

Attendance Management using AWS Cloud

Abstract:

Recording classroom attendance can be a time-consuming process for teachers and can add up to hours of lost productivity. The goal of this project is to improve the attendance taking process in a classroom environment. The Automated Classroom Attendance System (ACAS) is a cloud-based solution built using Amazon Web Services (AWS) for automatically recording and tracking classroom attendance using facial recognition. AWS was chosen based on its wide range of services that allow for scalability, reliability, and ease of administration. ACAS uses Amazon's Rekognition technology to identify students and record them as present or absent. ACAS has an easy to use web application that allows teachers to create students, add classes and retrieve attendance history. The only component of ACAS that does not run in AWS is the classroom cameras, which are responsible for uploading images to AWS for processing. By implementing ACAS in the classroom, manual attendance taking is not necessary, allowing for more teaching time and increased reporting accuracy.

Introduction:

The current manual attendance management systems in developing nations are proven to be very inefficient. Students are made to fill in their names, registration number and signature. Most times, it is difficult to spot out students who are absent from lectures because their friends who must have learnt their signature sign for them. The lecturers are also faced with the challenges of manually reviewing the attendance. The same goes with staff attendance management as regards to their performance checks, reprisal and rewards. Another annual systems of attendance gathering usually rely on paper or report cards which have times stamped onto them using a time stamping machine. Another method is the use of timesheets or attendance registers. Manual system of attendance gathering widely used in schools and organizations till date.

An Attendance management system is therefore necessary for effectively monitoring and tracking of students' attendance and the time employees resume and close work. It is very important as it ensures proper monitoring remotely on a cloud hosted database. In their research they made use of Rapid application development methodology (RAD) to enable a working

prototype of their system to be available within the shortest possible time.

A. RFID Reader module and Tags: Radio Frequency Identification (RFID) is one of the wireless technologies that use the detection of electro-magnetic signal as identification. This technology is a non-contact type similar to that of barcodes and magnetic strips.

Radio Frequency Identification (RFID) is one of the wireless technologies that use the detection of electro-magnetic signal as identification. This technology is a non-contact type similar to that of barcodes and magnetic strips.

1. RFID TAGS:

This consists of an antenna and a chip for storing the data. The used cards are Passive RFID cards. The passive RFID card doesn't need any external power. The required power is drawn from the electromagnetic field generated by the RFID reader for the operation.

2. RFID READER:

RFID reader module is a radio frequency transceiver. It reads and writes the data in to the RFID cards. The used RFID reader module is EM-18 with 125 KHz frequency range. The RFID doesn't need any physical contact, thus they are scanned against their corresponding RFID reader module.

3. ESP32 DEVELOPMENT BOARD:

ESP32 is a low cost SOC (System-on-chip), widely used in IoT based projects. It is an advanced successor of the 8266 chip primarily in the implementation of two cores clocked in different version up to 240 M Hz. This has both the Wi-Fi and Bluetooth capabilities, which make it an all rounded chip for the development of IoT projects and embedded systems.

4. LIQUID CRYSTAL DISPLAY with 12C

Converter:

An LCD is used to display the information which is retrieved from the RFID cards when scanned over the

reader module. LCD is used along with attached 12C converter to convert SPI communication to I2C communication thus obtaining the output with minimum wires (In case of I2C there are only two wires SDA, SCL for communication). The components of the project are ESP32, RFID reader module, RFID cards and an LCD display. The RFID reader module EM-18 consists of 4 pins: VCC, TX, RX and GND which runs on 12V. The communication between the reader module and micro-controller is implemented using UART protocol. The RFID reader reads the information from the card and transmits to the host i.e. ESP32 board. The TX pin of the reader must be connected to RX pin of ESP32. An LCD is used to display the information that is retrieved from the RFID card. The general block diagram is shown in the figure.

AWS

LCD with 120 Converter

ESP32 Board

RFID Reader

Power Supply

Amazon web service:

A.W.S has so many services which enables that the user's data to be encrypted and can be utilized in a manner that they wants. The services used in the proposed paper are:

1. AWS IoT Core:

AWS IoT Core is the most customizable and closest to integrating the desired characteristics. In the pro-posed paper, IoT core is useful in direct communication between ESP32 board and AWS Cloud in MQTT (Message Queue Telemetry Transport) format. It is also helpful in connecting with other services when a Rule is created.

2. AWS DynamoDB:

Amazon is using Dynamo Databases, which is a fully managed NoSQL database that provides predictable and super-fast performance with unified scalability. The incoming MQTT messages from IoT core are stored in a table named as "Attendance".

3. AWS Glue: Glue consists of a crawler and acts as a pipeline in exporting or importing data from one database (Source) to other database (Target). In this proposed paper, DynamoDB is taken as source and S3 bucket is taken as Target.

4. AWS Lambda:

Lambda is a serverless computing platform that runs in response to events configured either internally or externally. Lambda service is used in this proposed paper to fetch the data from S3 bucket and sends Email to the recipient.

5. AWS SES (Simple Email Service):

SES is useful in sending emails through cloud to the verified recipients. In this proposed paper, this service has been used for sending student data in the form of an email attachment.

Results:

As soon as the student scans his card over the RFID reader, the name of the student along with the roll number appears on the LCD display as shown in the figure. The ESP32 board then sends updates the things shadow accordingly.

Hardware setup showing students attendance

The proposed system achieves in not only capturing the student's data but also provides storage facility via a virtualized server platform A.W.S and the output is easily accessible to the recipient through the mail as shown in figure 8 through AWS lambda server less platform.