Project Design Phase-I Proposed Solution Template

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| Team ID | NM2023TMID20443 |
| Project Name | IoT based Weather adaptive lighting system |

**Proposed Solution Template:**

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| **S.No.** | **Parameter** | **Description** |
| 1. | Problem Statement (Problem to be solved) | Design and develop an IoT based weather adaptive lighting system that can adjust the lighting levels of an outdoor area based on the weather conditions in real-time. The system should be able to gather weather data from various sources, such as weather APIs and sensors, and use this information to adjust the lighting levels in the outdoor area. The system should also be able to adapt to changes in weather conditions, such as sudden changes in temperature or precipitation. The lighting system should be designed to be energy-efficient and cost-effective, with the ability to adjust the lighting levels based on the amount of natural light available in the area. The system should also be able to communicate with other IoT devices, such as security cameras and motion sensors, to provide a more integrated and efficient outdoor lighting solution. The overall goal of the system is to provide a safer and more comfortable outdoor environment for users, while also reducing energy consumption and costs. |
| 2. | Idea / Solution description | The IoT based Weather adaptive lighting system can be designed and developed using a combination of hardware and software components. This project aims at designing smart street lighting system for energy saving of street lights. It controls the street lights based on detection of vehicles or any other obstacles on the street. We can control the lights wirelessly and also vary its intensity depending on the darkness level. Whenever the obstacle is detected on the street within the specified time the light will get automatically ON/OFF according to the obstacle detection.  Components used:  IR sensors - Basic working of an Infrared sensor used for obstacle detection is to transmit an IR signal, this infrared signal is reflected back from the surface of the obstacle and the signal is received at the IR sensor.  Light dependant resistor - The resistance of a LDR decreases in the absence of light and increases in the presence of it. Basically, an LDR makes the light connected to it glow automatically in the absence of light and turns it off when light comes.  Arduino - It is open source software which can be used for projects requiring to control or program objects. It is basically used for electronics based projects. It consists of two parts, the circuit board, used for making connections (hardware part) and the arduino IDE the software part of the arduino in which the programming is done.  Voltage regulator - One will get a continuing high-voltage power supply employing affordable 3-terminal voltage regulators through some straightforward techniques represented below. Relying upon this demand, an affordable load regulation will be achieved. Some benefits of the regulator are given below: simplicity, low cost, and much affordable regulation characteristics.  With the help of the IoT based Weather adaptive lighting system, outdoor areas can be illuminated in a way that is safe, comfortable, and energy-efficient, adapting to the changing weather conditions. |
| 3. | Novelty / Uniqueness | The IoT based Weather adaptive lighting system has several unique and novel features that distinguish it from other lighting systems:  Weather adaptability: The system's ability to adjust lighting levels based on real-time weather data makes it unique. This feature ensures that the lighting levels are appropriate for the prevailing weather conditions, which can improve user safety and comfort.  Energy efficiency: The system's ability to adjust lighting levels based on natural light levels in the area can significantly reduce energy consumption. This feature ensures that the lighting system operates optimally and minimizes energy costs.  Integration with IoT devices: The system can integrate with other IoT devices such as security cameras and motion sensors. This integration ensures that the lighting system is more efficient and provides a more comprehensive solution for outdoor areas.  Cloud-based platform: The cloud-based platform used in the system enables the collection and processing of large amounts of data. The machine learning algorithms used in the platform enable the system to adapt to changing weather conditions and improve over time.  User-friendly interface: The user-friendly interface provided by the system makes it easy for users to adjust the lighting levels manually if needed. The interface also provides access to features such as scheduling and remote access, making it a flexible and convenient solution for outdoor lighting needs.  Overall, the IoT based Weather adaptive lighting system's unique features make it a highly adaptable, energy-efficient, and user-friendly lighting solution that can significantly improve outdoor lighting quality. |
| 4. | Social Impact / Customer Satisfaction | The IoT based Weather adaptive lighting system can have a significant social impact and high customer satisfaction. Here are some potential benefits of the system:  Improved safety: The system's ability to adapt to changing weather conditions can help improve outdoor safety by ensuring appropriate lighting levels. This feature can help reduce the risk of accidents and crime in outdoor areas.  Increased energy efficiency: The system's energy-efficient features can help reduce energy consumption, which can have a positive impact on the environment and reduce energy costs for customers.  Greater comfort: The system's ability to adjust lighting levels based on natural light levels and weather conditions can improve the overall comfort of outdoor areas. This feature can create a more enjoyable and relaxing environment for users.  Improved aesthetics: The system's ability to adapt the lighting levels can enhance the appearance of outdoor areas. This feature can create a more visually appealing and welcoming environment for users.  Ease of use: The system's user-friendly interface and remote access features can make it easier for customers to manage and control their outdoor lighting. This feature can improve customer satisfaction and make it a convenient and easy-to-use solution.  Overall, the IoT based Weather adaptive lighting system can have a positive social impact and high customer satisfaction by providing an efficient, safe, comfortable, and visually appealing outdoor lighting solution. |
| 5. | Business Model (Revenue Model) | The IoT based Weather adaptive lighting system can have several potential business or revenue models. Here are a few examples:  Sales Model: The company can sell the hardware components required for the system, such as the weather sensors, lighting fixtures, and IoT gateway devices. This model would involve a one-time purchase fee for the hardware components.  Subscription Model: The company can offer a subscription-based model, where customers pay a recurring fee for access to the cloud platform and machine learning algorithms used by the system. This model could be based on the number of weather sensors or lighting fixtures connected to the system.  Service Model: The company can offer a service-based model, where they provide installation, maintenance, and support services for the system. This model could involve a one-time installation fee and ongoing maintenance fees.  Partnership Model: The company can partner with other businesses, such as municipalities or commercial real estate owners, to install and maintain the system. This model could involve a revenue-sharing agreement between the company and the partner.  Advertising Model: The company can offer an advertising-based model, where they use the system's data and user insights to provide targeted advertising to users in outdoor areas. This model would involve a revenue-sharing agreement between the company and advertisers.  Overall, the IoT based Weather adaptive lighting system can have several potential business or revenue models, depending on the company's strategy and market. A combination of these models could also be used to create a more diverse and sustainable revenue stream. |
| 6. | Scalability of the Solution | The IoT based Weather adaptive lighting system has the potential to be highly scalable due to its modular design and cloud-based platform. Here are some ways the system can be scaled:  Adding more sensors and lighting fixtures: The system can be scaled up by adding more sensors and lighting fixtures to cover larger outdoor areas. This can be done by connecting additional sensors and fixtures to the IoT gateway devices used by the system.  Cloud-based platform: The cloud-based platform used by the system can handle large amounts of data and can be easily scaled up as the system grows. This can ensure that the system can process real-time weather data and make accurate lighting adjustments for a large number of sensors and lighting fixtures.  Machine learning algorithms: The machine learning algorithms used by the system can be continually improved and optimized as more data is collected. This can help the system adapt to changing weather patterns and improve its accuracy over time.  Integration with other IoT devices: The system can be scaled up by integrating with other IoT devices such as security cameras and motion sensors. This integration can improve the overall efficiency and effectiveness of the system and provide a more comprehensive solution for outdoor areas.  Partnering with other businesses: The system can be scaled up by partnering with other businesses, such as municipalities or commercial real estate owners, to install and maintain the system in a larger number of outdoor areas.  Overall, the IoT based Weather adaptive lighting system's modular design, cloud-based platform, and machine learning algorithms make it highly scalable and adaptable to different outdoor environments and customer needs. |