Diploma/Master Thesis
(Diplom/Masterarbeit)

Context-aware Entity Management for Collective Adaptive Systems

Beginning: immediately

Background
The EU Project Allow Ensembles aims to develop a new design principle for large-scale collective systems (CAS) based on the concepts of cells and ensembles, where cells represent a concrete functionality in a system, and the ensembles are collections of cells which collaborate in order to fulfill a certain goal in a given context. For representing each individual being part of the collective, the concept of Entity is introduced. In the scope of the Allow Ensembles project, an entity is defined as a physical or virtual organizational unit that aggregates a set of cells and operates in a certain context. Interactions between multiple entities which constitute the collective can be achieved by using cells exposed by other entities that are part of a collaboration. For example, if a concrete payment entity provides a cell which incorporates the functionality to pay a bus ticket using the credit card, a bus passenger can use such cell to pay the purchased bus ticket. Cells are defined by means of services’ orchestration using WS-BPEL [3] for its specification, Apache ODE [4] for its execution, and Fragmento [7] for its storage and retrieval. The different entities constituting the system may reside in a distributed and virtualized infrastructure, such as a Cloud infrastructure. Towards integrating and running such a system in a Cloud infrastructure, multi-tenancy awareness has to be taken into consideration.

In this thesis existing approaches on context-aware entity management systems are first investigated, such as [1], and it suitability evaluated. Based on the previous analysis, such system must be adapted and integrated with the multi-tenant aware middleware infrastructure presented in [2].

Tasks
- State-of-the-art on existing approaches for Administering and Managing Context-aware Entities in a CAS.
- Architecture, specification, and design of a system capable of:
  1. Administering and managing entities of a CAS.
  2. Entity context and preferences storage and retrieval (key-value storage) via Web services messaging.
  3. Compliant and integrated via Web services messaging with the following components:
    1. JBI Multi2 Administration and Management Application for multi-tenant aware ESBs [2]
    2. Fragmento [7]
- Prototypical implementation under the Apache Software License 2.0.
- Validation and Evaluation of the implemented approach using a provided scenario.
Required previous knowledge and experiences

- Java programming skills and expertise
- SOA, Web-services
- WS-BPEL [3]
- Apache ODE [4]
- Enterprise Service Bus - Apache ServiceMix 4.3 [5]
- …or the declared intention to deeply dive into these topics in advance

The lectures of Service and Service Composition, Business Process Management, and the literature attached, such as [1], [2], [5], and [7] are recommended for preparation. The student has to manage his schedule including this work packages and milestones for himself. A helpful guide for planning and writing a thesis can be found in [9] and [10]. The preferred language of the work is English.

Literature


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