PROJECT AND TEAM INFORMATION

Project Title

(Try to choose a catchy title. Max 20 words).

Rise 'n Riddle: Puzzle Your Morning

Student / Team Information

Team Name:	*Lonely Riddler*
Team member 1 *(Lastname, Firstname; SDSU email; picture):*	*Pielmaier, Julian –* *jpielmaier9966@sdsu.edu* 

PROPOSAL DESCRIPTION (20 pts)

Motivation (2 pt)

(Describe the problem you want to solve and why it is important. Max 300 words).

This project features an interactive alarm that displays a 3x3 LED puzzle, which must be solved to turn off the alarm. This engaging challenge forces immediate cognitive activation, reducing sleep inertia and ensuring you wake up alert. The system logs key metrics like reaction time and the number of attempts, providing insights into your morning alertness.
In addition, the device monitors local environmental conditions by recording temperature and humidity, and it retrieves current weather data via WiFi. This integration helps you understand how your surroundings may affect your sleep quality.
The alarm also adapts to your performance by adjusting the puzzle's difficulty over time, ensuring the challenge remains effective without becoming too frustrating. Furthermore, remote configuration and logging allow you to customize settings and review long-term trends through a companion app or dashboard.
Together, these functionalities not only help you wake up fully engaged and ready for the day, but also offer valuable data to improve your sleep habits and overall well-being.

State of the Art / Current solution (2 pt)

(Describe how the problem is solved today (if it is). Max 200 words).

Current solutions typically involve standard smartphone alarms or dedicated alarm clocks. Many people use apps like Alarmy that require solving a simple puzzle or task to dismiss the alarm, which adds a layer of engagement compared to traditional alarms. However, these apps usually focus only on the wake-up function and do not offer detailed sleep or environmental monitoring.
Some devices simulate a natural sunrise to help with a gradual wake-up, but these too lack interactive elements and adaptive features based on user performance. In essence, while there are methods to make waking up slightly more engaging, current solutions generally fall short of integrating a comprehensive system that combines cognitive challenges, sleep quality tracking, and environmental data monitoring in one cohesive device.

Project Goals (4 pts)

(Describe the project general goals. Max 200 words).

The project aims to develop an interactive alarm system that promotes alertness and improves sleep quality. Its primary goal is to ensure that users are fully awake by requiring them to solve a 3x3 LED puzzle before the alarm is dismissed, engaging the brain immediately upon waking. The system will also track key performance metrics such as reaction time and the number of attempts, providing insights into sleep inertia and overall alertness.
Additionally, the project integrates environmental monitoring by recording local temperature and humidity, while retrieving current weather data via WiFi. This helps users understand how their surroundings may influence sleep quality. An adaptive puzzle difficulty feature will adjust the challenge based on the user's past performance, ensuring a balanced and effective wake-up process.
Remote configuration and logging enable users to customize settings and review long-term trends through a companion dashboard or app. Overall, the project aims to create a holistic, user-friendly solution that not only improves the waking process but also offers actionable data for better sleep management and daily productivity.

Project Approach (6 pts)

(Describe how do you plan to articulate and design a solution, architecture you would like to use and communication protocol (Wi-Fi, BLE, ...). Include initial milestones as well. Max 300 words).

The solution will be built around the TTGO board, integrating a 3x3 LED grid, a corresponding 3x3 button field, a buzzer, and a temperature/humidity sensor.. At the designated alarm time, the system generates and displays a random LED pattern that the user must replicate using the button field.
User interaction is managed locally via simple digital I/O for the LEDs and buttons. Performance metrics (reaction time, number of attempts) are logged for each alarm event. Environmental monitoring is achieved by sampling temperature and humidity from the sensor and retrieving current weather data via Wi-Fi from an external API. This combined data is stored and analyzed for long-term sleep quality insights.
Remote configuration and logging will be implemented using Wi-Fi. Communication with a cloud service or a custom web server (via REST API) will allow users to update settings and view historical data through a companion dashboard or mobile app.

Initial Milestones:

1. ***Hardware Integration:***
   Assemble the TTGO board with the LED grid, button field, sensors, and buzzer
2. ***Core Software Development:***
   Implement alarm scheduling, random puzzle generation, and button-based input for puzzle resolution
3. ***Sensor and Wi-Fi Integration:***
   Integrate environmental monitoring (temperature/humidity) and establish Wi-Fi connectivity for weather data retrieval
4. ***Remote Logging and Configuration:***
   Enable remote data logging and configuration updates through integration with a cloud service or companion dashboard
5. ***Adaptive Difficulty:***
   Implement a performance-based algorithm to adjust puzzle complexity over time
6. ***Testing and Calibration:***
   Finalize testing to ensure system reliability and user-friendly operation

Hardware Required (2 pt)

(The provisional/initial list and quantity of the required components for the proposed project)

Component/part	*Quantity*
Breadboard	*1*
LILYGO-TTGO	*1*
LED	*9*
Button	*9*
Humidity Sensor	*1*
Temperature Sensor	*1*
Buzzer	*1*
USB Type-C Cable	*1*

Resistor Kit	*9*

Project Outcome / Deliverables (4 pts)

(Describe what are the outcomes of the project and how you will conduct a short final video/zoom demo. Max 200 words).

The project will deliver a fully functional interactive alarm system that combines a cognitive puzzle for alarm dismissal, sleep quality tracking, and environmental monitoring. Key outcomes include:

- *A working prototype that displays a random 3x3 LED puzzle requiring corresponding button presses to turn off the alarm*
- *Integration of performance logging—recording reaction time, number of attempts, and environmental data (temperature and humidity)*
- *An adaptive algorithm that adjusts puzzle difficulty based on user performance*
- *A unique sleep rating system where users rate their sleep quality from 1 to 9 using the buzzer*
- *Remote configuration and data logging via a companion dashboard for long-term trend analysis*

For the final demonstration, a short video will be conducted. The demo will cover the system architecture and hardware setup, followed by a live demonstration of the alarm triggering, puzzle interaction, and sleep rating process using the buzzer. Environmental data logging and remote configuration features will also be showcased, illustrating how the device provides actionable insights to improve sleep habits and morning alertness.