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IoT (INTERNET OF THINGS) ON ANDROID APP – ANDROID APPLICATION FOR REMOTE MONITORING SYSTEM

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Abstract: *This project provides the idea and method for developing the android app for connecting IoT devices. It's always a difficult task for connecting an embedded device to a mobile device and mainly creating it as an app. So the method which I used is quite easy for implementing this process and will be efficient as well. "To check the working condition of heat pump" – it's the main aim of the project and have to achieve through the android operating system platform. Heat pump is an embedded device which may be present at remote location and mainly in an industry. So to connect the heat pump to the internet the "Thingworx" platformwas used. The main theme of the app is to extract the data from the Thingworx cloud and to show in the android based mobile device.*

Keywords: *IoT, Thingworx, Heat Pump, JSON, Android, Web service*

INTRODUCTION

This project focuses mainly on developing android applications for the IoT (Internet of Things) devices. (IoT is the internetworking of physical devices which is embedded with electronics, software, sensors etc. that enables these objects to collect and exchange data.)In this project, I use Thingworx platform to send and receive data from the Heat Pump. The heat pump contains the sensors from which the data are sent and received through HTTPS in time period.Thingworx is the complete development of IoT platform mainly designed as cloud (Server) to store data from the embedded system which obviously uses sensors for exchanging data. So in my app, I have to get the "thing" (A thing is the collection of properties, service and events.) and show its properties and working in android OS, so the person working in the company will easily check over the machines.

The Heat Pump will be present in the remote location and will be inside a turbine which can't be seen from outside. It has sensors present in it as I mentioned above. The sensors will send the data to the Thingworx server in an encrypted form and HTTPS format. So the data will be stored in those servers and the data can be processed and analyzed. The data

then made to be displayed in the android platform as a working app. This is the main theme of the project.

RELATED WORK

There are many existing system which use thingworx platform for connecting the embedded devices and which can run as an android app. But most of the software doesn't connect with android mainly industrial equipment which has several process and very tough to execute by using a simple mobile device. The software will be run in the web browser of the company (Service based company). If there are any changes/problem/issues in the working condition of the device, the service will be made from the company like through Phone calls or through e-mail. They'll inform the person working there with the heat pump. The person will be informed and the device will be managed according to the situation.Before using the sensor, the temperature will be checked using thermometer which will have percentage error around 5%. Using the sensor will be quite accurate. It won't have any types of errors.

DRAWBACKS OF THE EXISTING SYSTEM

1. The data will be run in the desktop or in the browser, and the data will be processed or analyzed only by the technician or experienced person.
2. There are many applications to connect the IoT devices but there are no application for connecting industrial equipments with this method as it is highly efficient.

PROPOSED WORK

There are five remote things (Heat Pumps) present in the industry. These five devices have to be connected in the android application. So the connection usually starts from the sensor in the device which sends the data lively. The data which is to be sent from the sensor will be encrypted with HTTPS. The encrypted data will be sent to the thingworx server i.e. sent to the cloud. This data will be raw, so have to extract the required parameters. This process will be done in the web service, converting the parameters (data) into JSON format. The JSON data will be sent to the android device. In the android platform, required parameters will be filtered and the data are shown. JSON is the easier way for getting data from the server to the android application. The main aim is to check the working condition of the device lively and will succeed through this method. The diagram explains the overall architecture of the devices which is connected to the android application.

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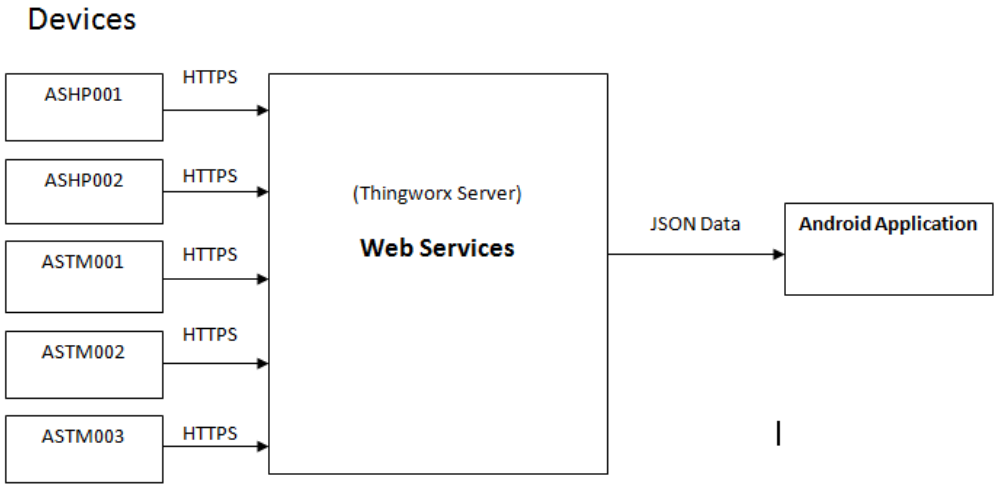

Fig. Overall Architecture of the Devices Connected to the Android Application

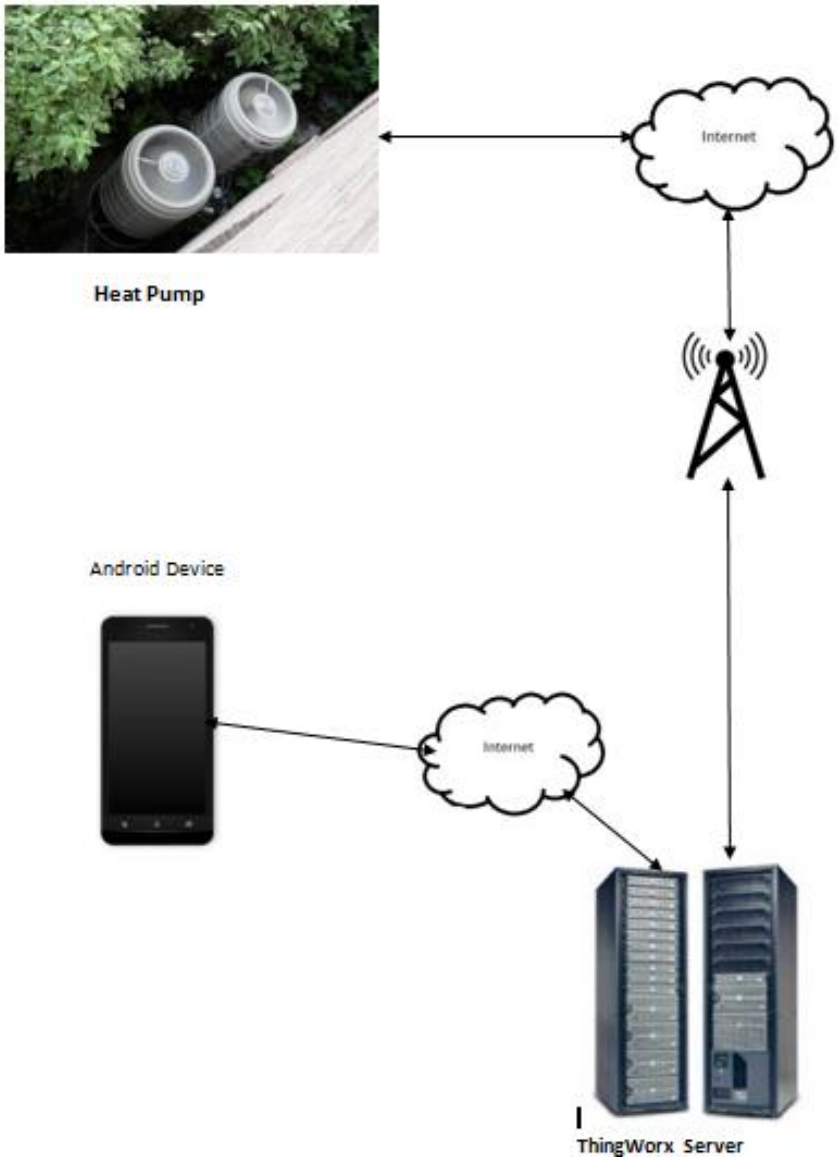

Fig. Overall Architecture Diagram of Heat Pump

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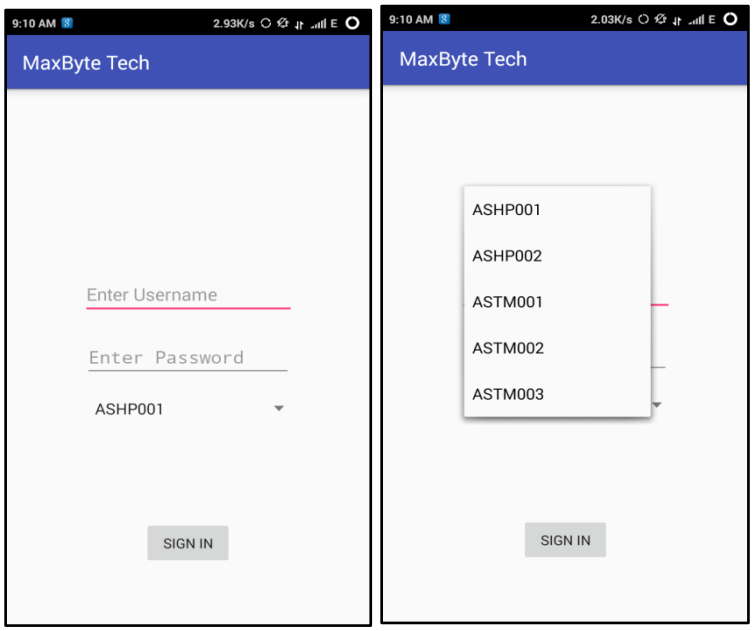
Pseudo Code:

Sensor Activity:

```
public class sensoractivity(){
Private void
setsensorvalue(){e.setText(sensorDetails.get("JSONParameter").toString()+(char)0x00B0+"C
");c.setText(sensorDetails.get("JSONParameter").toString()+(char)0x00B0+"C");
a=String.format("%.2f",Double.valueOf(sensorDetails.get("JSONParameter").toString()));
 String n=
String.format("%.2f",Double.valueOf(sensorDetails.get("JSONParameter").toString()));
  String m = String.format("%.2f",
Double.valueOf(sensorDetails.get("JSONParameter").toString()));
txt1.setText(JSONParameter+" kWh");
txt2.setText(JSONParameter+" kWh");
txt3.setText(JSONParameter+" kWh");
@override
Protected void Execute(JSONObject object){
//set sensor details
}}}
```

RESULT

Login Activity: List of Devices:



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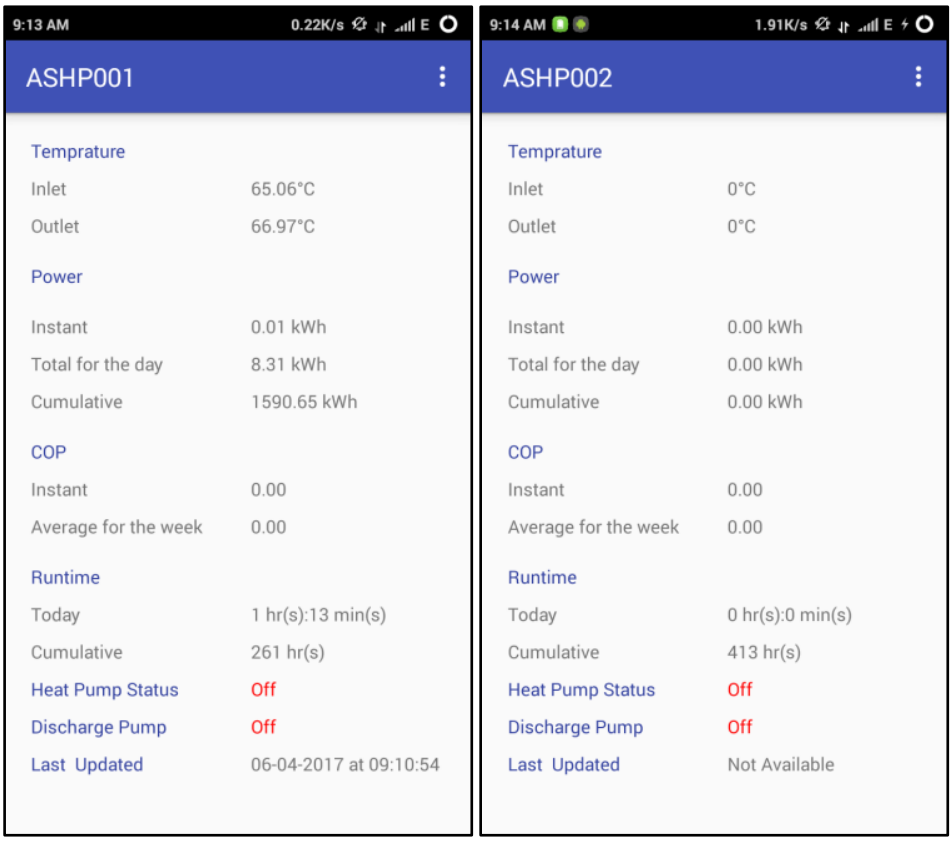
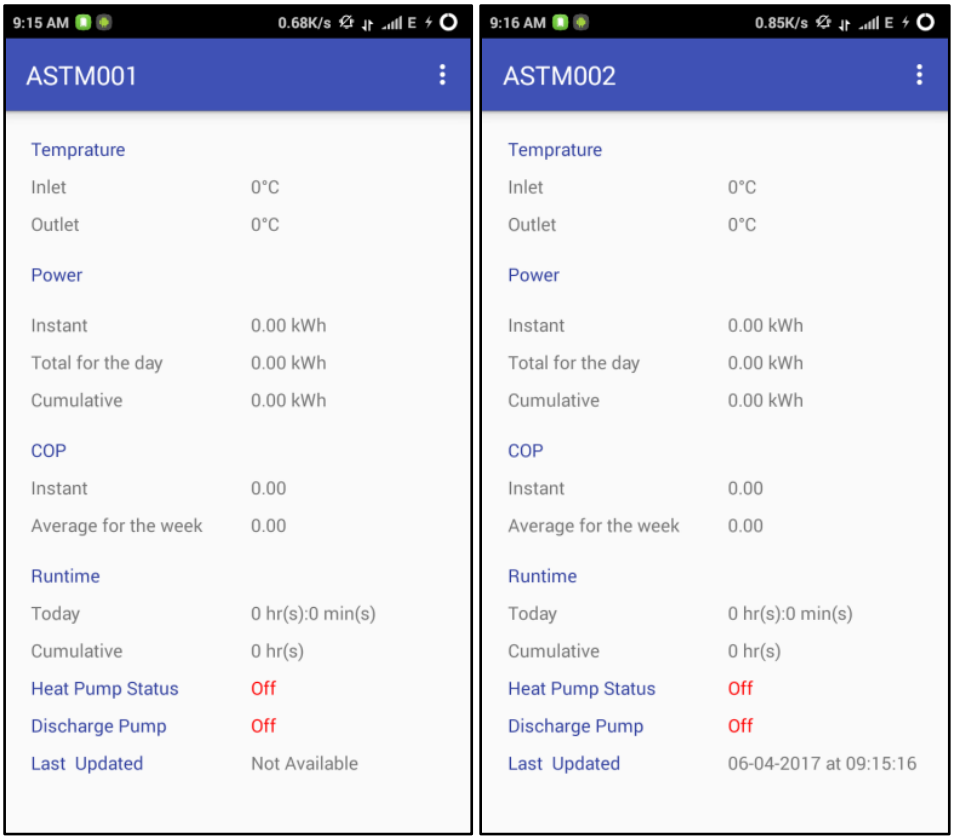
Device 1-ASHP001 Device-2 ASHP002



Device-3 ASTM001Device-4 ASTM002



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Device-3 ASTM003

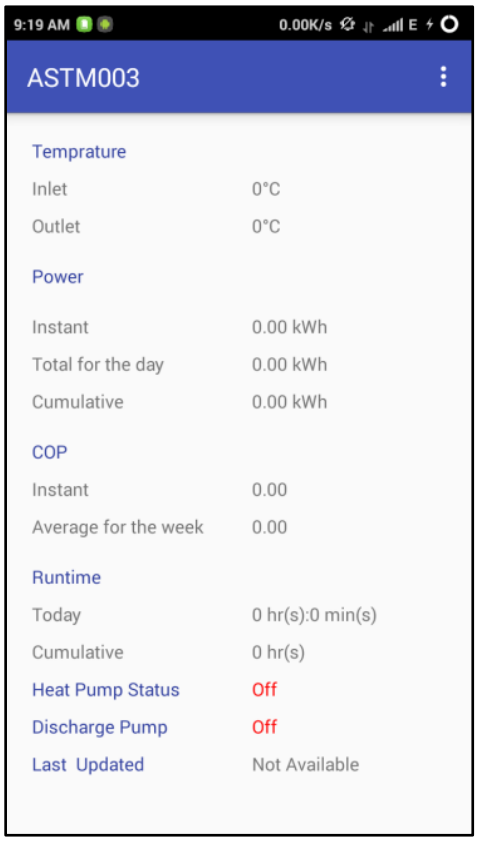

Table 1. Temperature from the Heat Pump Sensor

S. No.	Time (mins)	Temperature (^{0}C)
1	T1	46.5
2	T2	50
3	T3	55
4	T4	59
5	T5	65
6	T6	69
7	T7	74
8	T8	80
9	T9	83
10	T10	84
11	T11	85
12	T12	85.5
13	T13	85
14	T14	84
15	T15	85

To find the average(f_x) for the temperature according to the time period.

$f_x = \sum(x) / N = 72.67°C$

$\sum$ represents the summation

X represents the sum of the temperature.

N represents the total number of temperature.

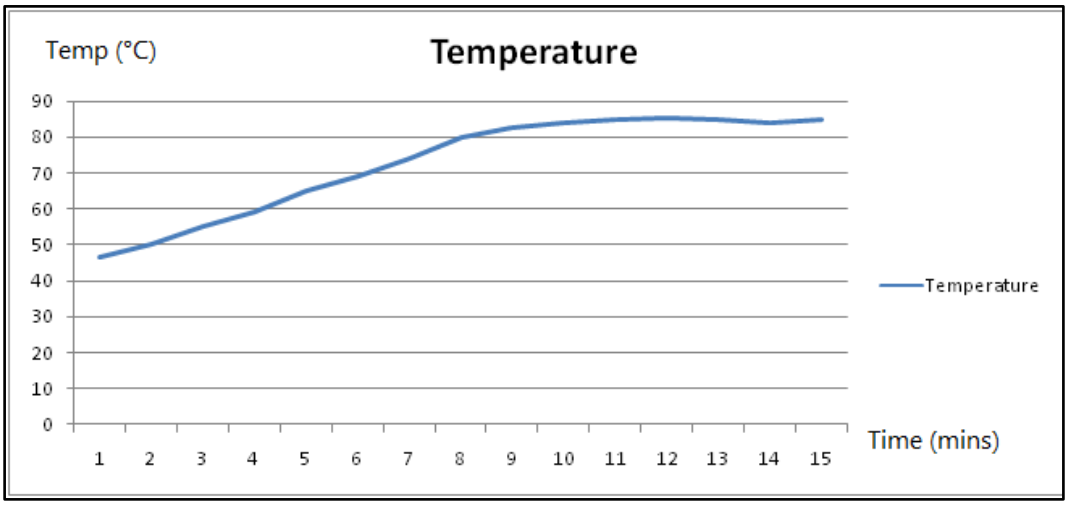

Fig. Graph for the Temperature from the Heat Pump Sensor

CONCLUSION

The app will be used by the person who works in the industry and who does not have the proper knowledge of handling data. So it's easy to view the working condition of the heat pump which is present inside the turbine. So if there is any issue on the device, it can be easily verified by the industrial worker. And it also saves the time of service team as they need not have to track the device condition and inform to the industrial people about the device. The app is just enough for noting the overall working condition of the heat pump. . The heat pump produces temperature around 80 – 85 degree Celsius.

FUTURE WORK

The app can be further developed by increasing the number of process done by the sensor. It can be designed to control the whole device from the app. Like, for example: If we switch-on the heat pump from the app, the heat pump will be switched-on and starts working in the industry and vice versa. So with the addition of parameters in the thingworx, and the process to be added in the sensors, then we can change it in app too. So there is more future scope in the IoT field and mainly to bring the device working on the mobile app. IoT is the trending technologies. And to control from the mobile app, it is totally useful.

REFERENCES

1. Joo,D.Y and Kim, J.K : Creative and Active Convergence Model of IoT, Korea Institute for Industrial Economics and Trade, Korea(2014).

2. Bagula.A., Castelli.L and Zennaro.M : An Optimal sensor placement model, Sensor,(2015), Vol 15, No.7, pp 15443 – 15467
3. DiptiJavale, Bharthi Dixit, Pankaj Javale "Performance Evaluation of Wireless Transmission using Embedded System" IEEE paper, November 26,2009.
4. Flavia C.Delicato, Paulo.F. Pires,LuciPermez, Thais Batista "Wireless Sensor Network as a Sevice", 2010 17th IEEE International Conference and Workshop on Engineering of Computer- Based System.
5. Feng.X and Laurence, T.Y.. 2012. Internet of Things(2014), retrieved from Microsoft[ONLINE]
6. ThingWorx Java SDK Developer's guide.
7. ThingWorx Android SDK Developer's guide.
8. developer.android.com
9. www.linda.com