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Intelligent and Communicating Systems, ICS

2nd Year Specialty SIQ G02

Intelligent SMS Gateway
Project report

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A. Project Context

With the growing need for real-time notifications, this project integrates SMS alerts for Google Calendar events and sensor-based warnings. It explores two approaches:

- SMS gateway linked to Google Calendar.
- IoT-based solution with edge computing for real-time processing.

Objectives:

The project aims to develop an SMS gateway for event-based and sensor-triggered notifications through two approaches:

- **Option 1:** Raspberry Pi-based SMS gateway using a GSM module and Google Calendar API.
- **Option 2:** Edge computing solution for real-time processing and IoT scalability.

B. Option 1

1. Hardware

GSM Module Specifications:

The SIM800L v2 GSM module requires a stable 5V power supply with a current of 3A, provided by an external power supply. The SIM card must be inserted before turning on the module. Power interruptions can affect the GSM module, causing it to restart.

Components:

Raspberry Pi 4 Model B, GSM Module SIM800L v2, MicroSD Card, Power Supply, Cables

Setup of the circuit:

- Connect Raspberry Pi's TX and RX pins to the GSM module for serial communication.
- Provide stable power (5V, 3A) to the GSM module.

The figure below shows the connection between the Raspberry Pi and the GSM module:

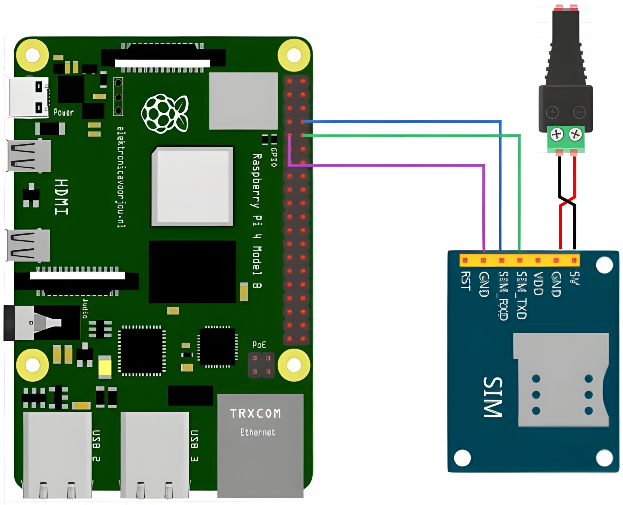


Figure 1: Raspberry pi - GSM module circuit

2. Software

Google Calendar Integration

Enable the Google Calendar API in Google Cloud Console, then configure OAuth credentials for secure access.

RaspiSMS Configuration

Install RaspiSMS, an SMS gateway for Raspberry Pi, then manage messages via a web-based dashboard.

Gammu Configuration

Install Gammu, a command-line tool for sending SMS via a GSM module. After that configure Gammu to integrate with RaspiSMS.

Web Application Development

- **Backend:** Python Flask
- **Frontend:** HTML/CSS/JavaScript
- **Purpose:** Provide an intuitive interface for managing SMS communications.
- **GitHub Repository:** Project Repository

C. Option 2

1. Hardware

Components

Raspberry Pi 4 Model B, DHT22 Temperature & Humidity Sensor, 10kΩ Resistor for data signal stability

Circuit Setup

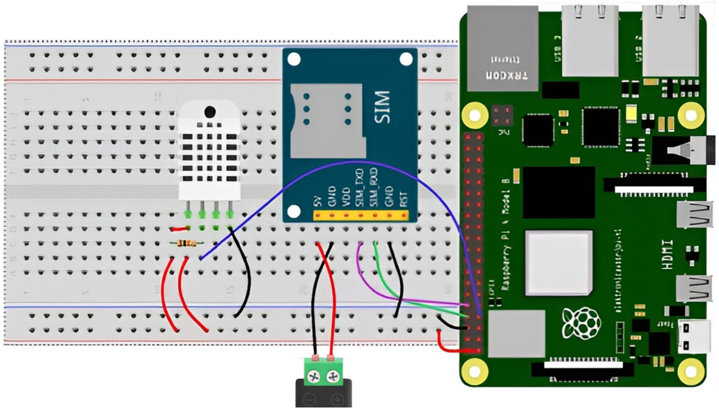


Figure 2: Raspberry pi - GSM module - DH22 circuit

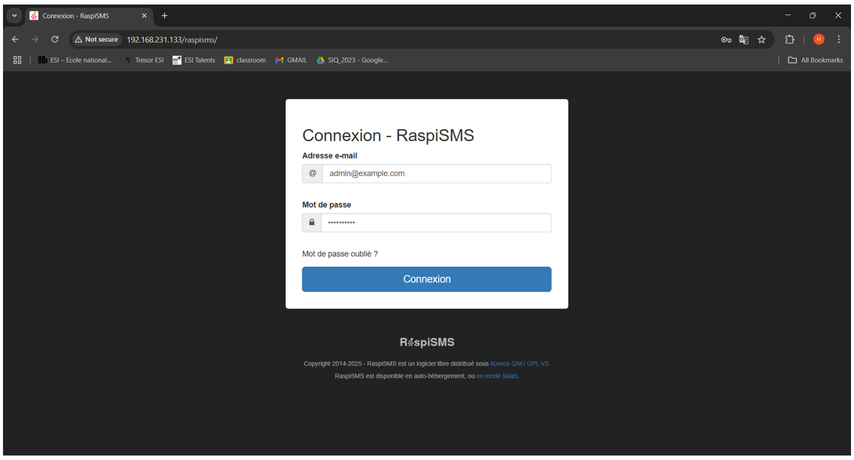
2. Software

Microsoft Azure IoT Integration

Microsoft Azure IoT Hub receives data from the Raspberry Pi and stores it in Azure Blob Storage for processing. Azure Stream Analytics processes sensor data in real-time using SQL-like queries, filtering and storing relevant information. Edge computing reduces cloud dependency, enabling faster responses for critical alerts.

D. Final Result: Application Demonstration

1. Admin interface - RaspiSMS



Connexion - RaspiSMS

Adresse e-mail

@ admin@example.com

Mot de passe

••••••••••

Mot de passe oublié ?

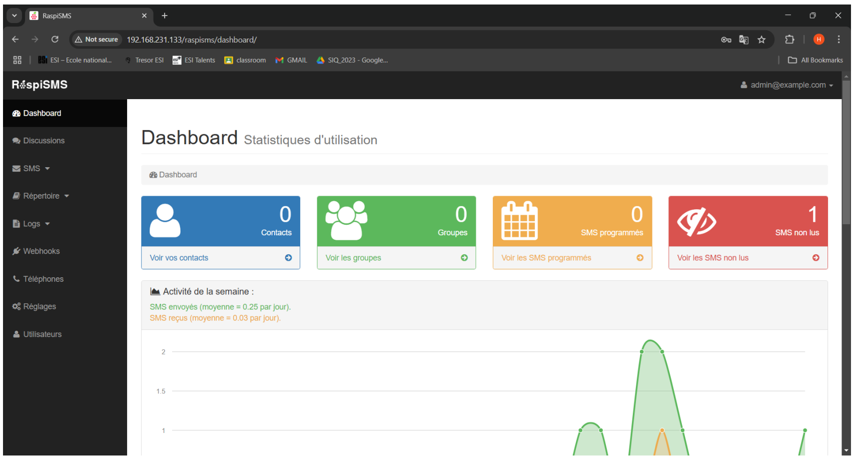
Connexion

RaspiSMS

Copyright 2014-2025 - RaspiSMS est un logiciel libre distribué sous licence GNU GPL V3.

RaspiSMS est disponible en auto-hébergement, ou en mode SaaS.

Figure 3: RaspiSMS login page



Dashboard Statistiques d'utilisation

Dashboard

0 Contacts — Voir vos contacts

0 Groupes — Voir les groupes

0 SMS programmés — Voir les SMS programmés

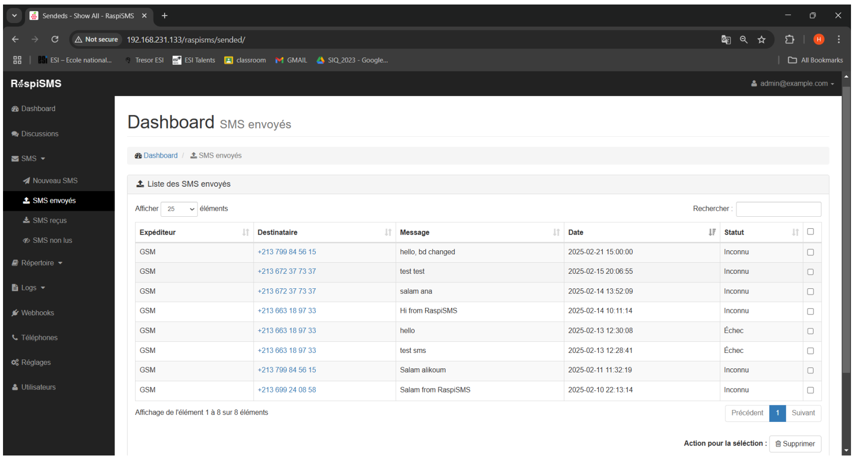
1 SMS non lus — Voir les SMS non lus

Activité de la semaine :

SMS envoyés (moyenne = 0.25 par jour).

SMS reçus (moyenne = 0.03 par jour).

Figure 4: RaspbiSMS dashboard



Dashboard SMS envoyés

Dashboard / SMS envoyés

Liste des SMS envoyés

Afficher 25 éléments

Rechercher :

Expéditeur	Destinataire	Message	Date	Statut	□
GSM	+213 799 84 56 15	hello, bd changed	2025-02-21 15:00:00	Inconnu	□
GSM	+213 672 37 73 37	test test	2025-02-15 20:06:55	Inconnu	□
GSM	+213 672 37 73 37	salam ana	2025-02-14 13:52:09	Inconnu	□
GSM	+213 663 18 97 33	Hi from RaspiSMS	2025-02-14 10:11:14	Inconnu	□
GSM	+213 663 18 97 33	hello	2025-02-13 12:30:08	Échec	□
GSM	+213 663 18 97 33	test sms	2025-02-13 12:28:41	Échec	□
GSM	+213 799 84 56 15	Salam alikoum	2025-02-11 11:32:19	Inconnu	□
GSM	+213 699 24 08 58	Salam from RaspiSMS	2025-02-10 22:13:14	Inconnu	□

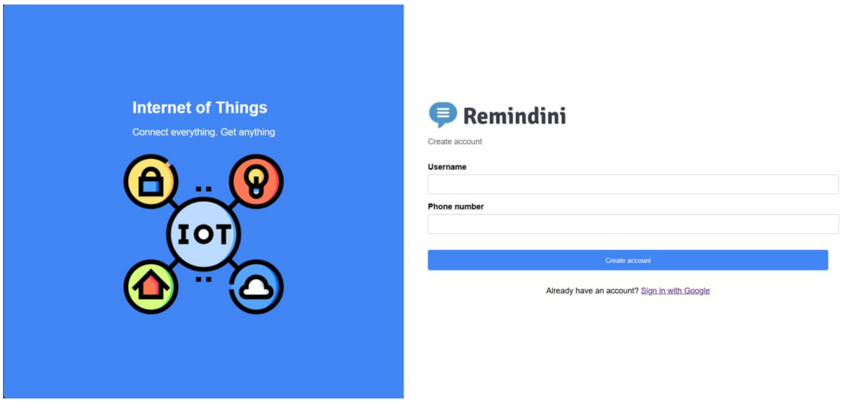
Affichage de l'élément 1 à 8 sur 8 éléments

Précédent 1 Suivant

Action pour la sélection : Supprimer

Figure 5: RaspiSMS sms history

2. User interface - RaspiSMS



Create account

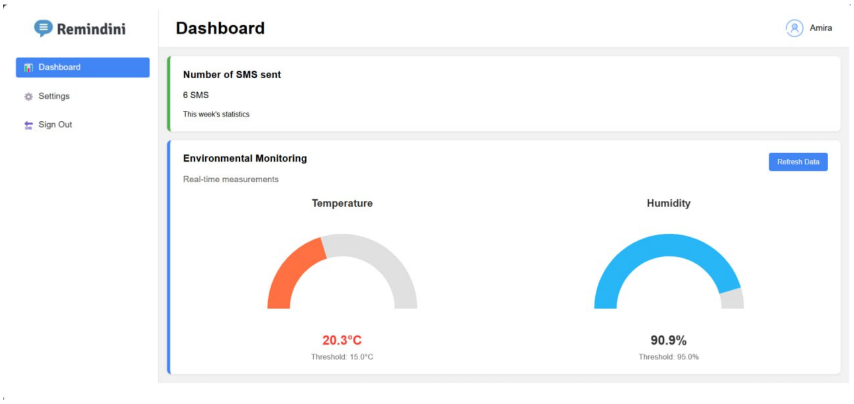
Username

Phone number

Create account

Already have an account? Sign in with Google

Figure 6: Remindini sign up page



Dashboard

Number of SMS sent

6 SMS

This week's statistics

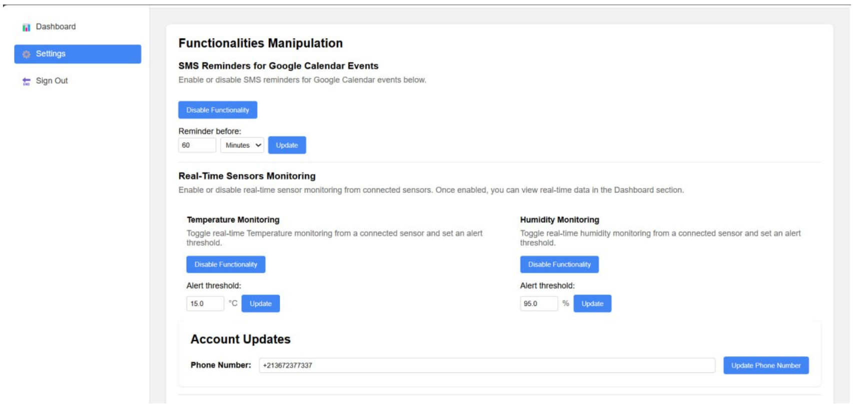
Environmental Monitoring

Real-time measurements

Temperature: 20.3°C
Threshold: 15.0°C

Humidity: 90.9%
Threshold: 95.0%

Figure 7: Remindini user's dashboard



Functionalities Manipulation

SMS Reminders for Google Calendar Events

Enable or disable SMS reminders for Google Calendar events below.

Reminder before: 60 Minutes

Real-Time Sensors Monitoring

Enable or disable real-time sensor monitoring from connected sensors. Once enabled, you can view real-time data in the Dashboard section.

Temperature Monitoring

Toggle real-time Temperature monitoring from a connected sensor and set an alert threshold.

Alert threshold: 15.0 °C

Humidity Monitoring

Toggle real-time humidity monitoring from a connected sensor and set an alert threshold.

Alert threshold: 95.0 %

Account Updates

Phone Number: +213672377337

Figure 8: Remindini user's settings

E. Conclusion

This project developed an intelligent SMS gateway for real-time notifications based on Google Calendar events and sensor data.

- Version 1: Uses Gammu, RaspiSMS, and Python to send SMS alerts for scheduled events.
- Version 2: Integrates edge computing for real-time sensor-based alerts, reducing cloud dependency.

Both versions enhance timely notifications. Future improvements include adding more sensors, expanding communication protocols, integrationg other Google services (google classroom, google wether, ...) and implementing predictive alerts.

References: Google Calendar API overview / RaspiSMS / sim800l-gsm-gps-raspberry/ / Send Receive SMS Call with SIM800L GSM Module Arduino / SIM800L restart automatically / Azure iot / Raspberry PI GPIO Pinout / Gammu et Wammu / DHT22 sensor pinout / RaspiSMS github project / gauges in frontend / Sim800L v2 / Binarytech Electronique Algérie.