Diploma / Master Thesis

Dynamic Deployment of Specialized ESB instances in the Cloud

Beginning: as soon as possible

Background
Cloud computing [8] is a recent paradigm proposing a new way of consuming and delivering IT services. In the PaaS delivery model, the underlying infrastructure (e.g., network, operating system, servers, etc.) is provided to the Cloud consumers for either deploying their own applications, or applications supplied by the Cloud provider. The need of an Enterprise Service Bus (ESB) [1] as an integration middleware between application services in a Cloud infrastructure is essential. As application services might utilize different communication protocols, the need of a mediator between them is fundamental. However, utilizing an ESB as a communication mediator between applications in a Cloud infrastructure raises several challenges such as elasticity based on current load. The number and type of ESB instances must dynamically vary depending on the communication load in the Cloud infrastructure. This can be achieved by first creating and specializing different ESB instances that handle different types of load, and secondly by dynamically horizontally scaling the middleware infrastructure to handle the resources demand evolution.

The goal of this thesis is to enable horizontal scalability by dynamically deploying and wiring specialized ESB instances using a lightweight container virtualization based approach. Furthermore, fine-grained monitoring mechanisms need to be implemented, e.g., to observe current load of running container instances and to trigger deployment and wiring of additional instances on demand.

Tasks
- Create reusable containers providing specialized ESB instances using Docker (www.docker.io); ESB instances can be categorized according to the supported communication protocols, e.g., HTTP, JMS, Email, or according to message transformation and routing functionalities, e.g., Apache Camel, XSLT, etc.
- Design and develop a mechanism to automatically and dynamically instantiate and wire these containers, e.g., to scale by adding HTTP-specialized ESB instances in case much HTTP traffic occurs
- Develop a mechanism to perform monitoring (CPU load, memory consumption, etc.) both on container-level as well as on a host where multiple containers are running
Required previous knowledge and experiences

- Java programming skills and expertise
- Apache ServiceMix [2]
- Cloud Computing [8]
- \textit{...or the declared intention to deeply dive into these topics in advance}

The lectures of Services and Service Composition and Message-based Application Integration, and the literature attached, such as [1], [3], [4], and [5] 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 [11] and [12]. The preferred language of the work is English.

Literature


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