SMART GENIE CYBORG

Dr. Surekha R Gondkar, Mr. Manohar Nayak K,
Mr. N S K K K Naga Jayanth, Ms. S Niruppama Shree, Mr. Sonu Kumar

Department of Electronics and Communication Engineering (ECE) BMS Institute of Technology and Management, Banglore, India – 560064.

surekha.r.gondkar@bmsit.in , kmanoharnayak@gmail.com , nagajayanthns@gmail.com, niruppama2610@gmail.com , sonusangam973@gmail.com,

Abstract:

Robotics is a rapidly expanding field. Robots are being used in a wide variety of places, including homes, hospitals, workplaces, and even military operations. This paper presents a novel approach to control a wireless robot using the Blynk Android software. Our robot can be controlled wirelessly by an Android software called Blynk. The robot can be moved forward, backward, left, and right by simply moving the joystick on the Blynk android application. In this case, a Node MCU installed in the robot is used as a receiver and the Blynk android application is used as a sending device. The robot will receive commands from the Blynk android application over Wi-Fi in order to travel in the desired direction, such as forward, backward, turning left, turning right, and stopping. We demonstrate a delivery robot that can deliver the goods in a secure and safe manner. Obstacle detection and live monitoring are the main features, and we implement these features utilizing Node MCU, Smart Camera, and IR Sensor. The prototype we design is for colleges and hospitals where it is necessary to transfer items securely and safely. Medications and food can be safely given to patients by this robot.

Keywords: Robotics, Blynk Android software, Node MCU, Wi-Fi communication, Obstacle detection, Live Monitoring, Smart Camera, IR Sensor.

I INTRODUCTION:

Robots play a vital role in multiple industries by providing assistance and automating various tasks. The advancement of wireless communication technology has unlocked new possibilities, such as using smartphones to control robots like maids, wheelchairs, and autonomous delivery robots. The latter have gained significant importance in the courier and postal services sector due to the rise of online shopping. To meet the demand for efficient and cost-effective delivery, we have developed a smart delivery robot named "Smart Genie Cyborg." This robot utilizes cutting-edge technologies, including NodeMCU ESP8266 Wi-Fi module, Blynk app, smart camera, and IR sensor, offering functionalities such as controlled movement, live monitoring, and obstacle detection. The integration of advanced technologies enables the autonomous operation and meaningful interaction of the robot with its environment. This project represents a significant breakthrough in robotics, catering to the growing demand for smart and efficient robots across industries. The versatile Smart Genie Cyborg has the potential to revolutionize sectors like manufacturing, logistics, healthcare, and education, enhancing efficiency, productivity, and safety. By leveraging the NodeMCU ESP8266 Wi-Fi module, Blynk app, smart camera, and IR sensor, we aim to design an affordable and adaptable robot that overcomes existing limitations. Our project addresses the need for advanced functionalities, including obstacle detection, remote control, and live monitoring, to augment the performance and capabilities of delivery robots. Combining these technologies, we aim to create a multifunctional robot that meets the evolving demands of modern industries.

II. IMPLEMENTATION

1. **Component Study:** Thoroughly studying the pin diagrams of each component, including the L298N motor driver, Node MCU ESP8266, and industrial-grade IR sensor, was the first step in our implementation process. This allowed us to gain a comprehensive understanding of their specifications and requirements. Additionally, we created block diagrams for each component, capturing the essential connections and noting the required supply voltage for each.

SN	Node MCU Pin	Connected to
1.	D0	ENA pin of Motor Driver
2.	D1	IN1 pin of Motor Driver
3.	D2	IN2 pin of Motor Driver
4.	D3	IN3 pin of Motor Driver
5.	D4	IN4 pin of Motor Driver
6.	D5	ENB pin of Motor Driver
7.	D7	Black wire of IR Sensor
7.	Vin	5V pin of Motor Driver
8.	Gnd	Gnd pin of Motor Driver

Table 1: Pin Configuration of Node MCU

2. **Power Supply Configuration:** Determining the power requirements for each component was crucial to ensure proper functionality. We powered the four high torque Johnson motors using three Li-Ion cells with a combined voltage of approximately 12V. For the industrial-grade IR sensor, which required a 5V supply, we used an IC7805 voltage regulator to bring down the voltage from a 9V battery. The Smart Camera CP Plus was powered using a power bank. By carefully configuring the power supply, we ensured the components received the necessary voltage for optimal performance.

3. **Integrated Block Diagram:** Integrating the block diagrams of individual components was a crucial step in the development of the circuitry for the Smart Genie Cyborg. This process involved merging the separate block diagrams of components such as the NodeMCU ESP8266 Wi-Fi module, L298N motor driver, smart camera, IR sensor, motors, wheels, chassis, and battery into a final integrated block diagram. This comprehensive diagram not only captured the interconnections between these components but also included important details regarding the supply voltage requirements. By creating this integrated block diagram, we gained a clear overview of the overall system architecture, enabling effective planning and implementation of the circuitry for the Smart Genie Cyborg.

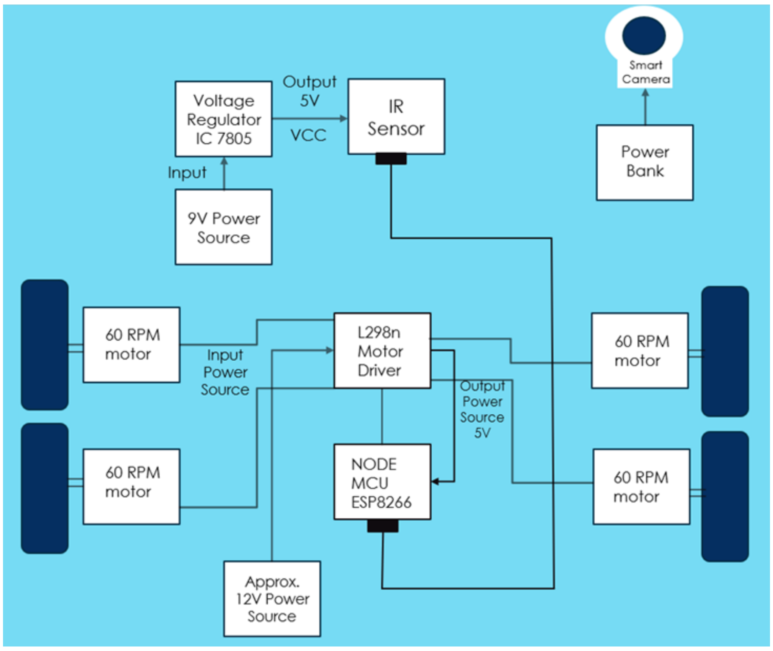


Figure 1: Block Diagram of Smart Genie Cyborg

4. **Circuit Development:** Based on the pin connections and component requirements, we developed the circuit connections. Attention to detail was crucial to ensure accurate and reliable connections between the hardware components. We documented the specific pin connections for code development, ensuring coherence between the circuitry and the software implementation.

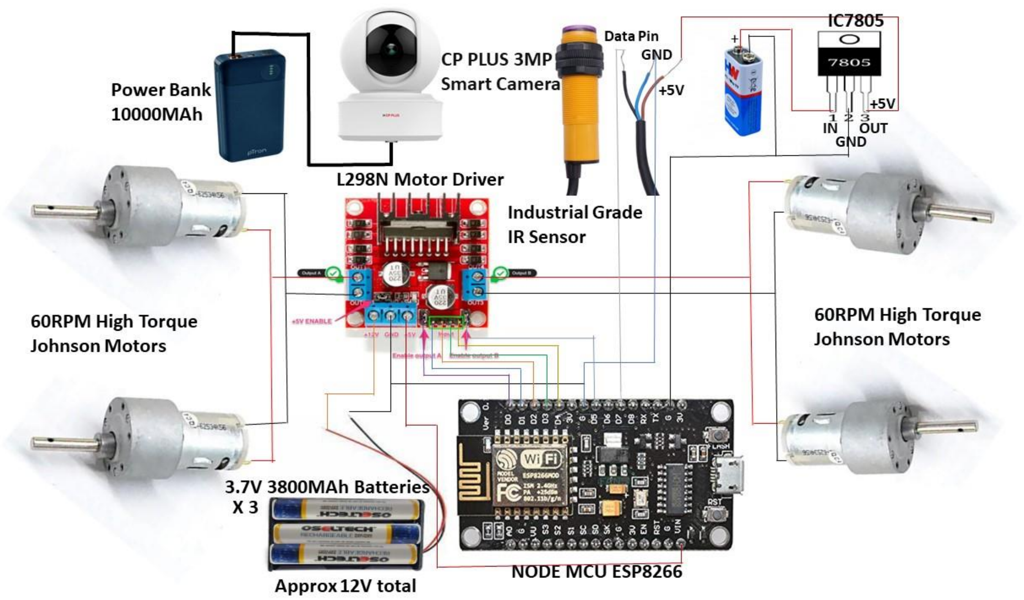


Figure 2: Final Integrated Circuit Diagram of Smart Genie Cyborg

5. **Testing Blynk Integration:** Integrating the Blynk platform played a vital role in controlling and monitoring the Smart Genie Cyborg. We developed Blynk widgets for speed and direction control, as well as to display the status of the IR sensor. Creating a new Blynk template and selecting the appropriate hardware configuration (ESP8266) enabled seamless interaction with the device.

6. **Control and Notification Setup:** To facilitate control, we configured Blynk widgets such as the Joystick and Slider to enable direction control and speed control, respectively. We also set up notifications using the IR sensor. An event called "IR_Notifier" was created, and notifications were configured to be displayed in the Blynk mobile app. Additionally, email notifications were enabled to provide users with immediate alerts when an obstacle was detected.

7. **Code Development and Testing:** Developing individual pieces of code for motor control, IR sensor value updating, and notification functionalities was crucial. Thorough understanding of the pin connections, DataStream values, and H-Bridge configuration of the L298N Motor Driver, as well as the input and output pins and values of the industrial-grade IR sensor, was essential for accurate code development. Each piece of code was tested individually for correctness before integrating them into a single comprehensive codebase**.**

8. **Integration Testing:** Integration testing was performed to ensure the proper working of all required functionalities. This involved testing the direction and speed control of the motors, displaying the state of the IR sensor, and verifying the functionality of the notification alerts. Comprehensive testing helped identify and address any issues or inconsistencies in the integrated system.

9. **Final System Validation:** Once the integrated code was uploaded onto the Node MCU, the circuit connections were rechecked. The required supply voltage was provided to the various components, and additional hardware components, such as the smart camera and industrial-grade IR sensor, were connected to the Smart Genie Cyborg. The overall system functionality, including live monitoring using the smart camera, proper motor control, and obstacle detection, was validated to ensure that the project met the specified objectives.

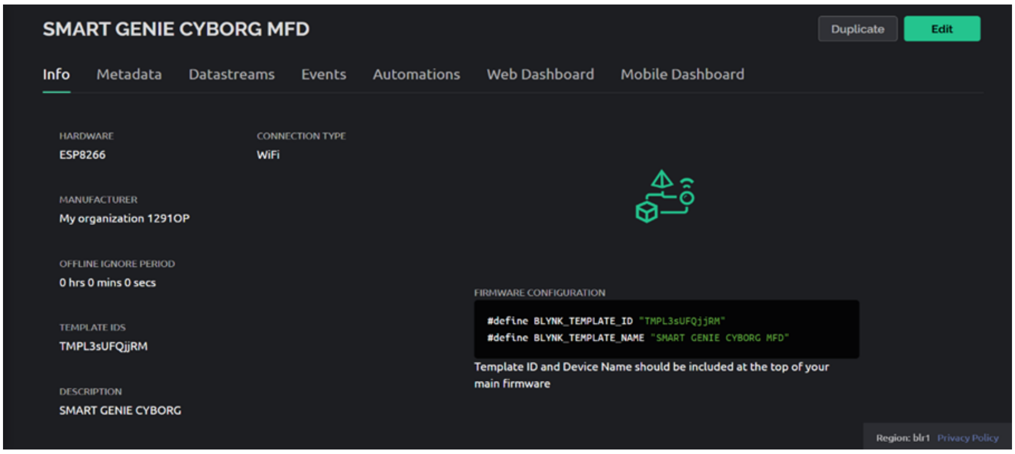


Figure 3: Blynk Web Interface

10. **Compliance and Demonstration:** Ensuring compliance with industrial standards was vital to guarantee the reliability, safety, and efficiency of the Smart Genie Cyborg. The project was verified to ensure its readiness for demonstration and publication. The compliance check involved confirming that the project adhered to industry guidelines and regulations, ensuring its suitability for real-world applications.

III. RESULTS AND DISCUSSION

The smart delivery robot was successfully designed and built using the hardware components listed, along with the necessary software requirements such as the Arduino IDE, Blynk mobile application, and Ezykam+ application. The robot was programmed to be able to navigate through a given path while detecting and avoiding obstacles using the industrial-grade IR sensor. The 60 RPM high-torque Johnson motors were used to drive the robot's four 100mm wheels, with the L298N motor driver and IC7805 voltage regulator ensuring efficient power management.

The objectives of Smart Genie Cyborg were achieved as shown below:

1. Controlling the motion of Smart Genie Cyborg using Mobile application remotely

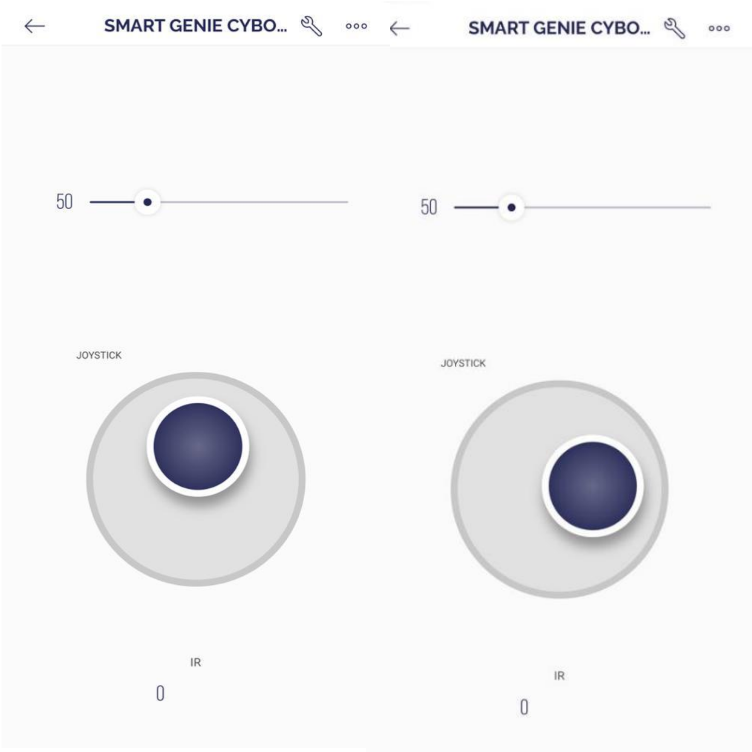


Figure 4: Motor Control using Blynk Widgets

We manually controlled the direction and speed of Smart Genie Cyborg. With the help of joystick, we were able to control the speed and direction of motor. Based on the joystick input motor driver will drive the motor in front, left, right and reverse direction.

2. Obstacle detection and avoidance

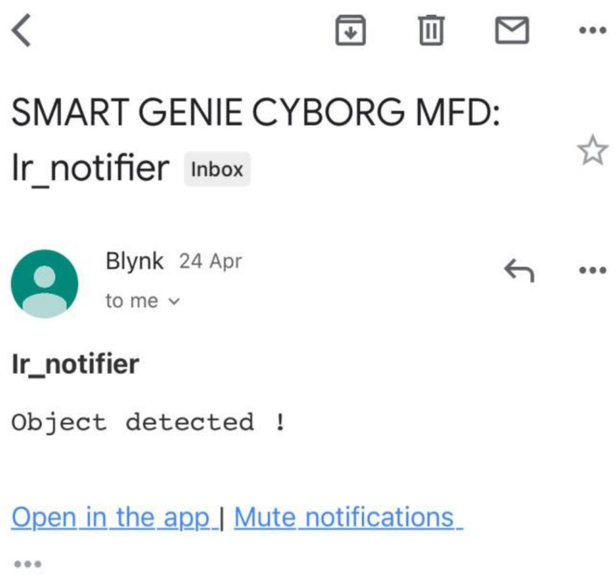


Figure 5: Email notification received when an object is detected by the IR sensor

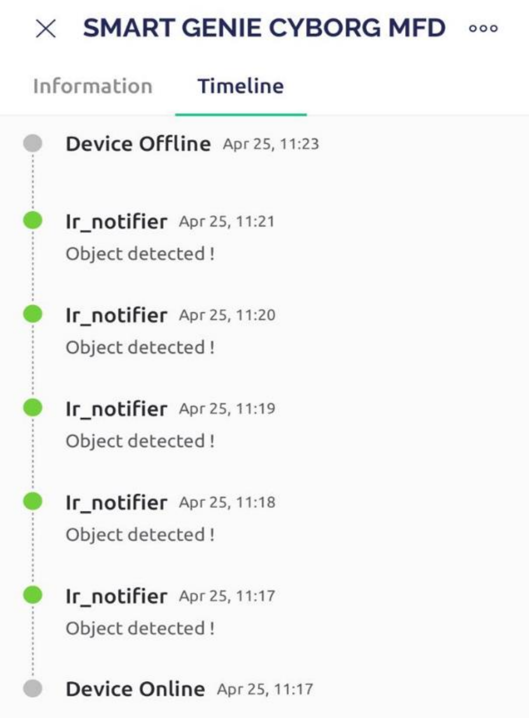


Figure 6: Notification received on Blynk App when an object is detected.

When an obstacle is detected we get notified that an object is detected as an alert in the Blynk mobile application as well as get the same notification via email.

3. Live monitoring of surrounding environment with motion detection and notification alert

One of the key features of the robot was the smart camera, which allowed it to detect and recognize objects that needed to be delivered. The live monitoring of the surrounding environment is achieved using a Smart Camera CP Plus, which is integrated into the Smart Genie Cyborg. The camera provides a real-time feed of the environment, which can be viewed through the mobile application Ezykam+.

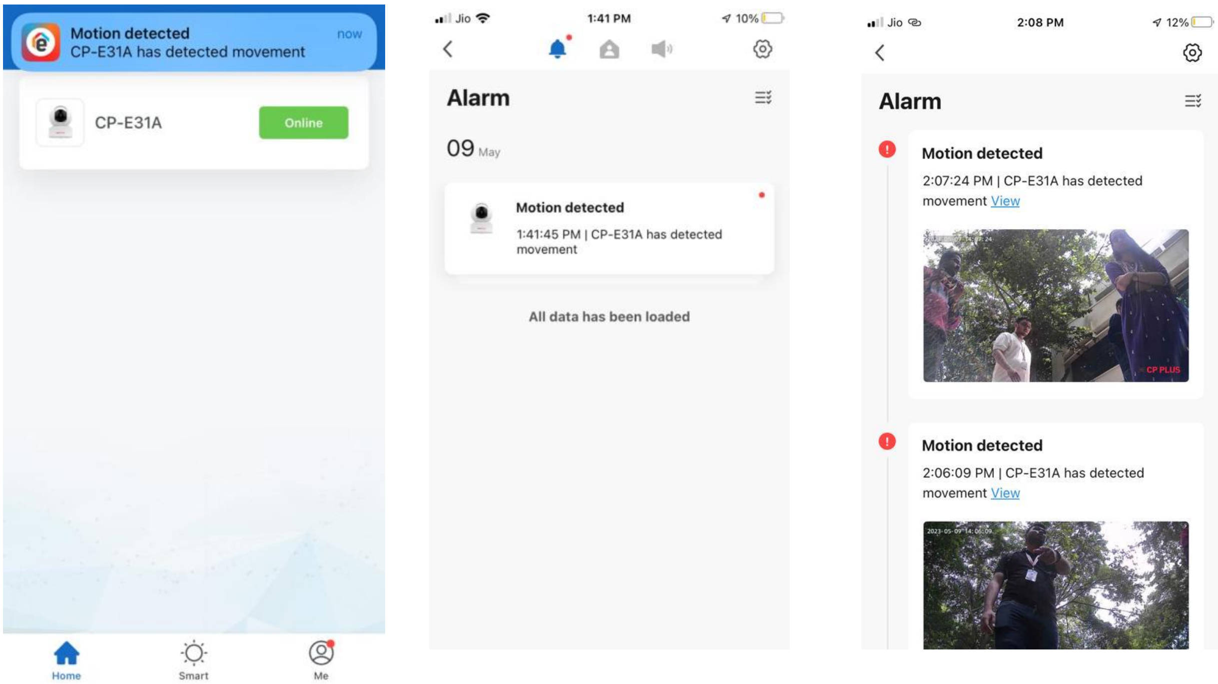
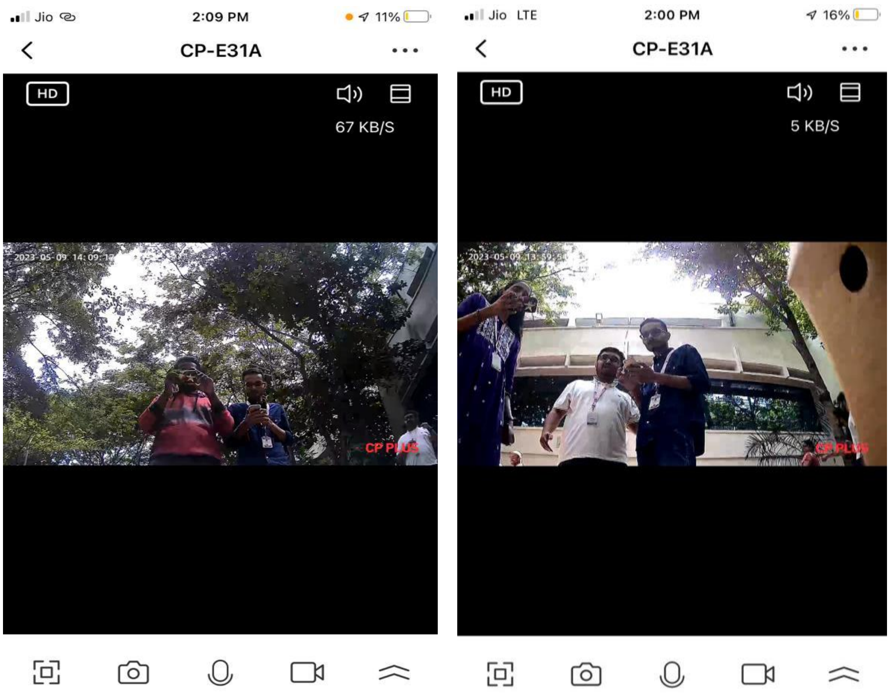


Figure 7: Notification received in the Ezykam+ app whenever movement of an object is detected by The Smart Camera CP Plus 3MP



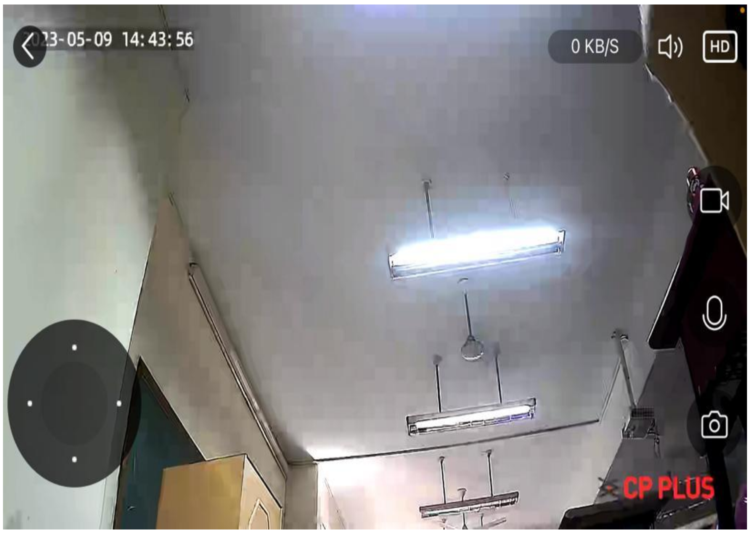


Figure 8: Snapshots of Ezykam+ app that shows the Live Footage of the environment captured by The Smart Camera CP Plus 3MP

IV. CONCLUSION

This paper presents the successful implementation of the Smart Genie Cyborg project, which utilized cutting-edge technologies to create an intelligent robot capable of performing diverse tasks. The integration of the NodeMCU ESP8266 Wi-Fi module, Blynk app, smart camera, and IR sensor enabled the robot to achieve functionalities such as controlled movement, obstacle detection, and live monitoring. The project successfully accomplished its objectives of designing and constructing a smart delivery robot that can be remotely controlled and monitored via a mobile application. The robot exhibits significant potential for applications in e-commerce, healthcare, logistics, and other industries where the demand for smart and efficient robots is growing.

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