

# Excerpt from *Software Product Lines: Practices and Patterns*

- **Software Product Lines: Practices and Patterns**
  - By Paul Clements, Linda M. Northrop.
  - Addison-Wesley
- #16. Enchiladas verdes: Corn tortillas baked with a zesty filling, covered with a green tomatillo sauce. Your choice of chicken, beef, pork, or cheese.
- #17. Enchiladas rojas: Corn tortillas baked with a zesty filling, covered with a red ancho chile sauce. Your choice of chicken, beef, or pork.
- See what I mean? This restaurant clearly produces an “enchilada” product line. (Well, all right, “clearly” applies only to those of us who have been thinking about this for too long.) While admittedly a cheesy example (sorry), it actually provides a pretty good analogy with software product lines and the central concepts they embody.
- The enchilada product line consists of seven separate products, differentiated by filling and sauce. This defines their variabilities. The corn tortillas are core assets because they’re used in every product. The red and green sauces are also core assets because they’re used in four and three products, respectively. And the meat fillings are also core assets, used in two products each. But the cheese is a product-specific asset, used only in the enchiladas verdes.
- Some of the core assets have attached processes that indicate how they are to be instantiated for use in products. Here, the beef, pork, and chicken have attached processes that dictate how they’re chopped, seasoned, and cooked. The processes call for different spices to be added depending on the sauce.
- All of the products share an “architecture”—tortillas wrapped around a filling, covered with sauce. And they also share a “production plan”: prepare filling, wrap filling in tortilla, cover with sauce, bake at 350 degrees for 15 minutes, garnish, serve.
- This little product line provides economies of scope; the common ingredients let the restaurant stock a small number of food items delivered from a small number of suppliers. They provide personnel flexibility: the same person who makes the pork enchiladas rojas is, I would bet my house, the same person who makes the cheese enchiladas verdes. And because the choices are limited, many of the ingredients can be pre-prepared, allowing for rapid time-to-market, which in this case means time-to-table.
- Finally, because the commonalities and variabilities are exquisitely clear, it’s easy to see how this product line’s scope could be expanded, by offering new fillings and new sauces and perhaps new combinations. You could even see how this efficient production capability could be used to launch an entirely new product line to capture a new market segment: replace the corn tortillas with flour tortillas, lose the sauce, add lettuce and tomato and other condiments, and open a new restaurant chain that sells “wraps.”

# Software Product Lines Practices And Patterns

**Ying Liu**



## Software Product Lines Practices And Patterns:

**Software Product Lines** Paul Clements, Linda Northrop, 2002-01 Long a standard practice in traditional manufacturing the concept of product lines is relatively new to the software industry A software product line is a family of systems that share a common set of core technical assets with preplanned extensions and variations to address the needs of specific customers or market segments Software organizations of all types and sizes are discovering that when skillfully implemented a product line strategy can yield enormous gains in productivity quality and time to market Software Product Lines is the culmination of an intensive investigation undertaken by the Software Engineering Institute SEI at Carnegie Mellon into how leading edge software development organizations have retooled for product lines With explanations of fundamental concepts further illuminated by real world experience this book spells out the technical issues involved in adopting a product line strategy as well as the organizational and management issues that are so critical for success In providing a comprehensive set of practices and patterns this book defines and explores the key activities for software product line development and explains specific practice areas in engineering technical management and organizational management Highlights include The benefits of a software product line approach including actual improvement data from industrial success stories Methods to develop a reusable base of core assets and to develop products that utilize that core Common problems paired with concrete solutions in the form of reusable software product line patterns Twenty nine practice areas for successful implementation including architecture definition component development configuration management market analysis and training The product line technical probe for identifying technical and organizational weaknesses that could impede success Three detailed case studies from the industry lead you step by step through the process of developing and managing software product lines illustrating potential pitfalls creative solutions and the ultimate rewards Discussion questions sidebars and real world anecdotes from the trenches reveal the collective wisdom of those on the front line of software product line ventures 0201703327B09102001 **The Java Developers Almanac** Patrick Chan, 2001 *Software Product Lines* Paul Clements, Linda Northrop, 2015-12-04 [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

*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 Language Engineering** Mark van den Brand, Dragan Gasevic, Jeff Gray, 2010-03-25 This book constitutes the thoroughly refereed post conference proceedings of the Second International Conference on Software Language Engineering SLE 2009 held in Denver CO USA in October 2009 The 15 revised full papers and 6 revised short paper presented together with 2 tool demonstration papers were carefully reviewed and selected from 75 initial submissions The papers are organized in topical sections on language and model evolution variability and product lines parsing compilation and demo modularity in languages and metamodeling and demo

*Software Product Lines: Going Beyond* Jan Bosch, Jaejoon Lee, 2010 This volume constitutes the refereed proceedings of the 14th International Software Product Line Conference SPLC 2010 held on Jeju Island South Korea in September 2010

**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 Product Lines** Robert L. Nord, 2004-07-30 This book constitutes the refereed proceedings of the Third International Software Product Line Conference SPLC 2004 held in Boston MA USA in August September 2004 The 18 revised full technical papers presented together with a keynote abstract and summaries of panels tutorials and workshops were carefully reviewed and selected for inclusion in the book Organized in sections on business architecture and quality assurance the papers address topics ranging from how to start a software product line in a company to case studies of mature product lines and the technology used to test strategies of product lines to strategies and notations for creating product line architectures and to the importance of binding times in creating product lines      **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

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