Overview of a Proactive Software Product Line Acquisition Approach

12 February 2009
**Alternative Acquisition Approaches for Acquiring Products via a Product Line**

<table>
<thead>
<tr>
<th>Government Develops</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Commission a government organization to develop a complete product line capability.</strong></td>
</tr>
<tr>
<td>This strategy involves acquiring a completely government-owned product line using the in-house capabilities of a designated government acquisition organization.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Contractor Develops</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Commission a supplier to develop a government-owned product line and build derivative products.</strong></td>
</tr>
<tr>
<td>This strategy involves acquiring a complete product line production capability and developing derivative products through contracting with one or more suppliers.</td>
</tr>
<tr>
<td><strong>Commission a supplier to develop products using its own proprietary product line.</strong></td>
</tr>
<tr>
<td>This strategy involves acquiring products directly from a supplier who has an existing product line and a demonstrated capability to build derivative products.</td>
</tr>
</tbody>
</table>
Example DoD Product Lines

Commission a government organization to develop a complete product line capability.

AMTS   CBT   RangeWare   ...

Commission a supplier to develop a government-owned product line and build derivative products.

CCT   FBCB2   ...

Commission a supplier to develop products using its own proprietary product line.

CAAS   OIC   CLIP   ...
# Impact of Selecting a Particular Product Line Acquisition Approach

<table>
<thead>
<tr>
<th>Government Develops</th>
<th>Product Line Acquisition Approach</th>
<th>Relative degree of organizational sophistication needed by acquirer</th>
<th>Relative degree of acquisition complexity</th>
<th>Typical scope of data rights</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.a</td>
<td>Development by acquisition organization</td>
<td>HIGH</td>
<td>LOW</td>
<td>Complete data rights</td>
</tr>
<tr>
<td>1.b</td>
<td>Development by acquisition organization and later transitioned to contractor</td>
<td>HIGH</td>
<td>MEDIUM</td>
<td></td>
</tr>
<tr>
<td>Contractor Develops</td>
<td>2.a Development involves one supplier</td>
<td>HIGH</td>
<td>HIGH</td>
<td>Complete Government-Use data rights</td>
</tr>
<tr>
<td>2.b</td>
<td>Development involves multiple suppliers</td>
<td>HIGH +++</td>
<td>HIGH +++</td>
<td></td>
</tr>
<tr>
<td>3.a</td>
<td>Single product acquired from supplier-owned product line</td>
<td>LOW</td>
<td>LOW</td>
<td>Negotiated Government-Use data rights</td>
</tr>
<tr>
<td>3.b</td>
<td>Multiple products acquired from supplier-owned product line</td>
<td>LOW</td>
<td>MEDIUM</td>
<td></td>
</tr>
</tbody>
</table>
Alternative Acquisition Approaches for Acquiring Products via a Product Line

Commission a government organization to develop a complete product line capability.
This strategy involves acquiring a completely government-owned product line using the in-house capabilities of a designated government acquisition organization.

Commission a supplier to develop a government-owned product line and build derivative products.
This strategy involves acquiring a complete product line production capability and developing derivative products through contracting with one or more suppliers.

Commission a supplier to develop products using its own proprietary product line.
This strategy involves acquiring products directly from a supplier who has an existing product line and a demonstrated capability to build derivative products.
Software Product Line Acquisition Concept

XYZ Product Line Production Capability (PLPC)

Development of XYZ Family\(^1\) of Software Products

Incremental Delivery

Family of XYZ Software Products

Legend:
- Contract Deliverables
- Contractual Task

\(^1\) XYZ Program Office is responsible for providing initial scoping document
Software Product Line Acquisition Concept
-- with example contract deliverables --

XYZ Concept of Operations

XYZ Product Line Production Capability (PLPC)

Development of XYZ Family\(^1\) of Software Products

Performed by XYZ Contractor

Product Feature Description

Product Production Plan

Incremental Delivery

Family of XYZ Software Products

Legend:
Contract Deliverables
Contractual Task

Legend:

1 XYZ Program Office is responsible for providing initial scoping document
Two Primary SOW Tasks
— Task 1 Summary —

**Task 1: Software Product Line Production Capability (PLPC)**

The contractor shall develop, sustain and operate a comprehensive software product line production capability, hereafter referred to as the PLPC, throughout the life of the XYZ contract. The specific requirements governing the development, sustainment and operation of the PLPC and the XYZ core assets are described in `<PLPC-specification>`.

The contractor shall develop and deliver a comprehensive *Concept of Operations* (CONOPS) document `<CONOPS-CRDL>` and a *Product Line Practice Description* (PLPD) document `<PLPD-CDRL>` that describe how the XYZ product line will operate from an organizational and technical management perspective and how it will fully accommodate all aspects of the on-going development and sustainment of the XYZ core assets and the on-going development and sustainment of the family of XYZ software products.
Two Primary SOW Tasks
— Task 2 Summary —

Task 2: Family of XYZ Software Products
The contractor shall use the PLPC exclusively to develop, deliver, and sustain a family of XYZ software products. A “software product” is a member of the XYZ software product line that corresponds to a to-be-deployed configuration of the XYZ. Each software product is to be built using the XYZ core assets in accordance with a prescribed production plan and the specified product delivery schedule [<CDRL-specifying-XYZ-product-deliverables>].
The specific requirements governing the development and sustainment of each of the software products in the XYZ family of products are described in <specification-for-XYZ-family-of-software-products>. The XYZ software products are to be built using the PLPC in accordance with the CONOPS and supporting practices described in the PLPD document. Moreover, the products are required to be compliant with the XYZ product line software architecture, which is itself a core asset and part of the PLPC. The core assets are to include pre-planned variation mechanisms that allow each asset to be customized to meet XYZ product-specific requirements.
Overview of a Proactive Software Product Line Acquisition Approach

Phase 1

- Competitive Solicitation*
- Initial Down Select
- Competitive Fly-Off
- Final Down Select

Phase 2

- Software Development

Additional Phases:
- GFI
- Call For Improvement (CFI)

Contractors:
- Contractor A
- Contractor B
- Contractor C

Phases:
- Open Solicitation
- RFP
- Proposal Evaluations and Contract Awards
- Single Contract Award

* Includes RFP acquisition planning activities
Phase 1 Product Line Acquisition Events

- **Competitive Solicitation**
  - Initial Down Select
  - RFP
  - QAW
  - GFI

- **Competitive Fly-Off**
  - Contractor A
  - Contractor B
  - Contractor C

- **Open Solicitation**
  - RFI
  - QAW

- **Technical Proposal**
- **Proposal Evaluations and Contract Awards**
- **Architectural Competency**
- **Architectural Drivers**
- **Call For Improvement (CFI)**
- **Technical Proposal**

Contract performance technical monitoring events applicable to each competing contractor.
Phase 2 Product Line Acquisition Events

Final Down Select

Software Development

Concurrent delivery of two XYZ products, developed from the same core assets using the PLPC, PP's, and Incremental Product Deliveries.

Proposal evaluation and Contract Award

PL Technical Probe, Architecture Evaluation, PDR, Core Asset DEMO, CDR, Two Product Production Plans (PP), XYZ System Prime Contractor.

Contract performance technical monitoring events
Overview of a Proactive Software Product Line Acquisition Approach

- **Competitive Solicitation***
- **Initial Down Select**
- **Competitive Fly-Off**
- **Final Down Select**
- **Software Development**

*Includes RFP acquisition planning activities
Questions
Contact Information

Larry Jones
Research, Technology, and Systems Solutions Program
Telephone: 719-548-4744
Email: lgj@sei.cmu.edu

John Bergey
Research, Technology, and Systems Solutions Program
Telephone: 215-348-0530
Email: jkb@sei.cmu.edu

Linda Northrop
Director: Research, Technology, and Systems Solutions Program
Telephone: 412-268-7638
Email: lmn@sei.cmu.edu

U.S. Mail:
Software Engineering Institute
Carnegie Mellon University
4500 Fifth Avenue
Pittsburgh, PA 15213-3890

World Wide Web:
http://www.sei.cmu.edu/productlines
SEI Fax: 412-268-5758
Example Product Line Aspects the Offeror is to Describe in its Technical Proposal

Section L – Instructions to Offerors

1. Describe how quality attribute scenarios resulting from the QAW will be integrated into the product line requirements baseline and managed from that point forward.

2. Describe how proposed changes to software component and other asset requirements will be managed and resolved across the family of software products.

3. Describe how product line “challenges” discovered during the Product Line Technical Probe (PLTP) will be prioritized and mitigated.

4. Describe the approach for ensuring the implementation of each software product will be in compliance with the product line software architecture under CM control.

5. Describe what kind of product line metrics will be routinely collected and reported to the government during the contract performance phase to achieve the government’s specified objectives for the product line.
Two Fundamental Ways for Implementing a Product Line Acquisition Approach

Reactive

Desired product line tasks/activities are conducted opportunistically and performed in situ under an existing contract.

Proactive

Desired product line tasks/activities are preplanned and integrated up front in a request for proposal (RFP) for a system (or software) acquisition.