# IPFS (InterPlanetary File System) A new Frontier for Next-Gen IoT Communication

PROJECT BY:

MANOJ KUMAR T
211121101603
DEPARTMENT OF IT

GUIDED BY:
Mr.N.JEYSANKAR
DEPARTMENT OF IT

CO-ORDINATED BY:
Dr.M.KIRUTHIGA DEVI
DEPARTMENT OF IT

# ABSTRACT

The Internet of Things (IoT) has witnessed an exponential growth in recent years, with billions of interconnected devices generating massive amounts of data. Traditional centralized approaches to IoT communication, relying on cloud-based platforms and centralized servers, have faced challenges in terms of scalability, security, and privacy. To address these limitations, this paper explores the potential of the InterPlanetary File System (IPFS) as a decentralized and secure solution for IoT communication. IPFS is a distributed file system that utilizes content-addressing and peer-to-peer networking to create a robust and resilient infrastructure for data storage and sharing. By leveraging IPFS, IoT devices can establish direct communication channels, eliminating the need for intermediaries and reducing the risk of single points of failure. Moreover, IPFS provides a decentralized storage mechanism that ensures data integrity and prevents tampering. This paper presents a comprehensive overview of IPFS and its key features, highlighting its suitability for IoT communication. Additionally, we explore the potential challenges and limitations of using IPFS in IoT environments, such as network latency, resource constraints, and compatibility issues. We have demonstrated the advantages of using IPFS in terms of scalability, security, and privacy, and addressed the potential challenges and limitations. By leveraging IPFS, IoT systems can become more resilient, secure, and scalable, paving the way for a more decentralized and interconnected future.

# Introduction of the project

- It's an open source project on a mission to develop a distributed IOT system. It feels like BitTorrent + Git smashed together to allow anyone running the IPFS daemon to access each other's files in a peer-to-peer (P2P) fashion.

- Pubsub basically lets you "subscribe" to a channel or topic allowing you to receive messages from other devices that "publish" messages to that same channel or topic.

- Just as easily automate the toggling of this LED to fully complete automated decentralised manufacturing factory

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# Problem Statement

Current Challenges in Traditional IoT Systems:

• Single Points of Failure

• Data Privacy Concerns

• Scalability Limitations

# Literature Survey

## Decentralized Industrial IoT Data Management Based on Blockchain and IPFS - Jun 2023

A decentralized IIoT data management approach using blockchain and IPFS. Addresses security and privacy concerns by storing data on a decentralized network, improving data efficiency and utilization.

## Trustworthy IoT Data Streaming Using Blockchain and IPFS - February 2022

A blockchain-based system for IoT streaming data that ensures decentralization, transparency, traceability, reliability, security, and trust. Uses proxy re-encryption for privacy, IPFS for decentralized storage, and smart contracts for security.

## Integrating IoT with Health Record Management System using IPFS and Blockchain – March 2022

A hybrid system using blockchain, IoT, and IPFS for secure, patient-controlled remote patient monitoring. Combines Arduino, private blockchain, and smart contracts to ensure data privacy, security, and patient ownership.

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# Requirement Analysis

## SOFTWARE REQUIRMENT:

- WINDOWS/LINUX
- IDE EDITOR
- IPFS DESKTOP
- COMMAND SHELL

## HARDWARE REQUIRMENT:

- MICROPROCESSOR (Rpi,ESP32,Arduino UNO)
- SENSORS
- ACTUATORS
- POWER PACK

# Existing System Challenges

- Centralized Data Storage:

- Security and Privacy Concerns:

- Inefficient Data Management:

# Proposed System

- Decentralized Data Storage

- Secure and Immutable Data
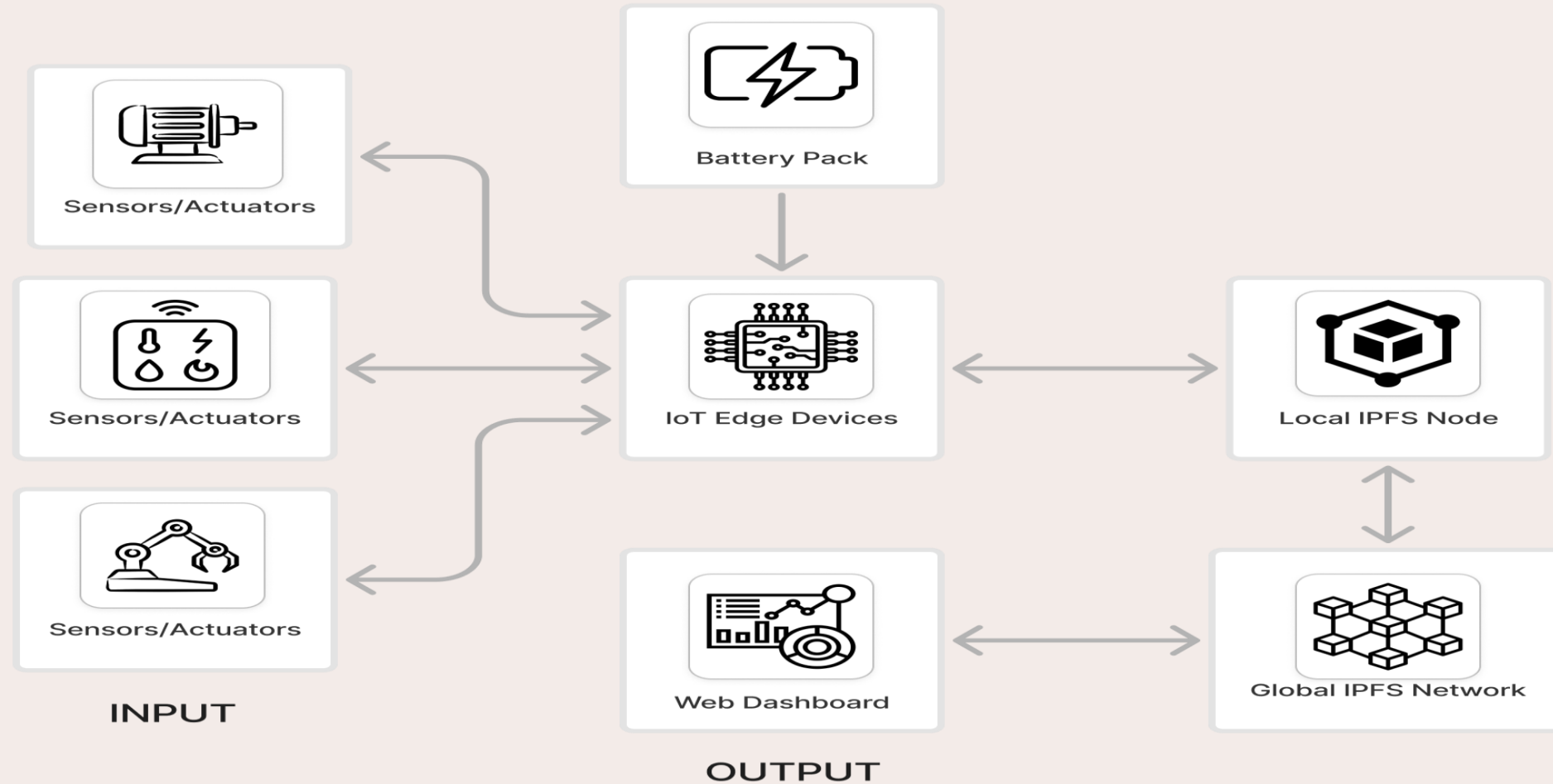
- Efficient Data Management

# Scope of the Project

- Develop a scalable and efficient IoT data management system using IPFS.

- Ensure secure and reliable storage of IoT data.

- Enable seamless data sharing and analysis between IoT devices.

- Provide a decentralized and privacy-preserving solution for IoT applications.

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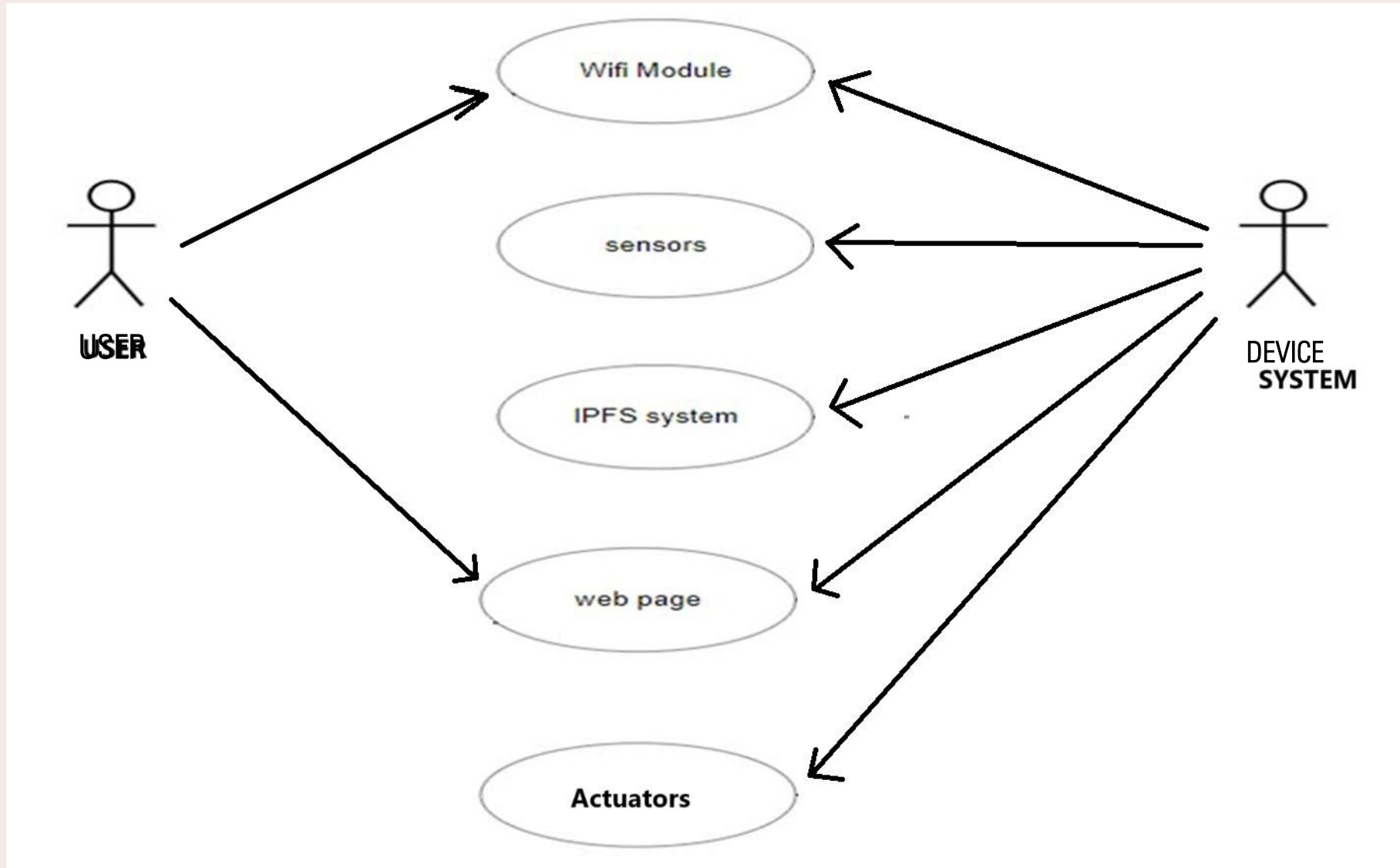
# Feasibility Study

- Technical Feasibility: Most microcontrollers (e.g., Arduino, Raspberry Pi, ESP8266/ESP32) can be easily programmed to interface with serial communication for receiving commands. Local IPFS Node: Running a local IPFS node on a computer is technically feasible with minimal resource requirements. IPFS has mature libraries for Python, making it easy to interact with the network.

- Operational Feasibility: The system requires regular monitoring to ensure the IPFS node is running and the microcontroller is functioning correctly. The project can be implemented with minimal setup. The most time-consuming part may be setting up the IPFS node and ensuring it communicates effectively with the microcontroller.

- Economic Feasibility: The project is technically and economically feasible with minimal costs and development time. It provides a valuable learning experience in combining IoT with decentralized technologies like IPFS.
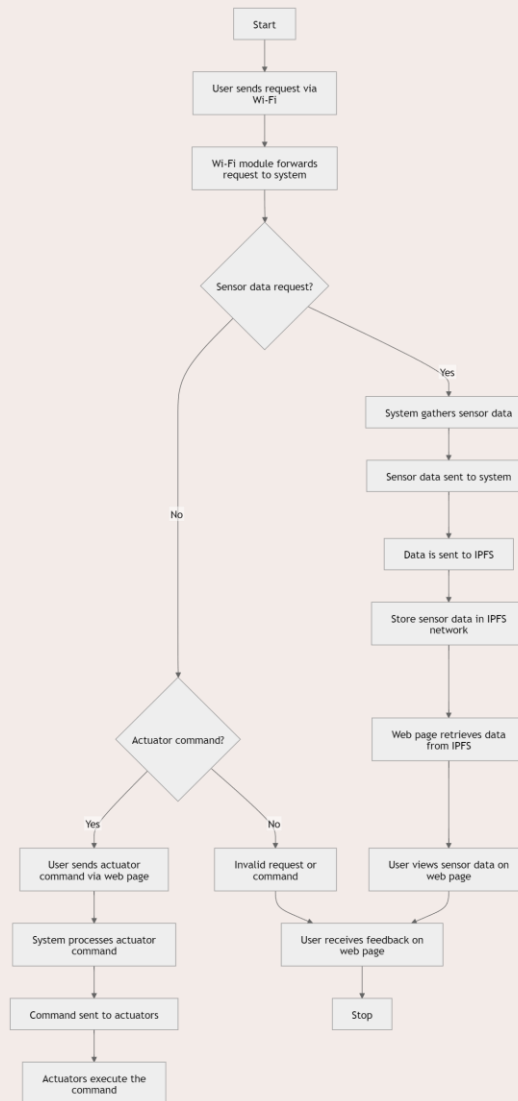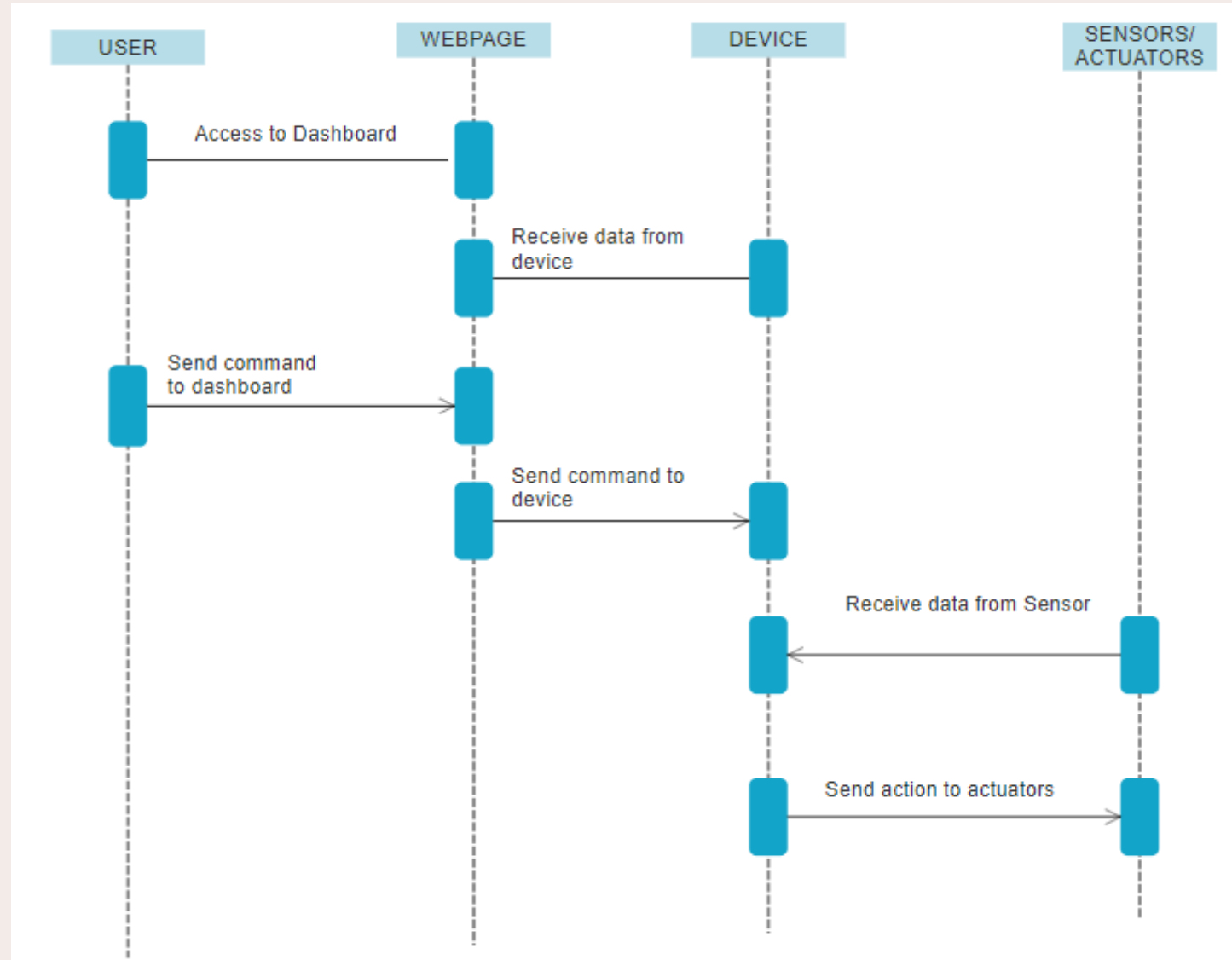
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# Architecture Diagram

# Use Case Diagram

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# ACTIVITY DIAGRAM

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# SEQUENCE DIAGRAM

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Thank you