Reuse is an Event.
Sharing is a Journey.

Charles W. Krueger, CEO
BigLever Software

CBSoft and SBCARS 2011
September 26, 2011
São Paulo, Brazil

Consolidate.

Simplify.

Leverage.

Software Reuse has <u>Long</u> been the Leading Candidate for Discontinuous Improvements in Engineering

- **1968** – Douglas McIlroy
  - 43 years ago!

- **1986** – Resurgence in the research community
  - 25 years ago!

- **1996** – Software Product Line Engineering
  - 15 years ago!

The Promise of Systems and Software Reuse been Slow to Materialize

- Reuse in *Concept* is simple, clear and powerful

- Reuse in *Practice* has been messy, muddled and anemic

Why? The Problem is…

- The things about Reuse that seem obvious don't work

- The things about Reuse that do work aren't obvious

As a Result...

- Many different engineering organizations predictably **take** the same ruinous path to **failed reuse initiatives**

- These same organizations consistently **overlook** the readily available path to **reuse breakthroughs**

How to best Explain this Conundrum?

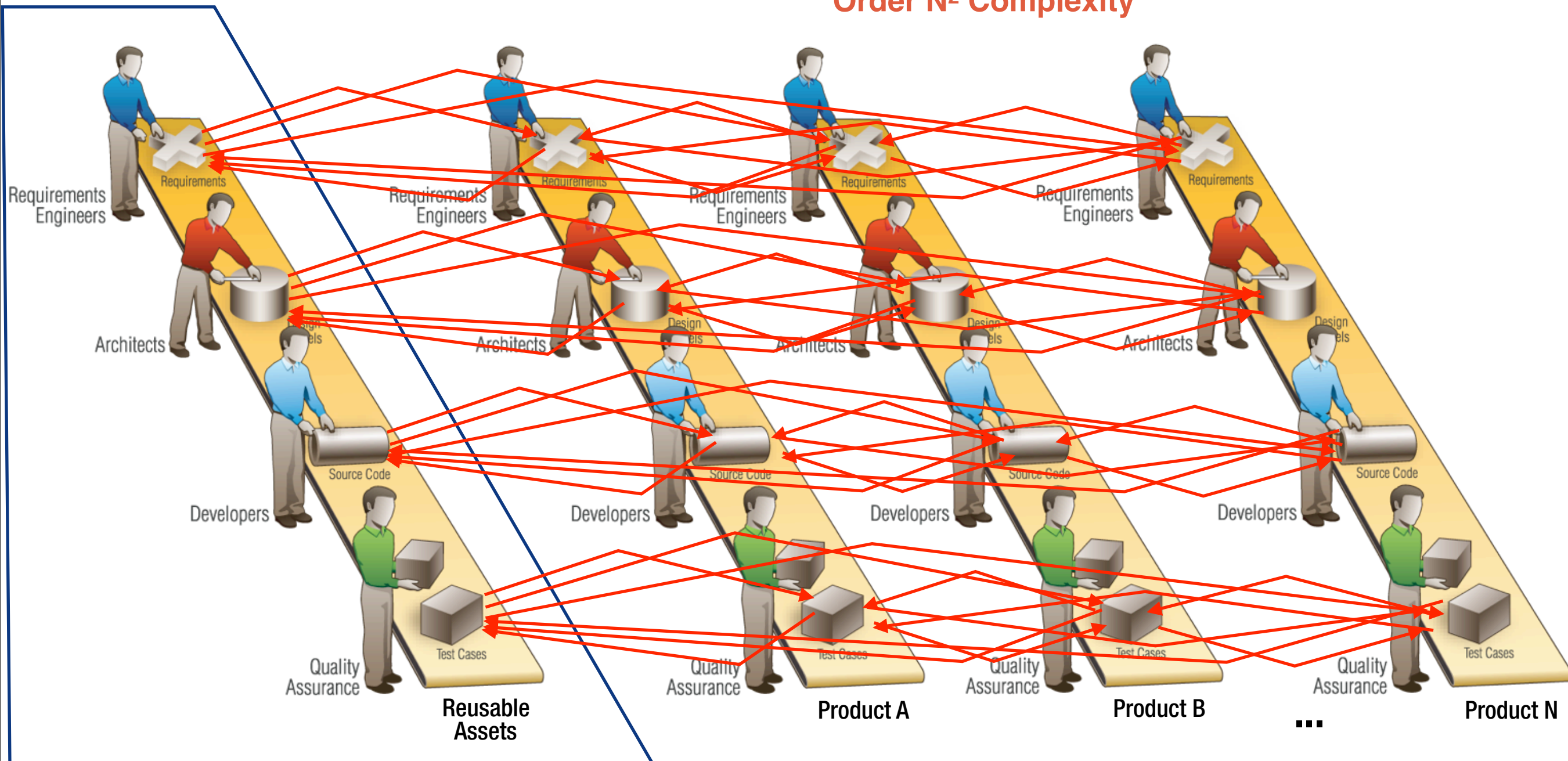**Reuse is an event. Sharing is a journey.**

Reuse is an Event

Thinking "Reuse is an Event" leads to the most Ineffective Reuse Approaches

- It's the intuitive first impression

- It's an impression that sticks

- Example: Library of reusable assets
  - The **Reuse Event** occurs when someone finds and reuses an asset for a new or enhanced product or system.
  - High fives all around!

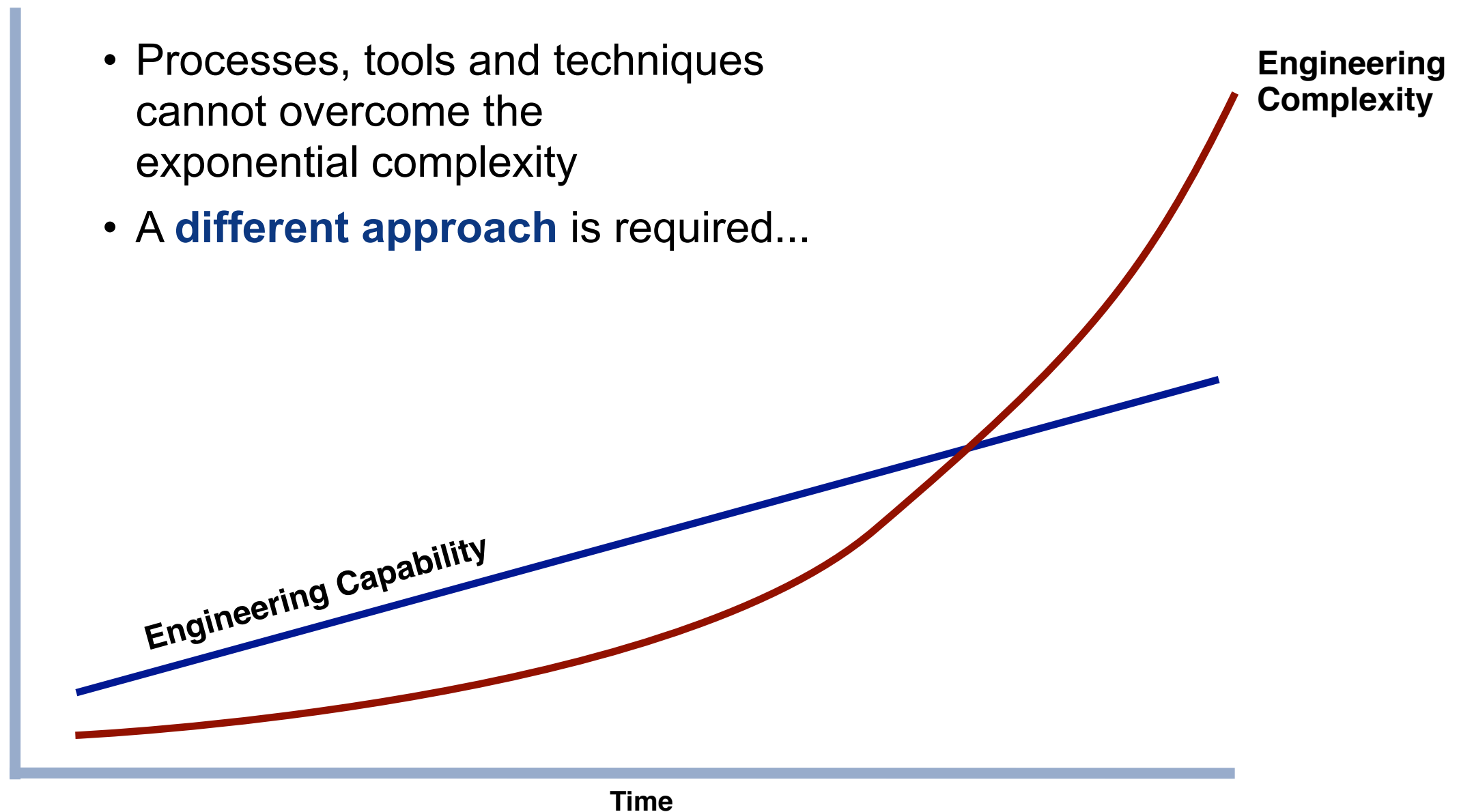- 100% reuse on day one. 0% reuse every day after that.

Complexity of "Reuse is an Event" Impedes Portfolio Production

Order N² Complexity

"Reuse is an Event" will not Scale

- Processes, tools and techniques cannot overcome the exponential complexity
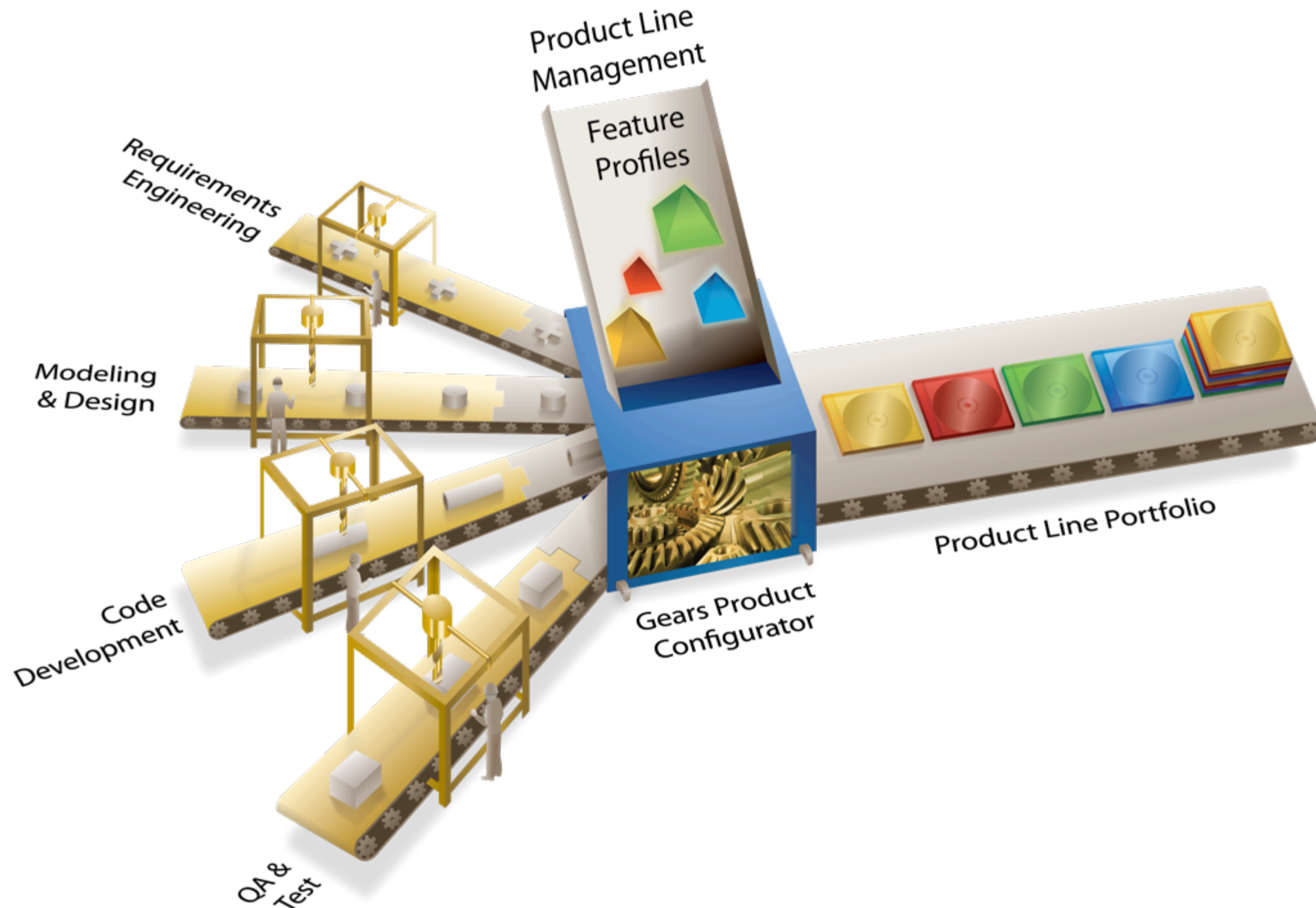- A **different approach** is required...

Engineering Complexity

Engineering Capability
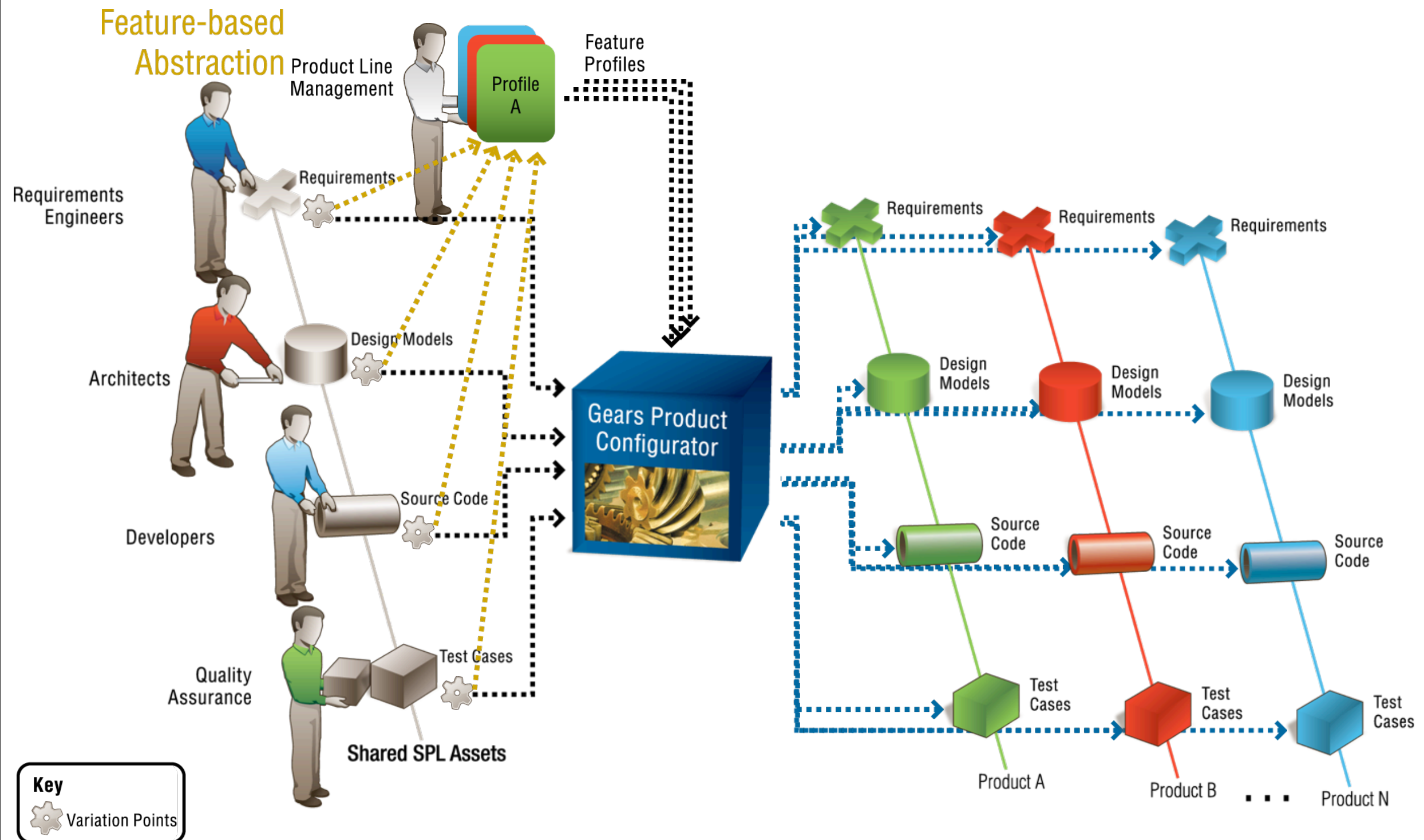
Time

Sharing is a Journey

Thinking "Sharing is an Journey" leads to the most Effective Reuse Approaches

- Reuse is not an event experienced in isolation

- It is odyssey embarked upon over time with others

- A rather non-intuitive perspective
  - On first impression, sounds like it might be more trouble than it's worth

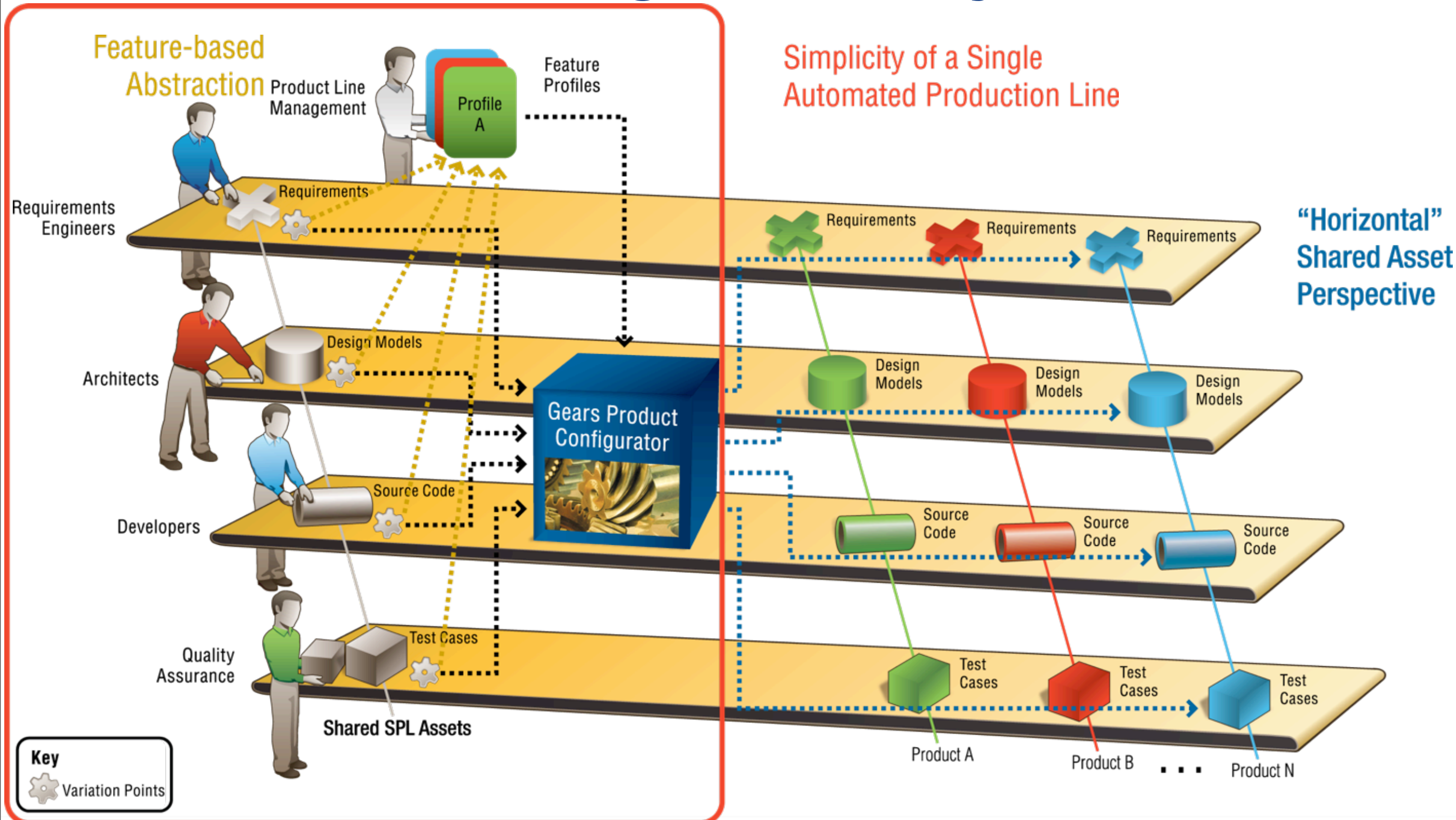- Generative in nature with feature-based abstractions

"Sharing is a Journey" Enables an Efficient Means of Production

Product Line Management

Feature Profiles

Requirements Engineering

Modeling & Design

Code Development

QA & Test

Gears Product Configurator

Product Line Portfolio
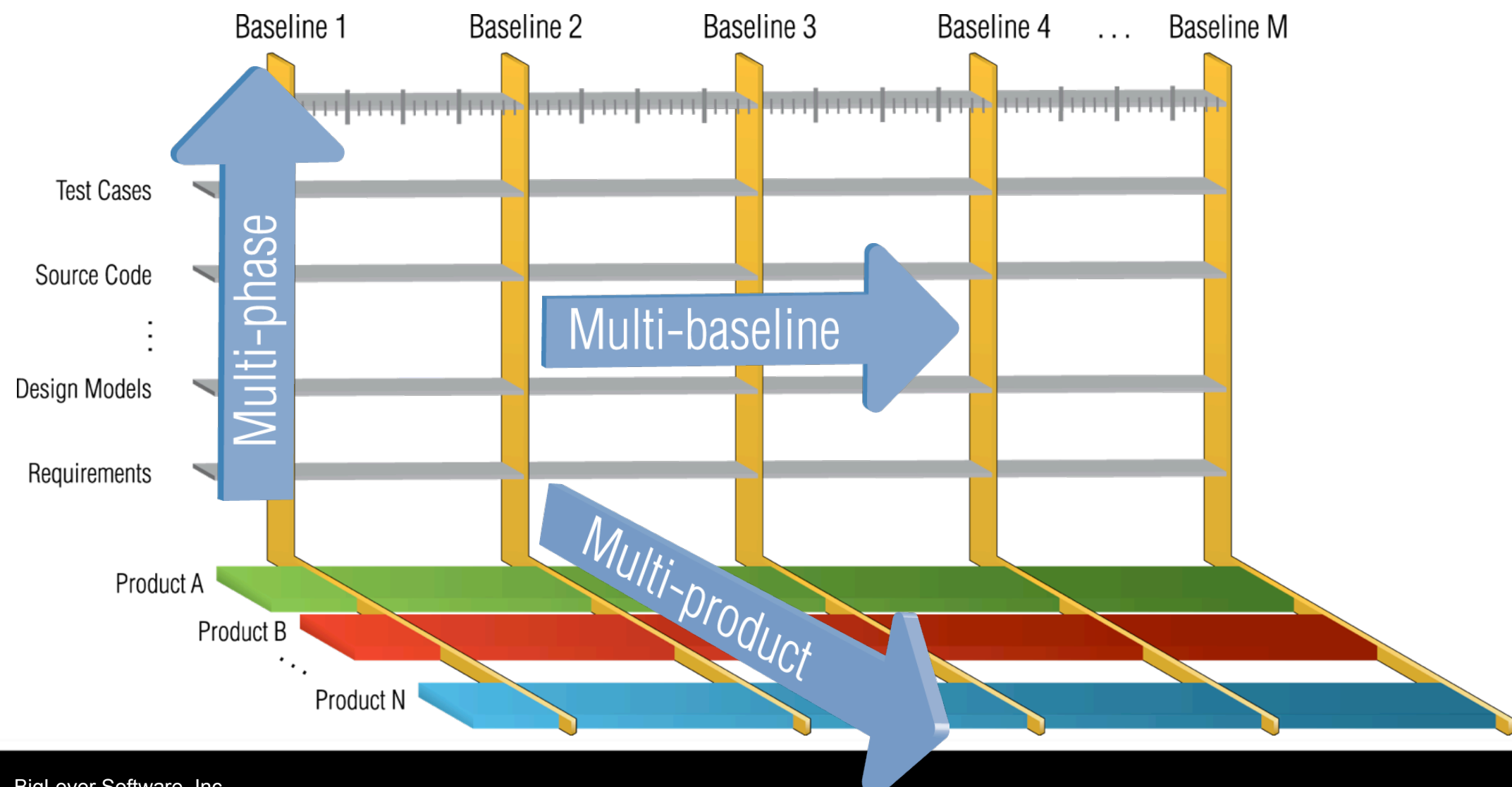
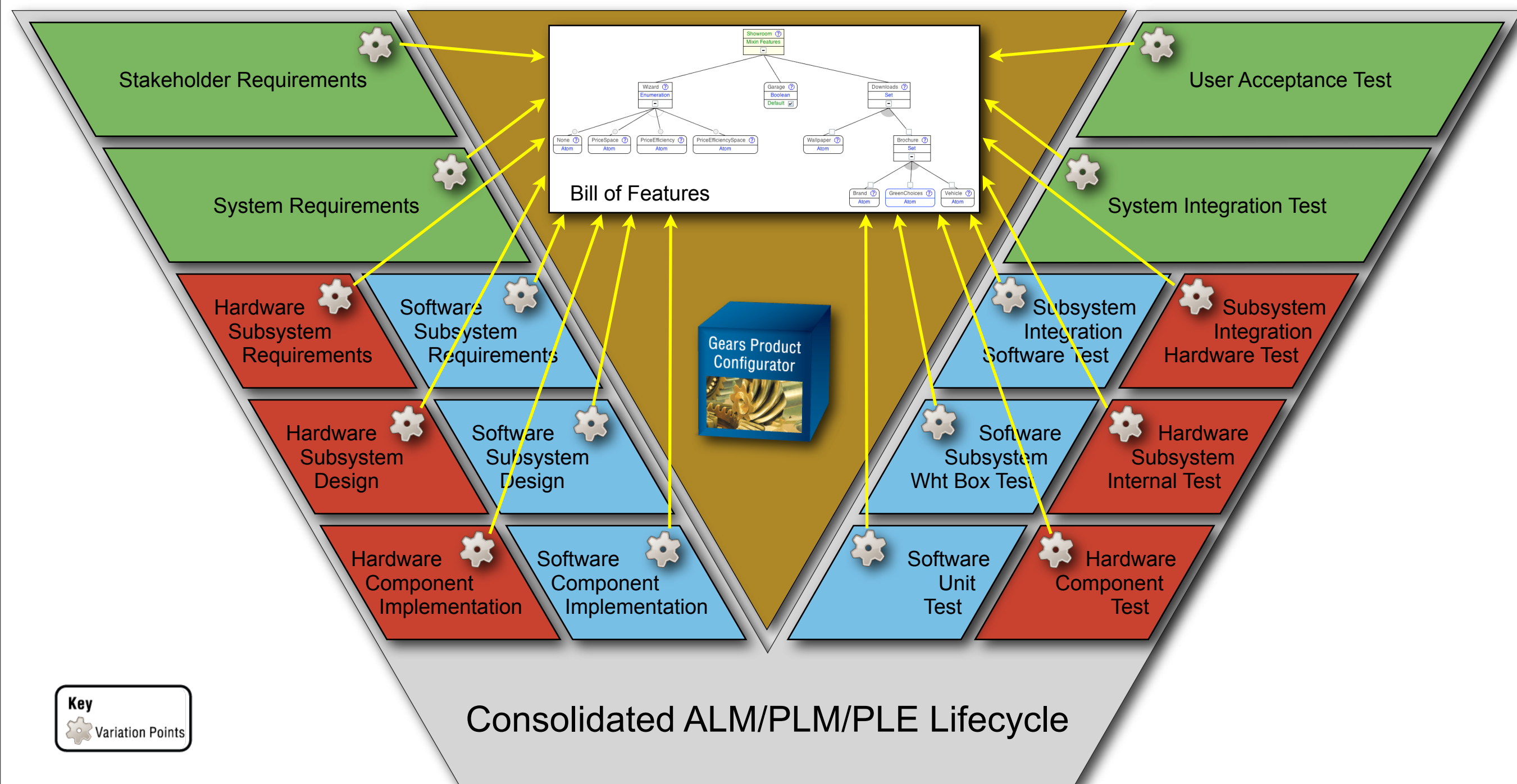# Sharing is a Journey

Sharing is a Journey
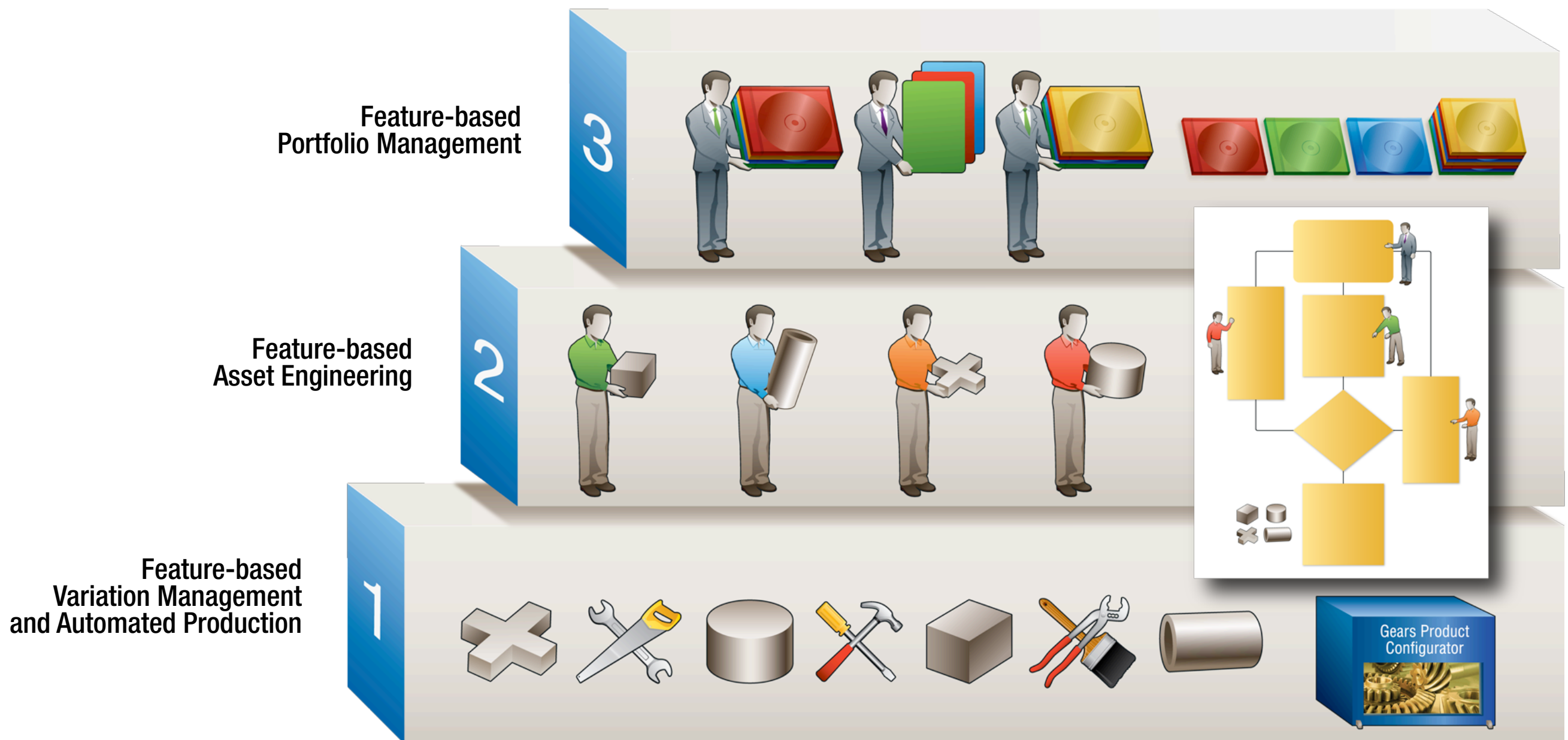
Synchronous concerns in the Sharing Journey

- *Multi-product*. Feature-based variation management and automated production line
- *Multi-phase*. Product line lifecycle assets, architecture and traceability
- *Multi-baseline*. Product line change management and baseline management

Feature-based Consolidation of the Sharing Lifecycle

Stakeholder Requirements

System Requirements

Hardware Subsystem Requirements

Software Subsystem Requirements

Hardware Subsystem Design

Software Subsystem Design

Hardware Component Implementation

Software Component Implementation

Bill of Features

Gears Product Configurator

User Acceptance Test

System Integration Test

Subsystem Integration Software Test

Subsystem Integration Hardware Test

Software Subsystem Wht Box Test

Hardware Subsystem Internal Test

Software Unit Test

Hardware Component Test

Consolidated ALM/PLM/PLE Lifecycle

Key — Variation Points

The 3-Tiered Methodology for "Sharing is a Journey"

Feature-based Portfolio Management — 3

Feature-based Asset Engineering — 2

Feature-based Variation Management and Automated Production — 1

Gears Product Configurator

Proven and Repeatable Successes with "Sharing is a Journey"

Lockheed Martin

- Combat and radar systems for 100:
  - US Navy AEGIS Cruisers and Destroyers
  - US Navy Littoral Combat Ships
  - US Coast Guard National Security Cutter
  - International Navy AEGIS ships
    - Japan
    - Korea
    - Spain
    - Norway
    - Australia

LSI Logic (now NetApp)
2006 Software Product Line Hall of Fame

- Engenio Storage Division
  - 300 product line engineers

- OEM supplier for high-end storage servers
  - IBM
  - Sun
  - Cray
  - Teradata
  - SGI
  - ...

- Over 250K installed systems, worth over $12B (as of 2004)

IKERLAN / Alstom

- IKERLAN and Alstom develop wind turbine control systems that optimize performance based on wind direction and speed, temperature and other factors

  - BigLever PLE solution utilized to create an array of turbine control systems customized to accommodate varying climates and geographies
    - 90% reduction in development time
    - 25% reduction in development costs

General Dynamics

- General Dynamics teamed with BigLever to create the winning proposal for the US Army Live Training Transformation "Consolidated Product-line Management"

  - Based on BigLever's 2nd Generation PLE tools and methodology

  - First DoD contract focused specifically on Product Line Engineering

  - $200M 5-year contract (2010 - 2015)

  - $50B product line investment
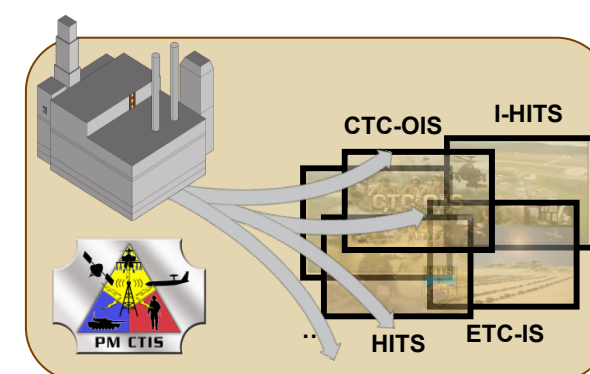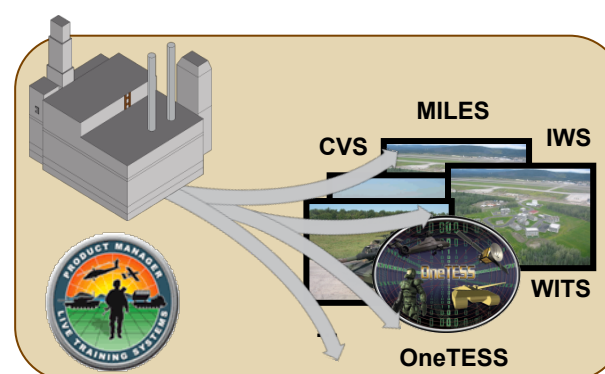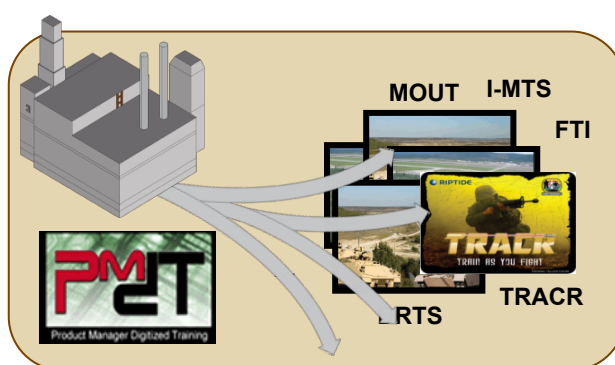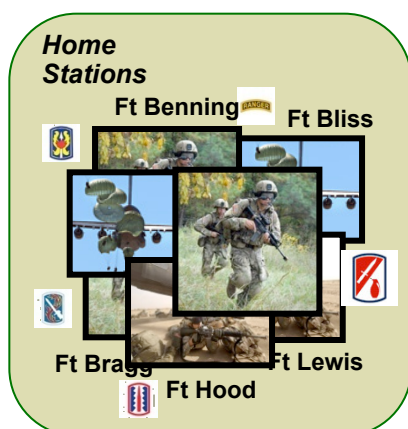
HomeAway
2009 Software Product Line Hall of Fame
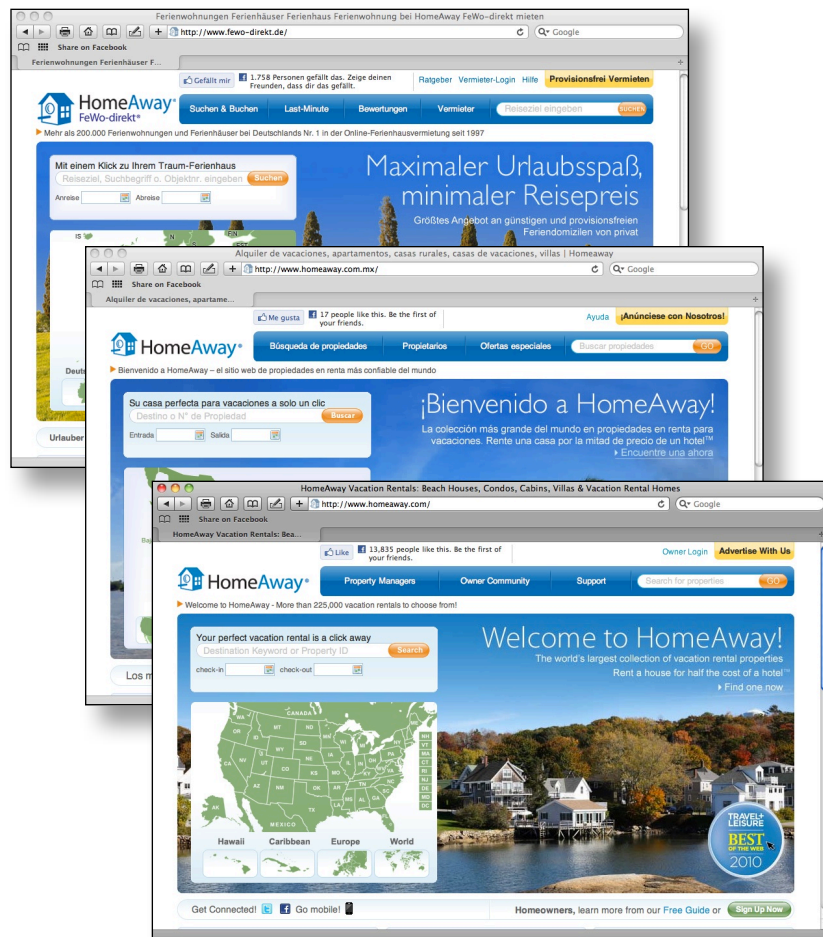
- eCommerce startup with $500M in combined venture investment

- Worldwide leader for online vacation home rentals
  - 50 million travelers visit HomeAway.com and choose from more than 130,000 vacation rental homes across 100 countries
  - Overall North American market for vacation rentals and timeshares is approximately $20 billion in gross travel bookings

- 30 different product instances are engineered and hosted using BigLever PLE tools and methods

- 50 product line engineers

General Motors

- GM has one of the most complex systems and software product line engineering challenges in the world

  - 3000 product line engineers

  - 300 hierarchical subsystems

  - Thousands of variant features

  - Millions of product instances

  - Tens-of-thousands of unique product variants

  - Entire product line and feature set evolves yearly

  - 15 concurrent temporal development streams
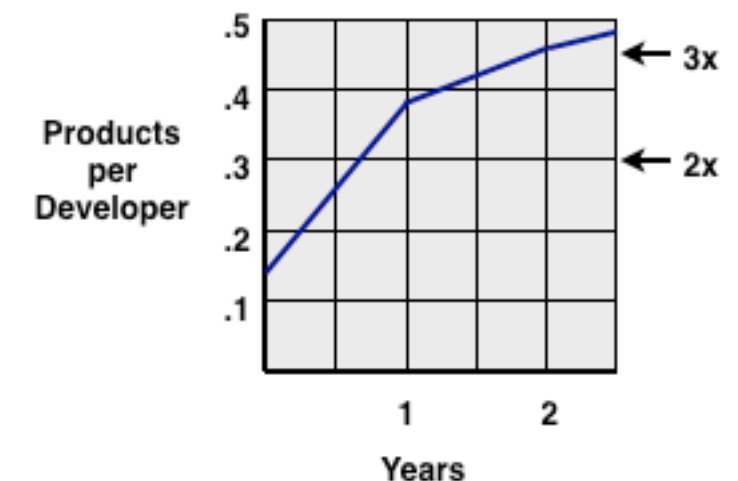
Benefits of "Sharing is a Journey"

- **Economy of Scale from Automated Production**
  - Increase in the scope of product diversity
  - Increase in the scale of different products delivered and maintained
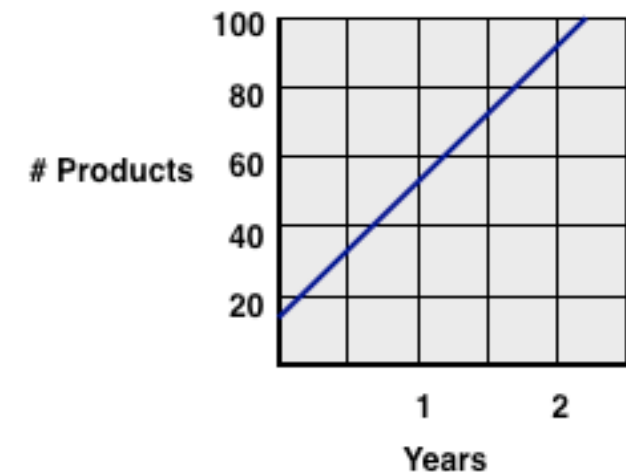
- **Cost Savings from Efficiency and Productivity**
  - Increase in productivity and efficiency
  - Reduction in per-product development cost and overhead
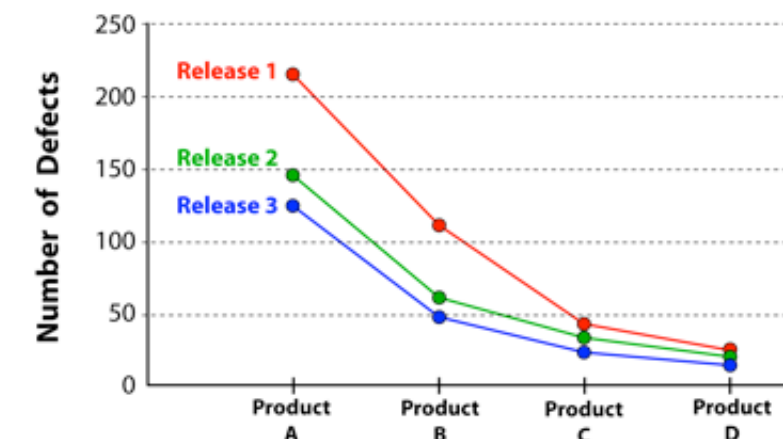 - Higher profit margins

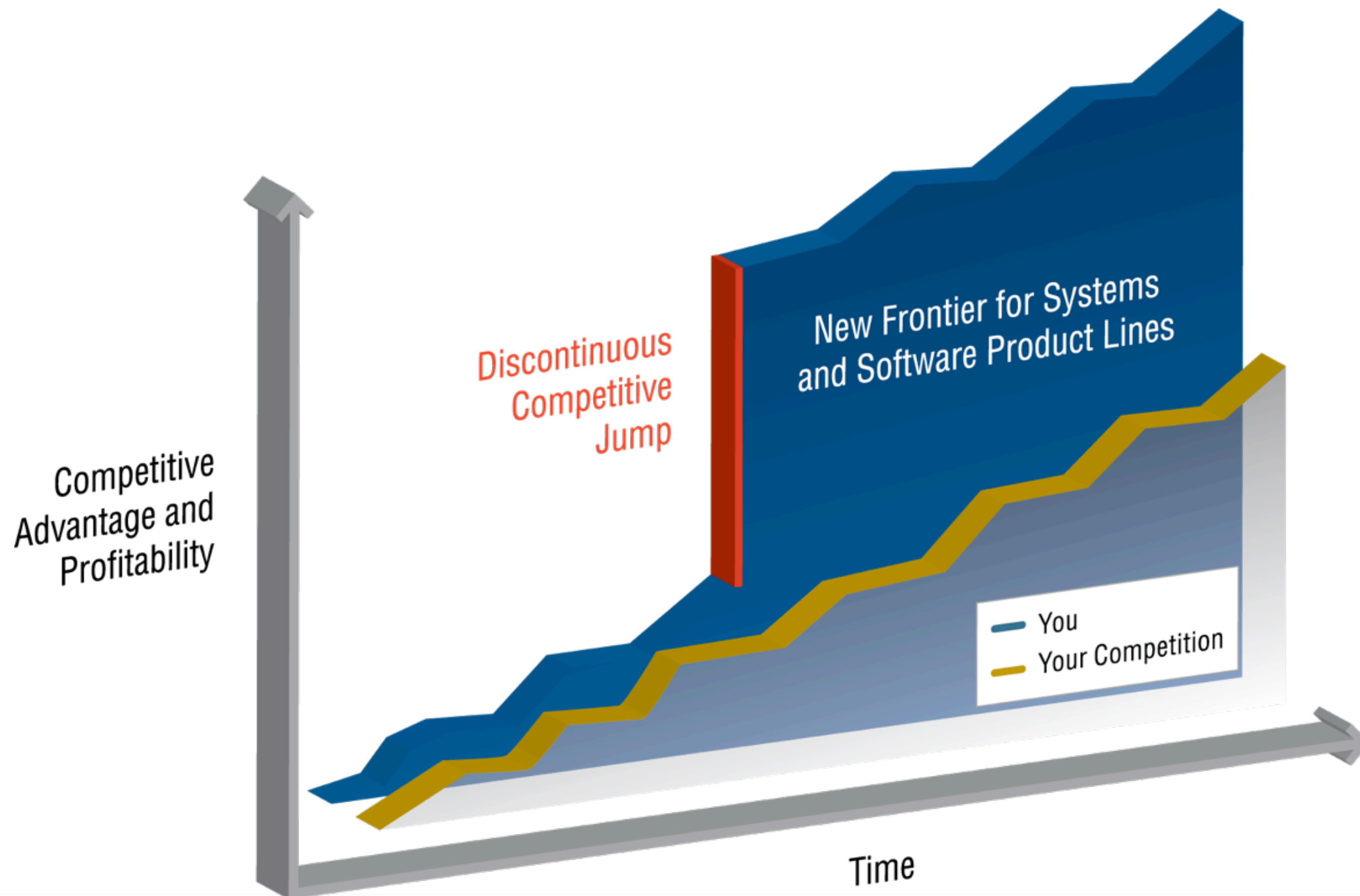- **Faster Profits from Faster Time to Market**
  - Reduction in time-to-market for new and updated products
  - Increased agility to react to new opportunities and changing markets

- **Better Products from Better Quality**
  - Increase in customer-perceived product quality
  - Reduction in defect density
  - Improved risk management

The New Frontier when "Sharing is a Journey"

Thank You!