



BIGLEVER NEWSLETTER: **Special Series**

At the Edge of the PLE Envelope Part 2: Product Line Engineering Meets Product Line Operations

Greetings from Dr. Charles Krueger, BigLever CEO:

February makes perfect timing for the next installment in this newsletter series, *At the Edge of the Product Line Engineering (PLE) Envelope*. Our partners and customers have completed their year-end reviews and created their Product Line Engineering objectives and plans for the new year. Looking across the industry in the February perspective, we can see how the advances in PLE practice last year are enabling the leading edge trends going forward into the new year.

In [part 1](#) of this series, I mentioned that many of the latest PLE innovations are occurring at the interface between engineering and the larger business enterprise. The scope of this trend has expanded with remarkable speed and clarity, exposing new opportunities where PLE methodology, tools and practices can be applied to align engineering and business operations.

The implications are similar to the paradigm shifts we saw when 1st generation Software Product Line (SPL) methods provided whole factor improvements in *software development* for a product family and when 2nd generation Systems and Software Product Line Engineering (2G PLE) methods provided additional whole factor improvements across the entire *systems and software engineering lifecycle*.

In this newsletter, I'll describe this next emerging paradigm that offers additional whole factor improvements in *product line operations*.

Product Line Engineering meets Product Line Operations

The complexity of managing the variability in a family of similar products or systems is not limited to engineering groups. Other organizations that can spend inordinate amounts of time and effort dealing with product feature diversity include manufacturing and supply chains in automotive, certification and compliance documentation in aerospace and defense, product marketing and product portfolio planning in highly competitive markets, web system deployments in e-commerce, sales automation for complex configurable systems, plus training, support, service, maintenance, disposal, and more in many industries.

■ **Careers at BigLever**

As the Product Line Engineering field grows, so does BigLever. We are expanding our staff in 2014 to help foster our growing customer community. We seek preeminent, experienced, industry professionals with proven expertise, instincts, and drive to have an impact on our mission to revolutionize the systems and software engineering field with industry leading PLE innovations.

Here are highlights of two key career opportunities at BigLever. See the [Careers page](#) on our website for details regarding required experience, skills and personal qualities for these positions.

Vice President of Sales:

Foundational opportunity to lead all of BigLever's worldwide Sales activities. Collaborate with BigLever executive leadership to define and refine the overall strategy and roadmap for Sales operations. Directly engage with organizations who have expressed interest in BigLever's solutions and benefits. Efficiently advance sales engagements with a combination of WebEx, teleconference, e-mail and face-to-face communications.

Director of Professional

Services: High profile opportunity to lead the execution of BigLever's customer service engagements, including solution pathfinding, technical leadership mentoring, and practitioner training. Work at the leading edge of the PLE field with BigLever's premier PLE experts and world class technical leadership at our customers who are undertaking the industry's most innovative PLE

Although it became clear to many successful 2G PLE organizations that alignment of PLE with their existing business *operations* was crucial, the idea of consolidating the variant management disciplines across engineering and operations groups is an emerging idea at the edge of the envelope. Some of the industry's most innovative product line enterprises are now leveraging or planning to leverage their PLE competence to create highly efficient Product Line Operations. We refer to this convergence as *Product Line Engineering and Operations*, or *PLE&O*.

Smart Automotive Variant Conference

An insightful view into this emerging convergence was at the [Smart Automotive Variant.con Conference](#) held in Germany last November, for which I was the invited [conference chair](#).

From that introduction you might expect this to be a PLE conference, though it was in fact primarily a Product Line Operations conference, with senior leadership representation from manufacturing, supply chain, portfolio planning and management, sales automation and configurators, support and maintenance, and more.

The challenges, opportunities and solutions for managing the complexity of product line variants in these disciplines is strongly analogous to those seen in PLE. This should not be too surprising since the complexity of variant management has the same root cause as PLE – product feature diversity. It was interesting to see that some of the most promising approaches were using feature-based abstractions, such as those found in traditional sales configurators for complex products.

It was immensely clear that the disciplines of PLE and Product Line Operations are overdue for a PLE&O convergence.

On the Wings of the V

Prior to the 2G PLE methodology, individual stages of the systems and software engineering lifecycle would typically invent their own solutions for managing product line variation. Requirements engineers might use attributes to annotate requirements variations in their database, designers might use supertypes and subtypes to model design variants, software developers might use IFDEFs to indicate source code variants, and testers might use file system directory naming conventions to sort out their test case variants. Of course, dissonance among the solutions across the lifecycle stages made it nearly impossible to manage the traceability among variants in the different lifecycle stages.

The 2G PLE solution uses feature-based approaches to consolidate variation management across the different stages of the



deployments.

■ Chad Jackson on BigLever

[Chad Jackson](#), Principal Analyst at Lifecycle Insights, spotlighted BigLever's innovative Bill of Features™ approach in a recent blog article entitled [BigLever Software: Third Leg to the Platform Design Stool?](#)

Jackson is a recognized authority on technologies that enable engineering, including CAD, simulation, PDM and PLM. He researches, publishes and speaks on how engineering leverages these technologies to improve design and development processes.

[Lifecycle Insights](#) assesses the business impact of technology on the most pressing issues affecting engineering organizations. The firm provides insight into how software applications and systems affect engineering strategies and initiatives.

■ BigLever at SEDC 2014

Dr. Paul Clements, BigLever's Vice President of Customer Success, will present a session entitled *Product Line Engineering Takes Off in Aerospace and Defense* at the [SEDC 2014 Conference](#).

Sponsored by the International Council on Systems Engineering (INCOSE), SEDC is the premiere systems engineering conference for the Washington DC area. The 2014 conference will be held on April 3rd - 5th in Chantilly, Virginia.

Dr. Clements will spotlight the growing number of notable PLE successes that can now be seen in the Aerospace & Defense arena. His presentation will feature high-visibility examples where 2G PLE techniques are being created and applied to meet the unique challenges of the A&D sector.

This session will offer insight into how A&D organizations are

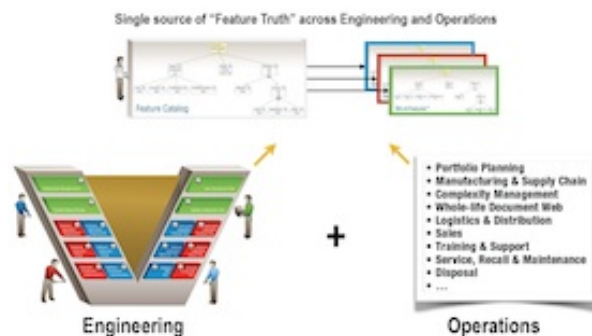
systems and software engineering lifecycle with a single source of the "feature truth" and sophisticated feature-based automation. This is shown in illustration 1, where the consolidated feature-based PLE approach sits in the middle of the traditional systems and software engineering 'V'.



>> See illustration 1.

Some of the most advanced 2G PLE organizations are pushing towards a similar convergence between PLE and Product Line Operations. However, business operations such as product marketing or customer training are not part of the engineering 'V'. A good way to think of operations is that they are on the *wings of the 'V'*. That is, there are operations that are upstream of the engineering activities on the left of the 'V' and there are operations that are downstream of the engineering activities on the right of the 'V'.

As shown in Illustration 2, the single source of the "feature truth" has been elevated out of the middle of the 'V', so that it can also be the single source of the "feature truth" for the operations on the wings of the 'V' and thereby facilitate the PLE&O convergence.



>> See illustration 2.

As you might imagine, the sophisticated feature-based ontology needed to support 2G PLE needs to be further extended with new abstractions to support Product Line Operations. Although this is still an area of pathfinding, emerging at the edge of the PLE envelope, it appears that these extensions may be mostly grounded on new *feature bundling* constructs. The feature ontology for PLE&O will be the subject of a future newsletter installment.

Note that PLE&O can be viewed as the product line specific concern within the field of *DevOps*, which promotes the overall efficient interoperability of engineering and business operations.

The Next Generational Step

PLE&O is more than just a new approach for aligning PLE with business operations. It is a generational step forward in the evolution of product line paradigms.

- 1st generation Software Product Line (1G SPL) engineering extended traditional software development with a fundamental new perspective and methodology for developing software in a family of similar systems.

optimizing PLE approaches based on BigLever's Gears PLE Lifecycle Framework to achieve order-of-magnitude gains in engineering efficiency, time-to-market, product line scalability, and quality.

■ 18th International Software Product Line Conference

Dr. Charles Krueger, BigLever CEO, is the Industrial Relations Co-Chair for SPLC 2014, the 18th International Software Product Line Conference, which will take place September 15th - 19th in Florence, Italy. We will leverage our BigLever newsletter to keep this community current on important dates and deadlines.

SPLC is the premier forum for practitioners, researchers and educators to present and discuss the innovations, trends, experiences, and concerns at the edge of the PLE envelope. Don't let the name fool you – the Software Product Line Conference name reflects its genesis in Software Product Lines, though the conference topics continually evolve to encompass the broader scope of Systems and Software Product Line Engineering and Product Line Operations.

SPLC 2014 has published its [Call for Papers and Contributions](#) for industry and research tracks, workshops, tutorials, panel discussions, demonstrations, doctoral symposium, and Hall of Fame. The deadline for abstract submissions is April 4th and full paper submissions is April 11th.

■ Additional BigLever Events

Dr. Krueger has been invited to participate in two distinguished events for industry leaders:

Dagstuhl Seminar: Unifying Product and Software Configuration

April 21 - 24, 2014

Wadern, Saarland, Germany

Congress on the Future of Engineering Software (COFES)

- 2nd generation Systems and Software Product Line Engineering (2G PLE) extended 1G SPL with a fundamental new perspective and methodology for consolidated feature-based variation management and automation across the full systems and software engineering lifecycle in a family of similar systems.
- Product Line Engineering and Operations (PLE&O) extends 2G PLE with a fundamental new perspective and methodology for consolidated feature-based complexity management, variation management and automation across an enterprise's entire engineering and business operations for their family of product or system deliverables.

I anticipate that PLE&O will continue to emerge this year from innovation and pathfinding at the edge of the envelope into more widespread and well known practice in the product line field. I look forward to hearing and sharing ideas and experiences with members of our community.

Stay tuned for more installments in the series, *At the Edge of the PLE Envelope* (which we may need to update to be *At the Edge of the PLE&O Envelope*).

Best Regards,

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April 24 - 27, 2014
Scottsdale, Arizona

BigLever's event participation also includes sponsorship and/or presentations at the following conferences:

IBM Systems and Software Engineering Symposium

March 25, 2014
Auburn Hills, Michigan

IBM Innovate

June 1 - 5, 2014
Orlando, Florida

Product Innovation San Diego

October 21 - 22, 2014
San Diego, California

■ About BigLever

BigLever Software, Inc.™ is the leading provider of systems and software product line engineering solutions. BigLever's patented Gears™ solution enables organizations to reduce development costs and bring new product line features and products to market faster, enabling businesses to more reliably target and hit strategic market windows.

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