**Smart Parking Project Definition and Design Thinking Document**

**Problem Statement**

Our challenge is to develop a smart parking solution using IoT technology. We aim to monitor real-time parking space occupancy, offer dynamic parking guidance to users, and seamlessly integrate these features into a mobile app. The ultimate goal is to enhance the efficiency and convenience of public parking services, alleviating the common difficulties of finding available parking spaces in urban areas.

**Understanding the Problem**

To effectively tackle this challenge, we must break it down into its fundamental components:

1. Real-Time Parking Space Monitoring: This project involves deploying IoT sensors within parking spaces to continuously detect and monitor occupancy in real-time. This necessitates careful sensor design and strategic placement throughout the parking area.

2. Mobile App Integration: Developing a user-friendly mobile app is crucial to deliver real-time parking availability information to users. This app will serve as a guide for users to locate vacant parking spaces, reducing search times and traffic congestion.

3. Efficient Parking Guidance: Beyond displaying available parking spaces, the system should provide efficient guidance to the nearest vacant spot. This may involve offering navigational instructions within the parking facility.

4. IoT Sensor System Design: The design of the IoT sensor system involves selecting appropriate sensors, determining optimal sensor placement strategies, and ensuring the reliability of data collection.

5. Real-Time Transit Information Platform: The platform should provide a clear and user-intuitive interface for presenting real-time parking availability information. This encompasses both the design of the mobile app and its user experience (UX).

6. Integration with Raspberry Pi: To enable real-time sensor data availability to the mobile app, we'll utilize Raspberry Pi for data collection and app updates.

**Design Thinking Approach**

*Project objectives:*

1. Real-time parking lot monitoring: The main objective is to provide real-time information with IoT sensors that can accurately monitor the parking lot.

2. Mobile App Integration: Developing an intuitive mobile app interface that displays real-time parking, to help users locate open parking spaces.

3. Effective parking management: The goal is to design a system that maximizes parking utilization, reduces congestion, and minimizes waiting times.

*IoT Sensor System:*

1. Sensor selection: Selecting the most appropriate IoT sensor (e.g., ultrasonic, infrared, magnetic sensors) based on cost, accuracy, and compatibility.

2. Deployment Strategy Determining the optimal sensor placement and density within the parking lot to ensure full coverage.

3. Data Transmission: Creating a way to transmit sensor data (e.g., via Wi-Fi, Bluetooth, LoRa) to a central data aggregator

*Real-Time Transit Information Platform:*

1. Mobile App Interface: Crafting an easy-to-use mobile app interface showcasing real-time parking availability, directions to open spots, and alternatives for user comments.
2. User Engagement: Incorporating mechanisms for consumer feedback, which includes ratings and remarks, to continuously beautify the app's usability.
3. Data Visualization: Creating visible representations of parking availability on a map to simplify the identification of vacant areas.

*Integration Strategy:*

1. Data Collection: Utilizing gadgets like Raspberry Pi or similar answers for amassing records from IoT sensors.
2. Data Processing: Implementing algorithms for records processing and analysis to make certain the accuracy of parking space availability records.
3. Mobile App Integration: Develop a stable and efficient conversation protocol that seamlessly connects the IoT sensor machine with the cellular app.
4. Real-Time Updates: Ensuring that the cellular app gets actual-time updates on parking area availability and right away notifies customers.