BigLever Software Gears and the 3-Tiered SPL Methodology

Charles W. Krueger
BigLever Software
10500 Laurel Hill Cove
Austin, TX 78730 USA
+1-512-426-2227
ckrueger@biglever.com

Abstract

BigLever Software Gears is a software product line development tool that allows you to engineer your product line portfolio as though it is a single system. Gears is designed to support and enable all three tiers in the new generation 3-Tiered Software Product Line (SPL) Methodology, across the full SPL engineering lifecycle. Gears and the 3-Tiered SPL Methodology have played an instrumental role in some of the industry's most notable real-world success stories including Salion, 2004 Software Product line Hall of Fame Inductee, and Engenio/LSI Logic, 2006 Software Product Line Hall of Fame inductee.

Categories and Subject Descriptors   D.2.13 [**Software Engineering**]: Reusable Software – *domain engineering, reusable libraries, and reuse models*.

General Terms   Design, Economics, Management, Measurement, Theory.

Keywords   Software Product Lines

1. BigLever Software Gears

The centerpiece of the BigLever Software solution is Gears™, an industry-leading software product line development tool. Gears provides simple, yet powerful, software engineering technology that elevates portfolio engineering to a first-class engineering practice.

1.1. The Gears Software Production Line

Gears is used to create a software production line capable of producing all of the products in a software product line portfolio. As illustrated in Figure 1, Gears software production line comprises three key elements:

 Software Assets are configurable software artifacts – such as source code, requirements, and test cases – engineered to be reused across the product line.

Product Feature Profiles model each product in the portfolio in terms of optional and varying feature choices specified for the product line.

The *Gears Configurator* automatically assembles and configures the software assets, guided by the product feature profiles, to produce the products in the portfolio.

1.2. Consolidate, Simplify, Leverage: Engineer Your Portfolio as a Single System

Manufacturers have long employed analogous engineering techniques to produce a product line portfolio, using a single factory that assembles and configures parts designed to be reused across the product line. For example, automotive manufacturers create many unique variations of a car model using a single pool of carefully architected parts and a production facility specifically designed to configure and assemble those parts.
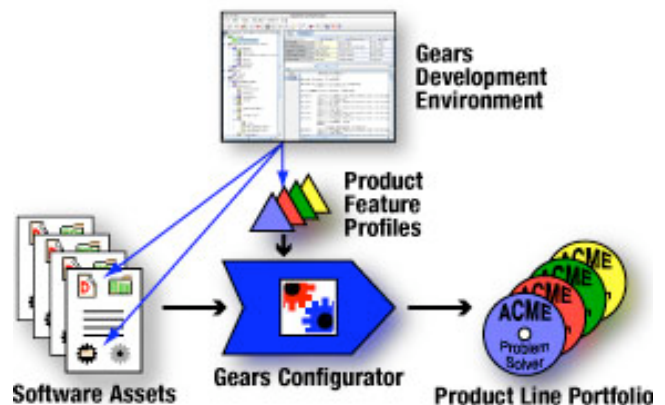

Figure 1. Gears Software Production Line

The powerful, though subtle, essence of this approach – for software and for manufacturing – is the focus on the single system rather than the many products. Once the production line is established, products are automatically instantiated rather than manually created. Organizations are able to leverage the order of magnitude improvements in time-to-market, development cost, portfolio scalability and product quality for overwhelming strategic business advantage.

2. The 3-Tiered Methodology

BigLever Software's direct involvement in more than a dozen different Software Product Line (SPL) deployments has illuminated a pattern, comprising a progression of SPL capabilities and a resulting progression of benefits. Based on this pattern, we have captured a pragmatic, new generation SPL methodology – simply referred to as the *3-Tiered SPL Methodology*™ – at the root of a new generation of SPL successes.

As organizations shift from conventional product-centric software development to SPL development, three tiers of capabilities and benefits are established, sometimes in sequence and sometimes in parallel. Each tier builds upon and is enabled by the capabilities and benefits of the previous tier.
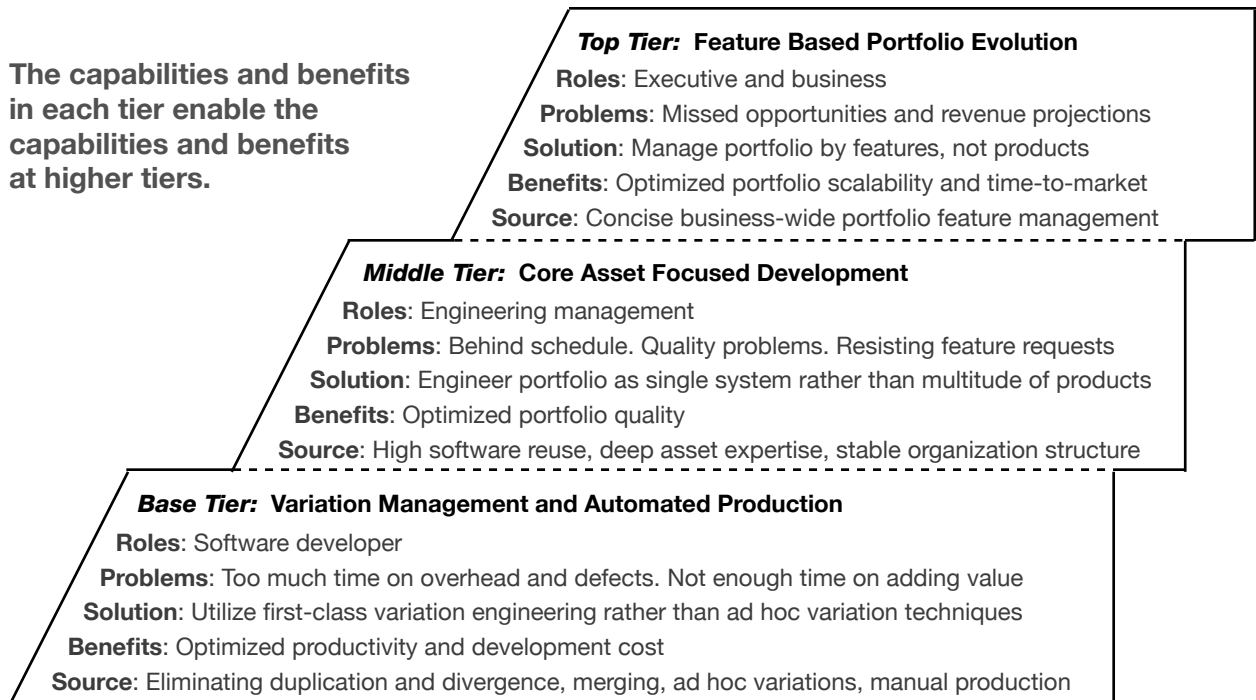
As illustrated in Figure 2, the base tier provides a very tactical set of developer capabilities and benefits, which enables a middle tier of engineering management capabilities and benefits, which ultimately enables the top tier of highly strategic capabilities and benefits for the business operations:

- **Base Tier**: *Variation Management and Automated Production*. First class variation management and a fully automated production line deliver optimized developer productivity and significant reductions in per-product development cost.
- **Middle Tier**: *Core Asset Focused Development*. Shifting from product focused to core asset focused

development enables the portfolio to be developed as a single system rather than a multitude of products. High levels of software reuse and deep core asset expertise are the result, leading to optimized product quality.

- **Top Tier**: *Feature Based Portfolio Evolution*. As the business transitions from product based to feature based portfolio evolution – where the entire portfolio evolves by adding or modifying feature requirements for common, optional, and varying features – the result is extremely efficient collaboration and concise communication between the business and engineering teams, leading to faster time-to-market and increased product line scalability.

This partitioning of capabilities and benefits into three distinct tiers provides a modular methodology that is easy to understand and explain. The well-defined relationships between the tiers reduce the number of options and clarify the choices when defining and adopting an SPL approach.

The capabilities and benefits in each tier enable the capabilities and benefits at higher tiers.

Top Tier: **Feature Based Portfolio Evolution**
Roles: Executive and business
Problems: Missed opportunities and revenue projections
Solution: Manage portfolio by features, not products
Benefits: Optimized portfolio scalability and time-to-market
Source: Concise business-wide portfolio feature management

Middle Tier: **Core Asset Focused Development**
Roles: Engineering management
Problems: Behind schedule. Quality problems. Resisting feature requests
Solution: Engineer portfolio as single system rather than multitude of products
Benefits: Optimized portfolio quality
Source: High software reuse, deep asset expertise, stable organization structure

Base Tier: **Variation Management and Automated Production**
Roles: Software developer
Problems: Too much time on overhead and defects. Not enough time on adding value
Solution: Utilize first-class variation engineering rather than ad hoc variation techniques
Benefits: Optimized productivity and development cost
Source: Eliminating duplication and divergence, merging, ad hoc variations, manual production

Figure 2. The 3-Tiered Software Product Line Methodology