# Idea/Approach Details

- Monitoring bandobast duty in India has been a challenge due to various factors such as lack of accountability, inefficiency, data inaccuracy, bias, and resource constraints, which can adversely impact law enforcement effectiveness. To address these challenges, we have developed an **open-source solution** built on a **mobile and web application platform**, enables remote deployment and tracking of officers, ensuring their presence at duty sites. It is **modular, scalable, reliable, cost-effective, and easy to use.**

- Entry and exit times are recorded using an **NFC tag** connected to an **NFC reader** at the destination. A backend system uses this information to monitor and track officers accurately. **Real-time encryption** is used in NFC tags to store data securely.

- Upon tapping the NFC tag, through the **MQTT protocol**, the data will be transmitted to a central database by an **ESP8266** microcontroller board, which will ensure efficient and secure data management. Additionally, a request will be sent automatically on officer's app to **grant location access.** When officer accepts it, **real time location** will be sent to the admin at **particular frequency**(5-10 mins)**.**

- Officer details and **real-time location** can be viewed on the Admin Dashboard. Using **Biometrics**, periodic identity verification is required to prevent officer from faking its location. Administrators will be notified if the officer fails to verify their identity. We utilized **Geo-fencing technology** to track officers' presence, with **green markers** indicating their location within a designated area and **red markers** alerting administrators if they exit the area.

- In cases where network connectivity is unavailable or internet jammers are present, our system utilizes **LoRa Technology (Low Power Wide Area Network LPWAN technology)** for data transmission. This involves setting up a **LoRa gateway(Central Hub)** and nodes within the duty region, with each node having a range of **5-10 kilometers**. Data from the Reader and the officer's mobile application is transmitted as **payload** to the LoRa gateway, where it is stored in a database and synchronised to the main cloud server when connectivity is restored. The system provides real-time statistics about officer movement, which are displayed locally on the admin dashboard.
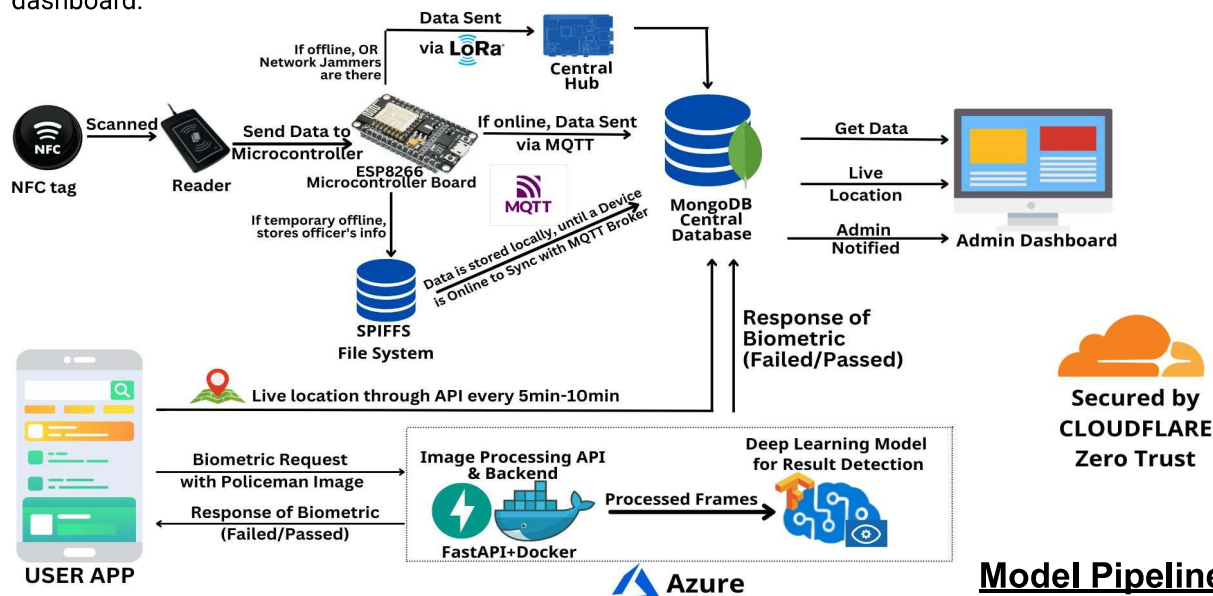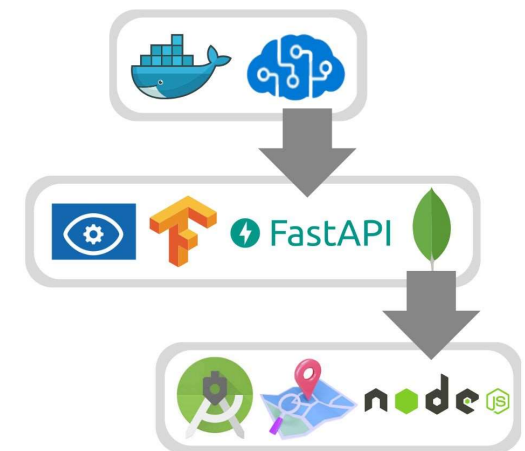
Model Pipeline | **Technology Stack**

Use Cases, Novelty of Work and Dependencies

Use Cases:
- Our solution not only effectively addresses the challenge of tracking officers during bandobast duty in the government sector but also has the potential to be implemented **across multiple sectors**. It can be leveraged for **monitoring and tracking people, logistics,** and much more, both in private and government sectors, thereby enhancing overall efficiency and security.
- To help ensure a timely and **effective response to emergency situations**, we can add a feature that allows the admin to quickly generate a flag at a specific location in case of an emergency. This flag serves as a request for additional police force or an ambulance to be dispatched to that location.
- Our mobile app features real-time detection of **GPS location spoofing** with automated alerts for admins.
- The Data from this application over a long period of time, gives idea of **overall performance of Police Department** of an area.
- In future for additional security, we can **restrict internet settings** while using the app **to prevent intentional disruptions** to GPS location tracking, ensuring uninterrupted, accurate monitoring and added security.
- To prevent unauthorized access to sensitive information stored in NFC tags, an **encryption feature** will be implemented in the future.
- This solution not only addresses the challenge of **tracking officers during bandobast duty** in the government but **also facilitates remote deployment** on bandobast duty.

Novelty of Idea:
- Our **Semi Automatic Solution**, serves as a bridge replacing the current manual monitoring system for officers of bandobast duty which addresses the limitations of current manual monitoring system while still retaining benefits of human oversight.
- Monitoring officers during bandobast duty tasks is now as simple as **a tap of an NFC tag**, hence making the process **hassle-free**.
- Our solution offers a **User-Friendly Interface** for admin dashboard and officer's mobile app, improving efficiency, productivity and allowing easy monitoring.
- Our **algorithm** checks an officer's live location and marks it **green** if they are **within their assigned area** (represented by an imaginary area), and **red** with an **alert** generated if they are **outside the assigned area**.
- To **promote fairness and transparency** in police monitoring, an **automated Biometric Recognition** check can occur randomly(at unpredictable time gaps), encouraging officers to stay alert during their shifts.
- We have introduced a **Credit-based System** to increase officer's motivation by rewarding **successful duties** completed without warnings .These credit scores can be used for **providing incentives** and **promotion** opportunities by the admin.

Dependencies / Show stopper :
- **Physical** : Mobile Phone camera, Mobile GPS/ NaviC, Internet Connection for syncing data to remote database, Proper Network on Server side, ESP8266, RFID module, GPRS module, E32-900T30D LoRa SX1276
- **Libraries and Frameworks**: FastAPI, CloudFlare, Android Studio, Machine Learning, MongoDB, NodeJS, Tensorflow, Open Maps API

Link to video describing the idea:
https://youtu.be/yXwt0SFXpIM