



# **DISTRIBUTED SYSTEMS**

## **Assignment 1**

### **Request-Reply Communication Paradigm**

### **Online Energy Utility Platform**

Ioan Salomie  
Marcel Antal

Tudor Cioara  
Claudia Daniela Pop

Ionut Anghel  
Cristina Pop

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## 1. Requirements

The first module of the system consists of an online platform designed to manage clients, smart devices equipped with energy consumption sensors and monitored data from sensors. The system can be accessed by two types of users after a login process: administrator, and clients. The administrator can perform CRUD operations on client accounts (defined by ID, name, birth date, address) registered smart devices that have sensors attach to monitor energy consumption (defined by ID, description, address (location), maximum energy consumption, average/baseline energy consumption), smart sensors attached to devices (ID, sensor description, maximum value) and on the mapping of clients to devices (each client can own one or more devices that are monitored) and sensors to devices (each device has one sensor monitoring its energy consumption). Usually, the device is either a house equipped with a smart power meter or part of a house, case in which a client has several devices. Each device has one sensor monitoring its energy consumption. The sensor records periodically, at fixed timestamps, tuples of the form <timestamp, energy consumption>, where energy consumption is a counter measuring in kWh the total energy consumed by the device since it was started. Each client can view its devices, and their current and historical energy consumption, as well as the total energy consumption of their devices.

### 1.1. Functional requirements:

- Users log in. Users are redirected to the page corresponding to their role.
- Administrator/Manager Role:
  - CRUD operations on clients
  - CRUD operations on devices
  - CRUD operations on sensors
  - Create mapping client-device and associate sensors to devices.
- Client Role
  - A client can view on his/her page all the devices and sensors.
  - A client can view their monitored energy consumption (current data and historical data)
  - View historical energy consumption for each client as line charts or bar charts for one day (OX- hours; OY- energy value [kWh] for that hour). Select day from a calendar.
- The users corresponding to one role will not be able to enter the pages corresponding to other roles (e.g. by log-in and then copy-paste the admin URL to the browser)

### 1.2. Implementation technologies:

- Use the following technologies: REST services for backend application (Java Spring REST or .NET Web API) and JavaScript-based frameworks for client application (Angular or ReactJS).

### 1.3. Non-functional requirements:

- Security: use authentication in order to restrict users to access the administrator pages (cookies, session, etc.)

## 2. Deliverables

- A solution description document (about 4 pages, Times New Roman, 10pt, Single Spacing) containing:
  - a) Conceptual architecture of the distributed system.
  - b) DB design.
  - c) UML Deployment diagram.
  - d) Readme file containing build and execution considerations.
- Source files. The source files and the database dump will be uploaded on the personal gitlab account created at the Lab resources laboratory work, following the steps:
  - Create a repository on gitlab with the exact name:  
*DS2021\_Group\_LastName\_FirstName\_Assignment\_Number*
  - Push the source code and the documentation (push the code not an archive with the code or war files)
  - Share the repository with the user *utcn\_dsrl*

## 3. Evaluation

### 3.1. Assignment Related Basic Questions:

During project evaluation and grading you will be asked details about the following topics:

- URI and URL
- Web Clients and Web Servers
- HTTP protocol
- HTTP methods
- HTML web forms
- Query strings
- Hidden variables
- Cookies
- Session
- Java Servlet
- Object-Relational Mapping (ORM)
- REST Services

### 3.2. Grading

The assignment will be graded as follows:

Points	Requirements
5 p	<b>Minimum to pass</b> <ul style="list-style-type: none"> <li>• REST Services and Frontend for CRUD operations for Administrator Role</li> <li>• Database</li> <li>• Documentation</li> <li>• Correct answers to 3.1 questions</li> </ul>
1 p	Log-in with redirect (administrator/client)
1 p	Administrator associates devices to clients and

	sensors to devices
2 p	<p>Full implementation of client role – client can view their total energy consumption for all their devices, both historical and current data (only if the administrator is able to configure devices and sensors)</p> <p>Client can view a chart showing their daily energy consumption (OX – displays time in hours, OY – energy consumption for time interval)</p>
1p	Minimum Security: The users will not be able to enter other users pages (filters according to role and sessions)

#### 4. Bibliography

1. [http://www.coned.utcluj.ro/~salomie/DS\\_Lic/](http://www.coned.utcluj.ro/~salomie/DS_Lic/)
2. Lab Book: M. Antal, C. Pop, D. Moldovan, T. Petrican, C. Stan, I. Salomie, T. Cioara, I. Anghel, Distributed Systems – Laboratory Guide, Editura UTPRESS Cluj-Napoca, 2018 ISBN 978-606-737-329-5, 2018,  
<https://biblioteca.utcluj.ro/files/carti-online-cu-coperta/329-5.pdf>
3. Lab Book: I. Salomie, T. Cioara, I. Anghel, T. Salomie, *Distributed Computing and Systems: A practical approach*, Albastra, Publish House, 2008, ISBN 978-973-650-234-7
4. Hibernate:
  - a. <http://www.tutorialspoint.com/hibernate/>
  - b. <http://www.javatpoint.com/hibernate-tutorial>
  - c. <http://www.javacodegeeks.com/2015/03/hibernate-tutorial.html>
  - d. <http://www.mkyong.com/tutorials/hibernate-tutorials/>
5. Maven: <https://maven.apache.org/>

#### Further reading:

- JSF and JSP vs Servlets
  - <http://www.tutorialspoint.com/jsp/>
  - <http://www.tutorialspoint.com/jsf/>
- Servlets:
  - <http://docs.oracle.com/javaee/6/tutorial/doc/bnafd.html>
  - <http://www.tutorialspoint.com/servlets/>
- HTML web forms – Servlets interaction: <http://www.tutorialspoint.com/servlets/servlets-form-data.htm>