

# Holmes: A System to Support Software Product Lines

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## KEYWORDS

Software product lines, tool support, JavaSpaces

## 1 INTRODUCTION

Holmes is a tool designed to support the Sherlock [2] software product line methodology. Holmes attempts to provide comprehensive support for product line development, from market and product strategy analysis to modeling, designing, and developing the resulting system.

## 2 ARCHITECTURE

Figure 1 shows the overall architecture of Holmes. It centres on the use of JavaSpaces [1] as a distributed blackboard of objects. This type of architecture was chosen because it is a simple way to support change consistency management, multi-user support, and tool integration, three key issues in the complex, multi-stakeholder, multi-activity development of a line of software products.

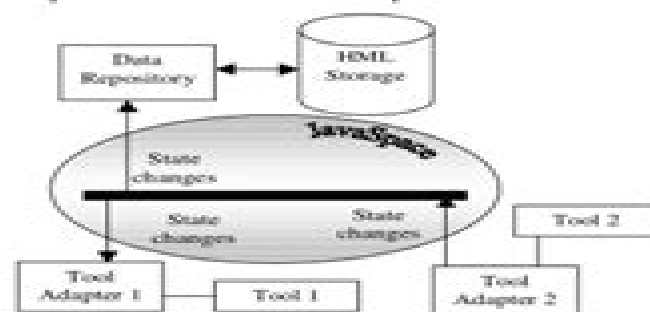


Figure 1: Holmes architecture with one event queue

The data repositories serve as persistent storage for data in a common XML-based format. Holmes uses multiple distributed event queue [1] data structures to allow changes

to propagate between tools and to the repositories. Each event queue is distinguished by the type of event and is not coupled to any particular tool. The JavaSpace is readily accessible by multiple machines, thus supporting distributed multi-user access; each user's client can just connect to the space and then post and listen to the appropriate event queue.

## 3 TOOLS

Several tools have been developed for Holmes. The domain definition tool supports adding and editing the vocabulary and other information in the domain.

Domain characterization supports the analysis of existing and proposed products. This includes examining the potential flow of users to a new product and the compatibility relationships with existing formats and interfaces. Holmes allows the user to enter information related to this analysis and generates visual representations of the user flows and compatibility relationships.

Two major activities of software product line development are the analysis of commonality and variability analysis, and the development of product strategies. These activities are supported by the domain scoping tool. Product strategies can be defined and compared based on their support of variants. Comparison is accomplished using projections of user-selected variation points.

To provide semantic support, Holmes also uses a critiquing system [3]. This system is based on a Prolog database built from events that are posted to the JavaSpace. When particular queries become positive, the critiquing tool will post "advice" that will be read by a separate "To do list" tool. The interface for "advice" is standardized to allow multiple critiquing systems to analyze posted events and provide specialized advice.

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# Process Support Of Software Product Lines Proceedings

**Abdelrahman Elfaki**



## **Process Support Of Software Product Lines Proceedings:**

Software Product Line Abdelrahman Elfaki, 2012-04-04 The Software Product Line SPL is an emerging methodology for developing software products Currently there are two hot issues in the SPL modelling and the analysis of the SPL Variability modelling techniques have been developed to assist engineers in dealing with the complications of variability management The principal goal of modelling variability techniques is to configure a successful software product by managing variability in domain engineering In other words a good method for modelling variability is a prerequisite for a successful SPL On the other hand analysis of the SPL aids the extraction of useful information from the SPL and provides a control and planning strategy mechanism for engineers or experts In addition the analysis of the SPL provides a clear view for users Moreover it ensures the accuracy of the SPL This book presents new techniques for modelling and new methods for SPL analysis

**Software Product Lines** Timo Käkölä, Juan Carlos Dueñas, 2007-02-07 Between July 1999 and June 2005 a group of European companies research institutes and universities executed the EUREKA ITEA projects ESAPS CAF and FAMILIES on the topic of product line engineering The projects originated from the need of the industry to improve software engineering performance by organizing product development in product lines The results obtained within the projects have been implemented in several large industries e g automotive e business medical systems and mobile phones They involve a radical shift in software construction and production The most important research results of the projects are collected in this book Product line engineering was already applied within industry in the 1980s and presumably earlier In the 1980s good architects in many telecommunications companies based their architectures on the ideas of David Parnas who published on the subject of program families They were facilitated by the CHILL language widely used by the telecommunications companies This language deploys the same modularity principles as the Modula programming language family Modularity is a crucial ingredient for implementing systems with a component based architecture Being able to compose the products of components is an important mechanism in all product line architectures In the 1990s the product line ideas started to gain ground in other industries Around 1995 the company experiences reached the academia and since then people in companies and academia have collaborated widely on this subject The ESAPS CAF and FAMILIES projects manifest an institutionalized form of this collaboration

UML-Based Software Product Line Engineering with SMarty Edson Oliveira Jr, 2023-02-06 This book is about software product lines SPLs designed and developed taking UML diagrams as the primary basis modeled according to a rigorous approach composed of an UML profile and a systematic process for variability management activities forming the Stereotype based Management of Variability SMarty approach The book consists of five parts Part I provides essential concepts on SPL in terms of the first development methodologies It also introduces variability concepts and discusses SPL architectures finishing with the SMarty approach Part II is focused on the design verification and validation of SMarty SPLs and Part III concentrates on the SPL architecture evolution based on ISO IEC metrics the System PLA method

optimization with the MOA4PLA method and feature interaction prevention Next Part IV presents SMarty as a basis for SPL development such as the M SPLearning SPL for mobile learning applications the PLeTs SPL for testing tools the PlugSPL plugin environment for supporting the SPL life cycle the SyMPLES approach for designing embedded systems with SysML the SMartySPEM approach for software process lines SPRL and re engineering of class diagrams into an SPL Eventually Part V promotes controlled experimentation in UML based SPLs presenting essential concepts on how to plan conduct and document experiments as well as showing several experiments carried out with SMarty This book aims at lecturers graduate students and experienced practitioners Lecturers might use the book for graduate level courses about SPL fundamentals and tools students will learn about the SPL engineering process variability management and mass customization and practitioners will see how to plan the transition from single product development to an SPL based process how to document inherent variability in a given domain or how to apply controlled experiments to SPLs Software Product Lines in Action Frank J. van der Linden, Klaus Schmid, Eelco Rommes, 2007-06-10 Software product lines represent perhaps the most exciting paradigm shift in software development since the advent of high level programming languages Nowhere else in software engineering have we seen such breathtaking improvements in cost quality time to market and developer productivity often registering in the order of magnitude range While the underlying concepts are straightforward enough building a family of related products or systems by planned and careful reuse of a base of generalized software development assets the devil can be in the details as successful product line practice can involve organizational change business process change and technology change The authors ideally combine academic research results with industrial real world experiences thus presenting a broad view on product line engineering so that both managers and technical specialists will benefit from reading it After presenting a common framework for the description of the industrial case studies they capture the wealth of knowledge that eight companies have gathered during the introduction of the software product line engineering approach in their daily practice After reading this book you will understand all the relevant aspects regarding business architecture process and organizational issues of applying software product line engineering If you consider using a product line approach in your organization or if you want to improve your current practices you will find a rich set of useful information at your fingertips from practitioners to practitioners *Software Product Lines* Patrick Donohoe, 2012-12-06 Software product lines are emerging as a critical new paradigm for software development Product lines are enabling organizations to achieve impressive time to market gains and cost reductions With the increasing number of product lines and product line researchers and practitioners the time is right for a comprehensive examination of the issues surrounding the software product line approach The Software Engineering Institute at Carnegie Mellon University is proud to sponsor the first conference on this important subject This book comprises the proceedings of the First Software Product Line Conference SPLC1 held August 28 31 2000 in Denver Colorado USA The twenty seven papers of the conference technical program

present research results and experience reports that cover all aspects of software product lines Topics include business issues enabling technologies organizational issues and life cycle issues Emphasis is placed on experiences in the development and fielding of product lines of complex systems especially those that expose problems in the design development or evolution of software product lines The book will be essential reading for researchers and practitioners alike

**Fundamentals of Software Engineering** Mehdi Dastani,Marjan Sirjani,2015-09-24 This book constitutes the thoroughly refereed post conference proceedings of the 6th IPM International Conference on Fundamentals of Software Engineering FSEN 2015 held in Tehran Iran in April 2015 The 21 full papers presented in this volume were carefully reviewed and selected from 64 submissions The topics of interest in FSEN span over all aspects of formal methods especially those related to advancing the application of formal methods in software industry and promoting their integration with practical engineering techniques *Software Evolution and Maintenance* Priyadarshi Tripathy,Kshirasagar Naik,2014-11-17

Provides students and engineers with the fundamental developments and common practices of software evolution and maintenance *Software Evolution and Maintenance A Practitioner s Approach* introduces readers to a set of well rounded educational materials covering the fundamental developments in software evolution and common maintenance practices in the industry Each chapter gives a clear understanding of a particular topic in software evolution and discusses the main ideas with detailed examples The authors first explain the basic concepts and then drill deeper into the important aspects of software evolution While designed as a text in an undergraduate course in software evolution and maintenance the book is also a great resource for software engineers information technology professionals and graduate students in software engineering Based on the IEEE SWEBOK Software Engineering Body of Knowledge Explains two maintenance standards IEEE EIA 1219 and ISO IEC14764 Discusses several commercial reverse and domain engineering toolkits Slides for instructors are available online *Software Evolution and Maintenance A Practitioner s Approach* equips readers with a solid understanding of the laws of software engineering evolution and maintenance models reengineering techniques legacy information systems impact analysis refactoring program comprehension and reuse *Applied Software Product Line Engineering* Kyo C. Kang,Vijayan Sugumaran,Sooyong Park,2009-12-22

Over the last decade software product line engineering SPLE has emerged as one of the most promising software development paradigms for increasing productivity in IT related industries Detailing the various aspects of SPLE implementation in different domains *Applied Software Product Line Engineering* documents best practices with regard to syst

**Artificial Intelligence in Information and Communication Technologies, Healthcare and Education** Parikshit N Mahalle,Rajendra S Talware,Ganesh C

Patil,Sachin R Sakhare,Yogesh H Dandawate,Pravin R Futane,2022-12-27 Artificial Intelligence in Information and Communication Technologies Healthcare and Education A Roadmap Ahead is designed as a reference text and discusses inter dependability communication and effective control for the betterment of services through artificial intelligence AI as

well as the challenges and path ahead for AI in computing and control across different domains of business and human life. The book accommodates technologies and application domains including backbone hardware systems and methods for deployment which help incorporating intelligence through different supervised and probabilistic learning approaches. Features: The book attempts to establish a connection between hardware software technologies and algorithmic intelligence for data analysis and decision support in domains such as healthcare education and other aspects of business and mobility. It presents various recent applications of artificial intelligence in information and communication technologies such as search and optimization methods machine learning data representation and ontologies and multi agent systems. The book provides a collection of different case studies with experimentation results than mere theoretical and generalized approaches. Covers most of the applications using the trending technologies like machine learning ML data science DS Internet of Things IoT and underlying information and communication technologies. The book is aimed primarily at advanced undergraduates and postgraduate students studying computer science computer applications and information technology. Researchers and professionals will also find this book useful.

Software Product-Family Engineering Frank van der Linden, 2004-05-24. This book constitutes the thoroughly refereed post proceedings of the 5th International Workshop on Product Family Engineering PFE 2003 held in Siena Italy in November 2003. The 36 revised full papers presented together with an introductory overview and 3 keynote presentations were carefully selected during two rounds of reviewing and improvement. The papers are organized in topical sections on variation mechanisms requirements analysis and management product derivation transition to family development industrial experience evolution and decision and derivation.

**Software Product Lines** Gary J. Chastek, 2003-08-02. Software product lines are emerging as an important new paradigm for software development. Product lines are enabling organizations to achieve impressive time to market gains and cost reductions. In 1997 we at the Software Engineering Institute SEI launched a Product Line Practice Initiative. Our vision was that product line development would be a low risk high return proposition for the entire software engineering community. It was our hope from the beginning that there would eventually be sufficient interest to hold a conference. The First Software Product Line Conference SPLC1 was the realization of that hope. Since SPLC1 we have seen a growing interest in software product lines. Companies are launching their own software product line initiatives product line technical and business practices are maturing product line tool vendors are emerging and books on product lines are being published. Motivated by the enthusiastic response to SPLC1 and the increasing number of software product lines and product line researchers and practitioners the SEI is proud to sponsor this second conference dedicated to software product lines. We were gratified by the submissions to SPLC2 from all parts of the globe from government and commercial organizations. From these submissions we were able to assemble a rich and varied conference program with unique opportunities for software product line novices experts and those in between. This collection represents the papers selected from that response and includes research and experience reports.

Software

Design and Development: Concepts, Methodologies, Tools, and Applications Management Association, Information Resources, 2013-07-31 Innovative tools and techniques for the development and design of software systems are essential to the problem solving and planning of software solutions Software Design and Development Concepts Methodologies Tools and Applications brings together the best practices of theory and implementation in the development of software systems This reference source is essential for researchers engineers practitioners and scholars seeking the latest knowledge on the techniques applications and methodologies for the design and development of software systems

**An Approach to Modelling Software Evolution Processes** Tong Li, 2009-03-15 An Approach to Modelling Software Evolution Processes describes formal software processes that effectively support software evolution The importance and popularity of software evolution increase as more and more successful software systems become legacy systems For one thing software evolution has become an important characteristic in the software life cycle for another software processes play an important role in increasing efficiency and quality of software evolution Therefore the software evolution process the inter discipline of software process and software evolution becomes a key area in software engineering The book is intended for software engineers and researchers in computer science Prof Tong Li earned his Ph D in Software Engineering at De Montfort University U K he has published five monographs and over one hundred papers

**Model Management and Analytics for Large Scale Systems** Bedir Tekinerdogan, Önder Babur, Loek Cleophas, Mark van den Brand, Mehmet Aksit, 2019-09-14 Model Management and Analytics for Large Scale Systems covers the use of models and related artefacts such as metamodels and model transformations as central elements for tackling the complexity of building systems and managing data With their increased use across diverse settings the complexity size multiplicity and variety of those artefacts has increased Originally developed for software engineering these approaches can now be used to simplify the analytics of large scale models and automate complex data analysis processes Those in the field of data science will gain novel insights on the topic of model analytics that go beyond both model based development and data analytics This book is aimed at both researchers and practitioners who are interested in model based development and the analytics of large scale models ranging from big data management and analytics to enterprise domains The book could also be used in graduate courses on model development data analytics and data management Identifies key problems and offers solution approaches and tools that have been developed or are necessary for model management and analytics Explores basic theory and background current research topics related challenges and the research directions for model management and analytics Provides a complete overview of model management and analytics frameworks the different types of analytics descriptive diagnostics predictive and prescriptive the required modelling and method steps and important future directions

*Business Modeling and Software Design* Boris Shishkov, 2017-04-06 This book contains revised and extended versions of selected papers from the Sixth International Symposium on Business Modeling and Software Design BMSD 2016 held in Rhodes Greece in June

2016 organized by the Institute IICREST in cooperation with BPM D Aristotle University of Thessaloniki TU Delft CTIT University of Twente IMI BAS the Dutch Research School SIKS and AMAKOTA Ltd BMSD 2016 received 59 paper submissions from which 27 papers were selected for publication in the BMSD 16 proceedings Additional post symposium reviewing was carried out reflecting both the qualities of the papers and the way they were presented 11 best papers were selected for the current Springer edition that were carefully revised and extended following the reviewers comments and recommendations The selection considers a large number of BMSD relevant research topics from business processes related topics such as business process management variability of business processes and inconsistencies risk detection here it is to be mentioned that several papers consider and analyze particular business process modeling formalisms and tools through system engineering related topics such as conceptual modeling enterprise architectures human centered design signs modeling and idiosyncrasies capturing to service oriented software engineering related topics such as service orchestration and e services design

**Non-Functional Properties in Service Oriented Architecture: Requirements, Models and Methods** Milanovic, Nikola, 2011-03-31 This book offers a selection of chapters that cover three important aspects related to the use of non functional properties in SOA requirements specification with respect to non functional properties modeling non functional properties and implementation of non functional properties Provided by publisher

**Systems and Software Variability Management** Rafael Capilla, Jan Bosch, Kyo-Chul Kang, 2013-06-12 The success of product line engineering techniques in the last 15 years has popularized the use of software variability as a key modeling approach for describing the commonality and variability of systems at all stages of the software lifecycle Software product lines enable a family of products to share a common core platform while allowing for product specific functionality being built on top of the platform Many companies have exploited the concept of software product lines to increase the resources that focus on highly differentiating functionality and thus improve their competitiveness with higher quality and reusable products and decreasing the time to market condition Many books on product line engineering either introduce specific product line techniques or include brief summaries of industrial cases From these sources it is difficult to gain a comprehensive understanding of the various dimensions and aspects of software variability Here the editors address this gap by providing a comprehensive reference on the notion of variability modeling in the context of software product line engineering presenting an overview of the techniques proposed for variability modeling and giving a detailed perspective on software variability management Their book is organized in four main parts which guide the reader through the various aspects and dimensions of software variability Part 1 which is mostly written by the editors themselves introduces the major topics related to software variability modeling thus providing a multi faceted view of both technological and management issues Next part 2 of the book comprises four separate chapters dedicated to research and commercial tools Part 3 then continues with the most practical viewpoint of the book presenting three different industry cases on how variability is managed in real industry



projects Finally part 4 concludes the book and encompasses six different chapters on emerging research topics in software variability like e g service oriented or dynamic software product lines or variability and aspect orientation Each chapter briefly summarizes What you will learn in this chapter so both expert and novice readers can easily locate the topics dealt with Overall the book captures the current state of the art and best practices and indicates important open research challenges as well as possible pitfalls Thus it serves as a reference for researchers and practitioners in software variability management allowing them to develop the next set of solutions techniques and methods in this complicated and yet fascinating field of software engineering

Advanced Computing and Systems for Security Rituparna Chaki,Agostino Cortesi,Khalid Saeed,Nabendu Chaki,2015-11-18 The book contains the extended version of the works that have been presented and discussed in the Second International Doctoral Symposium on Applied Computation and Security Systems ACSS 2015 held during May 23 25 2015 in Kolkata India The symposium has been jointly organized by the AGH University of Science Ca Foscari University Venice Italy and University of Calcutta India The book is divided into volumes and presents dissertation works in the areas of Image Processing Biometrics based Authentication Soft Computing Data Mining Next Generation Networking and Network Security Remote Healthcare Communications Embedded Systems Software Engineering and Service Engineering

Models in Software Engineering Jörg Kienzle,2012-04-13 This book presents a comprehensive documentation of the scientific outcome of satellite events held at the 14th International Conference on Model Driven Engineering Languages and Systems MODELS 2011 held in Wellington New Zealand in October 2011 In addition to 3 contributions each of the doctoral symposium and the educators symposium papers from the following workshops are included variability for you multi paradigm modeling experiences and empirical studies in software modelling models run time model driven engineering verification and validation comparing modeling approaches models and evolution and model based architecting and construction of embedded systems

**Relating Software Requirements and Architectures** Paris Avgeriou,John Grundy,Jon G. Hall,Patricia Lago,Ivan Mistrík,2011-08-03 Why have a book about the relation between requirements and software architecture Understanding the relation between requirements and architecture is important because the requirements be they explicit or implicit represent the function whereas the architecture determines the form While changes to a set of requirements may impact on the realization of the architecture choices made for an architectural solution may impact on requirements e g in terms of revising functional or non functional requirements that cannot actually be met Although research in both requirements engineering and software architecture is quite active it is in their combination that understanding is most needed and actively sought Presenting the current state of the art is the purpose of this book The editors have divided the contributions into four parts Part 1 Theoretical Underpinnings and Reviews addresses the issue of requirements change management in architectural design through traceability and reasoning Part 2 Tools and Techniques presents approaches tools and techniques for bridging the gap between software requirements and

architecture Part 3 Industrial Case Studies then reports industrial experiences while part 4 on Emerging Issues details advanced topics such as synthesizing architecture from requirements or the role of middleware in architecting for non functional requirements The final chapter is a conclusions chapter identifying key contributions and outstanding areas for future research and improvement of practice The book is targeted at academic and industrial researchers in requirements engineering or software architecture Graduate students specializing in these areas as well as advanced professionals in software development will also benefit from the results and experiences presented in this volume

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