Predicting Web Service Performance based on Web Service States and Input Data Properties

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Abstract

Web service performance prediction is crucial in situations when the result of the web service processing must be delivered under limited conditions. In this paper we investigate an approach to web service performance prediction based on web service state information and used input data properties. The history of web service performance is captured, analyzed, transformed into a model and stored in a form of cases for later reuse. Such cycle is known as a knowledge management cycle and is used in the proposed approach. Such case base can be later reused to predict the performance of web services of the same class for given states and input data properties. Having sufficiently rife base of web service performance cases enables us to support decision support process during selection of proper web service instances for a certain operation execution. The overall web service performance depends on the internal processing performance of the service and on the underlying system workload - both of which are considered in the approach.

1. Introduction

This article deals with run time prediction of stateful web services (WS) for the purposes of optimal WS workflow construction and scheduling. Work presented in this paper is a part of effort to design a Knowledge Assimilation Agent (KAA) responsible for WS run time prediction in scope of the 6th IST FP called K-Wf Grid (Knowledge-based Workflow System for Grid Applications) [3].

At the present it is difficult to predict the behavior of a WS which carries out a job in a shared distributed computing environment such as Grid. The more complex the job is the more difficult is to predict the time needed by a web service to complete the execution. The run time of a WS is influenced by several aspects: internal WS performance, run times of other services utilized by WS during its operation and load of Grid resources which are used by WS during its execution. Additional complexity is introduced when constructing composite WS – workflows constructed of several interconnected WS. For the purpose of this article we work with stateful web services, i.e. web services which are stateless in nature, but which manage resources with state. Such stateful WS are responsible for creation, maintenance and destruction of WS resources with state.

There have been already attempts to predict application performance in Grids [6], however existing approaches do not deal with WS prediction in context of WS workflows. The main difference of our approach is that we investigate the service performance in dependence of invocation parameters and related resource properties.

The following chapter introduces the context of our work. We describe the way in which the WS are selected, planned and executed in Grid environment. In chapter 3 we describe the approach we use to measure performance of WS. Next chapter describes our approach to prediction of some WS performance measures. We conclude with short description of application in which the approach will be used and with plans for future