# A National Infrastructure for Defense Reuse

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## 1 Position

Interest in software reuse is not confined to the Department of Defense; commercial industry is vigorously pursuing such techniques. There are, however, some problems specific to defense reuse. For example, there is a difference in scale; few commercial programs require the combination of size, reliability and responsiveness that characterizes many defense programs. Perhaps most importantly, though, there are comparatively few opportunities for defense reuse. Few similar defense systems are started within any short period of time and the development of those systems may be awarded to different contractors. This means that effective defense reuse must be done across company boundaries rather than within a particular company. Coping with this characteristic requires the development of a national, inter-company infrastructure for the preservation and presentation of reusable software assets.

The Army's RAPID (Reusable Ada Products for Information Systems Development) reuse library [Nied 91], and similar programs have performed pioneering work in setting up operational libraries to provide reusable assets to local communities of users who share requirements and values. A "qualification" or "certificatio"n process [Pipe 91] applies these values to the screening of candidate assets. The effectiveness of value-based qualification is diminished, though, when applied outside of the community of users who share those values. It seems unlikely that such an approach can be scaled up to the national level.

The USAF CARDS (Central Archive for Reusable Defense Software) program, chartered by congress to lay out a blueprint for DoD software reuse, will take a different approach. This program is initially focusing on domain specific reuse processes applicable to command and control software. Knowledge from a fairly rigorous domain analysis of command and control centers will be tangibly expressed in a knowledge-base [Sold 89], resulting in a generic architecture. Reusable components will be qualified on the basis of their "form, fit and function" within the generic architecture. This, in effect, permits the government to "standardize" upon the domain analysis and to create multiple instances of command centers derived from the generic architecture, thus achieving high levels of reuse.

Even rigorously structured domain-specific libraries like CARDS will not lead to a single national reuse resource. With today's reuse technology, there are simply too many unsolved problems to select a single design point for solution. Even after the problems are solved, there will still be a need for diversity because different communities will specialize in different application domains, will want different fee structures, and will prefer different user interfaces and communications mechanisms. Most importantly, though, institutionalization of software reuse requires a cultural change where thousands of individuals will have to make individual decisions to prefer reuse to new development. The probability of a single design point appealing to thousands of users is vanishingly small. Moreover, a diversity of choices will provide an element of intellectual (and perhaps commercial) competition which will ultimately have the effect of reducing costs, improving services, and accelerating technology infusion.

In order to present the resources of many different reuse libraries to many different users, a national marketplace is required. The DARPA ASSET (Asset Source for Software Engineering Technology) program has the mission of providing this marketplace. ASSET will perform the functions necessary to create an interoperating network of reuse libraries so that any user of any library will be able to access the services of all of the libraries. ASSET would also serve any central coordination functions such as the administration of schemes for nomenclature and identification. ASSET is following a strategy of encouraging the participation of private entrepreneurs to provide value-added services in all aspects of its operation. By attracting a variety of participants, it is hoped that the electronic marketplace will become populated by a diverse set of producers providing goods and services for a diverse set of consumers.

Of course, interoperability of reuse libraries requires some level of standardization. A cooperative government/industry consensus group, the Reuse Library Interoperability Group (RIG), has been formed to draft and propose such standards. The group hopes to identify and standardize well-understood technologies to provide a stable base for value-added activities by the various reuse library efforts. In its six months of existence, the RIG has attracted twenty-three organizations as members, including major corporations, government agencies, and reuse library programs.

In looking to the future, we can see a "reuse industry" serving local community (or intra-company) reuse libraries, domain- specific libraries which cross corporate boundaries, and a national infrastructure for sharing among libraries. The national marketplace will be populated by providers of components, value-added tools, consulting, and system integration. All of the services will be delivered to end-users via their local library.

# References


[Nied 91] Major Alvin Nieder, "RAPID: Implementing a Comprehensive Reuse Program," *Joint DoD Software Technology Symposium*, Salt Lake City, UT, Apr 91.

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[Sold 89] James J. Solderitsch, Kurt C. Wallnau and John Thalhamer, "Constructing Domain-Specific Ada Reuse Libraries," *7th Annual National Conference on Ada Technology*, 1989.