

An aerial photograph of a dense city skyline, likely New York City, featuring numerous skyscrapers. The image is overlaid with a vertical gradient that transitions from a vibrant green on the left to a deep blue on the right. Centered over this background is the text 'PLAN FOR THE FUTURE' in a large, white, sans-serif font.

PLAN FOR THE FUTURE

Mother Nature Earth Team

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"PLEDGE TO PROGRESS Sustainability Hackathon sponsored by Microsoft"

Prototype Round



PROJECT FLOW

1 SOLAR ENERGY GENERATION

Install solar panels along the electric roads to generate renewable energy. Ensure the panels are positioned optimally for maximum sunlight exposure.



2 ENERGY STORAGE

Set up energy storage systems, such as batteries, to store excess energy generated during the day. This stored energy can be used during low solar generation periods or during high demand.



3 SMART METERING

Implement smart metering infrastructure to monitor energy consumption and generation in real-time. Smart meters can provide data on individual vehicle charging, road energy usage, and overall energy flows.



4 DATA COLLECTION AND ANALYSIS

Connect the smart metering infrastructure to Azure IoT (Internet of Things) Hub. This allows for the collection and analysis of energy data from various sources, including solar generation, battery storage, and vehicle charging.



5 AZURE IOT SUITE

Utilized Azure IoT Suite, which offers a range of services for building and managing IoT applications. Leverage Azure IoT Hub, Azure Stream Analytics, and Azure Machine Learning to process and analyze the collected energy data.

6 ENERGY DEMAND PREDICTION

Used historical and real-time data to develop predictive models like LSTM, Linear regression and light bgm model that forecast energy demand for vehicle charging. Azure Machine Learning helped create accurate demand prediction models based on factors like traffic patterns, weather conditions, and historical usage.



7 ENERGY MANAGEMENT ALGORITHMS

Develop energy management algorithms that optimize the energy distribution and charging schedules based on demand predictions and available solar energy. Used function app for this from azure and set energy consumption as a threshold.

8 VEHICLE-TO-GRID INTEGRATION

Implement Vehicle-to-Grid (V2G) technology, which allows electric vehicles to discharge excess energy back into the grid when not in use. This feature helps stabilize the grid and provide additional power during peak demand periods.



9 INTEGRATION WITH MICROSOFT SMART ENERGY MANAGEMENT

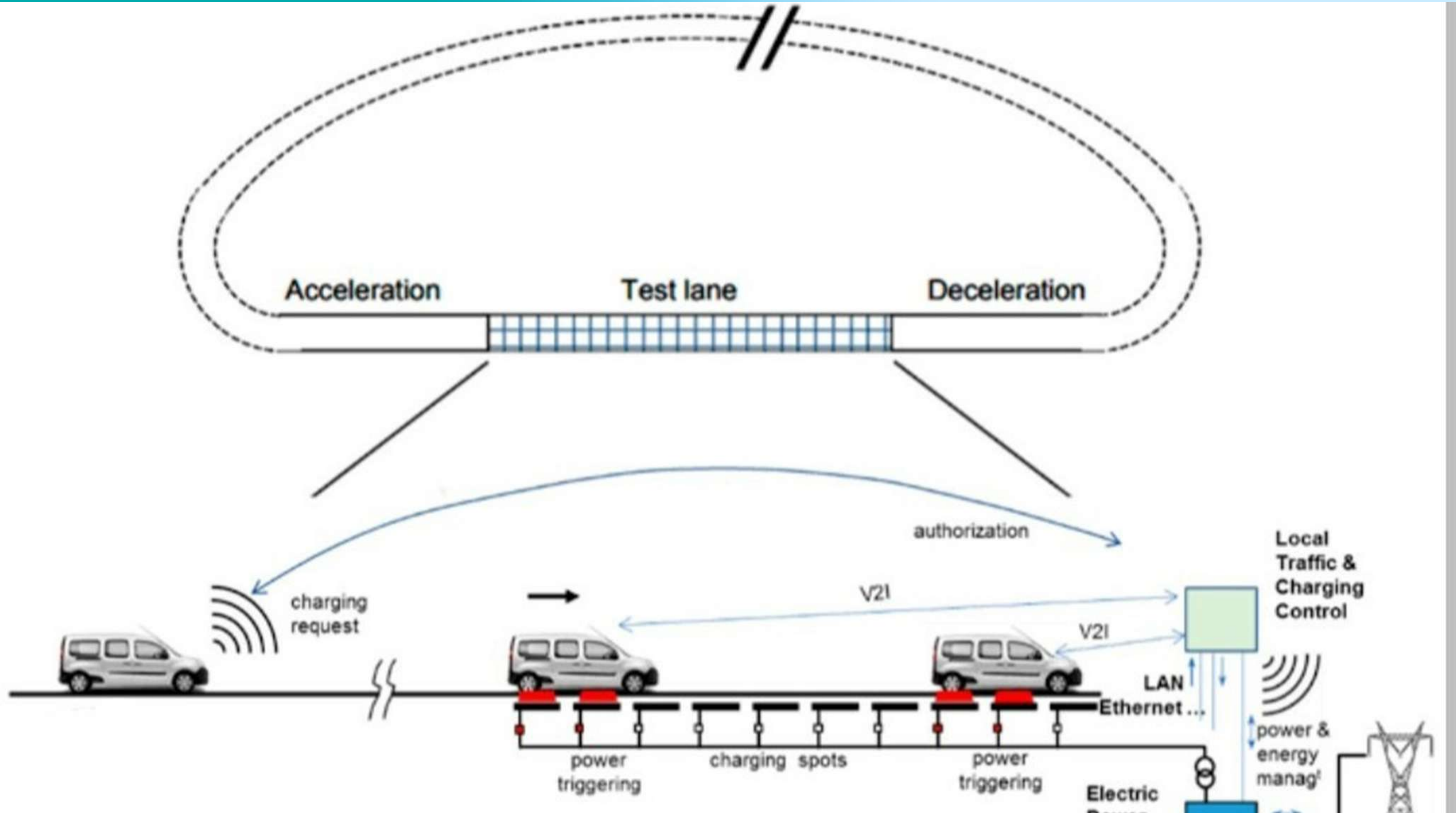
Utilize Microsoft Smart Energy Management (MSM) solutions to integrate with the energy management system. MSM offers additional features like for calculating cost of energy consumed, real-time monitoring, and energy optimization algorithms and reduction/sustainability goals.



10 FEEDBACK AND ITERATION

Continuously monitor the system's performance and gather feedback to refine the algorithms and improve energy management efficiency. Use the insights gained from data analysis to optimize charging schedules, maximize solar energy utilization, and enhance overall energy management.

Architecture Diagram



Power Bi

- Data Modelling
- Exploratory Data Analysis

IOT Hub

- Retrieve Data and IP address from physical meters

Azure Notebook

- Train model
- Predict energy consumption using LSTM, Light BGM, linear regression model

Gradio Library

Web deployment

MSM

- Data Import
- Analyzing and monitoring data
- Calculation model for cost of energy
- Reduction/ Sustainability goals

Function App

HTTP trigger function for street lighting levels and battery charge adjustments

Sensor Adjustment

Energy Calculator

Model's RMSE

Sustainability Aspect of IP addresses

- Scalable IP Address Management
- Dynamic Allocation and Reallocation
- Automation and Orchestration
- Integration with Microsoft Sustainability Manager

Include Microsoft cloud for sustainability

- Microsoft Azure architecture
- Microsoft Sustainability Manager
- Power BI

Novelty of the idea – Innovation Quotient

- Integration of Solar Power and Electric Roads
- Decentralized Charging Infrastructure
- Dynamic Charging Capability
- Smart Grid Integration and Energy Management
- Sustainability Monitoring and Reporting

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**Have a Great Day!!
Mother Nature Earth
Team**

An aerial photograph of a dense city skyline, likely New York City, featuring numerous skyscrapers and buildings. The image is overlaid with a diagonal gradient from teal on the left to yellow on the right. Centered over the image is the text "Thank you for joining us today!" in a large, white, sans-serif font.

**Thank you for
joining us today!**