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CONFERENCE ROOM TRACKER IOT BASED APPLICATION FOR SMART OFFICES

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ABSTRACT

In this paper, we present a way to determine if given room, place or any other area of application is occupied or unoccupied. The work done here has focused on conference rooms availability. The modern-era workplaces are made with having a focus on data collection, and it's automation. The data collected data is then used in multiple ways to monitor workplace and employees. Data based smart intelligence is opening new, faster, and smarter ways of possibilities with smart and predictive analytics.

Conference room tracker optimises the availability of the conference room using IoT technologies. The sensor delivers the room activity to the cloud. A conference room tracker provides the facility to know when a room is unoccupied regardless of what the online scheduler shows so that one has not to cancel the meeting due to wrong information regarding usage of the conference room.

A conference room tracker includes a plurality of handheld computers in communication with a cloud computing network or a remote server that has accessible information about the room activities. This application is not only limited to office; we can also set it up at home for building smart homes as IoT is subjected to build smart cities, intelligent shopping system, smart traffic system, smart grid and so forth.

The hand-held computer or single board computer (Raspberry Pi) allows the sensors to connect through it and receives the information about the room activity and send it to the IoT cloud. The IoT cloud demonstrates a new type of emerging distributed system compromising of a set of smart appliances interconnected with a remotely connected Cloud computing framework, platform, or software through the Internet and able to give IoT as services

1. INTRODUCTION

Internet of things (IoT) examples extends from intelligently connected homes to wearables devices. IoT has now become part of every aspect of human lives. Not only internet of things applications is to improve the comforts of our lives, but also it is giving us more control by simplifying the regular work life and personal activities.

With the recent buildup about the future possibilities, IoT has made companies to take the action of coming up with the basic structure of internet of things, i.e. support, software and hardware to enable developers to deploy apps that can connect anything within the sphere of the IoT.

We know that the likelihood of IoT markets is vast, but specific domains will mature much faster than the rest. Here is the list of application areas for the internet of things with examples that have the potential for exponential growth.

- IoT Applications for Smart offices/Smart Home
- IoT Applications for Wearables
- IoT Applications in Retail
- IoT Applications for Smart Cities
- IoT Applications in Healthcare
- IoT Applications in Automotive/Transportation

A. Iot applications for smart offices/ homes

Definition of connected home/office is different for different people. In simple words, a smart home/office is the one in which the devices can communicate with each other as well as to their light environment. A smart office gives the owner the capability to customise and control office environment for increased security,

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efficient energy management and utilisation management. There are hundreds of IoT technologies available for monitoring and building smart homes and offices.

B. Smart office solution for a smarter workplace

Smart Office Solution for small, medium and big enterprise businesses can be built by implementing sensors, Internet, and Cloud technology to develop and create a smart working culture in the workplace. However, sensor-based technology makes it simple, fast, and convenient to create and manage a smarter workplace.

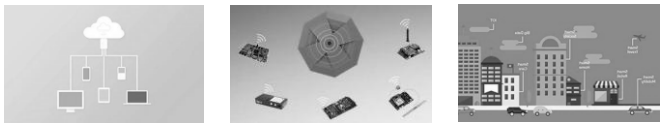

Fig. 1 Cloud, Sensors and IoT technology

Following are the main features of Smart Room solution enabling a smarter and efficient workplace.

- Checking availability and booking meeting room/facility straight from our mobile.
- Inviting connections- adding employees / connections and sending invitation to all from our mobile.
- Easily sharing required documents- PDFs, video, Word files or whatever documents we needed for the presentation.
- Managing offices on multiple locations and tracking our workforce on our mobile.

C. Modernize the Conference Room with the help of IoT

Regardless of size and complexity, most workplaces encounter complications and issues. With the modernisation of Internet technology, it has become easier to solve complications into ease. Cloud computing, data, and automation have already put humans on ease with performance. As far as capability is concerned, we need human input to manage and monitor the intelligent technology systems – that's where the human role comes on priority.

2. MATERIALS AND METHODS

A. Components used

Raspberry Pi3

Passive Infrared (PIR) Motion Sensor

Solderless breadboard half size

Male/Female jumper wires

LED and Resistor

Microsoft Azure

Microsoft Windows 10 IoT core

B. Hardware assembly

Raspberry Pi's GPIO pins were used to read the input from the PIR motion sensor and to turn on the LED when motion was detected. The applications running on Raspberry Pi sends conference room status – either occupied (motion detected) or unoccupied - data to the Azure IoT Hub.

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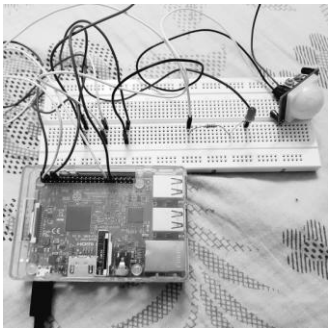

Fig. 2 Assembled Hardware

C. Azure IoT Hub Creation

In the Preview Portal after signing in to the Azure account, IoT hub was created from the new tab, by creating new resource group. Then in the Device Explorer app and the device identity was created using the app's UI. Under the management tab, connection string from configuration tab in IoT hub was entered along with device ID. This generated the primary and secondary key**.**

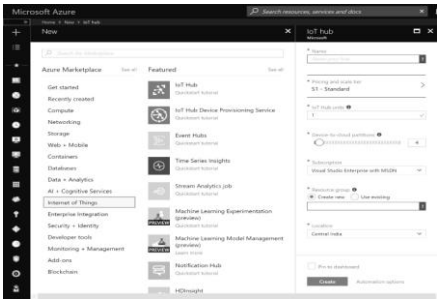

Fig. 3 Azure IoT Hub

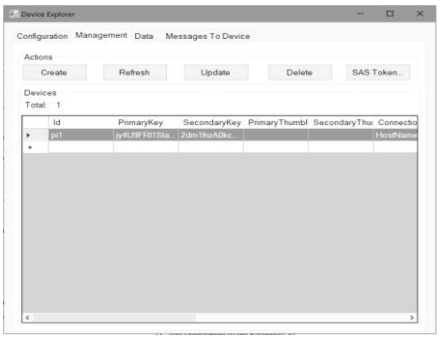

Fig. 4 Device Explorer

D. App Deployment to the Raspberry Pi

The code was written, and the solution was opened in Visual Studio 2015. Three variables were then entered into the code to be able to connect to the device to the instance of Azure IoT Hub. At first, IoT Hub's URI was inserted into the iotHubUri string. Then, device ID was inserted into the deviceName string - the device ID was specified when we created the device in Device Explorer. Finally, device keys were inserted into the deviceKey string. The app is then deployed to the Raspberry Pi.

Every 60 seconds (the interval defined for the timer), the Raspberry Pi reads the signal pin on the PIR sensor. If it is "HIGH", the LED turns on to indicate that motion was detected or turns off to indicate that no motion was detected. The app sends a ping to the IoT Hub about the detection. The message contains the device ID, the time, and the room status - either "Motion detected" or "No motion detected."

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3. RESULTS

The easiest way to see the messages was being received or not in the IoT Hub was by the Data tab in the Device Explorer. The device was selected from the Device ID drop-down list. Start time was entered, then Device Explorer displays all messages received by IoT Hub afterwards. Event hub data area, displayed incoming message form sensor, occupied or unoccupied. The messages sent from the device was displayed as shown in the Fig. 5

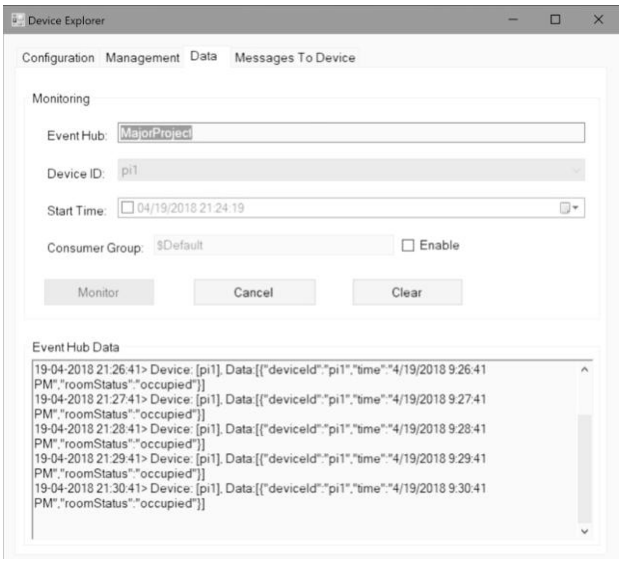

Fig. 5 Event Hub Data

Additionally, we were able to track the number of devices connected and the number of messages sent to the IoT Hub in the Preview Portal. The statistics were shown as in the Fig. 6

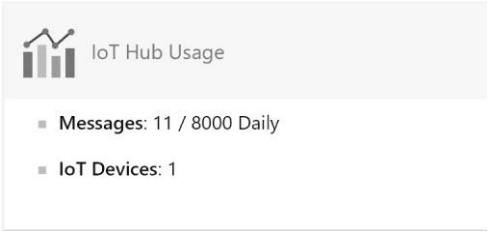

Fig. 6 Conference room usage

4. CONCLUSION

The Internet of Things (IoT) is, primarily the topic of attraction in IT industry. Every organisation or workplace wants to participate in the IoT, and many IT experts want to know how to add IoT skills. There are lots of options for gaining knowledge about IoT, but nothing competes with the hands-on experience. By using our IoT solutions for offices, we have created a better workplace and improved business productivity. In this finding connected smart devices optimises every area of the workplace which increased efficiency. In this way, we can improve day-to-day functions and can enjoy greater connectivity with IoT solutions.

Our finding advocates that "Conference Room Tracker" collects data from the sensor, and sent to the Cloud so that the decision makers can get access to it from anywhere, at any time. This offers the best cloud solutions offering remote monitoring.

One more thing businesses and organisations need to focus on energy utilisation- how smartly and efficiently we are utilising or conserving energy. When everything is managed smartly, cost and time saving comes

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eventually, and that is where recent conferences are setting a new culture in the workplace environment with connectivity, communications, and real-time reports.

Other things can be adequately managed by using the power of cloud computing, big data, automation and analytics like poor project management, scope expansion, uncertainty, and other IT industry-related problems. If we want to transform our office into a smarter and intelligent workplace, then we must get ready for the change.

5. Acknowledgement

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