CSC7321 Middleware and software architecture for distributed applications

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Presentation of CSC7321

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Administrative Information

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- TU teachers:
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- TU resources:

- Remote conditions
  - The classes will be accessible remotely via BigBlueButton
  - Software should be installed in your own computer
Objectives of this teaching unit

- Be aware of different software techniques for designing distributed applications
  - Name and describe the main interaction patterns (synchronous request, publish/subscribe) between distributed software components
  - Learn master technologies for producing enterprise distributed applications: Web Services (REST), JavaEE, RabbitMQ
  - Design the architecture of a multi-component distributed application made of several functional modules with computing components, persistent components, client components.
  - Learn responses to architectural concerns (scalability, interoperability, security)
- Design and implement one distributed applications through one micro-project
Prerequisites for this Teaching Unit

- Labs on Unix OS
- Object oriented programming and modeling (with UML diagrams)
- Implementation in the Java language
- Integrated development environment such as Eclipse IDE
- Relational databases
Organisation of this teaching unit I

- Middleware for synchronous requests (illustrated with REST Web Services)

- Introduction to software architecture and quality attributes (scalability, interoperability, security)
Component-based middleware with JavaEE (persistent components)
Plan of this TU

Organisation of this teaching unit III

- Publish subscribe pattern and Distributed Event Based Systems (illustrated with AMQP RabbitMQ)
Plan of this TU

Big Picture

Structural Compositions

Activity Orchestrations

Application servers
- Life cycle (instantiate)
- Persistency

JavaEE

Publish/Subscribe

WebServices/JavaRMI
Synchronous Call

sockets
TCP/UDP

BPEL
SCA

RabbitMQ
Evaluation

- Study and presentation of an article (3/10)
  - Slides and oral presentation

- Labs and intermediary deliverables (1/10)

- Micro Project (6/10)
  - Design and architectural choices
  - Implementation in java
  - Slides and final defense
Subject: realize a bike tourism application (for olympics 2024)

- Administrators define bike tours (e.g. From Musée Grévin to Les Catacombes)
- Group of tourists select a tour among available ones
- Group of tourists exchange and visualize their positions
- The system verify bike availabilities all around the tour
Use Case Diagram — management of tours and POIs

A travel agency that acts as an operator of the system can prepare some tours, etc. on behalf of future clients.
Use Case Diagram — management of group of participants

Tourist

create a group and join it

join a group

leave a group

remove a group

The creation of group is performed by one participant, he becomes the first member to join the group.

The action is performed automatically in these cases:
- after a timeout (e.g. 1h) with no action from the participants
- all participants arrived to the last POI
- all the participants have leaved the group

high priority use case are in green

VLibTour
Use Case Diagram — management of locations

VLibTour

- subscribe to location information
- remove subscription to location information
- publish location
- notify the location of a participant

Tourist

- To receive the location of the other participants, the actor agree to give their location periodically

high priority use case are in green
Use Case Diagram — management of visits

- VLibTour
  - get current position
  - get the position of the next POI
  - search for the arrival bike station
  - step to the next position in current path towards the next POI
  - step to next POI in current visit

- Tourist
  - high priority use case are in green
Use Case Diagram — statistics of visits

VLibTour

get the total number of groups on a period

get the average group size

get the number of visits

get the most popular tour
These two components are co-located if they use the same RabbitMQ broker. If so, the lobby room system creates the group communication systems on demand (one per group).
Micro Project modalities

- **Important dates**
  - Subject of the project: today
  - Implement parts of the microproject during the labs
  - Project defense: Exam week (mid November)

- **Results**
  - Original implementation
  - Report (6-10 pages)
  - Defense: slides and demo (1/2 hour)
Questions