Logo, company name

Description automatically generated

Assignment 3

Requirements

Suppose that the clients have intelligent home appliances that can be controlled remotely using remote procedure call (RPC). Each such device can communicate with the server that will compute the time when the device will be started for an optimal energy consumption. Develop a client-side application (either a desktop application or a web application based on a JavaScript framework running from the browser) for the smart appliance associated to a client that:

1. gets the client hourly historical energy consumption over d days in the past (𝐸𝑐𝑙𝑖𝑒𝑛𝑡 𝑑 (ℎ));
2. gets the averaged energy consumption for the client over the past week (e.g. client baseline);

𝐵𝑎𝑠𝑒𝑙𝑖𝑛𝑒(ℎ) = 1 7∑𝐸𝑐𝑙𝑖𝑒𝑛𝑡 𝑑 (ℎ) 7 𝑑=1 ,∀ℎ ∈ {1. .24},

𝑤ℎ𝑒𝑟𝑒 𝐸𝑐𝑙𝑖𝑒𝑛𝑡 𝑑 (ℎ) 𝑖𝑠 𝑡ℎ𝑒 𝑐𝑙𝑖𝑒𝑛𝑡 𝑒𝑛𝑒𝑟𝑔𝑦 𝑐𝑜𝑛𝑠𝑢𝑚𝑝𝑡𝑖𝑜𝑛 𝑓𝑜𝑟 𝑑𝑎𝑦 𝑑 𝑖𝑛 𝑡ℎ𝑒 𝑝𝑎𝑠𝑡 𝑎𝑛𝑑 ℎ𝑜𝑢𝑟 ℎ 𝑓𝑟𝑜𝑚 𝑑𝑎𝑦 𝑑

1. allows the selection of a program with a duration in hours (select a duration D of a program);
2. gets the best time to be started considering the baseline and the program duration to avoid energy peaks from the client (e.g. to minimize the maximum energy consumption for every hour of the day)

𝐶𝑜𝑚𝑝𝑢𝑡𝑒 𝑡𝑠 ,𝑡𝑒 𝑠𝑢𝑐ℎ 𝑡ℎ𝑎𝑡 𝑀𝑖𝑛(𝑀𝑎𝑥(𝐵𝑎𝑠𝑒𝑙𝑖𝑛𝑒(ℎ) + 𝐸𝐷𝑒𝑣𝑖𝑐𝑒)),∀ℎ ∈ [𝑡𝑠 ,𝑡𝑒 ],𝑡𝑒 = 𝑡𝑠+D

Java Spring Boot

Java Spring Framework (Spring Framework) is a popular, open source, enterprise-level framework for creating standalone, production-grade applications that run on the Java Virtual Machine (JVM).

Java Spring Boot (Spring Boot) is a tool that makes developing web application and microservices with Spring Framework faster and easier through three core capabilities:

1. Autoconfiguration
2. An opinionated approach to configuration
3. The ability to create standalone applications

React

React. js/React is an open-source frontend framework that is based on JavaScript, developed by Facebook, and best known for its virtual DOM feature. React. js is an open-source JavaScript library that is used for building user interfaces specifically for single-page applications. It's used for handling the view layer for web and mobile apps. React also allows us to create reusable UI components.

DB designGraphical user interface

Description automatically generated with medium confidence

Table Client (defined by ID, name, birth date, address)

Table Device(defined by ID, description, address, maximum\_energy\_consumption, average\_energy\_consumption)

Table Sensor (defined by ID, description, max\_value)

Table Users(defined by ID, name, password, role)

Table Monitored(defined by ID, sensor\_id, measurement\_value, timestamp)

UML Deployment diagram

Diagram

Description automatically generated

Sensor Simulator -jar

java -jar jarPath sensor\_id

RPC

In [distributed computing](https://en.wikipedia.org/wiki/Distributed_computing), a **remote procedure call** (**RPC**) is when a computer program causes a procedure ([subroutine](https://en.wikipedia.org/wiki/Subroutine#:~:text=In_computer_programming,_a_subroutine,particular_task_should_be_performed.)) to execute in a different [address space](https://en.wikipedia.org/wiki/Address_space) (commonly on another computer on a shared network), which is coded as if it were a normal (local) procedure call, without the programmer explicitly coding the details for the remote interaction. That is, the programmer writes essentially the same code whether the subroutine is local to the executing program, or remote. This is a form of client–server interaction (caller is client, executor is server), typically implemented via a request–response message-passing system. In the object-oriented programming paradigm, RPCs are represented by [remote method invocation](https://en.wikipedia.org/wiki/Distributed_object_communication) (RMI).

Diagrama

Diagram

Description automatically generated

Webography

<https://www.ibm.com/cloud/learn/java-spring-boot>

<https://www.youtube.com/watch?v=VlklL6TPlpw&ab_channel=CodeStepByStep>

<https://www.youtube.com/watch?v=-W0-vN6mk78&ab_channel=KindsonTheTechPro>

<https://www.codegrepper.com/code-examples/java/java+repeat+function+every+minute>

<https://www.baeldung.com/java-csv-file-array>

<http://theblasfrompas.blogspot.com/2013/02/json-messages-with-rabbitmq.html>

<https://www.cloudamqp.com/docs/java.html>

<https://en.wikipedia.org/wiki/Remote_procedure_call>

<https://zetcode.com/java/jfreechart/>

<https://www.baeldung.com/spring-remoting-hessian-burlap>