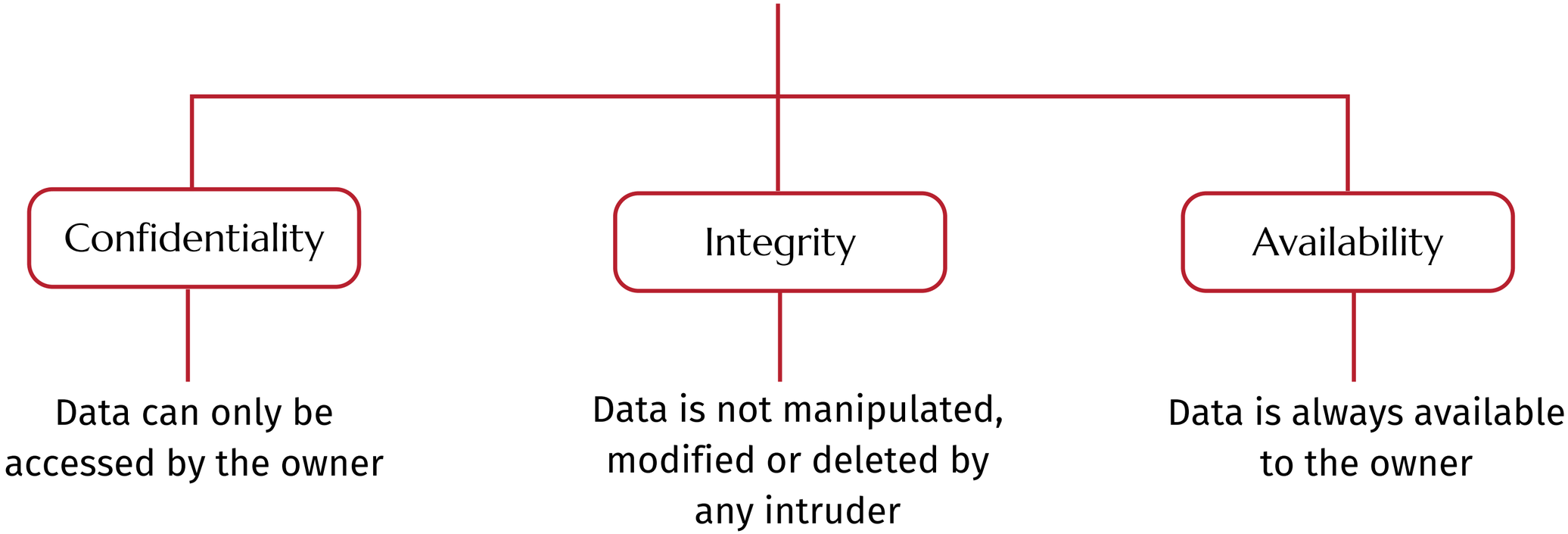
Introduction &
Problem statement

Introduction

IoT data collectors generate valuable data from IoT devices, while other companies rely on this data for analysis and insights. However, third-party buyers of data often encounter challenges in **confirming its authenticity, reliability, and ensuring that it is not merely random or fabricated information.** Another challenge can be the data breaches during data transmission that pose a significant risk to the integrity and confidentiality of the data.



CIA Triads

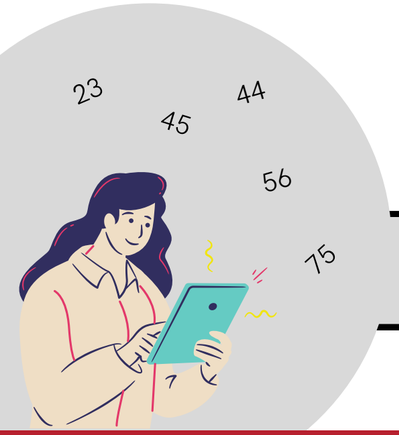

Confidentiality
Integrity
Availability
Data can only be accessed by the owner
Data is not manipulated, modified or deleted by any intruder
Data is always available to the owner

Problem Statement

To ensure authentic and secure transaction of data from vendors to buyer, a transparent system is needed that eliminates the requirement for third-party brokers and resolves issues related to data confidentiality, integrity, and authenticity.

Objectives

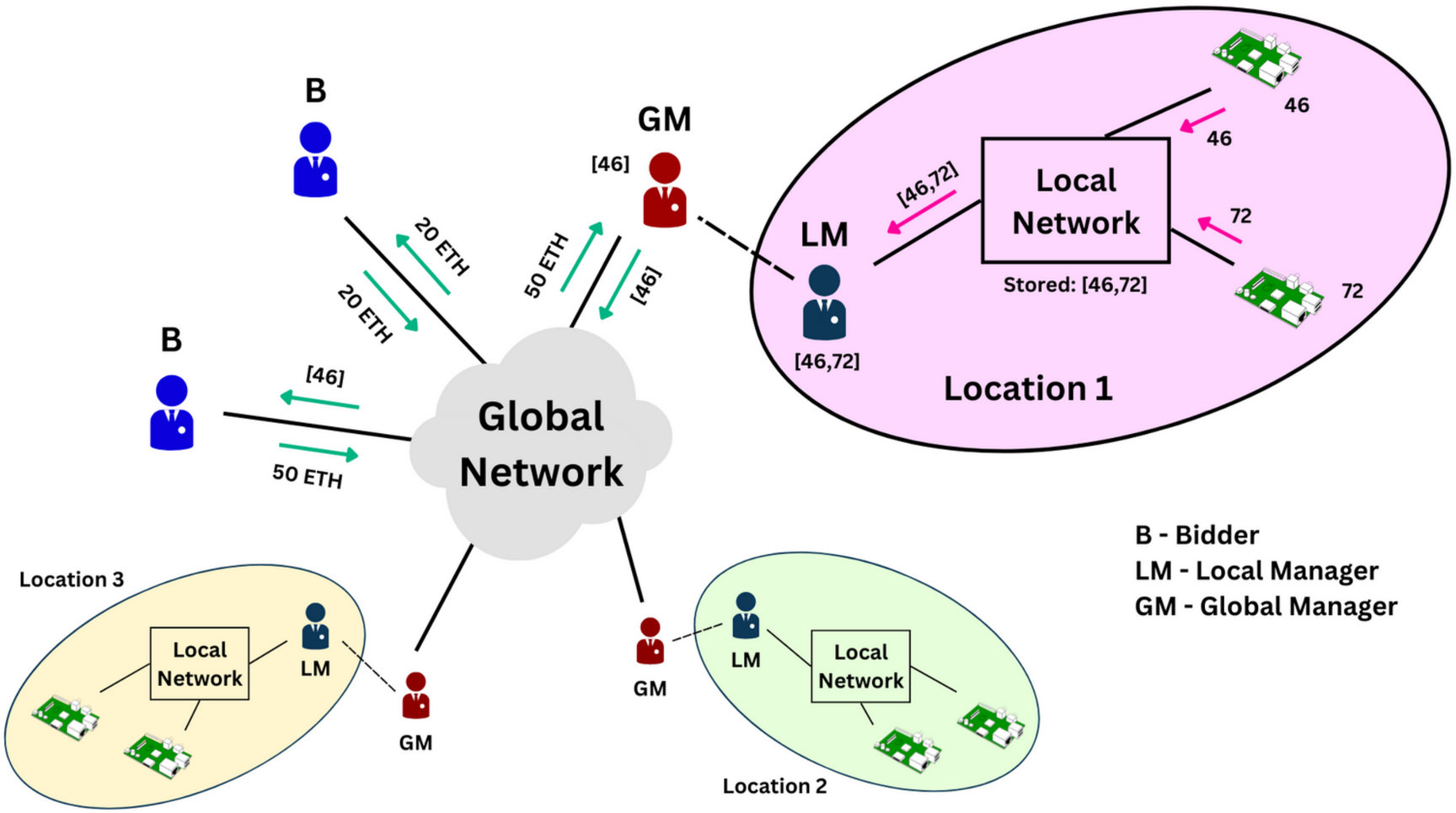
- To create an end to end secure and transparent system which facilitates secure transactions between buyers and sellers of data.
- To ensure the goals - data authenticity, integrity and confidentiality.
- To design an interactive interface for the user to view and manage their data.
- Leverage Blockchain technology by setting up a private Ethereum blockchain network among sellers and buyers.
- To eliminate third party brokers and provide a cost efficient solution



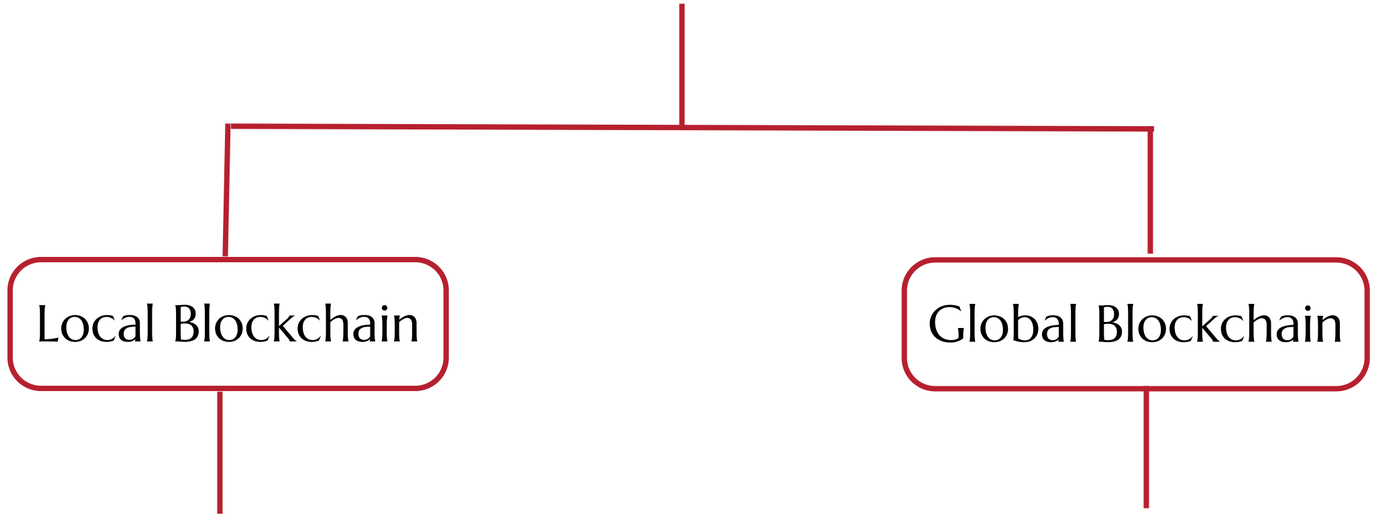
B L O C K C H A I N

Entities &
System Architecture

Architecture



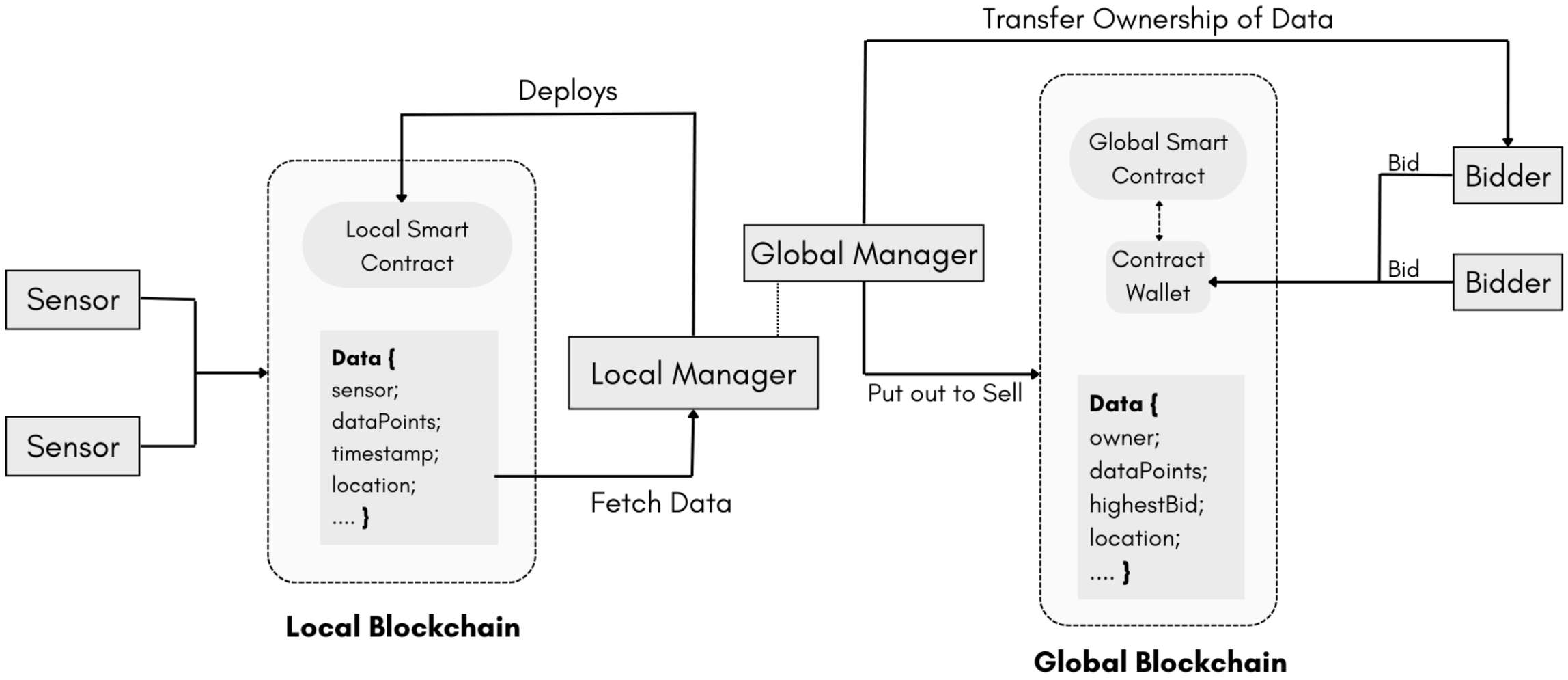
Blockchain levels



- ✓ Responsible for collecting IoT data generated by the sensor nodes
- ✓ Transferring it securely from the sensor nodes to the manager (secure data transfer)

- ✓ Facilitate the buying and selling of data
- ✓ Managers can put their collected data up for sale
- ✓ Bidders can bid on data they are interested to purchase
- ✓ Managers can close the bid and transfer ownership of the data to the highest bidder

Proposed System



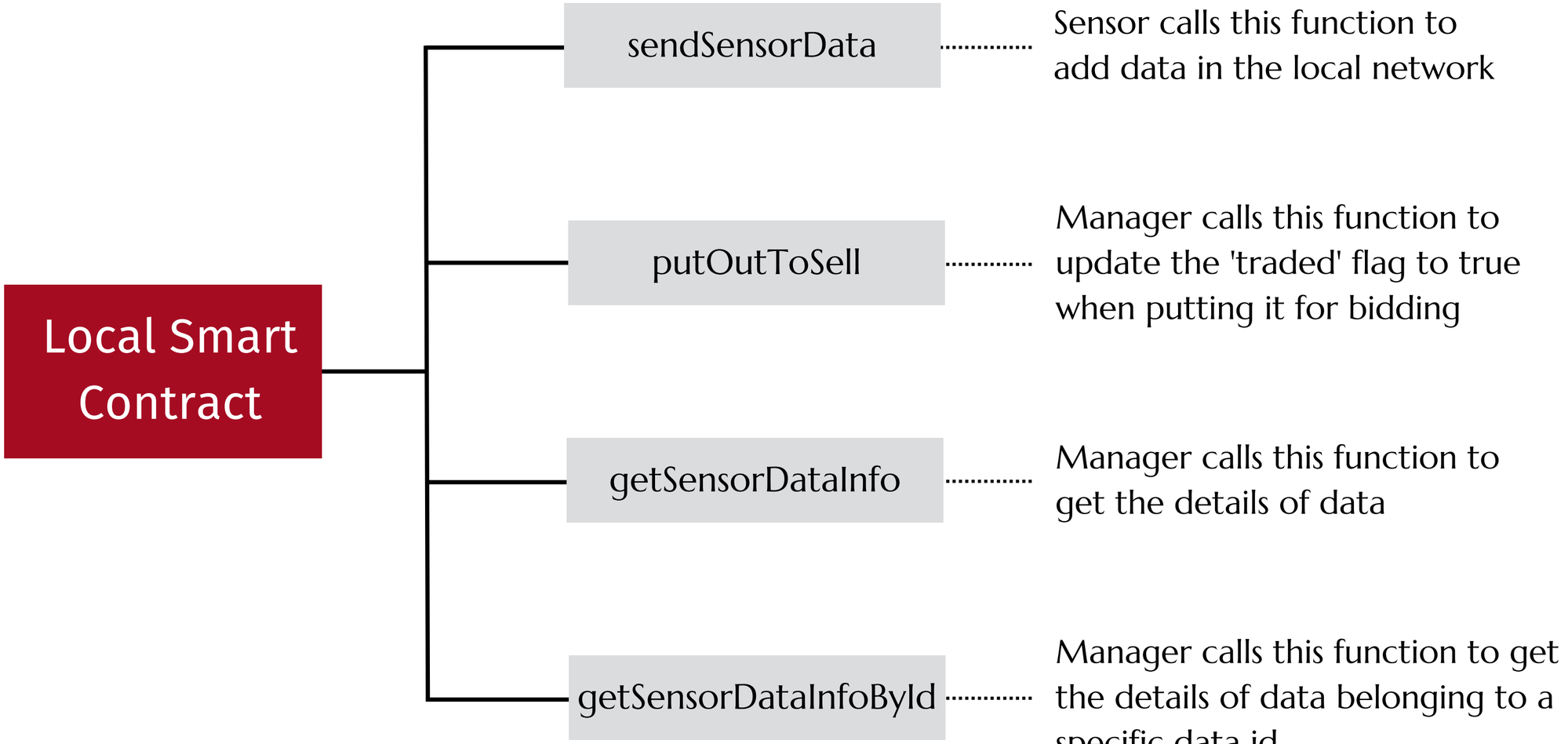
Structure of Data

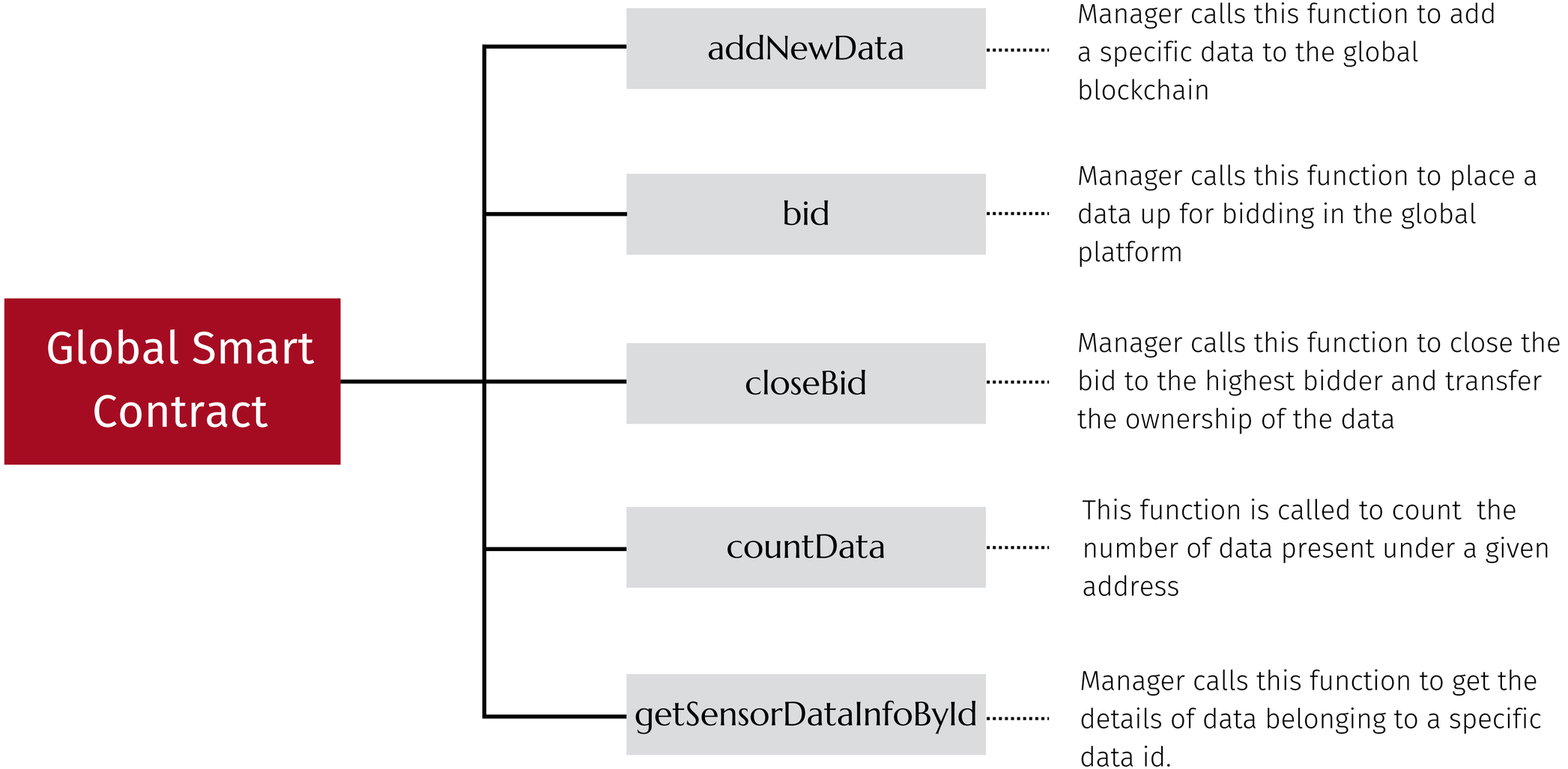
Local Blockchain

```
struct Data{
    bytes32 id;
    address sensor;
    uint dataPoints;
    bytes32 dataHash;
    uint timestamp;
    bytes32 location;
    address manager;
    uint value;
    bool tradedOutside;
}
```

Global Blockchain

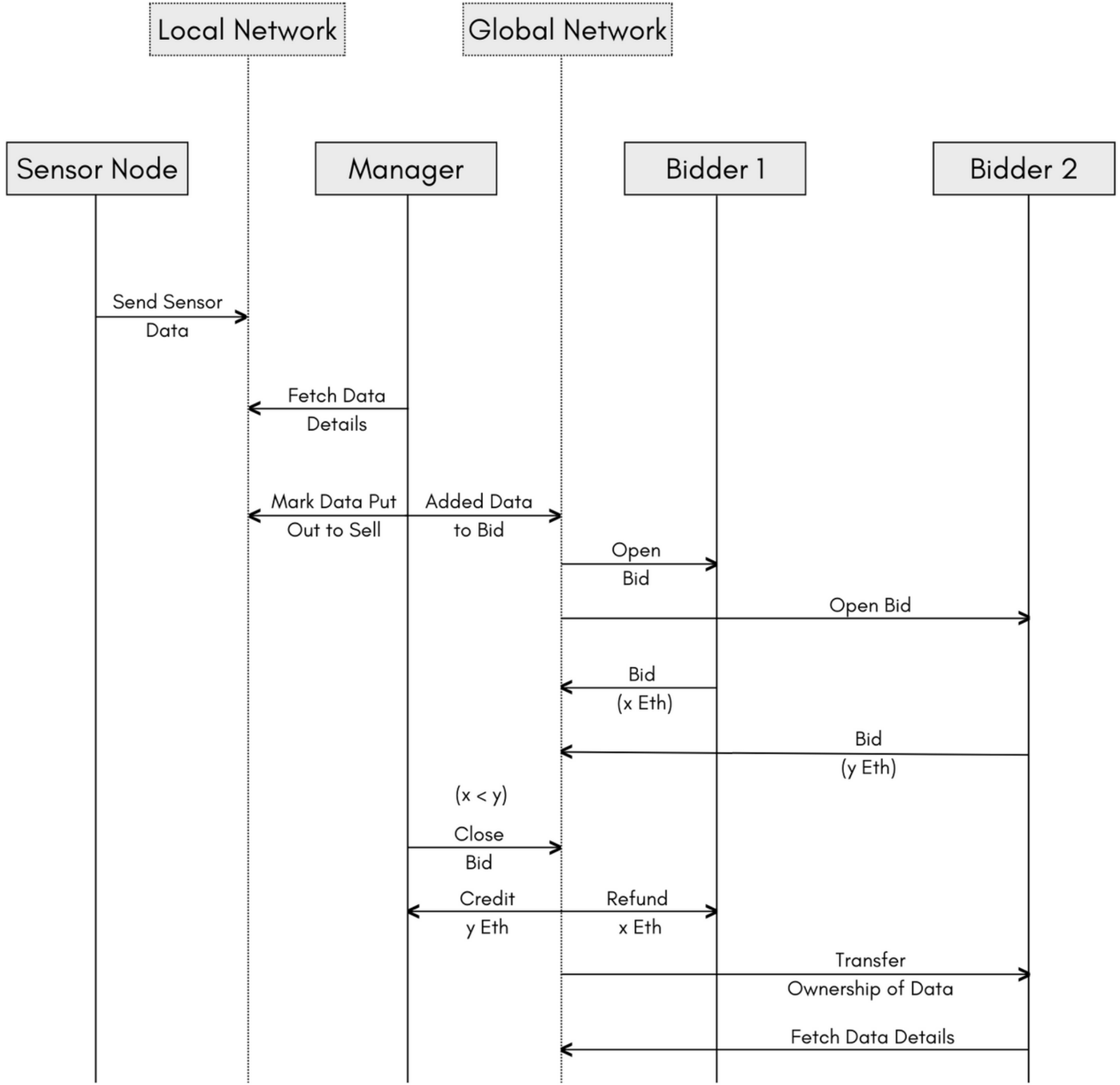
```
struct Data{
    bytes32 id;
    address sensor;
    uint dataPoints;
    bytes32 dataHash;
    uint timestamp;
    bytes32 location;
    address manager;
    address bidder;
    address owner;
    uint bid;
    uint index;
    bool bidOpen;
}
```


Local Smart Contract
sendSensorData
Sensor calls this function to add data in the local network
putOutToSell
Manager calls this function to update the 'traded' flag to true when putting it for bidding
getSensorDataInfo
Manager calls this function to get the details of data
getSensorDataInfoById
Manager calls this function to get the details of data belonging to a specific data id.

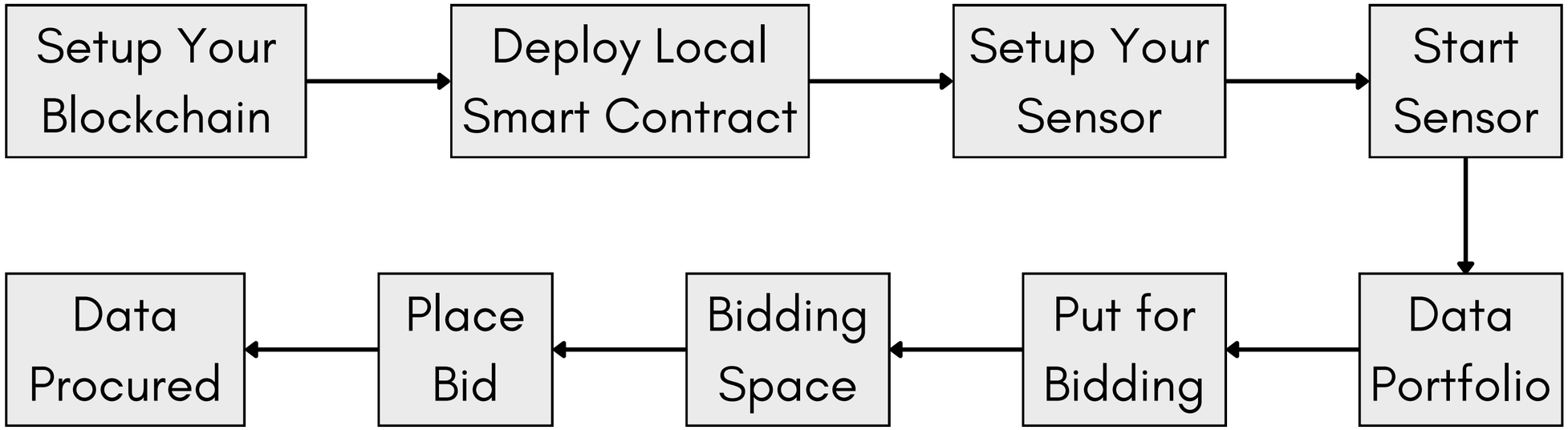

Global Smart Contract
addNewData
Manager calls this function to add a specific data to the global blockchain
bid
Manager calls this function to place a data up for bidding in the global platform
closeBid
Manager calls this function to close the bid to the highest bidder and transfer the ownership of the data
countData
This function is called to count the number of data present under a given address
getSensorDataInfoById
Manager calls this function to get the details of data belonging to a specific data id.

Implementation

Function Call Sequence



Web app Flow


Setup Your Blockchain
Deploy Local Smart Contract
Setup Your Sensor
Start Sensor
Data Portfolio
Put for Bidding
Bidding Space
Place Bid
Data Procured