Implementing a Product-Line Based Architecture in Ada
(abstract)

Joel Sherrill, Ph.D., Jennifer Averett, and Glenn Humphrey
On-Line Applications Research Corporation
4910-L Corporate Drive
Huntsville, AL 35805
Email: joel.sherrill@OARcorp.com, jennifer.averett@OARcorp.com, and
  glenn.humphrey@OARcorp.com

Keywords: product line architecture, reuse, risk management, software lifecycle, component
architecture, object-oriented, Ada

This paper describes a software component model that encourages reuse in application
families by leveraging similarities between products within a product family, as well as
among product families themselves. Reusing existing software is a well-known approach to
lowering development cost and time to market. However, recognizing and achieving
effective reuse is an elusive challenge. By applying a product-oriented view, developers gain
insight into the capabilities of the organization’s products and can leverage that insight to
incorporate common software components across the entire enterprise.

This component model has successfully applied to a family of similar embedded systems
whose application software is written in Ada. As a programming language designed to
support the development of highly complex, long-life systems, Ada includes numerous
features that make it an excellent choice for implementing product-line based software
architectures. These language features will be examined in the context of how they facilitate
construction of reusable product-line based components.

Organizations that successfully apply a product-line based component architecture can incur
numerous benefits throughout a product/program lifecycle. This architecture paradigm can
lead to significant reductions in system development and maintenance costs while
simultaneously improving individual product reliability. System reliability is improved by the
utilization of existing software components that are well tested and whose behavior is trusted.
Moreover, when multiple projects share software components, the cost of maintaining those
components is shared. Equally important is that encouraging a common component
implementation within products makes it possible to present a common look and feel across
multiple product families. This is a significant marketing advantage for a product line as it
minimizes end user training, thus reducing system deployment costs. This paper presents a
product-line based software architecture and the features of the Ada programming language
that support this paradigm.