AOT Lab
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A Multi-Agent System to Support Remote Software Development

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Overview

- The RAP system
  - Architecture
  - Case Study
  - Documents and profiles management
  - Implementation
- Related and future works

Motivation

- Finding relevant information is a longstanding problem
  - Conventional approaches partially address the problem
  - Often the most valuable information is not widely available
    - finding the “expert”
    - avoiding
      - “banal” questions
      - asking different times the same questions

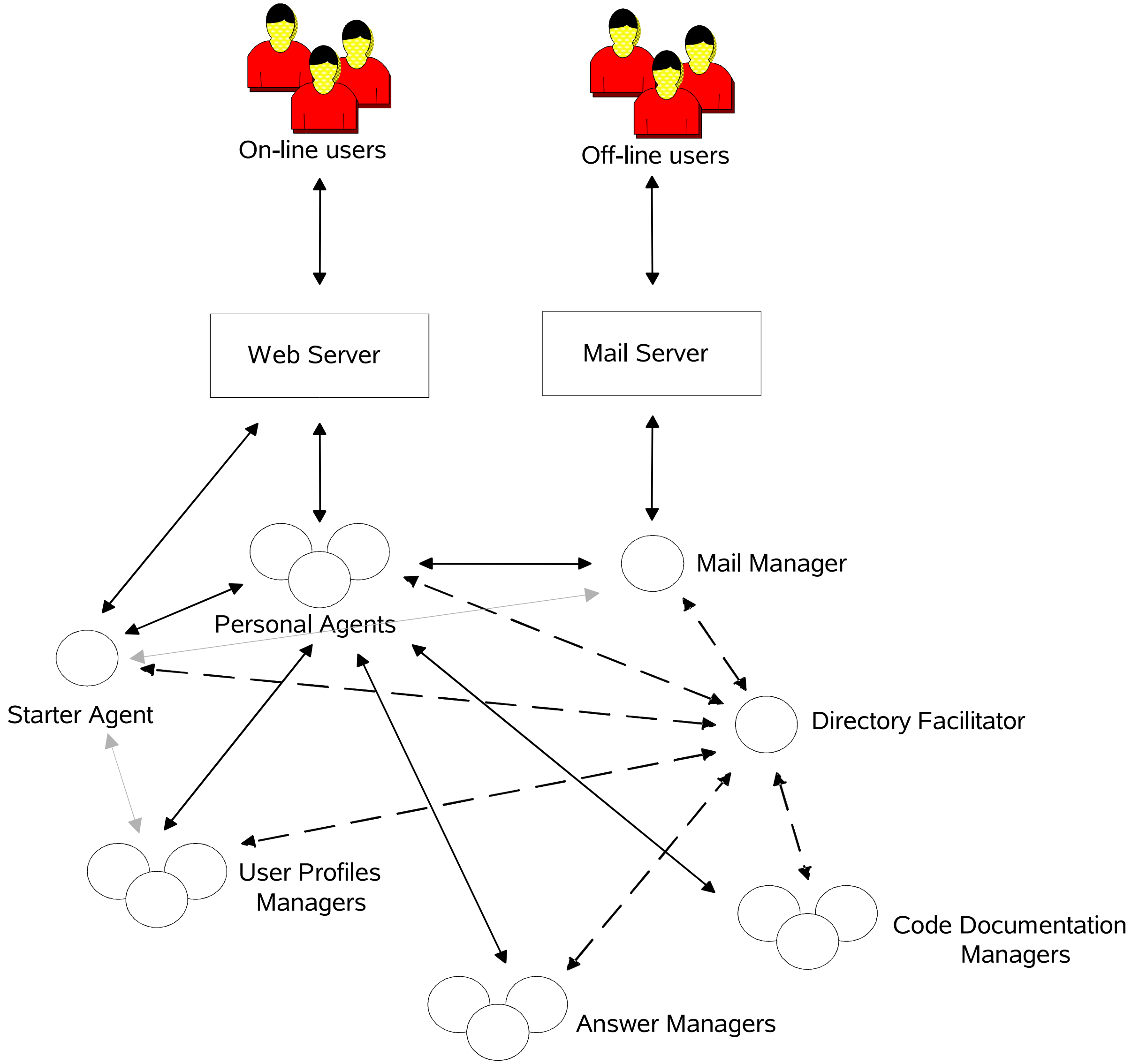
RAP System

- A multi-agent system that integrates information and expert searching facilities
  - First prototype: specialized for communities of remote students and researchers working on related projects, using the Java programming language
- Supports users by recommending:
  - Documents (javadocs, tutorials, code fragments)
  - Expert answers
  - On-line or off-line experts

RAP: Architecture

- The system is based on seven different kinds of agents:
  - Personal Agents
  - Code Documentation Managers
  - Answer Managers
  - User Profile Managers
  - Email Managers
  - Starter Agents
  - Directory Facilitators

Architecture



Submitting a Query

- The user submits a query through a web interface

- The query is composed of two parts:
  - ***Annotation***: list of
    - Keywords from the system glossary
    - Package and/or class names from Java/JADE API
  - ***Content***: textual description

- The user can select the types of answers she/he would like to receive

Case Study

- Scenario:

A user asks information to hers/his own PA in order to solve a problem.

The PA finds one (or more) “pieces of information” that may help her/him.

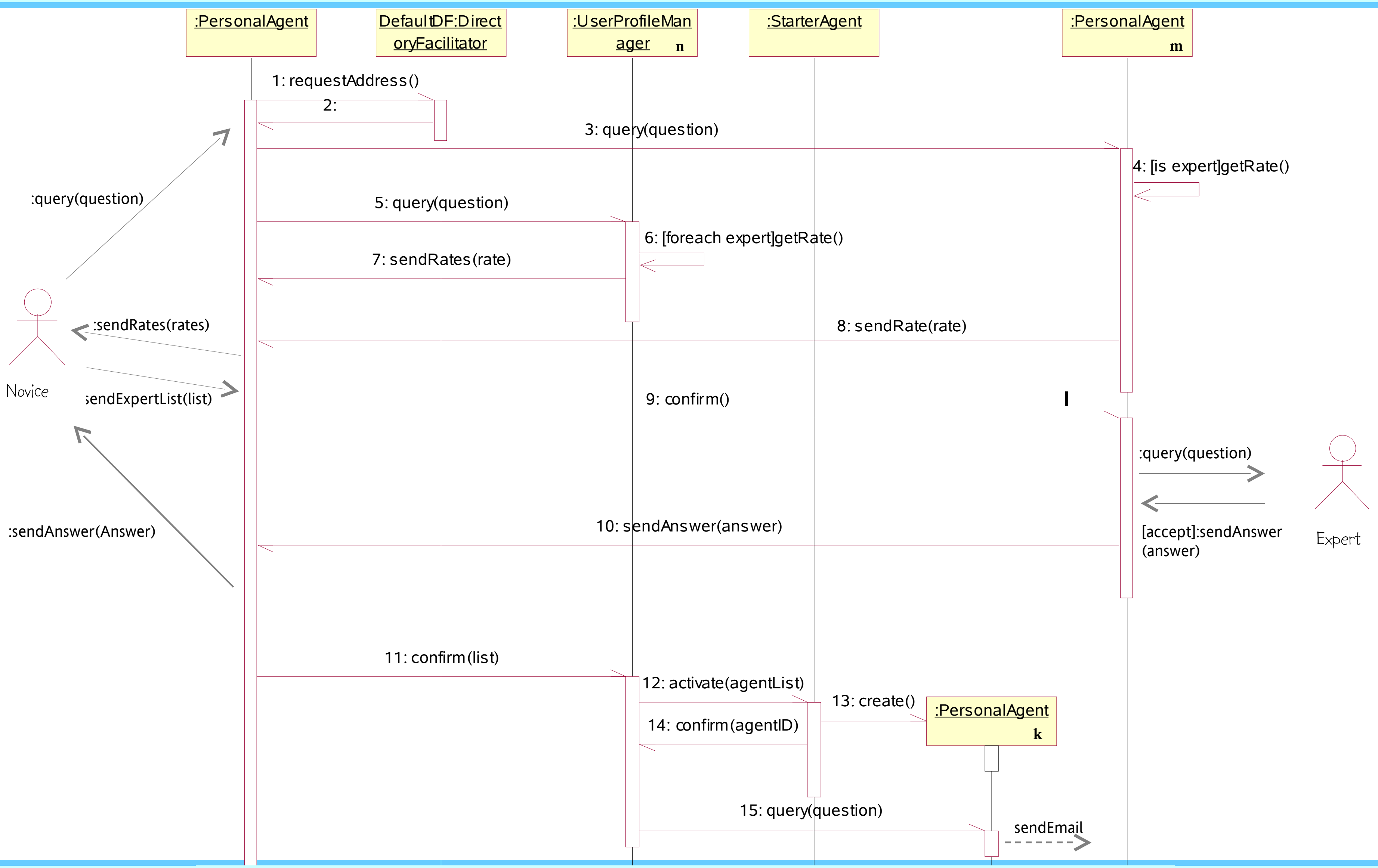
- Related issues:
  - Submit a query
  - Find answers
  - Rate answers

Finding Answers

- Documentation/answer repositories
  - PA asks DF for all the code documentation/answer managers
  - PA forwards the query to all the manager agents
    - They send back code fragments/answers related to the query, with an assigned score

- Users with the appropriate expertise
  - Find experts
  - Receive expert rating
  - Select experts
  - Receive answers

Novice – Experts Interaction



:PersonalAgent

DefaultDF:DirectoryFacilitator

:UserProfileManager n

:StarterAgent

:PersonalAgent m

1: requestAddress()

2:

3: query(question)

4: [is expert]getRate()

:query(question)

5: query(question)

6: [foreach expert]getRate()

7: sendRates(rate)

:sendRates(rates)

8: sendRate(rate)

Novice

sendExpertList(list)

9: confirm()

:query(question)

Expert

:sendAnswer(Answer)

10: sendAnswer(answer)

[accept]:sendAnswer (answer)

11: confirm(list)

12: activate(agentList)

13: create()

:PersonalAgent k

14: confirm(agentID)

15: query(question)

sendEmail

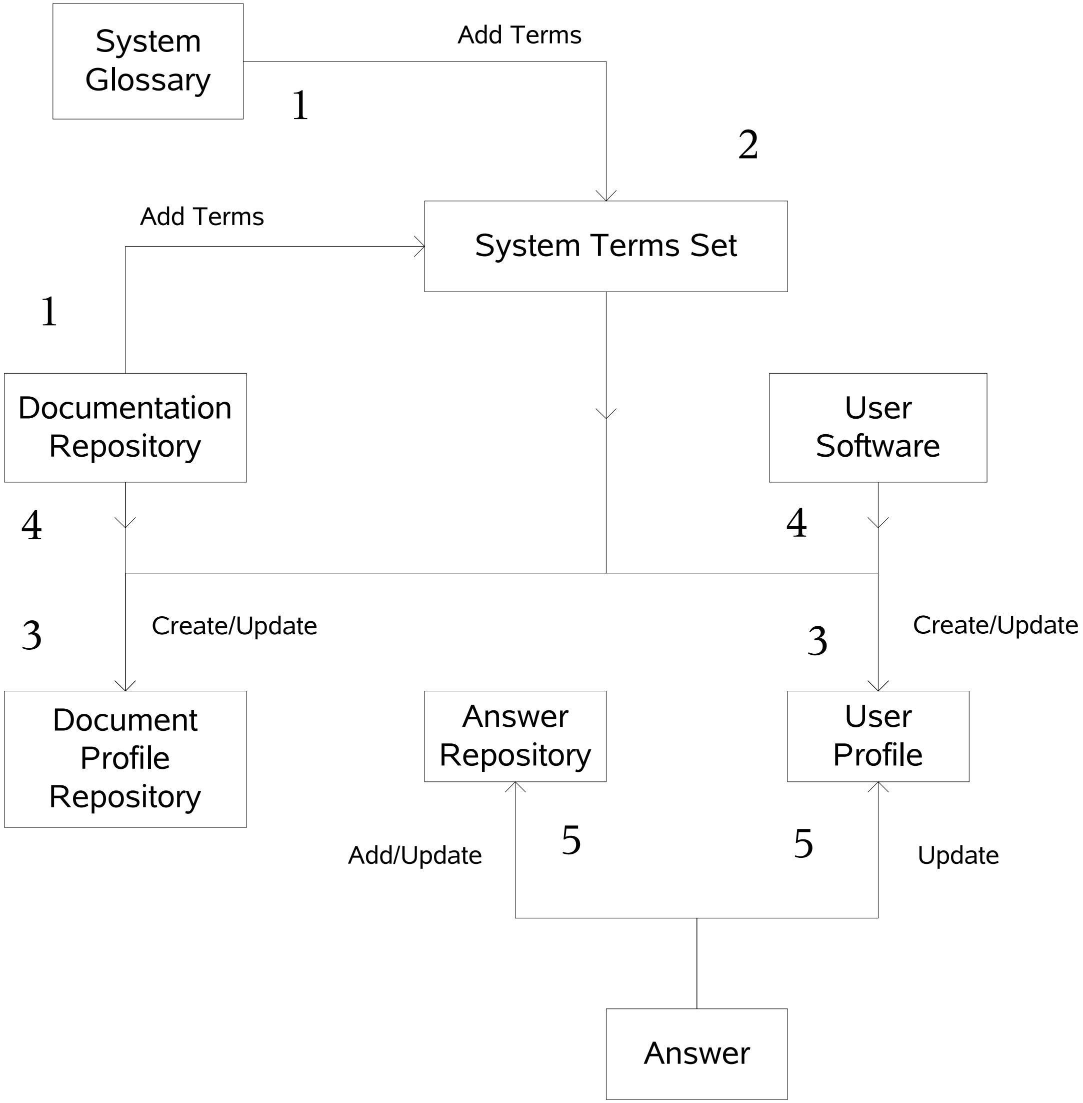
Rating Answers

- Finally the PA asks the user to rate the list of the answers received
- The PA forwards each rating to the corresponding agent (PA, Answer Manager, User Profile Manager)
  - Automating profiling
    - Reduce the possibility of inaccuracy
    - Profiles are dynamic
    - But agents might be wrong in their assessments
      - Users can alter their profiles

Documents and User Profiles

- Terms used in the profiles are not extracted from a training set of documents, but correspond to:
  - Terms included in the system glossary
    - SUN "glossary of Java related terms"
  - Package and class names of Java/JADE software libraries
- Both documents and user profiles are represented by vectors of weighted terms. Weights correspond to:
    - Documents: TF-IDF weight
    - Users:
      - The real frequency in the source code
      - History of help interactions - rating assigned to the answers
        - "decaying expertise"

Profile Management Process



Related Work

- RAP has similarities with WBT, I-MINDS and, in particular, with the Expert Finder system
  - All these systems provide agents that recommend possible “helpers”
  - ***But …***
    - None of them provides integration of different sources of information (experts, answers archive and code documentation)
    - None of them builds the users’ profile by using both
      - Their own Java source code files
      - The answers provided by the users themselves

Future Work

- RAP implementation by using JADE
- We plan to test RAP in practical courses on JADE shared among students and researchers involved in two projects:
  - @lis Technology Net
  - ANEMONE
- We plan to extend RAP to be used in other software development areas:
  - Maintenance
  - Design
  - …

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Questions?

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