2EL5020 – Introduction to multi-tier application development and web services

Instructors: Michel Ianotto
Department: CAMPUS DE METZ
Language of instruction: ANGLAIS
Campus: CAMPUS DE METZ
Workload (HEE): 60
On-site hours (HPE): 35,00
Elective Category : Fundamental Sciences
Advanced level : Yes

Description

More and more applications are built as a composition of services. The objective of this course is to present the underlying architectures and to introduce students to the development of solutions exploiting, creating and deploying services.

Enterprise applications access local or remote data, apply business logic to them, and then present or transmit the results. To ease their design, implementation and operation, they can be decomposed into layers and components. The Java Enterprise Edition (JEE) platform is designed to enable the development of these applications and their integration into existing information systems. The course will present the principles of the 3-tier architecture, with an implementation exploiting the main components of the JEE platform. The application will then be deployed in the cloud.

The application may require access to online data. Web pages are important data sources but they are designed for human interaction. A tedious process ("web scraping") needs be set up on a case-by-case basis so that a machine (a program) can recover the data exposed by web pages. Fortunately, many players such as Amazon or eBay for example offer another interface to access data, focused on resources or processes and not on graphical presentation. These "web services" simplify the data collection phase and allow their consumers to focus on their core business. This course will present how to discover a service, how to invoke it, and possibly how to build a composition of several services. It may also be relevant to open the developed application to partners (customers, suppliers ...). The course will present how to offer them such a service: how to design a service, develop and deploy it, describe it and make it discoverable.

Quarter **number**
SG8

Prerequisites (in terms of CS courses)

1CC1000 – Information Systems and Programming

Syllabus
Java programming basics

Introduction

- N-tier architectures
- Application servers
- The MVC model

Data persistence in Java

- DBMS
- The JPA specification
- Object-relational mapping (ORM)

Business layer implementation

- Enterprise Java Beans containers(EJB)
- Presentation layer implementation
- JSPs and Servlets

Presentation of treatment-oriented services

- Architectural principles
- Introduction to XML
- SOAP protocol overview
- WSDL description language
- Practice: definition of a service contract, development of a server, publication of the interface to the client as a development kit

Presentation of resource-oriented services

- REST architectural style
- Introduction to JSON and OpenAPI
- Practice: development of a client application requesting online services, development, test and deployment of a service

Class components (lecture, labs, etc.)

The approximate distribution of "student presence hours" will be as follows: 24h of lectures and 9h of tutorial sessions in the computer room. The structure "16 lectures + 6 labs" is administrative because the course is actually mostly composed of "learning by doing" sessions led by teachers.

Grading

Students' knowledge and skills will be evaluated regularly by short individual written tests during lessons and on the basis of a small project carried out in pairs and presented at the end of the course. Score weights: individual tests : 50%, project completion: 30%, presentation of the project: 20%. The catch-up exam will be in the form of oral exam with exercices partly done on computer. In case of a justified absence to one of the intermediary examinations, the grade of this latter is replaced by the grade of the final examination.

Course support, bibliography

- *Java EE : Développez des applications web en Java.* Thierry Richard. ENI. 2017
- *Web Services Foundations.* Athman Bouguettaya, Quan Z Sheng. Springer. 2014

Resources

Teaching staff: Virginie Galtier, Michel Ianotto, Patrick Mercier
Tutorial class: 24 students
Lab sessions: computer rooms of Metz campus, 24 students /room
Software tools: free and open source software

Learning outcomes covered on the course

At the end of this course, students should be able to:

- use an integrated development environment (IDE) to develop an application
- create an application in Java language implementing object-oriented programming concepts
- compose programs in Java using some annotations
- design and implement a business application with the JEE platform
- choose a service development strategy and implement it

- manipulate XML and JSON structured data
- develop a program requesting one or more services
- deploy a business application in the cloud

Description of the skills acquired at the end of the course

C1 : Analyze, design, and build complex systems with scientific, technological, human, and economic components

C2 : Develop in-depth skills in an engineering field and a family of professions

C6 : Be operational, responsible, and innovative in the digital world