SMART WATER CONTROLLING PUMP

USING BLYNK

A PROJECT REPORT

submitted by

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in partial fulfillment for the award of the degree of

BACHELOR OF ENGINEERING

in

COMPUTER SCIENCE AND ENGINEERING

RAJALAKSHMI ENGINEERING COLLEGE,

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MAY 2024

RAJALAKSHMI ENGINEERING COLLEGE, CHENNAI

BONAFIDE CERTIFICATE

Certified that this project report titled "**Smart water controlling pump Using blynk"** is the bonafide work of "**RANJITH KUMARAN G (210701209), SAM LAWRANCE V (210701225)"** who carried out the work under my supervision. Certified further that to the best of my knowledge the work reported herein does not form part of any other thesis or dissertation on the basis of which a degree or award was conferred on an earlier occasion on this or any other candidate.

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ABSTRACT

Water management is crucial in both agricultural and domestic environments, necessitating efficient and adaptable solutions. This project introduces a Smart Water Controlling Pump leveraging IoT and the Blynk platform to optimize water usage. Utilizing a microcontroller (such as Arduino or ESP8266/ESP32) connected to a water pump and sensors (soil moisture, water level, and flow meters), the system monitors environmental conditions and controls the pump accordingly. The Blynk app enables real-time monitoring and remote control via smartphones, providing users with the flexibility to manage water resources efficiently. Key features include automated watering based on sensor data, remote accessibility, data logging for usage analytics, and customizable alerts for prompt action. This system enhances water management by automating and optimizing water distribution, conserving resources, reducing costs, and improving productivity. Future enhancements may incorporate additional sensors and advanced analytics to further improve system adaptability and efficiency.

ACKNOWLEDGEMENT

First, we thank the almighty God for the successful completion of the project. Our sincere thanks to our chairman **Mr. S. Meganathan, B.E., F.I.E.,** for his sincere endeavor in educating us in his premier institution. We would like to express our deep gratitude to our beloved Chairperson **Dr. Thangam Meganathan, Ph.D.,** for her enthusiastic motivation which inspired us a lot in completing this project, and Vice-Chairman **Mr. Abhay Shankar Meganthan**, **B.E., M.S.,** for providing us with the requisite infrastructure. We also express our sincere gratitude to our college principal, **Dr.S.N.Murugesan M.E., PhD.,** and **Dr. P. Kumar M.E., Ph.D., Head of the Department of Computer Science and Engineering,** and our project guide **Ms. S. Ponmani M.E.,MBA,** for her encouragement and guiding us throughout the project. We would like to thank our parents, friends, all faculty members, and supporting staff for their direct and indirect involvement in the successful completion of the project for their encouragement and support.

CHAPTER 1

INTRODUCTION

Water management is crucial in both agricultural and domestic environments, necessitating efficient and adaptable solutions. This project introduces a Smart Water Controlling Pump leveraging IoT and the Blynk platform to optimize water usage. Utilizing a microcontroller (such as Arduino or ESP8266/ESP32) connected to a water pump and sensors (soil moisture, water level, and flow meters), the system monitors environmental conditions and controls the pump accordingly. The Blynk app enables real-time monitoring and remote control via smartphones, providing users with the flexibility to manage water resources efficiently. Key features include automated watering based on sensor data, remote accessibility, data logging for usage analytics, and customizable alerts for prompt action. This system enhances water management by automating and optimizing water distribution, conserving resources, reducing costs, and improving productivity. Future enhancements may incorporate additional sensors and advanced analytics to further improve system adaptability and efficiency.

1.1 MOTIVATION

- **Efficient Water Resource Management**: Water is a precious and often limited resource. In many regions, inefficient water usage leads to waste and depletion of water supplies. Traditional irrigation systems and manual watering methods are often not optimized, leading to either overuse or underuse of water. By developing a Smart Water Controlling Pump, we aim to automate and optimize water distribution based on real-time data from soil moisture sensors, water level sensors, and flow meters

- **Cost Reduction and Economic Benefits:** Inefficient water use not only impacts the environment but also incurs higher costs for users, particularly in agriculture where water is a significant operational expense. By implementing a system that precisely controls water usage, farmers and homeowners can significantly reduce their water bills.

- **Convenience and Remote Management:** Modern lifestyles and large-scale agricultural operations often require the ability to manage water resources remotely. Traditional irrigation systems require physical presence and manual intervention, which can be time-consuming and impractical, especially for those managing multiple or remote locations. The integration of the Blynk platform in our Smart Water Controlling Pump allows users to monitor and control their water systems from anywhere using a smartphone or tablet.

1.2 OBJECTIVES

- **Optimize Water Usage Efficiency:** The primary objective is to maximize the efficiency of water usage in agricultural and domestic settings. By integrating sensors (soil moisture, water level, and flow meters) with a microcontroller and the Blynk platform, the system can monitor real-time environmental conditions and adjust water distribution accordingly. This ensures that water is used precisely where and when it is needed, minimizing waste and conserving this vital resource.

- **Reduce Operational Costs:** Another key objective is to lower the operational costs associated with water management. Traditional irrigation systems and manual watering can lead to excessive water usage, increasing utility bills and operational expenses. By automating the water control process through the Smart Water Controlling Pump, users can significantly reduce water consumption, thereby cutting costs.

- **Enhance User Convenience and Accessibility:** The third objective is to enhance the convenience and accessibility of water management. The Blynk platform enables users to monitor and control their water systems remotely via a smartphone or tablet. This is particularly beneficial for those managing multiple or remote sites, as it eliminates the need for physical presence and manual adjustments. The system aims to provide a user-friendly interface that allows for real-time monitoring, automated control, and customizable alerts, making water management more efficient and less labor-intensive.

CHAPTER 2

LITERATURE REVIEW

1.The literature survey reviews existing IoT-based water level monitoring and pump control systems, highlighting advancements in sensor technologies, wireless communication, and automation. It identifies key challenges such as energy efficiency, reliability, and integration with smart systems, providing a foundation for developing more intelligent and effective water management solutions.

2. The literature survey examines IoT applications in agricultural water pumping systems, emphasizing the efficiency and automation of water management. It reviews advancements in sensor technology, data analytics, and wireless communication, addressing challenges like system reliability and energy consumption, to improve agricultural productivity and resource conservation.

3. The literature survey explores IoT-based water level control systems, focusing on advancements in sensor integration, real-time monitoring, and automated controls. It discusses improvements in system accuracy, responsiveness, and user interface design, while addressing challenges such as connectivity issues and energy efficiency, aiming to enhance water management practice

2.1 EXISTING SYSTEM

Current water management systems typically rely on manual intervention or basic automated timers, lacking the sophistication to adjust based on real-time conditions. These systems often do not incorporate sensors for soil moisture or water levels, leading to inefficient water use. As a result, there is a tendency to either over-water or under-water, wasting resources and increasing costs. Additionally, these systems often require physical presence for monitoring and adjustments, making them impractical for managing multiple or remote sites. This lack of real-time data integration and remote accessibility highlights the need for a more intelligent and flexible solution.

2.1.1ADVANTAGES OF THE EXISTING SYSTEM

- **Real-Time Data and Automated Control:** The system utilizes real-time data from soil moisture sensors, water level sensors, and flow meters to automatically adjust water distribution. This ensures optimal water usage, preventing both over-watering and under-watering.

- **Remote Monitoring and Accessibility:** By integrating with the Blynk platform, users can monitor and control the water pump remotely using a smartphone or tablet

- **2.1.2 DRAWBACKS OF THE EXISTING SYSTEM**

  - **Initial Setup Cost and Complexity:** Implementing a smart water controlling system can involve significant initial costs for purchasing sensors, microcontrollers, and setting up the necessary infrastructure.

  - **Dependency on Internet Connectivity:** The system relies heavily on internet connectivity for real-time monitoring and remote control through the Blynk platform.

2.2 PROPOSED SYSTEM

The proposed project aims to address the limitations of existing systems by developing a comprehensive health monitoring system that tracks heart rate, blood oxygen saturation (SpO2), and temperature in real-time using the HW-827 sensor, ESP-32 microcontroller, and a temperature gun. The collected data will be transmitted to Firebase for storage and analysis, where a machine learning model trained using Support Vector Machines (SVM) will predict potential health issues based on the monitored parameters. Upon detection of abnormal health patterns, the system will generate health alerts advising users to consult healthcare providers, with additional SMS alerts sent to the user's mobile device for immediate notification. By integrating real-time monitoring, data analysis, and proactive alerting mechanisms, the proposed system aims to provide users with proactive health management and timely intervention, enhancing overall health outcomes and user satisfaction.

2.2.1 ADVANTAGES OF THE PROPOSED SYSTEM

- **Enhanced Water Efficiency:** The proposed system uses real-time data from soil moisture sensors, water level sensors, and flow meters to precisely control water distribution.
- Timely Alerts and Interventions: Cost Savings: By optimizing water usage, the system significantly reduces water consumption, leading to lower water bills and operational costs. The automated control reduces the need for manual labor and constant monitoring, providing economic benefits over time.

CHAPTER 3

SYSTEM DESIGN

3.1 DEVELOPMENT ENVIRONMENT

3.1.1 HARDWARE REQUIREMENTS

- ESP32 Wi-Fi Module
- DC Water Pump
- Relay Switch
- Battery
- Tubes
- Jumper wires

ESP32 Wi-Fi Module: We used the ESP32 to connect to Wi Fi networks, allowing it to transmit data over the internet. This capability is crucial for remote monitoring applications, as it allows the device to send heart rate and oxygen saturation data to the firebase platform for analysis and storage.

Relay switches: Electromechanical devices used to control the flow of electricity in circuits. They act as remote-controlled switches, turning electrical circuits on or off in response to a signal. Commonly used in automation, they provide isolation between low and high voltage circuits, enhancing safety and control in various applications.

DC water pumps: electric devices that utilize direct current (DC) to circulate water in various systems. They are commonly employed in applications such as aquariums, water gardens, and irrigation systems. These pumps are efficient, compact, and versatile, offering precise control over water flow rates and pressures.

Batteries: It serves as vital energy storage devices in various applications, powering everything from portable electronics to electric vehicles. They store chemical energy, which is converted into electrical energy to provide a reliable power source. From smartphones to renewable energy systems, batteries play a crucial role in ensuring uninterrupted power supply, enhancing mobility, and enabling sustainable energy solutions.

Water tubes: It often made of materials like PVC or polyethylene, serve as conduits for transporting water in various applications.

Jumper wires: Jumper wires are used to establish connections between components on the breadboard or between the breadboard and Arduino UNO, facilitating the flow of electrical signals in the circuit.

3.1.1 SOFTWARE REQUIREMENTS

- Arduino IDE
- Blynk

Arduino IDE: This is the software used for writing, compiling, and uploading firmware code to the Arduino microcontroller. It is essential for programming the Arduino board to interface with the MAX30102 sensor, read sensor data, and transmit it to Firebase.

Blynk: This application is widely used in IoT (Internet of Things) projects to create user-friendly interfaces for remote monitoring and control. It allows users to interact with connected devices using smartphones or tablets, enabling a wide range of applications.

CHAPTER 4

PROJECT DESCRIPTION

The project involves developing a Smart Water Controlling Pump using the Blynk platform. Integrating sensors and microcontrollers, the system monitors soil moisture, water levels, and flow, automating water distribution for optimal usage. Through the Blynk app, users can remotely monitor and control the pump, enhancing convenience and efficiency. Key features include real-time data visualization, automated watering, cost savings through efficient water usage, and customizable alerts for prompt action. This project aims to promote sustainable water management practices, reduce operational costs, and provide a user-friendly solution for both agricultural and domestic water management needs.

4.1 SYSTEM ARCHITECTURE

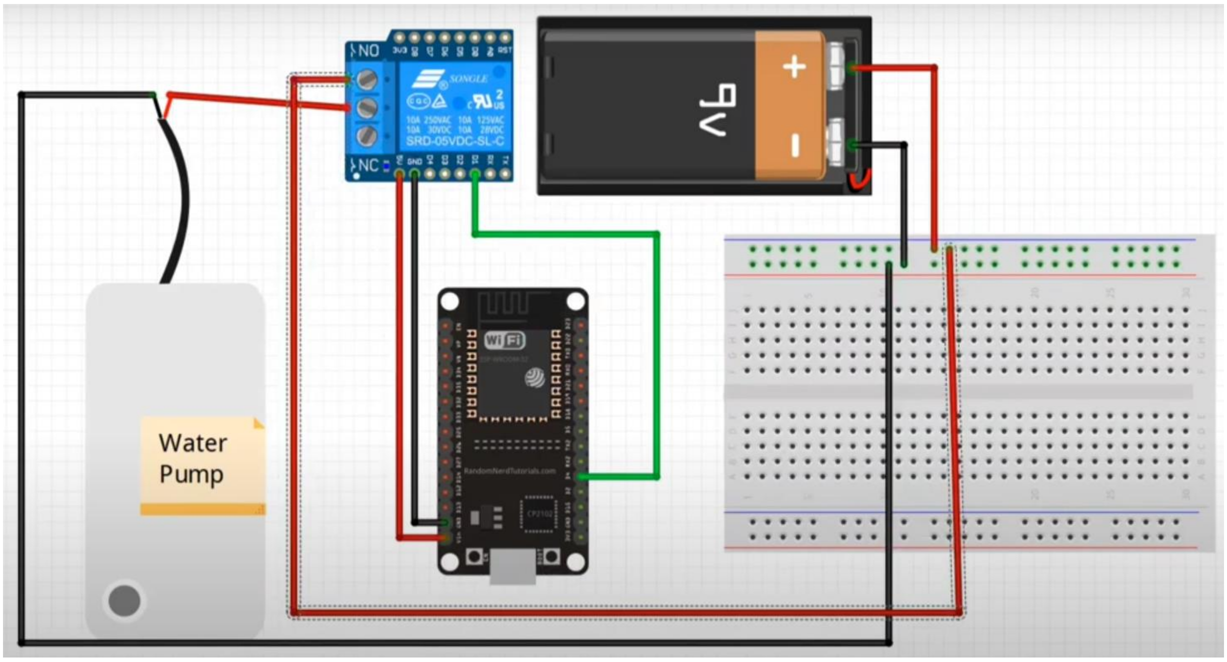


Figure 4.1 System Architecture

4.2 METHODOLOGY

The methodology for developing the Smart Water Controlling Pump involves initial requirement analysis to determine project objectives and user needs, followed by the selection and assembly of hardware components including sensors, microcontrollers, and the water pump. Integration with the Blynk app is established to create a user-friendly interface for real-time monitoring and control. Code development encompasses sensor data reading, pump control, and communication with the Blynk platform. Rigorous testing, calibration, and optimization phases ensure system functionality and efficiency. User training and documentation facilitate smooth deployment and ongoing maintenance, with continuous evaluation and refinement to enhance system performance and user experience.

ARDUINO IDE SETUP:

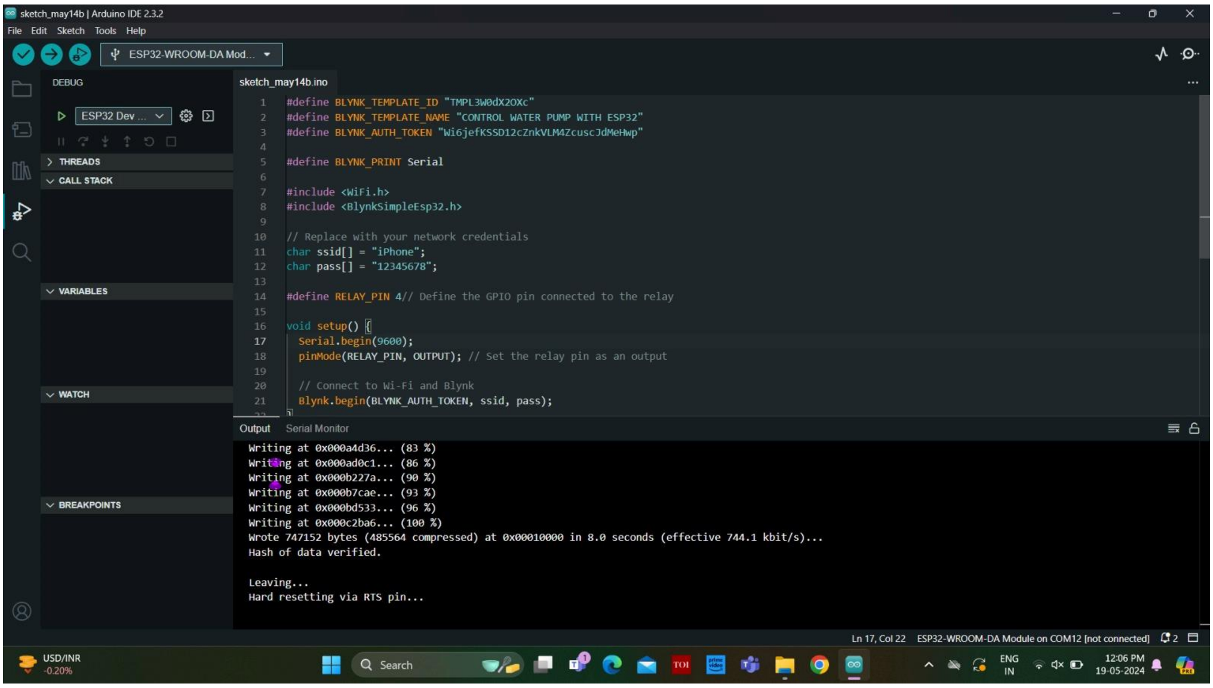
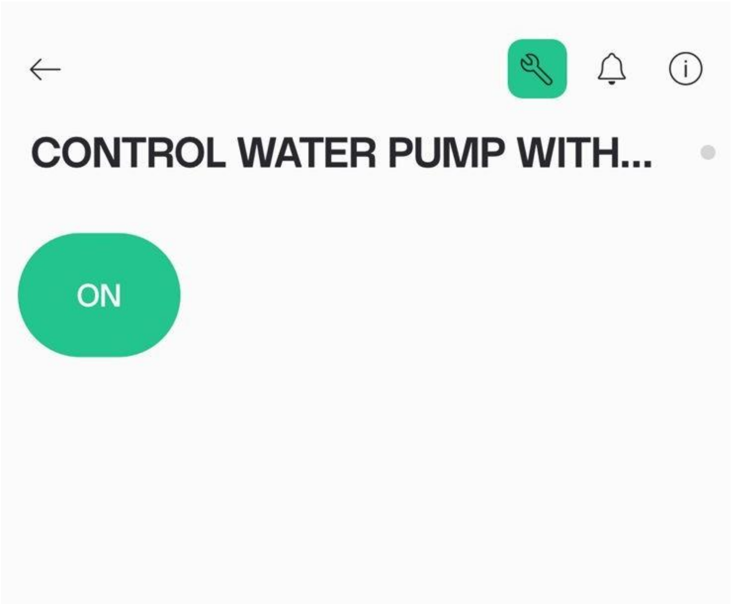
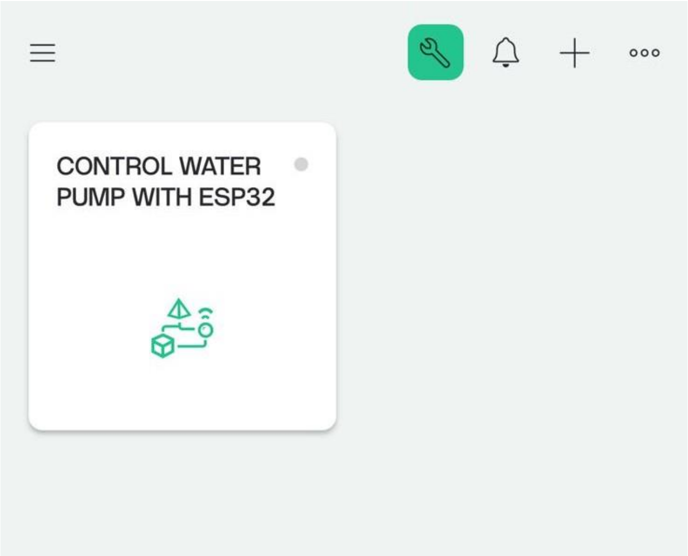


Figure 4.2.1 Arduino IDE

BLYNK INTERFACE:





CHAPTER 5

RESULTS AND DISCUSSION

The results of implementing the Smart Water Controlling Pump show significant improvements in water management efficiency. Real-time monitoring and control capabilities provided through the Blynk app enable users to effectively manage water resources, leading to reduced water consumption and operational costs. Automated watering based on sensor data ensures optimal soil moisture levels, promoting plant health and growth while minimizing water waste. The system's remote accessibility enhances convenience, particularly for users managing multiple or remote sites. Customizable alerts and notifications facilitate prompt action in response to changing conditions, further optimizing water usage. Overall, the Smart Water Controlling Pump demonstrates the effectiveness of IoT technology in addressing water management challenges, with potential applications in agriculture, landscaping, and other water-intensive industries. Discussions may focus on the system's performance, limitations, and opportunities for future enhancements, including sensor accuracy, power efficiency, and integration with advanced analytics for predictive water management. Additionally, considerations for scalability, cost-effectiveness, and environmental impact warrant further exploration to ensure broader adoption and sustainability of the proposed solution.

CHAPTER 6

CONCLUSION AND FUTURE WORK

6.1 CONCLUSION

In conclusion, the development of the Smart Water Controlling Pump using the Blynk platform offers a promising solution for efficient water management in various applications. The system's ability to automate watering based on real-time sensor data, coupled with remote accessibility and customizable alerts, significantly improves water usage efficiency, reduces operational costs, and enhances user convenience. However, there are opportunities for future enhancements to further optimize system performance and expand its capabilities.

6.2 FUTURE WORK

Future enhancements may include the integration of advanced analytics for predictive water management, leveraging machine learning algorithms to anticipate water needs and optimize irrigation schedules. Additionally, improvements in sensor accuracy, power efficiency, and cost-effectiveness can enhance the system's reliability and affordability. Scaling the system for larger applications and addressing environmental considerations, such as water conservation and sustainability, will be crucial for broader adoption and long-term impact. Overall, the Smart Water Controlling Pump demonstrates the potential of IoT technology to address critical water management challenges, with ongoing research and innovation driving continuous improvement and advancement in the field.

APPENDIX

SOFTWARE INSTALLATION

Arduino IDE

To run and mount code on the Arduino NANO, we need to first install the Arduino IDE. After running the code successfully, mount it.

BLYNK

To install Blynk, download the app from the App Store or Google Play Store. Create an account and log in. Select "New Project," choose your hardware, and obtain an authentication token. Add widgets for desired functionality. Flash your hardware with the Blynk sketch, input your token, and start controlling your devices remotely.

SAMPLE CODE

ARDUINO CODE:

```
#include <ArduinoIoTCloud.h>
#include <Arduino_ConnectionHandler.h>

const char DEVICE_LOGIN_NAME[]  = "b61cdsd1sd26-80e3-45e5-b65a-c9d6231sdf6b0sfbd";

const char SSID[]               = SECRET_SSID;    // Network SSID (name)
const char PASS[]               = SECRET_OPTIONAL_PASS;    // Network password (use for WPA, or use as key for WEP)
const char DEVICE_KEY[]  = SECRET_DEVICE_KEY;    // Secret device password

void onPumpChange();
```

```
bool pump;

void initProperties(){

  ArduinoCloud.setBoardId(DEVICE_LOGIN_NAME);
  ArduinoCloud.setSecretDeviceKey(DEVICE_KEY);
  ArduinoCloud.addProperty(pump, READWRITE, ON_CHANGE, onPumpChange);

}

WiFiConnectionHandler ArduinoIoTPreferredConnection(SSID, PASS);

#include "thingProperties.h"

const int Switch=4;
void setup() {
  Serial.begin(9600);

  pinMode(Switch,OUTPUT);
  delay(1500);


  // Defined in thingProperties.h
  initProperties();

  // Connect to Arduino IoT Cloud
  ArduinoCloud.begin(ArduinoIoTPreferredConnection);
```

```
 /*
    The following function allows you to obtain more information
    related to the state of network and IoT Cloud connection and errors
    the higher number the more granular information you'll get.
    The default is 0 (only errors).
    Maximum is 4
 */
  setDebugMessageLevel(2);
  ArduinoCloud.printDebugInfo();
}

void loop() {
  ArduinoCloud.update();

void onPUMPChange()  {

  if(pUMP)
  {
    digitalWrite(Switch,HIGH);
    Serial.println("ON");
  }
  else
  {
    digitalWrite(Switch,LOW);
    Serial.println("OFF");
  }
}
```

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