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This functional task area strategy describes the broad, achievable requirements for accomplishing the relevant STARS objectives. Its main purpose is to help guide the implementation process.

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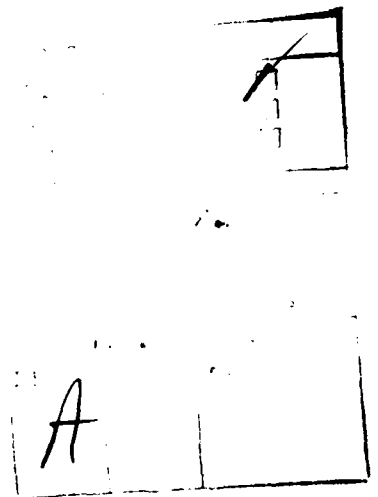
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**SOFTWARE TECHNOLOGY FOR
ADAPTABLE, RELIABLE SYSTEMS (STARS)
FUNCTIONAL TASK AREA STRATEGY FOR
SUPPORT SYSTEMS**



Department of Defense

30 March 1983



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FOREWORD

This strategy document is one of eight functional task area strategies produced by the STARS Joint Task Force. All of the documents produced by the Task Force, including the general STARS Program Strategy document, are listed in the STARS Joint Task Force Report.

This document identifies the scope, sub-objectives and strategies designed to provide the conceptual approach for accomplishment of the STARS Program objectives in the support systems functional task area. It identifies and describes the high-level activities, products and capabilities. In order to provide full understanding, background and rationale material is sometimes covered that is also in STARS Program Strategy.

These functional task area strategy documents do not attempt to delineate the detailed plans, costs and procedures for bringing the proposed products and capabilities into being and do not identify the form of the particular projects that will undertake the work nor the organizations in which the work will be accomplished. Instead, these strategies are intended to guide the process of such implementation planning and accomplishment.

Indeed, because of the high degree of linkage among the functional task areas, implementation plans and acquisitions may well combine related capabilities and products across areas. Individual projects may tackle only part of one subtask from a functional area or several subtasks from several functional areas.

Thus, this functional task area strategy describes broad, achievable requirements for accomplishing the relevant STARS objectives. Its main purpose is to help guide the implementation planning process.

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1.0 PREFACE

This document identifies the scope, objectives and strategy for the Support Systems task area of the STARS program. It is based on the Software Initiative Strategy delineated in [1] a 25 January 1983 draft plan and [2] that was modified as a result of the Software Initiative Workshop held in Raleigh, NC on 7-9 February 1983. It presents a strategy for technical activities; it is not an implementation plan. Thus, it identifies the work that needs to be done, not the form of the particular projects that will undertake that work nor the organizations in which the work will be accomplished. Individual projects may tackle only part of one subtask from this area, or parts of several subtasks, possibly including subtasks defined in other functional task areas within the STARS program. Similarly, various organizations may provide resources for performing STARS activities. Clearly, the Software Engineering Institute, proposed as part of STARS, will play an important role in implementing the plan for the Support Systems area.

2.10 OVERVIEW

The Support Systems area within the STARS program focuses on the preparation and support of demonstrably effective software development and in-service support in DoD software-intensive systems. In this document, the term "environment" is used in its technical sense to connote a "core" set of basic tools and an integrated, extended set of support tools. The "core" (or the core environment) is relatively invariant over time (i.e., it evolves slowly), whereas evolution of the tools and toolsets is planned. The term "support system" encompasses both environments and methods.

The Support Systems area serves as a conduit for delivering results of STARS activities to the software community. It does this by incorporating the results and activities of many of the other areas of the STARS program into integrated environments and toolsets. Thus, the Support Systems area is a cornerstone of STARS in that it provides environments that demonstrate progress made toward achieving the program's objectives.

3.0 SCOPE

The scope of the Support Systems task area covers 1) the consolidation and development of evolutionary software development environments for mission-critical software systems; 2) the development of enhancements to the environments by integration of more advanced automated tools to support the entire life-cycle process; 3) research and development along both evolutionary and revolutionary paths; 4) demonstration of value and effectiveness of the methods and environments developed; and 5) transition to the wide availability and use of the products of the task area.

The primary focus of the Support Systems task area is in developing evolutionary environments to support the development and in-service support (maintenance) of mission-critical software systems. This includes the early consolidation and development of tools into coherent collections, the engineering of production-quality versions of the support environments, and the fielding of results to the user community. Enhancements to the environments would be primarily through the integration of more advanced automated tools which support the entire software development and maintenance life-cycle. Although these enhancements are intended to be evolutionary, demonstrated revolutionary results would be incorporated into the environment. If necessary, the radical redirection of the environment to adequately incorporate these results would be undertaken.

In addition to producing the fielded environments, this task area in conjunction with the Human Engineering and Application-Specific task areas would produce standards and interfaces to enable the further incorporation of additional tools through the marketplace. These standards and interfaces would help focus the market and provide a means for the Support System results to be cumulative.

In support of the primary focus on developing environments, research would be carried out along both evolutionary and revolutionary paths. This activity includes research in disciplined and effective methods for developing and maintaining software-intensive systems, study of methods and techniques for building or generating environments (particularly useful for tailoring environments to application-specific areas), and research in alternative paradigms for software development. Examples of the latter research thrust include the knowledge-based systems paradigm, the formal verification-oriented paradigm and the rapid prototyping paradigm as well as the appropriate tools in the environments necessary to support the particular approach. These research thrusts may be pursued individually or in combination with each other.

Work on methods and tools that are generic is clearly within the scope of the Support Systems area. In addition, activities related to methods and tools that are goal-, target system- or application-oriented would be included in the Support Systems area whenever that work is not more meaningfully done within the context of one of the other STARS functional task areas. In many instances, goal-, target system- or application- oriented methods and tools would be identified within other task areas; for example, tools supporting project management are identified within the Project Management area. In some cases, however, tools supporting a particular goal, target or task may not fit appropriately within any other area and these would be within the scope of the Support Systems area. Also within the scope of the Support Systems task is the quantitative assessments of the value of support environments by developing experiment-based demonstrations and evaluations of methods, tools and environments. This activity would be carried out in conjunction with the Measurement task area. It includes designing the experiments, instrumenting the environments so that the necessary measurements can be made, con-

ducting the experiments and interpreting the results of the experiments in terms of the value of the methods, tools and environments.

4.0 OBJECTIVES

The overall goal of the Support Systems area within the STARS program is to prepare and support demonstrably effective software development environments and methodologies which are suitable for use in the development and support of DoD mission-critical software systems. Activities in this area should provide for the integration of methods and automated tools, developed both within and outside STARS, to form environments that encourage and support the use of disciplined software development methods. The underlying premise is that methods, languages and tools should together form a coherent framework, held together by a realistic, modern view of the system life-cycle. The approach described in this document to achieve this goal takes a long-term view, but nonetheless provides for the early demonstration of the value of these methods and environments, followed by their fielding in both the defense and the broader software production and maintenance community. The overall goal of the Support Systems area can be articulated into a set of specific objectives:

- o Provide production-quality environments that support the full life-cycle of mission-critical software;
- o Evolve a realistic modern concept of the life-cycle;
- o Demonstrate improved understanding of how to integrate tools, methods and management practices and how environments support methodologies and life-cycle models;
- o Experiment with and actively promote use of methods and environments on real development efforts;
- o Support the research necessary for a continuing technology flow and integrate this research into the environment.

The remainder of this section elaborates on these objectives.

4.1 Provide Production-Quality Environments

The primary objective of the Support Systems task area is to provide production-quality environments that support the full life-cycle of mission-critical software and thereby support the different classes of users involved in the various life-cycle activities. These activities include analysis and development, testing and verification, management, quality assurance, configuration management, and auditing. These environments would be models of an integrated extendible tool set that would evolve from a core environment available during the early phase of the STARS program. They would be easily rehosted and retargeted and would incorporate state-of-the-art technology in user interfaces, hardware and networking. The environments would serve as a testbed for the integration of tools and methods and would be developed from an evolutionary methodology for building environments.

4.2 Evolve DoD Life-Cycle Concept

In support of the primary objective of the Support Systems task area, it is crucial to evolve a realistic modern concept of the life-cycle which treats software development as an incremental process and considers maintenance and change as essential components of the life-cycle. This life-cycle model must accommodate the profile of DoD mission-critical systems that have the following characteristics:

- o Large-scale, real-time and fail-safe
- o Long-lived and continually changing
- o Developed by a large team and maintained by a different organization
- o Coexists with older systems and interfaces with unique hardware.

Another key requirement is that the model foster reusability and increased reliability of the software developed.

This concept of the life-cycle should be pursued because current models of the life-cycle do not adequately support the development and maintenance of mission-critical systems. Furthermore, the use of new technologies is expected to cause an evolution of the model by altering the relative importance of the various life-cycle activities.

4.3 Demonstrate Improved Understanding

In order to provide environments supportive of DoD mission-critical software needs, it is critical to develop and demonstrate an improved understanding of the mission-critical needs. Issues that need to be addressed to satisfy this objective include the integration of tools, methods and management practices to suit different sets of DoD needs and the relationship of methodologies (and their supporting tools) to different application areas and to different development and maintenance organizations. These issues go well beyond the strictly technical issues of integrating tools and techniques. The key question to be answered is how a different mix of tools and methods from a common integrated set can be configured to suit the needs of each particular mission-critical area.

4.4 Experimentation and Use

The early demonstration of the value of the methods and environments developed is important for encouraging the widespread use of these environments in both the defense and the broader software production and maintenance community. This objective can be accomplished by experimenting with and promoting the use of the methods and environments on real applications. Initially, the experimental use would be in parallel with a real-life system development but would not be on its critical path. As the STARS program progresses,

later uses of the environments would be for the actual mission-critical system development and maintenance.

4.5 Support Necessary Research

A major objective of the Support Systems area is to support the research that is necessary for a continuing flow of technology so that the STARS program can capture and integrate this technology into the evolutionary environment. This objective should be pursued along both evolutionary and and revolutionary paths and would be carried out in cooperation and coordination with other DoD agencies and activities. The evolutionary path would offer predictable and early results, thus ensuring the continuous availability of a usable environment. The revolutionary path would ensure that potentially high payoff approaches can be exploited to their fullest extent and incorporated into the environment. If necessary, this objective would provide for the radical redirection of the evolutionary environment to successfully incorporate the demonstrated results of the revolutionary thrusts.

Several areas of research would be necessary to support the evolutionary and revolutionary thrusts. These might include (but are not limited to) research in the following areas:

- o Advanced automated tools
- o Alternative paradigms for software development (e.g., rapid prototyping paradigm, verification-oriented paradigm, knowledge-based systems paradigm)
- o Methods and methodologies that support systematic, visible, and high-quality software development and foster software reusability
- o Integration strategies that effectively put tools together into a coherent framework
- o Extensibility issues that ensure an evolutionary environment

- o Database technology to effectively capture and record all facets of the life-cycle process
- o Full life-cycle support.

Research in these areas will ensure a continuous flow of technology throughout the time frame of the Initiative that would significantly enhance the environment in both evolutionary and revolutionary directions.

5.0 STRATEGY

The objectives of the Support Systems area can be achieved by a strategy that is based on evolutionary development but also provides for the possibility of radical redirection. Evolutionary development is a process of controlled change based on standards which change slowly if at all. Thus, in particular, the Support Systems area will tend to follow an evolutionary course by producing a succession of environments, each being composed of increasingly sophisticated toolsets all of which are installed on an essentially unchanging standard core. Radical redirection, should it occur, would involve producing an environment having neither its toolset nor its core in common with its predecessor. There are three key elements to this strategy:

- o Continual development, integration and fielding of products and technology
- o Research and development contributing to environment improvement
- o Management and ongoing planning.

The remainder of this section elaborates on these elements.

5.1 Continual Development, Integration and Fielding

The central focus of activity in the Support Systems area would be the development and fielding of environments, methodologies and environment-building technology. The strategy calls for the Support Systems area to produce a stream of products, beginning by the end of the third year, and continuing throughout the STARS program.

The primary products produced by the Support Systems area would be a succession of software development support environments. A key aspect of the strategy is that these environments would consist of two parts, a core and a toolset. This structure supports the evolutionary development that is central to the strategy. The core would evolve slowly, being changed only as necessary to support the various

toolsets that would be installed on top of it. Thus, the core provides the foundation upon which the succession of environments would be based. Toolsets would evolve more rapidly. The strategy envisions the release of new toolsets, resulting in new environments providing expanded and improved capabilities, at least once per year, beginning with the initial toolset that would appear by the end of the Initiative's third year of the STARS program.

One of the early products of technology consolidation should be workstations to support modern software development. The Human Engineering task area would support the Support Systems task area in designing or selecting this workstation.

The succession of environments produced by the Support Systems area would draw upon and contribute to other activities taking place both inside and outside the STARS program. At least initially, the environments and particularly the core component of the environments would be based upon existing MAPSEs, other programming support environments and the standards promulgated by the KIT, all of which are anticipated to appear as predecessors to the environments produced by the Support Systems area. Input from other areas within the STARS program, especially in the form of tools to be included in the toolsets of fielded environments, would be encouraged and facilitated. The Application-Specific and Systems areas are expected to be two major sources of such input. The Support Systems area strategy includes providing a mechanism for any re-engineering of tools produced by other STARS task areas that is required to install those tools in fieldable environments. Finally, the environments produced by the Support Systems area would be instrumented to support experimentation and evaluation. This facet of Support Systems area activity is expected to benefit many other areas of the STARS program.

In addition to the succession of environments, the Support Systems area would produce an evolving collection of software development methodologies. This activity would build upon the current Methodman effort. It would encompass development of new and enhanced methodologies as well as development of tools and toolsets supporting and encouraging the use of methodologies. One of the early activities in this area would be carrying out the Methodman experiments described in [3].

Finally, the Support Systems area would produce a stream of environment-building technology along with the succession of environments and methodologies. A major focus of this activity would be techniques supporting the evolution of software development support environments. Among the products of this effort would be standards for the core of the fielded environments, which would facilitate the production of toolsets compatible with the evolving environments by groups working inside and outside the STARS program. This should help to encourage private sector market forces to contribute to achieving the goals and objectives of STARS. An evaluation mechanism for the interface standards and techniques for integration of toolsets into environments would also be produced as part of this activity.

5.2 Research and Development

The strategy for the Support Systems area crucially depends upon supporting two parallel streams of research. One of these is research and advanced development activity supporting evolutionary development of improved environments, methodologies and environment-building technology. This evolutionary path offers predictable and early payoff. The other path is research and advanced development activity providing a basis for radical redirection by pursuing concept demonstrations to ensure that potentially high-payoff approaches can be exploited.

The research and development supporting evolution would be directed toward producing tools and methods compatible with previous environments fielded by the Support Systems area. Also included in this stream of activity would be research on environment evolution and on integration of tools into environments.

The research and development to facilitate radical redirection would address alternative approaches to software development, that is, approaches differing significantly from those supported by the environments being fielded by the Support Systems area at the time. In particular, this stream of activity would include prototype development of tools and methods supporting alternative development paradigms such as knowledge-based development techniques, rapid prototyping or formal verification-oriented approaches. This research and development would be pursued in cooperation and coordination with DARPA initiatives and the Consolidated Computer Security Program activities in related areas. This work would provide the basis for periodic assessment of the value of alternative approaches. It could lead to the incorporation of some tools or methods based on alternative approaches into future versions of the evolving environment being fielded by the Support Systems area. It could also lead to a decision, at some point, to undertake a radical redirection and begin fielding environments based on an alternative approach that had shown itself to be superior to that supported by the evolving environment.

5.3 Management and Ongoing Planning

Although it would produce no deliverable products, the management and ongoing planning activity is vital to the Support Systems area strategy. This activity would be responsible for evaluating and choosing directions for environment-building efforts and research. It would have the task of guiding the evolution of the Support Systems area environment products as well as determining when and if radical redirection is appropriate.

As part of guiding evolution, the management and planning activity would perform configuration management. This aspect of planning also involves assessment and choice among candidate tools and methods for inclusion in environments produced by the Support Systems area. Planning for integration, so that tools and methods developed both inside and outside STARS could be easily incorporated into these environments, will be another key aspect of this activity.

Another essential part of management and planning is the monitoring of outside research. This includes coordination with other tool-building activities within the STARS program, such as those taking place in the Applications Specific and Systems task areas. It also involves monitoring environment, tool and method research and development taking place outside the STARS program. A part of this role would be selecting promising outside work or new approaches for Support Systems R&D funding. Another part would be providing active, possibly financial, encouragement to external activities that are related to or could contribute to Support Systems area objectives.

Preparing for radical redirection, and determining when, if and how to undertake it, are important roles of the management and planning activity. Risk assessment and selection of alternative approaches to software development for R&D funding are key elements in this aspect of the strategy.

A final facet of management and ongoing planning is the evaluation of environments. This implies providing evaluation mechanisms for environments and their components, including core, toolsets and methods. Such mechanisms would allow producers of these items to assess their products and, for instance, to demonstrate that a core which they produce is compatible with the standards of the core fielded by the Support Systems area. They also provide the basis for periodic assessment of the environments being fielded by the Support Systems area, which should be carried out as part of the management

and ongoing planning activity. These evaluation and assessment activities would also be coordinated with the Measurement task area.

6.0 ASSUMPTIONS

The following list represents a set of assumptions that are relevant to the Support Systems task area. It includes assumptions about the other task areas in the STARS program, relevant external activities, the current state-of-the-art and the state-of-the-practice.

- o The Support Systems area would produce two principal types of products: the fielded environments and environment technology. Benefits would be derived not only from usable environments/tools/life-cycle methodologies but also from the technology of methodologies/standards/tools for environment evolution.
- o Ada will be the DoD standard implementation language for embedded systems. Whenever the implementation language being supported by an environment influences the form or function of any tool, methodology or environment being developed in the Support Systems area, the language of choice would be Ada. This does not preclude the implementation of tools to support other languages.
- o Methodologies and life-cycle models for environment evolution, integration and re-engineering as well as for software development, reuse and maintenance are not completely understood and are subjects for research.
- o Research and development would continue outside of the Support Systems area both within STARS, within the DoD and outside the DoD. However, there are critical research and development gaps, particularly in environment technology (integration, evolution, validation), which might not be pursued without direct support.
- o There are potential high payoff alternative software development and environment paradigms at the research and development stage. The Support Systems area should support activities that will prepare the environment to incorporate the research results.
- o There are potential high payoffs for integrated toolsets and for bringing as much of the software development process as possible into the machine.

- o Effective progress in developing environments, methodologies and environment-building technology is possible while we are improving our understanding of the problems and relationships.
- o Some tools, methods and environment aspects are language independent. "Methodology free" environments are possible, at least at the core level, assuming that evolution of the core is possible.
- o Existing tools/methods/environments are available but may not be entirely appropriate as a basis for long term evolution.
- o An effective mechanism for continual planning and for making support system architectural decisions would be established as part of the Support Systems task area.
- o Mechanisms would be available for reengineering, distribution and support of tools.
- o Support for trusted system development is necessary in order to satisfy the security and integrity requirements of the software development database and the software under development.

7.0 ACTIVITIES

This section describes activities that would be carried out in the Support Systems area of the STARS program. They follow the strategy delineated in Section 5 of this document and fall into the following categories: (1) management and planning, (2) research and development to improve the software development environment, (3) product development, integration and export and (4) evaluation, demonstration and experimentation.

The remainder of this section elaborates on these activities.

7.1 Management and Planning

The following activities would be carried out in the management and planning category:

- o Management and Coordination

This activity includes primarily tasks to manage the overall Support Systems effort and to coordinate the various internal efforts. It also includes the necessary coordination with the other functional task areas within the STARS program, external related research and development and other relevant DoD activities.

- o System Architecture

This activity is to provide the overall system architect function for the Support Systems area. This is an on-going function which is vital to ensuring that the methods, tools and environments fit together in a coherent framework. It will also guide the evolution of the environment products.

- o Assessment and Choice of Tools

This planning activity involves the on-going assessment of candidate methods and tools for inclusion in the environments produced by the Support Systems area. This assessment would include evaluating candidates from other task areas of STARS (e.g., the Systems and Application-Specific areas) as well as those external to the STARS program.

- o **Actively Monitor the State-of-the-Art**

This activity is closely related to the on-going assessment and choice of tools and is an essential part of planning. It includes actively monitoring research and development in methodologies, tools and environments being pursued outside the STARS program and possibly selecting external promising research for funding or for incorporation into future environments to be fielded.

- o **Leverage on External Activities**

This activity is to provide active encouragement, perhaps including partial funding, to external promising activities that are relevant to or could meaningfully contribute to the Support Systems area goals.

- o **Planning for Integration**

This activity would provide on-going planning so that methods and tools developed both within the STARS program and externally could be effectively incorporated into the evolving environments in a coherent manner. This planning would include developing a framework for integration.

- o **Preparation for Radical Redirection**

This activity includes planning for the potential radical redirection of the evolutionary environments to capture and incorporate the demonstrated results of one or more revolutionary research thrusts. Assessment of the risk involved and determining if, when and how to undertake the radical redirection are key facets of this planning activity. A closely related activity is determining which revolutionary research areas would be encouraged and funded.

- o **Configuration Control**

This activity provides for the configuration management of the evolving environments and helps guide the evolution. It would ensure that an environment is stable before fielding it and that its documentation is updated to reflect the current state of the environment.

- o **Planning Technology Insertion**

This activity includes tasks to help ensure that the fielded

environments will be widely used in DoD and the broader software development and maintenance community. Planning for active support to the early users of the fielded environments is a necessary component of this activity.

7.2) R&D to Improve Environment

The following activities would be carried out in the research and development category:

- o Concept Development

This activity includes various tasks to develop concepts for a realistic, modern life-cycle, approaches for effectively integrating methodologies and tools as well as ways of evolving an environment.

A critical task for the success of the Support Systems area is to evolve a life-cycle concept which accommodates the profile of DoD mission-critical systems and which fosters reusability. A key facet of this task is the development of an improved understanding of mission-critical needs and then selection of an appropriate combination of methods and tools which satisfy the requirements of each particular mission-critical area. This improved understanding will help develop criteria for evaluating the success of the Support Systems area.

A necessary research activity that would be carried out is to determine integration strategies that effectively put together methods and tools into a coherent framework and support the life-cycle concept being modeled. An early activity would be to pursue the Methodman methodology experiments.

This activity would also pursue research on environment evolution and would include tasks to ensure that more advanced methods and tools can be effectively incorporated in the environment.

- o Environment-Building Methodology Development

This activity would develop the technology for how to build environments. This is in addition to the succession of environments that are fielded and is itself a product of the Support Systems area.

- o Support Alternative Paradigm Research

These activities would pursue R&D along revolutionary paths and would support alternative approaches to software development. Examples of such approaches include the knowledge-based systems paradigm, rapid prototyping approach and formal verification-oriented approach. The primary focus of these activities would be on concept demonstration and prototype development to demonstrate feasibility and effectiveness of the particular approach(es). These approaches may be pursued singly or in combination.

7.3 Product Development, Integration and Export

The following activities would be carried out in developing methods and tools and integrating them into environments, developing standards and interfaces for incorporating additional tools into the environments, and in making widely available the technology that is developed and the environments that are produced.

- o Provide Core

This activity is one of the primary tasks of the Support Systems area; to provide the core environment which is the foundation upon which the evolving environments would be based. This core, together with a toolset, produces an environment.

- o Develop Workstation

This activity is to develop or select workstations to support modern software development. It would be carried out in coordination with the Human Engineering task area.

- o Develop Environment Building Methodology

This activity would develop methodologies for building environments, particularly addressing issues necessary for environments that are to evolve over time.

- o Provide Environments

This activity is a primary task of the Support Systems area to produce the succession of software development environments. These environments would consist of a core and tool-

sets. The core would evolve slowly while the toolsets would evolve more rapidly. The initial environment would be produced by the end of the third year of the STARS program. In addition to the environments, an evolving collection of software development methodologies would be produced. These would be based initially upon the Methodman effort currently underway.

- o Produce Tools for Tool and Environment Development

This activity would produce the tools that are needed for developing tools and environments for software development. Developing tools and integrating them into environments is a critical task of the Support Systems area and requires the support of good tools in order to be done effectively.

- o Acquire and Integrate Tools

This activity is central to the Support Systems area. The acquisition and incorporation of tools into evolutionary environments requires an overall integration strategy and a coherent framework in order to be carried out successfully. The results of the R&D activity to develop tool integration concepts would be utilized and transitioned into this acquisition and integration process.

- o Prepare for Revolutionary Research Results

This activity would prepare for the evolutionary environment to incorporate the demonstrated results of the revolutionary research thrusts pursued both within the STARS program and externally. This may require radical redirection of the environment (including modification to the core environment) to accommodate the demonstrated research results.

- o Redesign and Integrate Alternative Paradigm Tools

This activity includes tasks to re-engineer tools supporting alternative software development paradigms and to integrate them into the evolutionary environment. In some instances, these tools (after re-engineering) could be easily integrated as advanced tools into the evolutionary environment. In other cases, to effectively utilize the alternative paradigm tools, a radical redirection of the environment may be required.

- o Support the Model Environment

This activity includes the tasks necessary for the support, configuration management and maintenance of the environment that is fielded. A stable version of the model environment is to be maintained in addition to environments in which new tools are being integrated.

- o Develop Standards and Associated Validation Mechanism

This activity is to develop standards for the core of the fielded environments to facilitate development of toolsets compatible with the evolving environments. Interface standards would also be produced and would initially be based upon the KIT standards currently being developed. This activity would also include evaluation and validation criteria to determine whether a new tool meets the specified standard. The development of standards is crucial to encouraging the marketplace to contribute to the STARS program and to enabling the leverage necessary to carry out the STARS activities.

7.4. Evaluation, Demonstration and Experimentation

The following activities would be carried out in the areas of evaluation, demonstration and experimentation:

- o Experiment With Tools and Methodologies

This activity is to carry out several projects which would experiment with tools and methodologies. An initial task would be to carry out the methodology experiments that are described in the Methodman document [3]. These experimentation activities would be carried out throughout the duration of the STARS program. Their results would provide valuable data even after the STARS program is completed.

- o Develop Evaluation Mechanisms

This activity is to develop evaluation and validation criteria against which methods, tools and environments can be assessed at each step (e.g., specifications, designs, prototypes, implementations). Emphasis should be placed on this task during the first three years of the STARS program; however, it will continue to be carried out during the latter years, particularly focusing on alternative paradigm methods and tools.

- o Evaluate Tools, Methods and Environments

This activity is on-going throughout the duration of the STARS program. Assessment of methods, tools and environments that are produced in the Support Systems area, other task areas in STARS (e.g., the Systems and Application-Specific areas) and externally to STARS, is crucial to the continual availability of the methods and tools for integration into the evolving environment. This evaluation activity will also assist in determining when and if the radical redirection of the environment is needed to incorporate the alternative paradigm methods and tools.

- o Monitor and Sponsor Full-Scale Experiments

This activity is to monitor experiments carried out external to the Support Systems area and to sponsor full-scale experiments using the methods, tools and environments that are developed in the Support Systems area. This activity would be coordinated with the Measurement task area.

- o Instrumentation of Environment

This activity which would be carried out in coordination with the Measurement task area, is to instrument the software development environment to effectively support the evaluation and experimentation that is to be done.

REFERENCES

1. "Strategy for a DoD Software Initiative" dated 1 October 1982.
2. "Draft Support Systems Task Area Plan" dated 25 January 1983.
3. "Comparing Software Design Methods for Ada: A Study Plan" by Peter Freeman and Anthony I. Wasserman, November 1982.

