

Optimizing the Deployment of Software in the Cloud

Sören Frey,¹ Florian Fittkau,² Wilhelm Hasselbring²

¹Daimler TSS GmbH, Wilhelm-Runge-Straße 11, 89081 Ulm
<http://www.daimler-tss.de/>

²Kiel University, Software Engineering Group, 24118 Kiel
<http://se.informatik.uni-kiel.de/>

Abstract: We present the genetic algorithm *CDOXplorer* that explores the cloud deployment options search space on the basis of automatically extracted architectural models and approximates the corresponding pareto optimum.

Migrating existing enterprise software systems to new programming platforms constitutes a great challenge [HBG⁺08]. Additionally, migrating to cloud platforms involves the comparison of various cloud deployment options (CDOs). A CDO comprises a combination of a specific cloud environment, deployment architecture, and runtime reconfiguration rules for dynamic resource scaling. Our simulator CDOSim can evaluate CDOs, e.g., regarding response times and costs [FFH12a, FFH12b]. However, the design space to be searched for well-suited solutions is very large. We approach this optimization problem with the novel genetic algorithm *CDOXplorer* [FFH13, Fre14]. It uses techniques of the search-based software engineering field and simulations with CDOSim to assess the fitness of CDOs. An experimental evaluation that employs, among others, the cloud environments Amazon EC2 and Microsoft Windows Azure, shows that *CDOXplorer* can find solutions that surpass those of other state-of-the-art techniques by up to 60%.

We present the genetic algorithm *CDOXplorer* that explores the CDO search space on the basis of automatically extracted architectural models and approximates the corresponding pareto optimum. Similar problems are addressed by methods of the search-based software engineering field, where genetic algorithms are widely used. To assess the fitness of CDOs, *CDOXplorer* uses simulation runs of CDOSim to restrict the search space and to steer the exploration towards promising CDOs.

CDOXplorer is implemented in our tool CloudMIG Xpress that supports our cloud migration approach CloudMIG [FHS13, FH11, FH10]. CDOSim facilitates the simulation of CDOs for determining their respective response times, costs, and SLA violations. With CloudMIG Xpress, CDOs can be simulated on the basis of a reverse-engineered architectural system model with monitored or synthetic workload [vHRH⁺10]. CloudMIG Xpress together with our experiment code and data are available online as open source software such that interested researchers may repeat or extend our experiments.¹

¹<http://www.cloudmig.org>

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