

Let's Talk Device using Cloud Computing and Embedded System

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Abstract— Our project is based on the growing concept Internet of Things (IoT). The Internet of Things is a global network that links physical objects using Cloud computing, web applications, and network communications. It allows devices to access information on the Internet, communicate with each other, store and retrieve data, interact with users and creating pervasive, smart and always-connected environments. It happens every other day that our device fail to work due to overheating, overuse etc. So using the concept of IoT we have built a system which detects such failures before they occur i.e. avoid them. Also through this system we can control the device i.e. on/off any device from anywhere over internet. Various projects have been built before using IoT but majorly they deal with just the automation of devices whereas in our project we have two-way communication which means that user can control the device and also the device can send its generated data back to user. And the technologies, embedded systems used to achieve the same are Salesforce (Cloud computing platform), Arduino board, node.js.

Key words: Internet of Things, Cloud Computing, Arduino

I. INTRODUCTION

The Internet of Things is more than just simple hype – it is a crucial, fundamental shift in technological progress that will dramatically impact our existing infrastructures, business models and even our private life. With it, we have the potential to create insights that before we could only dream of. The impact of this is truly immense.

Through the sheer proliferation of sensors and recording smart devices – numbers point to between 50 and 60 billion sensors by 2020 alone – and the data they produce, the IoT gives us context. What happens, when it happens and how it happens, often in real-time. We can now understand the past through analysis of recorded data, the present through real-time interpretation of constant data flows and even the future through predictive modeling and simulations, using supercomputers.

Now with resources being easily available and technologies being open source the question that, Can we do it? Has changed to should we do it? So we have built a system based on IoT which automates the device as well as the real time data it generates can be recorded and send to the user and then the user can take specific action based on it, which also can be automated.

II. LITERATURE REVIEW

Moataz Soliman, Tobi Abiodun, Tarek Hamouda, Jiehan Zhou, Chung-Hong Lung presents a Smart Home which minimizes user's intervention in monitoring home settings and controlling home Appliances. This paper presents an approach to the development of Smart Home applications by integrating Internet of Things (IoT) with Web services and Cloud computing. The approach focuses on: (1) embedding intelligence into sensors and actuators using Arduino

platform; (2) networking smart things using Zigbee technology; (3) facilitating interactions with smart things using Cloud services; (4) improving data exchange efficiency using JSON data format. Moreover, we implement three use cases to demonstrate the approach's feasibility and efficiency, i.e., measuring home conditions, monitoring home appliances, and controlling home access. [1]

We implement all of the above features listed in the work done by the researchers above i.e. monitoring and controlling appliances. However the researcher take into account only measuring the home conditions, monitoring of appliances whereas we go a step forward and the recorded data which is stored in the cloud platform is used to automate the action that is to be taken based on the current state of appliance i.e. Instead of waiting for a device to just stop working, the system will identify faults, communicate them to technical support and initiate actions to resolve them – from ordering replacement parts to requesting a completely new device. All this can happen before your user is even aware of the issue.

III. PROPOSED SYSTEM

The main objective of our project is to build a Two-Way Communication System by using the concept of Internet Of Things, Cloud Computing and Embedded Systems. Our approach is inspired by the Smart Home projects build earlier which monitors and controls the actions of appliances and different devices. In our system we move a step forward, with monitoring and controlling of devices it will also take necessary actions like sending email to user perform some task etc. if it fails to walk properly or have exceeded the time for which it should be working.

First, we collect the real time data and status of the device i.e. whether it is on, off, its temperature etc. using the Arduino board, connected sensors, actuators. In turn the Arduino connected is controlled by NodeJS through the USB port of the board using a library called Johnny Five. That library interacts with the Arduino. Also the nodeJs will be interacting with the salescloud using nforce library thus serving as a bridge between the device and salesforce.

A. Step 1:

Firstly the device is connected to the Arduino board and loaded with standard fermata. It collects the data as well as controls the device which is itself controlled by the Node.js to activate/deactivate its pin etc.

B. Step 2:

Then we setup salesforce. An object for the device is created for eg: to create an object called "Light", with 2 fields: State and PIN.

C. Step 3:

To do so we need to head to Setup/Create/Objects click "New Custom Object", and then add the 2 custom fields.

D. Step 4:

After that we need to create “Light” records using the pin of the relay connected to the Arduino, and the initial state. Give the records names of the places that the lights will be located, for example “Lobby”.

E. Step 5:

Create a Streaming API PushTopic. So when we subscribe to this PushTopic, if a Light object is created or modified, we will receive a notification.

F. Step 6:

Create a connected app from Setup/Create/Apps in Salesforce.

G. Step 7:

After the app is created take note of the “Consumer Key” and “Consumer Secret”. The terminology is from OAuth 1.0 those now are called “Client Id” and “Client Secret”.

H. Step 8:

Create a user called “Controller” and grant access to the connected app for his profile editing it and checking the app name under the section “Connected App Access”.

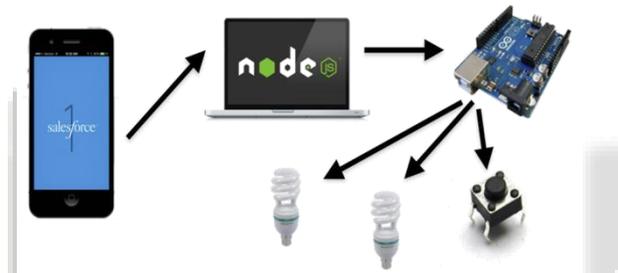


Fig. 1: System Overview

Also the other use case of the system is executed on the same lines using connected application of salesforce. The arduino continuously records the temperature data using LM35 sensor and send it to salesforce via node.js app. Arduino communicates with node, js via serial port and node.js with salesforce using nforce library. When the board senses some critical high temperature a workflow email alert triggers and the user is notified about it , Also a case is raised in the users salesforce account.

IV. SCOPE

It's the technology of today which is touching and transforming the every aspect of our real life. IOT has given a concept of Machine to-Machine (M2M) communication. IOT is going to have huge impact on home automation and building automation system where every convenience will be taken care of by the interconnected devices on IOT. So with the field being new and not explored to its full potential, there's a lot of market space and uniqueness for our project to do well.

A. Feasibility Study:

The different aspects involved in feasibility are

1) Economic Feasibility:

With the major components used in the project are software based and the embedded parts like arduino board, relays etc. being easily available and cheap, the total cost of the project was really affordable and cheap i.e. just 1000 Rs.

2) Technical Feasibility

The technologies used in the project are:

- NodeJS: Node.js known for its speed, scalability and efficiency makes it great for developing data-intensive, real-time applications. This, of course, makes Node.js well-suited for the IoT, which is reliant on data-intensive, real-time devices and applications.
- IoT Cloud: We can easily make connected applications in the Salesforce IoT cloud and its ability to store huge amount of data and the features it provide makes it the best choice for the project.
- Arduino Board: As we can write sketches for the arduino board and configure it the way we want it serves the functionality we want in our project.

3) Operational Feasibility:

The appliance/device can be controlled by any device which is connected to the internet having the configured salesforce application.

V. RESULT

A. Test Case 1: Email alert and trigger to switch on fan when the temperature rises above the set critical temperature.

1) Input:

The input for this case is the surrounding temperature taken from the reading of the temperature sensor attached to the arduino board.

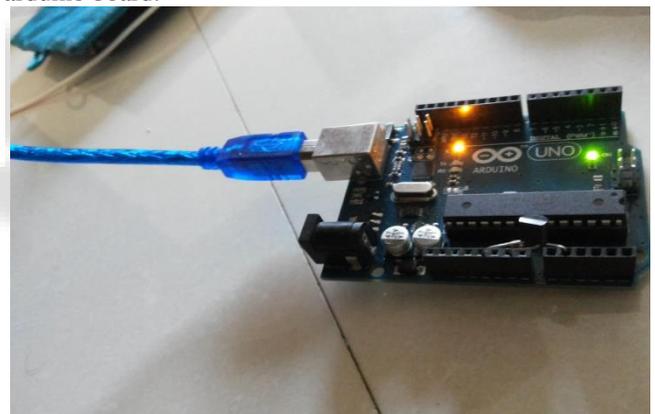


Fig. 2: Temperature sensor reading data from the environment

2) Output: Email alert

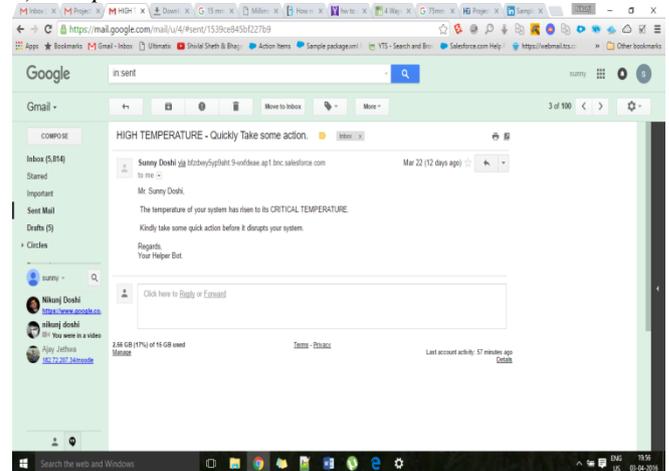


Fig. 3: Automated Email alert to the user with predefined written message.

B. Test Case 2: To control device (here red led) from anywhere over internet.

1) *Input:*

Change of status field on the device object created in salesforce.

2) *Output:*

When the status is changed you can see the appliance turn on and off.

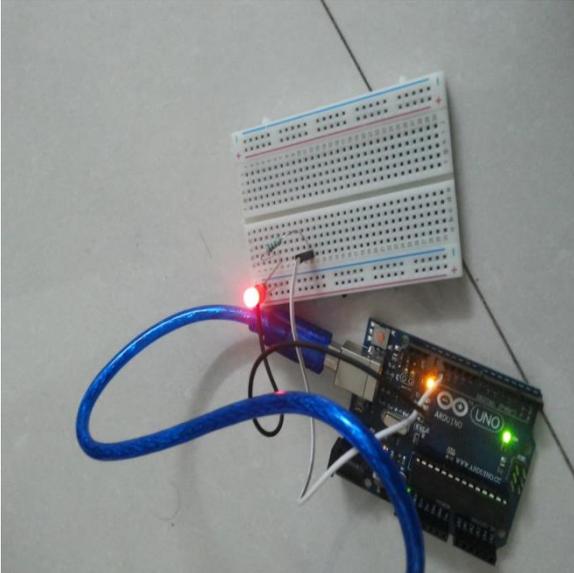


Fig. 4: Led turns on.

VI. CONCLUSION

The implementation of Let's Talk Device using Cloud Computing and Embedded System has been successfully performed. The system enables user to control the appliance/device remotely i.e. from anywhere in the world, over internet using the salesforce application modified for the same.

The system also has the capability to identify faulty rise in temperature of the device or appliance and automatically alert the user via sending an email to him and also turning an extra fan on till some appropriate action is taken. All this happens through an integrated system of arduino, nodeJS application and Salesforce which is a cloud computing platform. A simple, economic and feasible method is provided by the system to avoid damage to your system and also if scaled up can be utilised for various industrial purposes.

Thus, this system makes an ideal and feasible choice to control appliances and also save it from damaging.

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