Getting Started with Restful

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Agenda

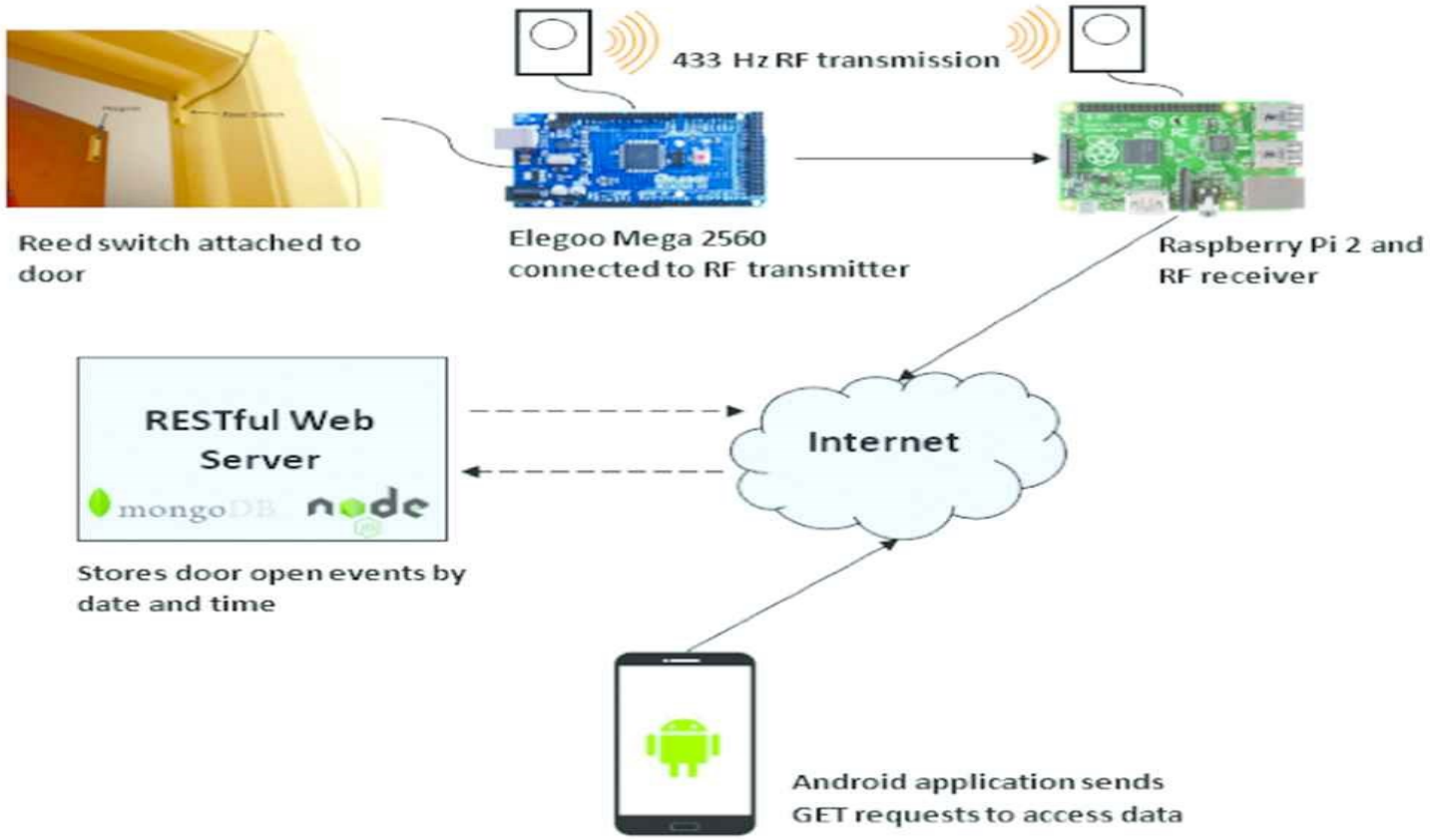
- Restful Review
- Software Preparation
- Example Code

Bagian I

Restful Overview

MQTT

Representational State Transfer (REST) is another popular IoT communication protocol, similar to MQTT. But unlike MQTT, REST is web-based. So, you can just use a web browser to view the messages, with no extra software needed.



Bagian II

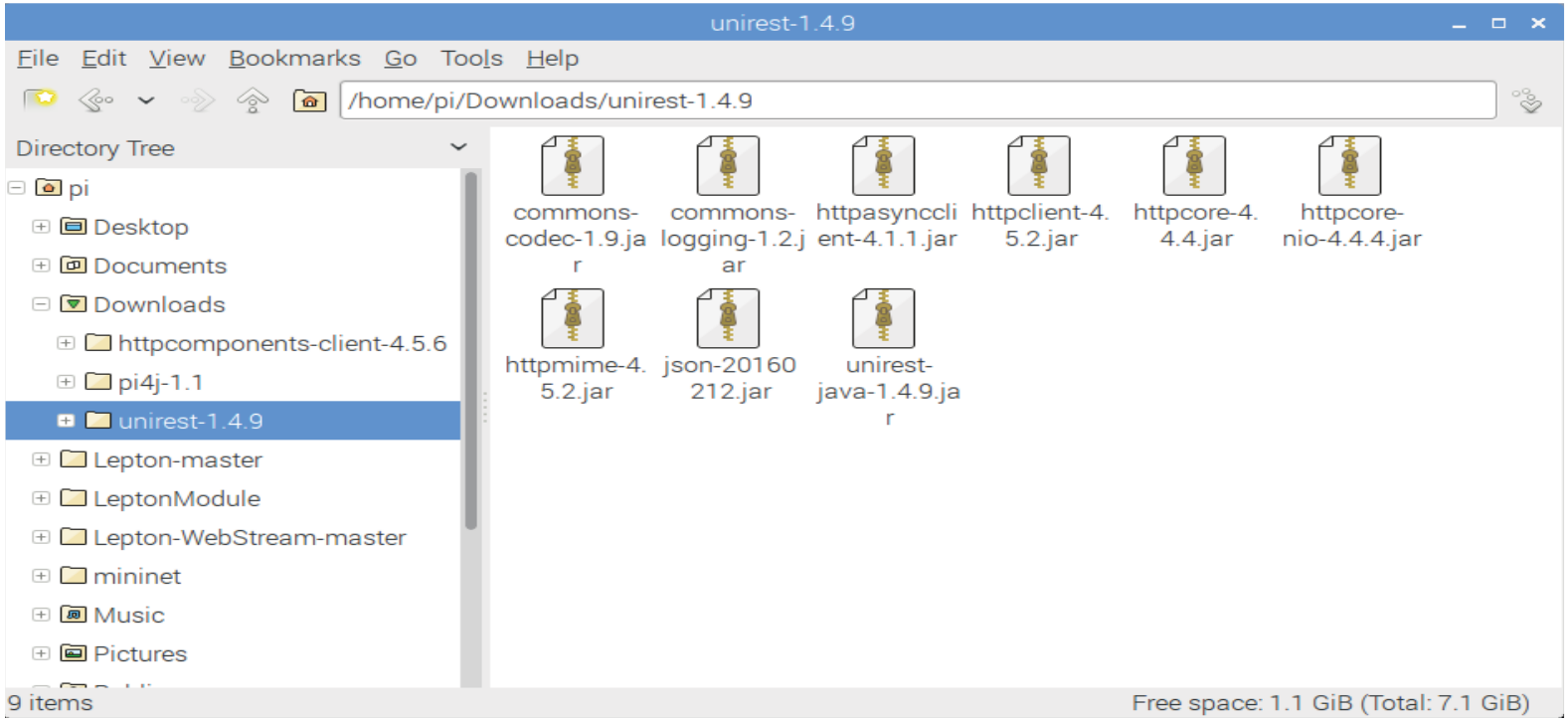
Software Preparation

Downloading Softwares

- In this example, you'll see how to create a Java REST program on the Raspberry Pi.
  - It will send messages to a REST server, Thingspeak, and use a web browser to view the messages on a computer.
- To do this example, you will need to do two things.
  - Download the Unirest Java library from http://unirest.io/java.html.
  - Register on the Thingspeak web site at https://thingspeak.com/.
- For the Unirest Java library, there are many ways of downloading and using it.
  - downloading the Unirest Java JAR 1.4.9 file with all dependencies as a zipped file called jar_files.zip from the following link: https://jar-download.com/artifacts/com.mashape.unirest/unirest-java/1.4.9/source-code

Downloading Software

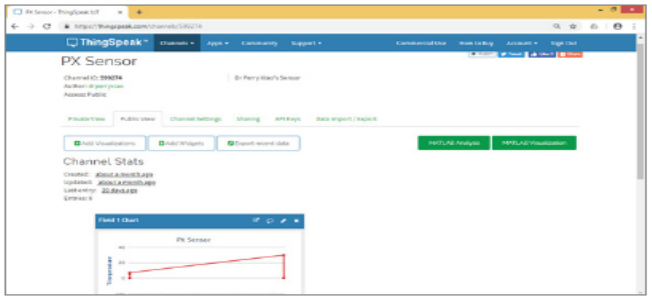
- Then just unzip the jar_files.zip file to a folder, for example, /home/pi/Downloads/unirest-1.4.9/.
  - It should contain the Unirest unirest-java-1.4.9.jar file and eight other JAR files; see Figure 7.24.

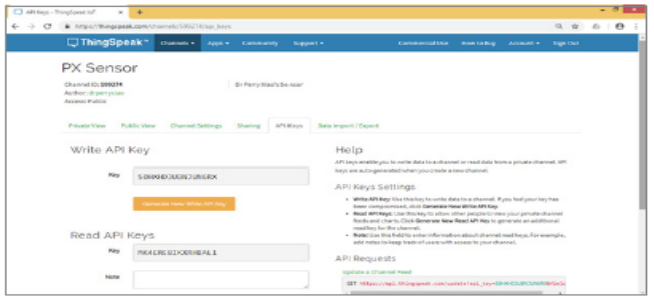


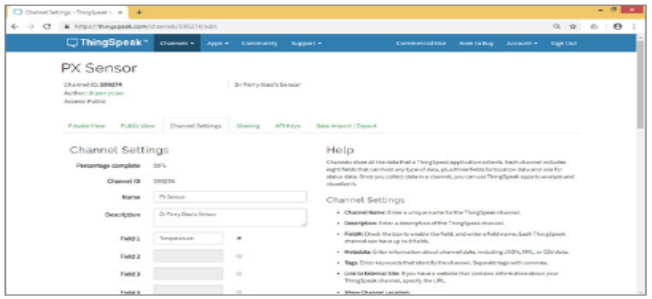
Restfull Server

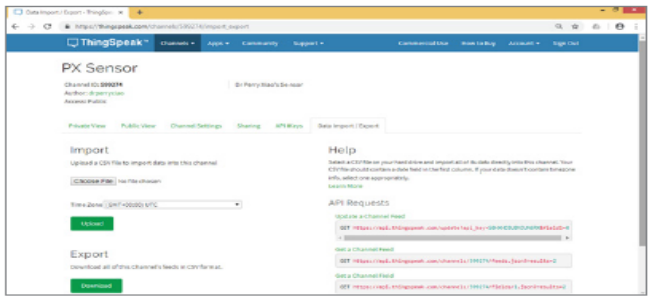
For the REST server, you will use Thingspeak (https://thingspeak.com/), which is an open IoT platform with MATLAB analytics.

- You will need to sign up first, if you do not have an account already. After signing up, you will be able to log in and create a channel. In this case, a channel called PX Sensor with channel ID 599274, is created









Bagian III

Example Code

Code Description

This Example shows a Java demonstration of how to send dumb temperature sensor data using the REST protocol to the `Thinkspeak` REST server web site. `Thinkspeak` web application will show:

- The Private View tab and Public View tab show how the web page looks for private and public users, respectively.
- The Channel Settings tab shows the channel statistics and the fields.
- There can be many fields for many sensor values. Here, only one field is used, Field 1, named Temperature.
- The API Keys tab shows the security keys used for writing to and reading from the Thingspeak REST server.
- The Data Import/Export tab shows how to update and retrieve data from the REST server using API requests.

Example Code

```
//Example 7.13
import java.io.InputStream;
import com.mashape.unirest.http.*;
import com.mashape.unirest.http.async.Callback;
import com.mashape.unirest.http.exceptions.UnirestException;


public class RESTCall implements Callback<JsonNode>{

    public void sendDataOverRest(double temp) {

        Unirest.post("https://api.thingspeak.com/update.json")
          .header("accept", "application/json")
          .field("api_key", "S0HXHD3UBNJUN6RX")
          .field("field1",temp)
          .asJsonAsync(this);
    }

    @Override
    public void cancelled() {
                System.out.println("The request has been cancelled");
    }

    @Override
    public void completed(HttpResponse<JsonNode> response) {
          int code = response.getStatus();

             JsonNode body =response.getBody();
             InputStream rawBody = response.getRawBody();

                System.out.println(code);
                System.out.println(body);
                System.out.println(rawBody);
    }
```

```
    @Override
    public void failed(UnirestException arg0) {
        System.out.println("The request has failed");
    }

    public static void main(String[] args) throws InterruptedException {
     RESTCall http = new RESTCall();

     double temp=30.0;
     http.sendDataOverRest(temp);

    }
}
```

Enter the following lines to compile and execute the program, making sure to include the Unirest library JAR file with all dependencies directory `/home/pi/Downloads/unirest-1.4.9/` in the classpath.

$ javac -classpath ".:/home/pi/Downloads/unirest-1.4.9/*" RESTCall.java
$ sudo java -classpath ".:/home/pi/Downloads/unirest-1.4.9/*" RESTCall

Bagian IV

Other Resources

Java and Raspberry PI

- http://www.oracle.com/technetwork/articles/java/raspberrypi-1704896.html#Java%20
- http://www.oracle.com/technetwork/articles/java/cruz-gpio-2295970.html
- http://www.oracle.com/webfolder/technetwork/tutorials/obe/java/RaspberryPi_GPIO/RaspberryPi_GPIO.html
- https://iot.eclipse.org/java/tutorial/
- http://agilerule.blogspot.com/2016/06/java-raspberry-pi-pi4j-pir-motionsensor.html
- http://www.robo4j.io/2017/05/be-ready-and-prepare-raspberry-pi-for.html

Oracle Java ME Embedded

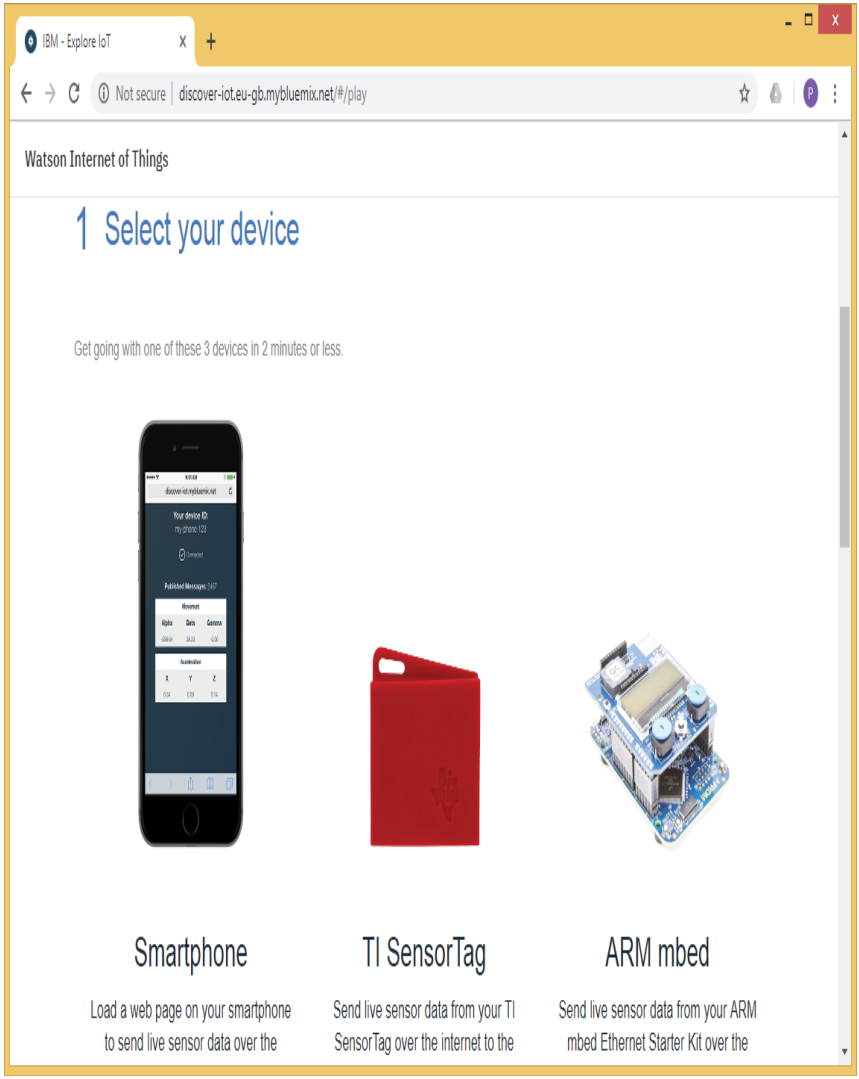
- https://www.oracle.com/technetwork/java/embedded/javame/embeddedclient/overview/meembeddedclientgetstarted-2177401.html
- https://docs.oracle.com/javame/8.1/get-started-freescale-k64/install.htm
- http://thomasweldon.com/tpw/courses/eegr6114/javambed/dspJavaMbed-Netbeans.html

Eclipse Open IoT Stack for Java

- The Eclipse Open IoT Stack for Java is a set of open source technologies that will make it easier for Java developers to build IoT solutions.
- The focus of the technology is to enable developers to connect and manage the devices, sensors, and actuators that are part of their IoT solution. The Open IoT Stack for Java includes support for a number of popular IoT standards, such as MQTT, CoAP, Lightweight M2M (LWM2M), and a set of services for building IoT Gateways.
- All the information is available at the Eclipse Open IoT Stack for Java web site (https://iot.eclipse.org/java/).
- Eclipse simplifies the development of IoT solutions with Open IoT Stack for Java. There are several interesting Eclipse tutorials, such as:
  - to build a smart greenhouse (https://iot.eclipse.org/java/tutorial/)
  - to build a smart home (https://www.eclipse.org/smarthome/getting-started.html).

IBM Watson IoT for Java

- IBM Watson IoT is another popular IoT platform (https://internetofthings. ibmcloud.com/#/).
  - See the IBM Watson IoT demonstration web site (http://discover-iot.eu-gb.mybluemix.net/#/play), where you can connect any of your embedded systems to the IBM IoT cloud and display the sensor readings there, without registration.
- There are several interesting web sites, such as the IBM Watson IoT Java client library web site (https://github.com/ibm-watson-iot/iot-java)
- The IBM Watson IoT recipes with Raspberry Pi (https://developer.ibm.com/recipes/tutorials/?s=Raspberry), as well as the IBM Watson IoT tutorial to use a Raspberry Pi camera and Watson Visual Recognition to determine whether an object of interest is in the image (https://developer.ibm.com/recipes/tutorials/use-a-raspberry-pi-camera-and-watson-visual-recognition-to-determineif-object-of-interest-is-in-the-image/).



Amazon IoT for Java

- Amazon Web Services (AWS) offers reliable, scalable, and inexpensive cloud computing services. It's free to join; you pay only for what you use. You can find all the documents on Amazon AWS SDK for Java web site (https://aws.amazon.com/sdk-for-java/).
- You can find the example programs available for the Amazon AWS IoT SDK for Java from its GitHub web site (https://github.com/o-can/aws-java-iot-example).
- For more information on the AWS IoT SDK for Java, see the following resources:
  - https://docs.aws.amazon.com/iot/latest/developerguide/iot-sdks.html#iotjava-sdk
  - https://aws.amazon.com/blogs/iot/introducing-aws-iot-device-sdksfor-java-and-python/

Microsoft Azure IoT for Java

- Microsoft Azure is an open, flexible, enterprise-grade cloud computing platform that provides infrastructure as a service (IaaS), platform as a service (PaaS), and software as a service (SaaS).

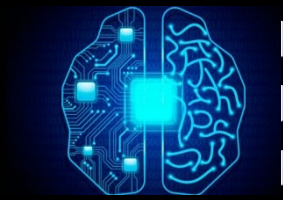
- It supports many different programming languages including Java. IaaS allows users to launch general-purpose Microsoft Windows and Linux virtual machines.
  - PaaS allows developers to easily publish and manage web sites.
  - SaaS allows users to connect to and use cloud-based software over the Internet, such as email, calendaring, and office tools (Microsoft Office 365).

- Microsoft Azure IoT services allow users—without writing code—to connect, monitor, and control IoT devices; to run analytics on real-time data streams; to store the IoT data; and to automate data access and use data across clouds.

- With Microsoft Azure Java SDK, you can develop Java applications to access Microsoft Azure Cloud Services such as Storage, Media Services, Queue Services, Service Bus Queues, and SQL Database. The best place to start with Java on Azure is its Java Developer Center (https://azure.microsoft.com/en-us/develop/java/), where you can get started with $200 credit and 12 months of popular services at no cost.

- In the Microsoft Azure Java documentation hub for Java developers (https://docs.microsoft.com/en-us/java/azure/), you can find a Get Started guide and more in-depth information. Microsoft Azure SDK for Java is open source software, so you can modify it or change it whatever way you like. You can get the full source code from its GitHub site (https://github.com/Azure/azure-sdkfor-java).

Terima Kasih



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