DISTRIBUTED SYSTEMS

Assignment 1

Request-Reply Communication

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2024-2025

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**Request-Reply
Communication Paradigm**

1. Requirements

Develop an Energy Management System that consists of a frontend and two microservices designed to manage users and their associated smart energy metering devices. The system can be accessed by two types of users after a login process: administrator (manager), and clients. The administrator can perform CRUD (Create-Read-Update-Delete) operations on user accounts (defined by ID, name, role: admin/client), smart energy metering devices (defined by ID, description, address, maximum hourly energy consumption), and on the mapping of users to devices (each user can own one or more smart devices in different locations).

1.1. Functional requirements:

➢ Users log in. Users are redirected to the page corresponding to their role.
➢ Administrator/Manager Role:
  o CRUD operations on users
  o CRUD operations on devices
  o Create mapping user-device.
➢ User/Client Role
  o A client can view on his/her page all the devices.
➢ The users corresponding to one role will not be able to access the pages corresponding to other roles (e.g., by log-in and then copy-paste the admin URL in the browser)

1.2. Implementation technologies:

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

1.3. Non-functional requirements:

➢ Microservices:
  o User Management Microservice
  o Device Management Microservice
➢ Security: use authentication 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) UML Deployment diagram.
  c) 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:

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- o Create a repository on *gitlab* with the exact name:
  DS2024_Group_LastName_FirstName_Assignment_Number
- o Push the source code and the documentation (push the code not an archive with the code or war files)
- o 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	**Minimum to pass:** • Two REST Microservices (one for User Management and one for Device Management) and Frontend for CRUD operations for Administrator Role • Database • Documentation • Correct answers to 3.1 questions
1 p	Log-in with redirect (administrator/client)
2 p	Devices to users' associations carried out by administrator (implement a synchronization mechanism between the two microservice databases so that user related changes are propagated to the device database)
1 p	Client role: view list of devices
1p	Minimum Security: The users will not be able to enter other users' pages (filters according to role and sessions)

4. Bibliography

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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. https://www.baeldung.com/learn-jpa-hibernate