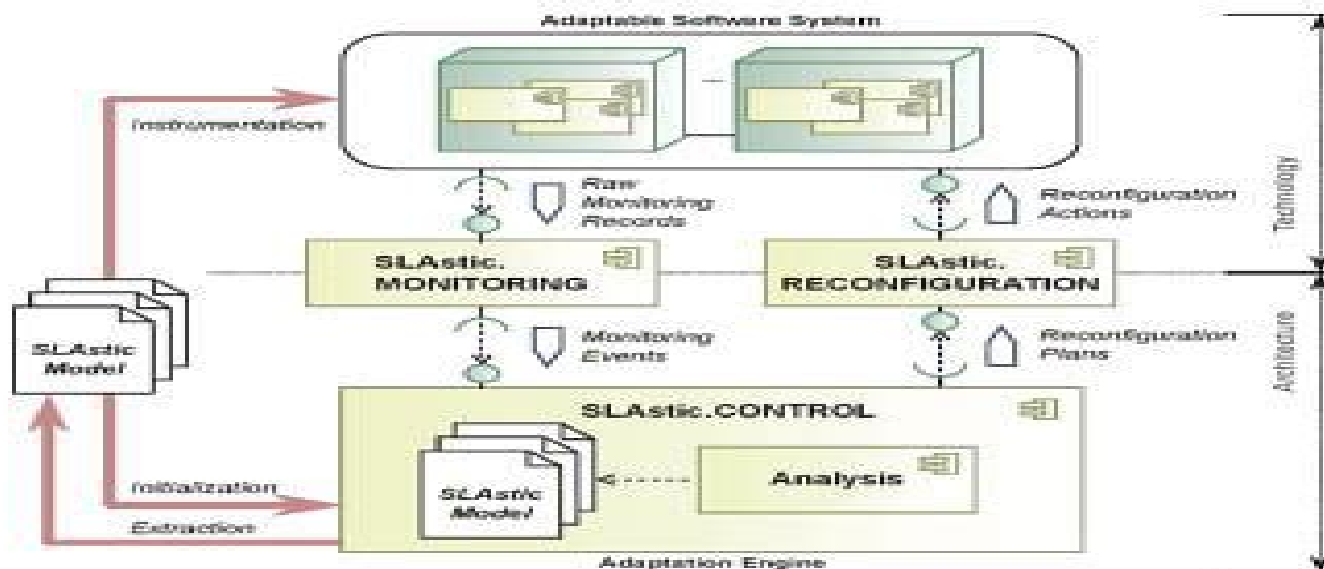


# Model-Driven Online Capacity Management for Component-Based Software Systems

André van Hoorn



2014/6

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# Model Driven Online Capacity Management For Component Based Software Systems

**Huangqi Zhang**



## **Model Driven Online Capacity Management For Component Based Software Systems:**

*Model-Driven Online Capacity Management for Component-Based Software Systems* André van Hoorn, 2014-10-15

Capacity management is a core activity when designing and operating distributed software systems. Particularly enterprise application systems are exposed to highly varying workloads. Employing static capacity management this leads to unnecessarily high total cost of ownership due to poor resource usage efficiency. This thesis introduces a model driven online capacity management approach for distributed component based software systems called SLastic. The core contributions of this approach are a modeling language to capture relevant architectural information about a controlled software system, an architecture based online capacity management framework based on the common MAPE-K control loop architecture, model driven techniques supporting the automation of the approach, architectural runtime reconfiguration operations for controlling a system's capacity as well as an integration of the Palladio Component Model. A qualitative and quantitative evaluation of the approach is performed by case studies, lab experiments and simulation.

**Architecture-Aware Online Failure Prediction for Software Systems** Teerat Pitakrat, 2018-06-19 Failures at runtime in complex software systems are inevitable because these systems usually contain a large number of components. Having all components working perfectly at the same time is if at all possible very difficult. Hardware components can fail and software components can still have hidden faults waiting to be triggered at runtime and cause the system to fail. This dissertation proposes an architecture aware online failure prediction approach called Hora. The Hora approach improves online failure prediction by combining the results of failure prediction with the architectural knowledge about the system. The task of failure prediction is split into predicting the failure of each individual component in contrast to predicting the whole system failure. Suitable prediction techniques can be employed for different types of components. The architectural knowledge is used to deduce the dependencies between components which can reflect how a failure of one component can affect the others. The failure prediction and the component dependencies are combined into one model which employs Bayesian network theory to represent failure propagation. The combined model is continuously updated at runtime and makes predictions for individual components as well as inferring their effects on other components and the whole system.

**Architecture-based Evolution of Dependable Software-intensive Systems** Heinrich, Robert, 2023-06-05 This cumulative habilitation thesis proposes concepts for i) modelling and analysing dependability based on architectural models of software intensive systems early in development, ii) decomposition and composition of modelling languages and analysis techniques to enable more flexibility in evolution and iii) bridging the divergent levels of abstraction between data of the operation phase architectural models and source code of the development phase.

*HPI Future SOC Lab - Proceedings 2019* Christoph Meinel, Andreas Polze, Karsten Beins, Rolf Strotmann, Ulrich Seibold, Kurt Rödszus, Jürgen Müller, 2024-06-28. EN The HPI Future SOC Lab is a cooperation of the Hasso Plattner Institute HPI and industry partners. Its mission is to enable and promote exchange and interaction between the

research community and the industry partners The HPI Future SOC Lab provides researchers with free of charge access to a complete infrastructure of state of the art hard and software This infrastructure includes components which might be too expensive for an ordinary research environment such as servers with up to 64 cores and 2 TB main memory The offerings address researchers particularly from but not limited to the areas of computer science and business information systems Main areas of research include cloud computing parallelization and In Memory technologies This technical report presents results of research projects executed in 2019 Selected projects have presented their results on April 9th and November 12th 2019 at the Future SOC Lab Day events DE Das Future SOC Lab am HPI ist eine Kooperation des Hasso Plattner Instituts mit verschiedenen Industriepartnern Seine Aufgabe ist die Ermöglichung und Förderung des Austausches zwischen Forschungsgemeinschaft und Industrie Am Lab wird interessierten Wissenschaftlern eine Infrastruktur von neuester Hard und Software kostenfrei für Forschungszwecke zur Verfügung gestellt Dazu zählen teilweise noch nicht am Markt verfügbare Technologien die im normalen Hochschulbereich in der Regel nicht zu finanzieren wären bspw Server mit bis zu 64 Cores und 2 TB Hauptspeicher Diese Angebote richten sich insbesondere an Wissenschaftler in den Gebieten Informatik und Wirtschaftsinformatik Einige der Schwerpunkte sind Cloud Computing Parallelisierung und In Memory Technologien In diesem Technischen Bericht werden die Ergebnisse der Forschungsprojekte des Jahres 2019 vorgestellt Ausgewählte Projekte stellten ihre Ergebnisse am 09 April und 12 November 2019 im Rahmen des Future SOC Lab Tags vor *HPI Future SOC Lab* Bär, Florian, Barrera-Animas, Ari Yair, Baumann, Annika, Cheng, Feng, Choudhary, Yash, Cooray, Thilini, de Oliveira, Roberto C. L., Di Varano, Igor, Eberhardt, Felix, Eloff, Jan H. P., Ermakova, Tatiana, Fabian, Benjamin, Friedrich, Tobias, Grohmann, Maria, Hecht, Sonja, Huegle, Johannes, Jabeen, Hajira, Jaeger, David, Kelkel, Stefan, Knigge, Marlene, Krcmar, Helmut, Kuster, Bernhard, Lehmann, Jens, López-Cuevas, Armando, Lundberg, Lars, Medina-Pérez, Miguel Angel, Meinel, Christoph, Monroy-Borja, Raúl, Möstl, Christian, Netzeband, André, Neumer, Tamas, Niederleithinger, Ernst, Plauth, Max, Podapati, Sasidhar, Polze, Andreas, Prifti, Loina, Ramírez-Márquez, José Emmanuel, Rodríguez, Jorge, Rosander, Oliver, Rothenberger, Ralf, Sapegin, Andrey, Schmidt, Christopher, Schmidt, Rainer, Sejdiu, Gözim, Servadei, Lorenzo, Sidorova, Julia A., Sköld, Lars, Soares, Fábio Mendes, Sutton, Andrew M., Trejo, Luis A., van der Walt, Estée, van Hoorn, André, Wilhelm, Mathias, Willnecker, Felix, Zhang, Shuhao, 2019 Das Future SOC Lab am HPI ist eine Kooperation des Hasso Plattner Instituts mit verschiedenen Industriepartnern Seine Aufgabe ist die Ermöglichung und Förderung des Austausches zwischen Forschungsgemeinschaft und Industrie Am Lab wird interessierten Wissenschaftlern eine Infrastruktur von neuester Hard und Software kostenfrei für Forschungszwecke zur Verfügung gestellt Dazu zählen teilweise noch nicht am Markt verfügbare Technologien die im normalen Hochschulbereich in der Regel nicht zu finanzieren wären bspw Server mit bis zu 64 Cores und 2 TB Hauptspeicher Diese Angebote richten sich insbesondere an Wissenschaftler in den Gebieten Informatik und Wirtschaftsinformatik Einige der Schwerpunkte sind Cloud Computing Parallelisierung und In Memory

Technologien In diesem Technischen Bericht werden die Ergebnisse der Forschungsprojekte des Jahres 2017 vorgestellt  
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parallelization and In Memory technologies This technical report presents results of research projects executed in 2017  
Selected projects have presented their results on April 25th and November 15th 2017 at the Future SOC Lab Day events

*An Approach for Guiding Developers to Performance and Scalability Solutions* Heger, Christoph, 2018-09-05 The quality  
of enterprise software applications plays a crucial role for the satisfaction of the users and the economic success of the  
enterprises Software applications with unsatisfying performance and scalability are perceived by its users as low in quality as  
less interesting and less attractive and cause frustration when preventing the users from attaining their goals This book  
proposes an approach for a recommendation system that enables developers who are novices in software perform

Performance Problem Diagnostics by Systematic Experimentation Wert, Alexander, 2018-03-29 In this book we introduce  
an automatic experiment based approach for performance problem diagnostics in enterprise software systems The proposed  
approach systematically searches for root causes of detected performance problems by executing series of systematic  
performance tests The presented approach is evaluated by various case studies showing that the presented approach is  
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**Benchmarking of Application Monitoring Frameworks** Jan Waller,2014-12-19 Application level monitoring of continuously operating software systems provides insights into their dynamic behavior helping to maintain their performance and availability during runtime Such monitoring may cause a significant runtime overhead to the monitored system depending on the number and location of used instrumentation probes In order to improve a system s instrumentation and to reduce the caused monitoring overhead it is necessary to know the performance impact of each probe While many monitoring frameworks are claiming to have minimal impact on the performance these claims are often not backed up with a detailed performance evaluation determining the actual cost of monitoring Benchmarks can be used as an effective and affordable way for these evaluations However no benchmark specifically targeting the overhead of monitoring itself exists Furthermore no established benchmark engineering methodology exists that provides guidelines for the design execution and analysis of benchmarks This thesis introduces a benchmark approach to measure the performance overhead of application level monitoring frameworks The core contributions of this approach are 1 a definition of common causes of monitoring overhead 2 a general benchmark engineering methodology 3 the MooBench micro benchmark to measure and quantify causes of monitoring overhead and 4 detailed performance evaluations of three different application level monitoring frameworks Extensive experiments demonstrate the feasibility and practicality of the approach and validate the benchmark results The developed benchmark is available as open source software and the results of all experiments are available for download to facilitate further validation and replication of the results **Software Architecture** Ivica Crnkovic,Volker Gruhn,Matthias Book,2011-09-09 This book constitutes the refereed proceedings of the 5th European Conference on Software Architecture ECSA 2011 held in Essen Germany in September 2011 The 13 revised full papers presented together with 24 emerging research papers and 7 research challenge poster papers were carefully reviewed and selected from over 100 submissions The papers are organized in topical sections on requirements and software architectures software

architecture components and compositions quality attributes and software architectures software product line architectures architectural models patterns and styles short papers process and management of architectural decisions software architecture run time aspects ADLs and metamodels and services and software architectures     Engineering Scalable, Elastic, and Cost-Efficient Cloud Computing Applications Steffen Becker, Gunnar Brataas, Sebastian Lebrig, 2017-05-31 This book provides an overview of the problems involved in engineering scalable elastic and cost efficient cloud computing services and describes the CloudScale method a description of rescuing tools and the required steps to exploit these tools It allows readers to analyze the scalability problem in detail and identify scalability anti patterns and bottlenecks within an application With the CloudScale method software architects can analyze both existing and planned IT services The method allows readers to answer questions like With an increasing number of users can my service still deliver acceptable quality of service What if each user uses the service more intensively Can my service still handle it with acceptable quality of service What if the number of users suddenly increases Will my service still be able to handle it Will my service be cost efficient First the book addresses the importance of scalability elasticity and cost efficiency as vital quality related attributes of modern cloud computing applications Following a brief overview of CloudScale cloud computing applications are then introduced in detail and the aspects that need to be captured in models of such applications are discussed In CloudScale these aspects are captured in instances of the ScaleDL modeling language Subsequently the book describes the forward engineering part of CloudScale which is applicable when developing a new service It also outlines the reverse and reengineering parts of CloudScale which come into play when an existing legacy service is modified Lastly the book directly focuses on the needs of both business oriented and technical managers by providing guidance on all steps of implementing CloudScale as well as making decisions during that implementation The demonstrators and reference projects described serve as a valuable starting point for learning from experience This book is meant for all stakeholders interested in delivering scalable elastic and cost efficient cloud computing applications managers product owners software architects and developers alike With this book they can both see the overall picture as well as dive into issues of particular interest     **Journal of Computer Resource Management** ,2006     **Capacity Management Review** ,1992     **UC Santa Cruz** University of California, Santa Cruz,2006     **Informationweek** ,2008     PC AI ,1997     **Optical Information Systems** ,1987     **Water Software Systems** B. Ulanicki, Bryan Coulbeck, John Paul Rance, 2001     **22nd DASC** ,2003     *Dissertation Abstracts International* ,2008

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