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# Software Product Lines in Acquisition

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## Motivation

Determine actions to stimulate adoption of product line strategies in DoD acquisition of software-intensive systems

- Product lines respond to DoD acquisition policy goals
  - improving productivity and product quality
  - facilitating change
  - reducing life cycle costs
- DoD policy gives no guidance on when or how to undertake a product line approach



# The Product Line Concept

A set of systems sharing a common set of features  
(*similar products*)

satisfying specific needs of a market segment or mission  
(*similar problems*)

developed from core assets in a prescribed way  
(*similar solutions*)

For more information: <http://www.sei.cmu.edu/plp/>



# Approach

Investigate how DoD acquisition policies and practices could be modified to promote consideration of a product line approach by acquisition programs

- Policies:
  - What makes an approach credible?
  - What guidance do program managers need?
- Practices:
  - What should program managers do differently?
  - What is industry's role?



# PL Acquisition Concepts

## *PL Capability*

the means to rapidly build a product at reduced cost, customized to specific needs

## *PL Acquisition Strategies*

- Direct: Acquire a PL capability for the purpose of repeatedly building customized products
- Indirect: Acquire customized products from a supplier who has a suitable PL capability



# Goals for PLs in Acquisition

Near-term vision: DoD officially supports program managers who adopt a product line perspective

- Policy specifies when and how to institute a PL approach
- Programs routinely evaluate suitability of a PL approach
- DoD and industry collaboratively invest in PLs to meet future needs
- Source selections favor suppliers with prior PL investments
- Legal/financial guidance accommodates PL economic profiles



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# Acquisition action perspectives

Acquisition-program life cycle

Source selections

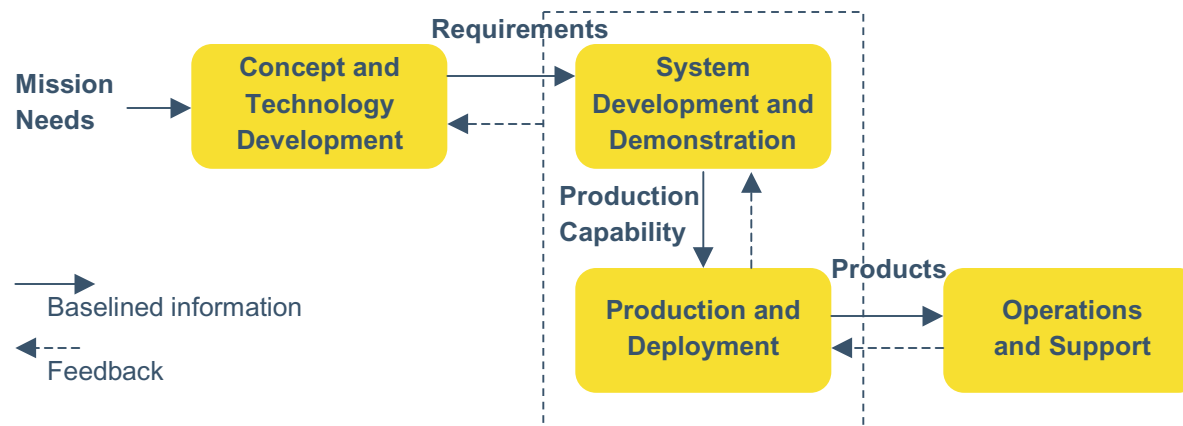
Industrial base

Funding models



## Acquisition-program life cycle perspective

Acquisition Management Framework will accommodate either a “point-solution” or a product line approach



PL approach requires feedback-driven repetition of program phases and cross-product life cycle management





## **Acquisition-program life cycle prescription**

Evaluate need for a PL approach during C&TD

Evaluate tradeoffs in direct vs. indirect PL strategy

Express diversity/uncertainty in needs as *variability*

Distinguish *development* from *production* for software too

Repeat acquisition phases when conditions change



## Source selections perspective

When is past performance predictive of future performance?

- Similar problem and technology and same people
- Performance instituted in a managed PL capability

Suppliers with an effective PL capability can build richer prototypes, faster and cheaper

True PL capability? Build variable prototypes on demand



## Source selections prescription

Look for prior PL performance and PL capability investments

- Prototypes that demonstrate pre-award PL capabilities, needs understanding, and solution approach viability
- Prototypes for multiple problems/solution formulations within a prescribed time and cost

Compare suppliers' existing and planned PL capabilities to PL needs

- Alternative problem-solution formulations
- Production capacity and quality of results
- Alignment of planned enhancements and evolution



## **Industrial base perspective**

DoD and defense industry are mutually dependent

DoD depends on but has low influence on current capabilities or evolution of commercial software

DoD needs to invest in R&D of software capabilities that will support future needs



# Industrial base prescription

Identify future software capability needs of programs

Target applied research and advanced technology funding to PL infrastructure needs

Expose uncertainties and expected changes when defining needs

Note potential divergences from future needs when evaluating commercial alternatives



## **Funding models perspective**

Cost reimbursement contracts discourage industry investment in PL capabilities

DoD and industry should share in cost/risk and savings/benefit of PL investment (proper mix of R&D, fixed-price, and cost-reimbursement funding)

Product acquisition cost needs to account for

- Prior investment in PL capability by DoD or industry
- Cost of enhancement to meet DoD current/future needs



# Funding models prescription

Develop guidance on funding and cost recovery for PL capability development

Develop guidance on DoD funding of existing PL capability extensions



## Near-term transition

Inform and advise policy makers on enacting PL prescriptions

Create guidance and training for acquisition practitioners

Advise and assist PL-qualified acquisition programs

For further information: *A Software Product Line Vision for Defense Acquisition* (CMU/SEI-2002-TN-002), Software Engineering Institute, June 2002.  
<<http://www.sei.cmu.edu/publications/documents/02.reports/02tn002.html>>