

# RASSP Enterprise Framework

## Abstract

The need to efficiently design and prototype new technology is becoming the greatest challenge in today's evolving global community. In order to meet this challenge, as systems become more complex and significantly increase signal processing requirements, a fully integrated design environment is required to improve cycle time, quality, and cost.

An Enterprise Framework, which supports an Integrated Product Development Environment (IPDE), is essential for achieving the 4X-improvement goal of the RASSP (Rapid Prototyping of Application-Specific Signal Processors) program. Organizations that establish an Enterprise Framework for use on developing large-scale systems including Digital Signal Processor (DSP) based systems will realize the benefits of:

- reduced design cycle-time
- improved quality and reduced cost through the elimination of rework
- support for a multi-vendor CAD tool environment
- ability to find and ENTERPRISE existing design technology for new designs
- seamlessly linking of design centers, manufacturing centers, and suppliers
- real-time access to design data, manufacturers, suppliers, and customers
- continuous process improvement through metrics collection and analyses

## Purpose

This application note details the technical approach and enabling technologies for implementation of the RASSP Enterprise Framework. The intended audience for this application note includes Project Managers, Project Leads, and Design Engineers.

## Roadmap

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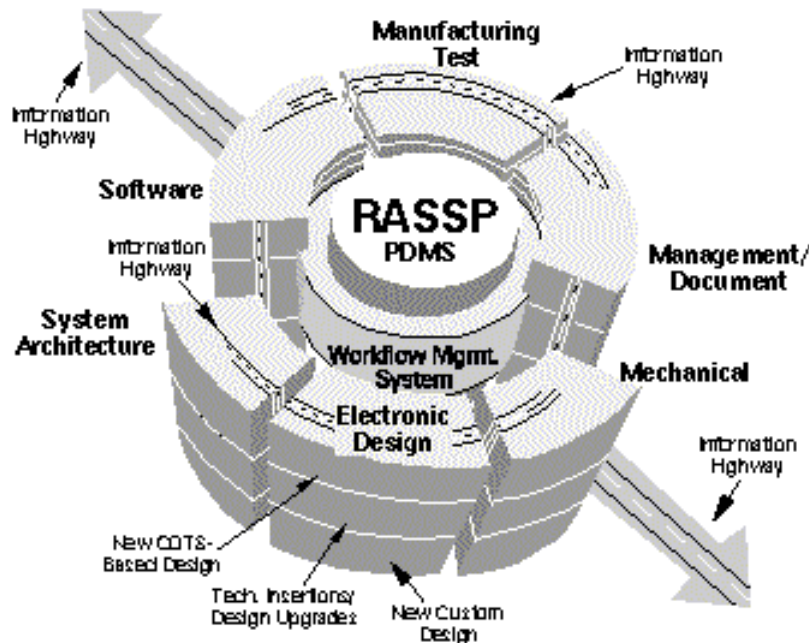
### 5.0 References

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# RASSP Enterprise Framework Appnote

## 1.0 Introduction

The RASSP Enterprise Framework, summarized in figure 1- 1 was developed by Lockheed Martin Advanced Technology Laboratories (LM-ATL), in collaboration with Intergraph Corporation, Rockwell International Corporation, Mentor Graphics Corporation (MGC) and South Carolina Research Authority (SCRA). It is comprised of an extensive set of tools, all seamlessly integrated with a common desktop environment. At the core of the Enterprise Framework is the Product Data Management System (PDMS). The PDMS configuration manages all of the design data produced during the design cycle of a DSP system, and provides complete file tracking for documentation of the system configuration. Integrated with the PDMS is the Workflow Management System. The Workflow Management System implements an organization's best design practices as repeatable workflow segments. These workflow segments are stored as templates and are attached to projects at project creation time. The Workflow Management System guides the user through the design process, using a graphical representation of the workflows, ensures that all critical steps in the process are followed, and provides access to the appropriate CAD tools and data at the proper times. The design process can be a simple upgrade to an existing design, a new COTS-based design, or a new custom design.



**Figure 1 - 1:** RASSP Enterprise Framework

Encapsulated with the Workflow Management System are multiple CAD tools used at various phases of the DSP system lifecycle - proposal phase through contract management, engineering design, purchasing, fabrication, and delivery to the customer.

Other enabling technologies associated with the RASSP Enterprise Framework include:

- Integration of design and manufacturing environments leveraging World Wide Web (WWW) technologies
- Use of industry standards EDIF 4.0.0 and STEP for exchange of design data between organizations
- Robust [Reuse Methodology](#) and supporting Reuse Data Management System (RDMS)
- Process toolkits which use simulation, analyses, and metrics collection to facilitate continuous process improvement

The [RASSP Manufacturing Interface \(RASSP-MI\)](#) developed by SCRA enables hardware designers to quickly and easily identify manufacturing issues at early phases of the design process (such as after completion of component layout). Using

robust standards such as EDIF 400 and STEP ISO 10303 - 210, the RASSP-MI ensures that the requirements of predictability, completeness, consistency, and semantic correctness in the exchange of product data are met. In addition, producibility analyses can be performed during design phases - a capability not available previously.

To facilitate reuse in the engineering projects, the [RASSP reuse data management system](#) enables designers to efficiently search across multiple libraries in an organization in a uniform fashion, to identify and select design objects for reuse from a vast network of available sources. Capabilities to perform stand-alone tests of the selected design object, modify the design object if necessary, and integrate it into the current system are also supported.

Continuous improvement of an organization-s design processes is enabled through the collection and analysis of project metrics. As the design cycle of a DSP system proceeds, the Workflow Management System logs records for each task event. Records include start and finish times, user's identity, CAD tool information, task identification, and other engineering notes. A facility is provided for analysis of this metrics information in order to support identification and resolution of schedule and resource bottlenecks.

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# RASSP Enterprise Framework Appnote

## 2.0 Technology Description

The core technologies associated with the Enterprise Framework include the product data management system, workflow management system, [reuse management system](#), and the [manufacturing interface](#). Commercial tools are used where suitable capability exists, augmented with new capabilities and features as appropriate. This section summarizes the architecture of each of these systems, and details the key enhancements developed on the RASSP effort.

### 2.1 Product Data Management System

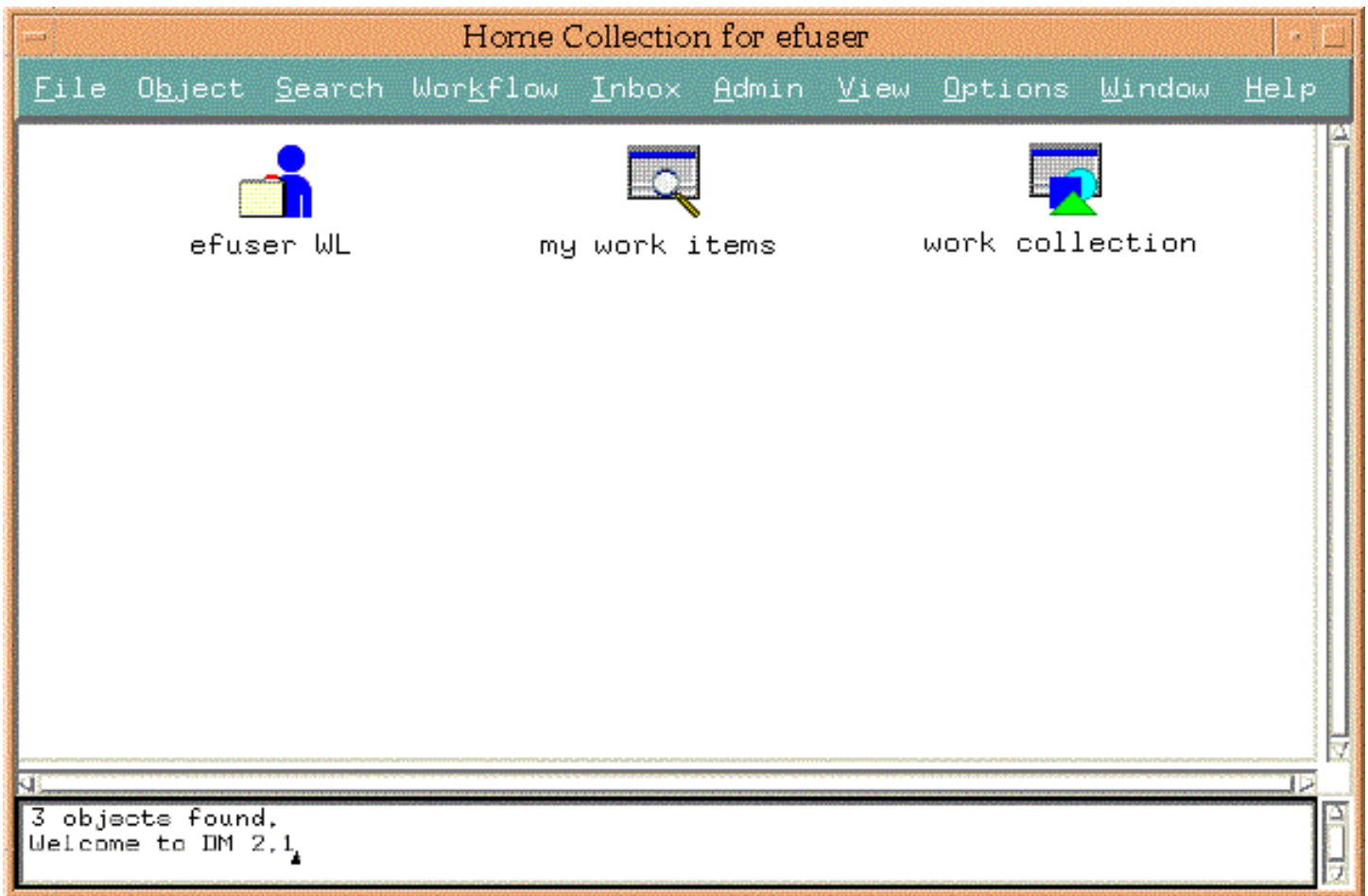
Intergraph's Asset & Information Manager (AIM) is used to implement the Product Data Management System (PDMS) within the RASSP Enterprise Framework. The AIM implementation used on RASSP uses Metaphase, version 2.1, as the underlying architecture. Metaphase uses an embedded Oracle relational database and offers a scalable client/server architecture, an object-oriented data model, and rules-based processing. Additional features were developed and added to AIM in order to meet the PDMS requirements for the RASSP program. These additional features include:

- Integration with the Workflow Management. System
- Implementation of the RASSP Configuration Management (CM) Model
- Implementation of the RASSP Authorization Management (AM) Model
- Change request and problem reporting system
- Automatic project creation
- Automatic project copying
- Automatic project deletion
- Automatic loading of business items
- Automatic tar & compress of MGC databases
- Expanded user interface

The PDMS is used for configuration management of all design data produced during the design and implementation cycles. The design data is organized by projects within the PDMS and managed according to the rules and conditions defined in the RASSP CM Model [[CM\\_VERSION\\_3\\_96](#)]. Access to design data stored within the PDMS is governed by the user roles and authorizations defined in the RASSP Authorization Model document [[AM\\_VERSION2\\_94](#)]. Additional details of these models are available in the indicated references or in the [Information Management Application Note](#).

Several user roles are identified in the RASSP Authorization Model implementation for the specific demonstration projects. Two of these roles support administrator and user functions. Administrator functions are associated with project management, for example creating and deleting projects, creating groups, creating users, assigning users to groups, assigning users and groups to projects, assigning user roles and authorizations, and creating project vaults and workspaces. User functions are associated with execution of a project. These include data creation, data registration, data check-in and checkout, and generating problem reports and change requests. Both administrator and user functions are performed through the PDMS user interface. The RASSP Home Collection user interface for the PDMS user *efuser* is shown in figure 2 - 1. Icons in the Home Collection represent the following:

- efuser WL - Represents the private work location for user efuser
- my work items - Shows all data items, within the PDMS, owned by user efuser
- work collection - A collection of any PDMS objects a user wishes to group together



**Figure 2 - 1: RASSP PDMS User Interface**

Detailed definition of the functions and capabilities of the PDMS implementation for RASSP is provided in the product documentation developed by Intergraph. The relevant documents include:

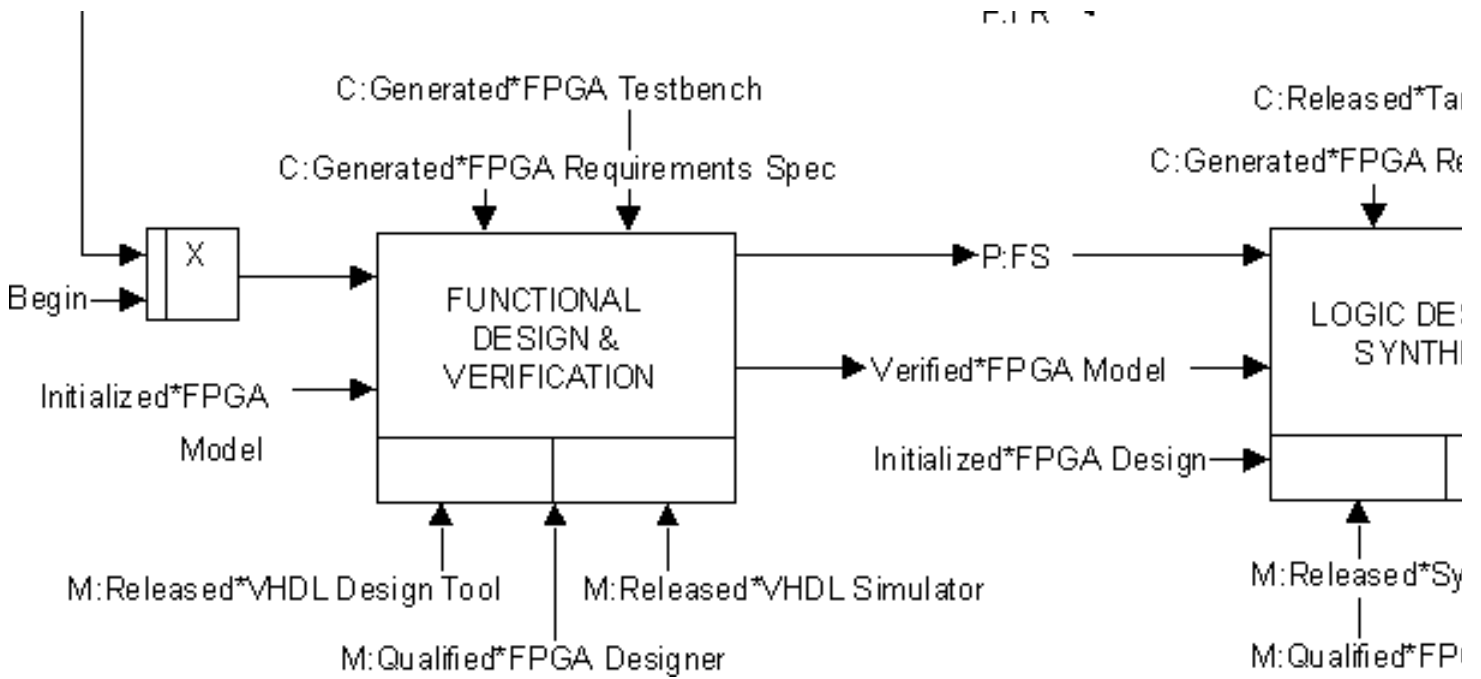
- [Enterprise Framework Administrator's Guide](#)
- [Enterprise Framework User's Guide](#)

## 2.2 Process Modeling

LM-ATL developed process models for the design phases of RASSP using the IDEF3X and IDEF3 modeling methods. IDEF3X, developed by Rockwell International Corporation, is an extended version of the Integrated Computer Aided Manufacturing DEfinition (IDEF) language Number 3 [IDEF]. An IDEF3X example is provided in figure 2 - 2. IDEF3X combines the ICOM (Input, Control, Output, and Mechanism) feature of IDEF0, the process flow description of IDEF3, and additional annotation features to facilitate implementation by a workflow management tool. The syntactic elements of an IDEF3X model are similar to IDEF3 and include units of behavior (UOBs), junction boxes, and precedence links. Additional features include:

- ICOMs are identified by the object name and its life cycle state separated by an asterisk (e.g., Draft\*Publication - where Publication is the name of the object and Draft is its current state)
- Object state link identify the flow of data between UOBs
- Feedback links indicate fail-back paths
- Annotations with the name of the junction boxes ("A", "S", or "X") indicate the type of junction - asynchronous, synchronous, or exclusive-OR
- Support for additional precedence links such as Start-Start, Start-Finish, Finish-Start, Finish-Finish, Concurrent, Cascade, Fail-Reset, and Fail-Cascade
- Annotation of the precedence links with a "P:" and a two-letter code indicates the precedence between the parent and dependent UOB.





**Figure 2 - 2: IDEF3X Process Model**

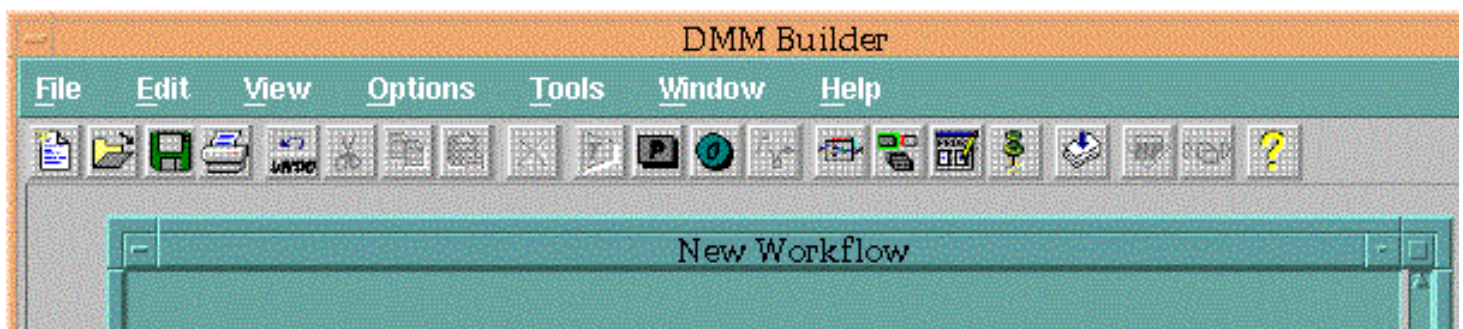
IDEF3 models were also developed enabling analysis and validation with commercial process simulation tools. In order to apply the models to projects, the IDEF models were implemented as workflows in the Workflow Management System. Utilizing IDEF methodologies enables maintenance of the process models in a tool independent format - allowing maximum flexibility in application of the models in multiple projects, groups, or organizations. Additional information on IDEF3X and processing modeling is available in the [Process Modeling Application Note](#)

### 2.3 Workflow Management System

Intergraph's Design Methodology Manager (DMM) is used to implement the Workflow Management System within the RASSP Enterprise Framework. DMM is a graphical workflow management tool with capability for construction and execution of workflows. Key discriminating features of DMM are support for hierarchical workflows, flexibility in implementation of tool and data item management schemes, and management support capabilities (metrics logging and interaction with project management tools). The components of DMM are:

- DMM Builder - Construction, editing of workflows
- DMM Attacher - Compilation, linking to associated resources
- DMM Detacher - Decoupling of workflows from completed projects
- DMM Displayer - Execution control for workflow

Workflows are constructed using DMM Builder (Figure 2 - 3) by selecting the components (tasks, terminals, and operators) from the pull-down menus, placing them in the window, and connecting them with precedence links. The precedence links govern the order in which workflow tasks are executed. Once the workflow has been constructed, it is compiled and saved as a file in a directory. These workflow files can be viewed as repeatable templates that are attached to projects as needed. DMM Attacher is the utility that attaches workflow templates to projects, and DMM Detacher is the utility that removes workflow templates from completed projects.





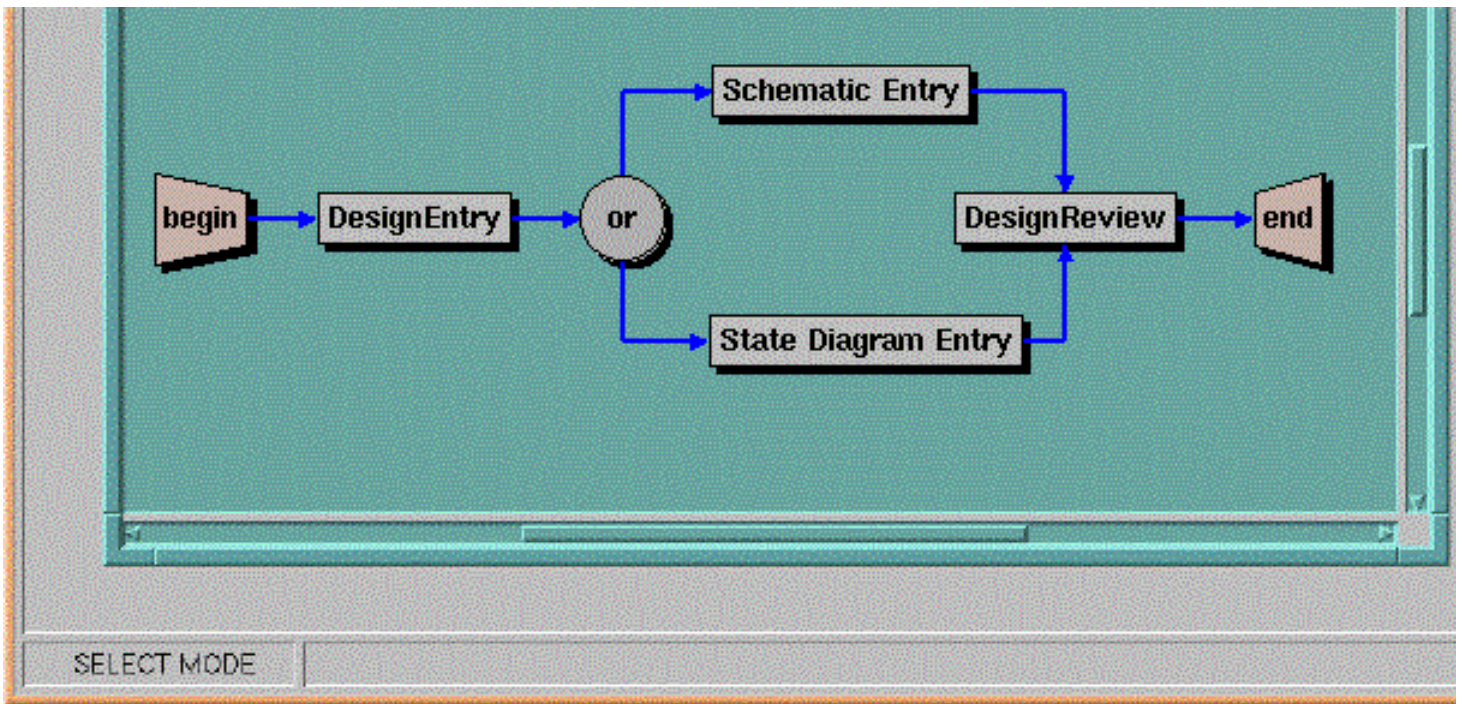
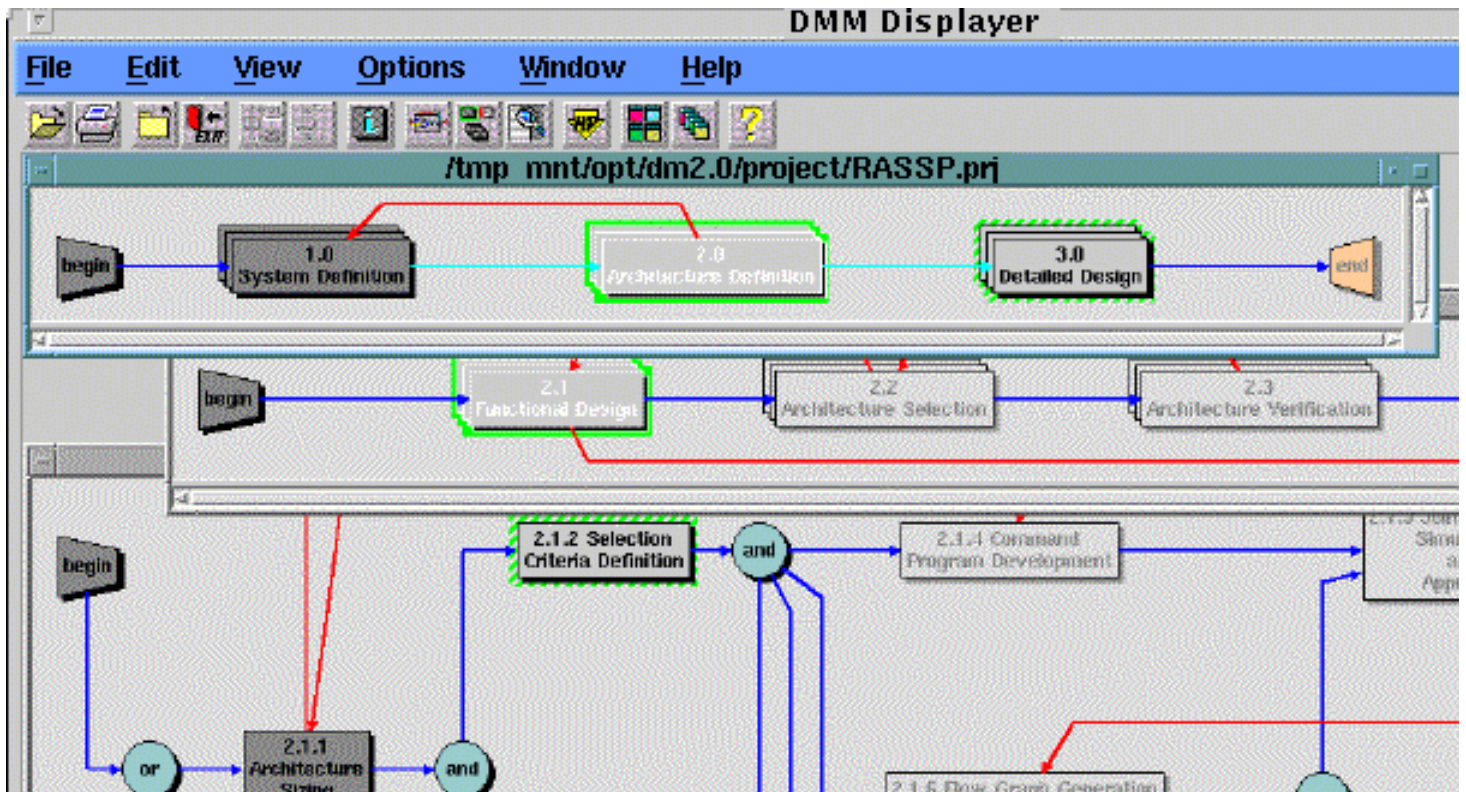
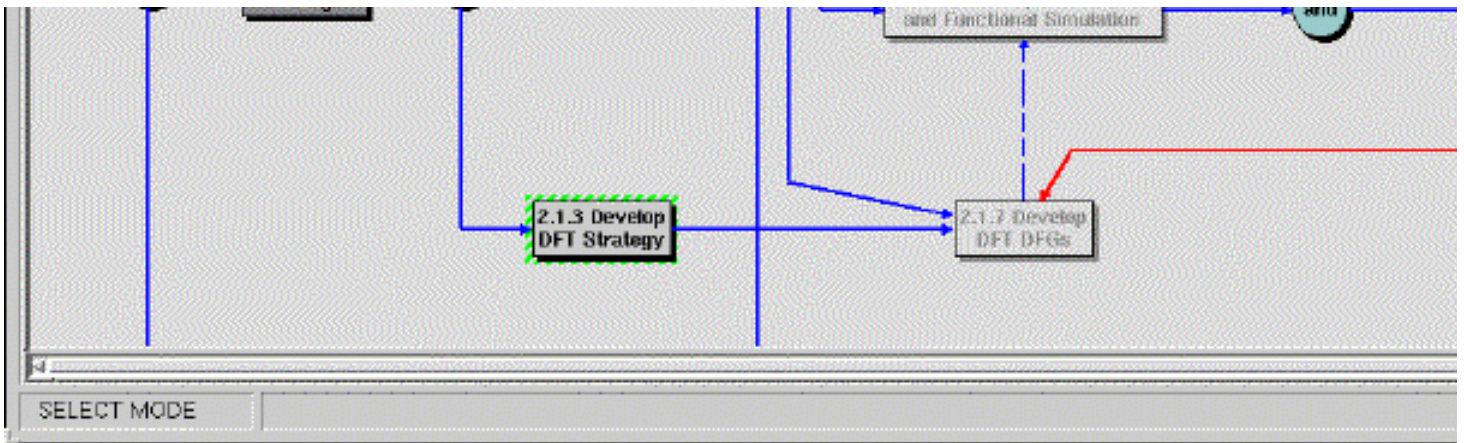


Figure 2 - 3: DMM Builder

The functionality of DMM and the Workflow Management System also consists of administrator and user functions. Administrator functions include creating workflows, and attaching and detaching workflows from projects. Operations with DMM Builder, DMM Attacher, and DMM Detacher are normally considered administrative functions. User functions generally involve execution of workflows that are attached to projects using DMM Displayer (Figure 2 - 4). Workflows are executed in DMM Displayer by placing the cursor on a workflow task that's startable and double-clicking the left mouse button. A dashed green border highlights startable tasks. When a workflow task is executed, its status changes to in-progress and is then highlighted by a solid green border. When the task is completed, its color changes to a dark gray. The workflow is considered complete when the status of all the tasks is complete.







**Figure 2 - 4: DMM Displayer**

More detailed information on the functions and capabilities of Design Methodology Manager is available from [Design Methodology Manager Users Guide](#).

DMM Builder was used to construct workflows for the design phases of RASSP using information represented in the IDEF3X models. These workflows were organized as templates, and managed in a repository for application to projects. Table 2 - 1 summarizes the process models, and workflows developed for each of the RASSP design phases.

<b>Design Phase</b>	<b>IDEF3X Model</b>	<b>DMM Workflow</b>
System Design	X	
Requirements Analysis	X	X
Functional Analysis	X	X
System Partitioning	X	X
Architecture Design	X	
Functional Design	X	X
Architecture Selection	X	X
Architecture Verification	X	X
Detailed Design	X	
ASIC Preliminary Design	X	X
ASIC Preliminary Design Review	X	
ASIC Final Design	X	X
ASIC Pre-Release Design Review	X	
ASIC Fabrication and Unit Test	X	X
Backplane Preliminary Design	X	X
Backplane Preliminary Design Review	X	
Backplane Final Design	X	X
Backplane Pre-Release Design Review	X	
Backplane Fabrication and Unit Test Design	X	X
Backplane Final Design Review	X	
Chassis Preliminary Design	X	X
Chassis Preliminary Design Review	X	
Chassis Final Design	X	X
Chassis Pre-Release Design Review	X	



FPGA Design	X	X
FPGA Preliminary Design Review	X	
Module Preliminary Design	X	X
Module Preliminary Design Review	X	
Module Final Design	X	X
Module Pre-Release Design Review	X	
Module Fabrication and Unit Test	X	X
Module Final Design Review	X	

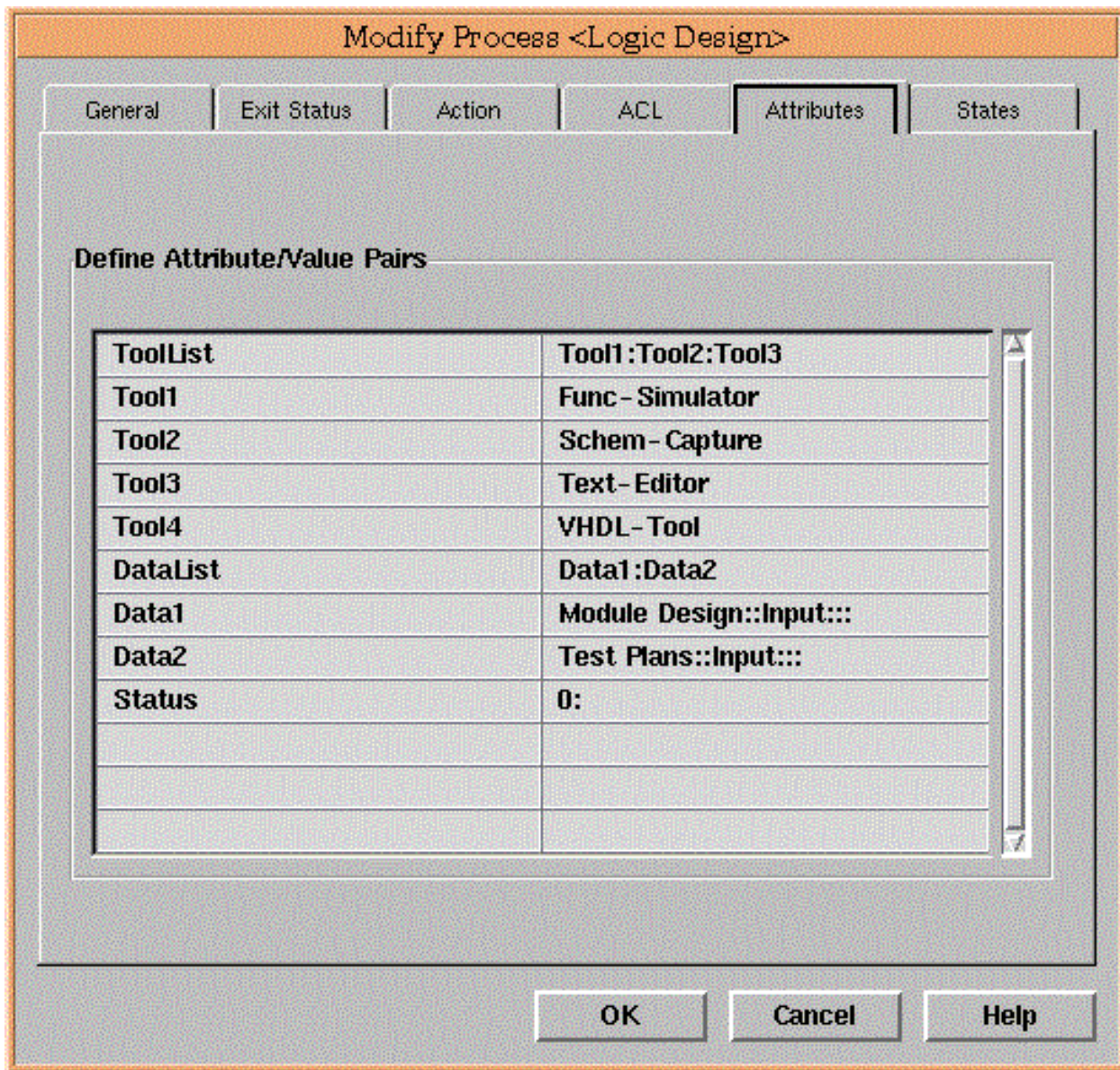
**Table 2 - 1: RASSP Process Models and Workflows**

### 2.3.1 Autoscript, DMCLI, and Toolpad

Functional enhancements to the workflow management tool consist of capability enhancements and integration with the AIM Product Data Management system. Autoscript and DMCLI (DM Command Line Interpreter) are RASSP products developed by Intergraph Corporation which implement the Workflow to PDM interaction. Another RASSP product, Toolpad, enhances the flexibility of DMM in tool and data item control during execution of an individual workflow step.

Autoscript is a custom application developed as an extension of the Workflow Management System specifically for interaction with the Product Data Management System. Autoscript is invoked when a workflow task is executed. At runtime it generates an execution script for the task, based on attributes defined for the task. These attributes, DataList and ToolList are defined for each workflow task when the workflow is constructed in DMM Builder.

- DataList attributes - DataList attributes are the names of the pre-defined business items that are stored in the PDMS. Data items required for execution of the tasks are attached to the business items in the PDMS. Autoscript generates calls to the Data Management Command Line Interpreter (DMCLI) application using the names in the DataList. DMCLI is an API-based application that issues the appropriate commands to the PDMS for the checkout and check-in of business items, and associated data.
- ToolList attributes - ToolList attributes are pointers for CAD tool encapsulation files. All CAD tool that can be invoked from within the RASSP Enterprise Framework must have an associated encapsulation file. Autoscript passes the references to the encapsulation files to the Toolpad application. Toolpad is a custom developed application that reads the tool encapsulation files, builds the RASSP Tool Launch Pad dialog, and displays the tool and data item information to the user. Clicking on a tool icon in the tool launch pad invokes the corresponding CAD tools, using the encapsulation file in generation of the launch script. All environment settings or additional setup required to launch the tool is built into the CAD tool's encapsulation file. Any required or optional command line settings can be predefined in the encapsulation file, or selectable by the user at run time. More detailed information on tool encapsulation files is provided in section 2.3.3.



**Figure 2 - 5:** Workflow Task Attributes Folder

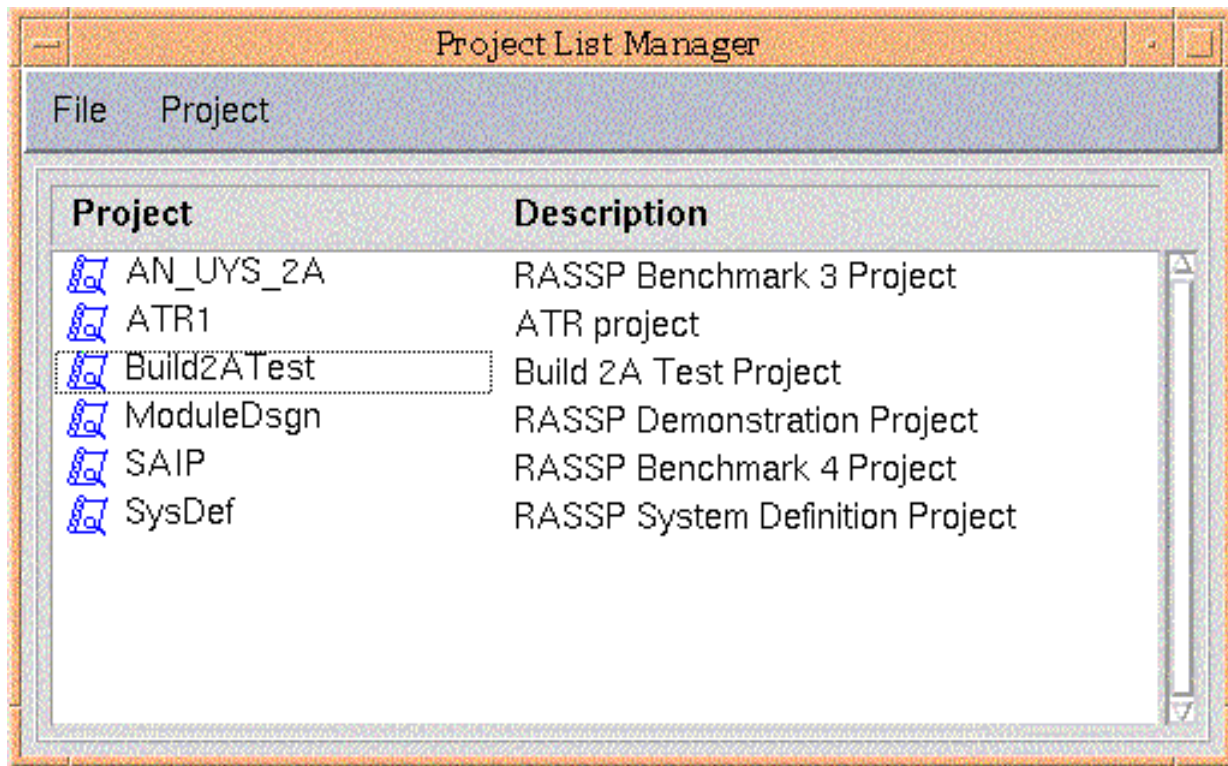
The DataList and ToolList attributes are defined in the Attributes folder, as illustrated in the DMM dialog box of figure 2- 5 for each workflow task. The command line that executes Autoscript is specified in the Action folder. Information on states, and exit status for the tasks are also specified in the corresponding folders. A complete description on the syntax for defining DataList and ToolList attributes, a description of the data required in all of the folders, as well as more information about Autoscript, DMCLI, and Toolpad, is contained in [Integrated Computer Aided Manufacturing DEFINITION \(IDEF\)](#) and the [Design Methodology Manager Users Guide](#).

### 2.3.2 Project List Manager

Project List Manager (PLM) is a custom application, developed by Intergraph Corporation, for management of reusable workflow segments and previously developed project plan workflows. It also manages active or in-process workflows.

When PLM is invoked, it displays a list of available pre-assigned projects available to the user based on assigned role. For an administrator or project manager (highest level of access privilege) all available projects would be displayed. In the example shown in PLM window figure 2 - 6, the user has access to six projects: AN\_UYS\_2A, ATR1, Build2ATest, ModuleDsgn, SAIP, and SysDef. Selection of a project is performed with mouse clicks.





**Figure 2 - 6:** Project List Manager

When a workflow project is selected for execution by a user, PLM will invoke both the DMM Displayer using the top-level workflow, and the AIM Product Data Management System. This combination the user with access to the relevant task information in the workflow, and the corresponding data items for the tasks.

### 2.3.3 CAD Tool Encapsulations

Encapsulation of CAD tools with the enterprise framework is accomplished by generation of an encapsulation file for each tool, which is referenced by the execution scripts produced dynamically during workflow execution. The encapsulation files are ASCII files which contain the necessary environment settings required to launch the tool (e.g. environment variables, path settings, command line arguments, etc.), and are stored in a designated tool information directory. The encapsulation file names, are specified as ToolList attributes for workflow tasks in which the tool is to be invoked. For example, in the Workflow Task Attributes Folder, shown in figure 2 - 5, Func-Simulator, Schem-Capture, Text-Editor, and VHDL-Tool are names of tool encapsulation files.

A benefit provided by the CAD tool encapsulation strategy is that the specific tool setup and initialization requirements environment (environment variable setups, etc.) are handled by the workflow encapsulation manager - simplifying the requirements for the user. Tool launch is accomplished by a mouse click on the tool icon in the Toolpad display.

CAD tool encapsulations were developed for multiple tools and applications on the RASSP program, for support of multiple benchmark programs, demonstrations, and beta site users. Table 2 - 2 summarizes the tool encapsulations developed, and as a result are available for application to programs.



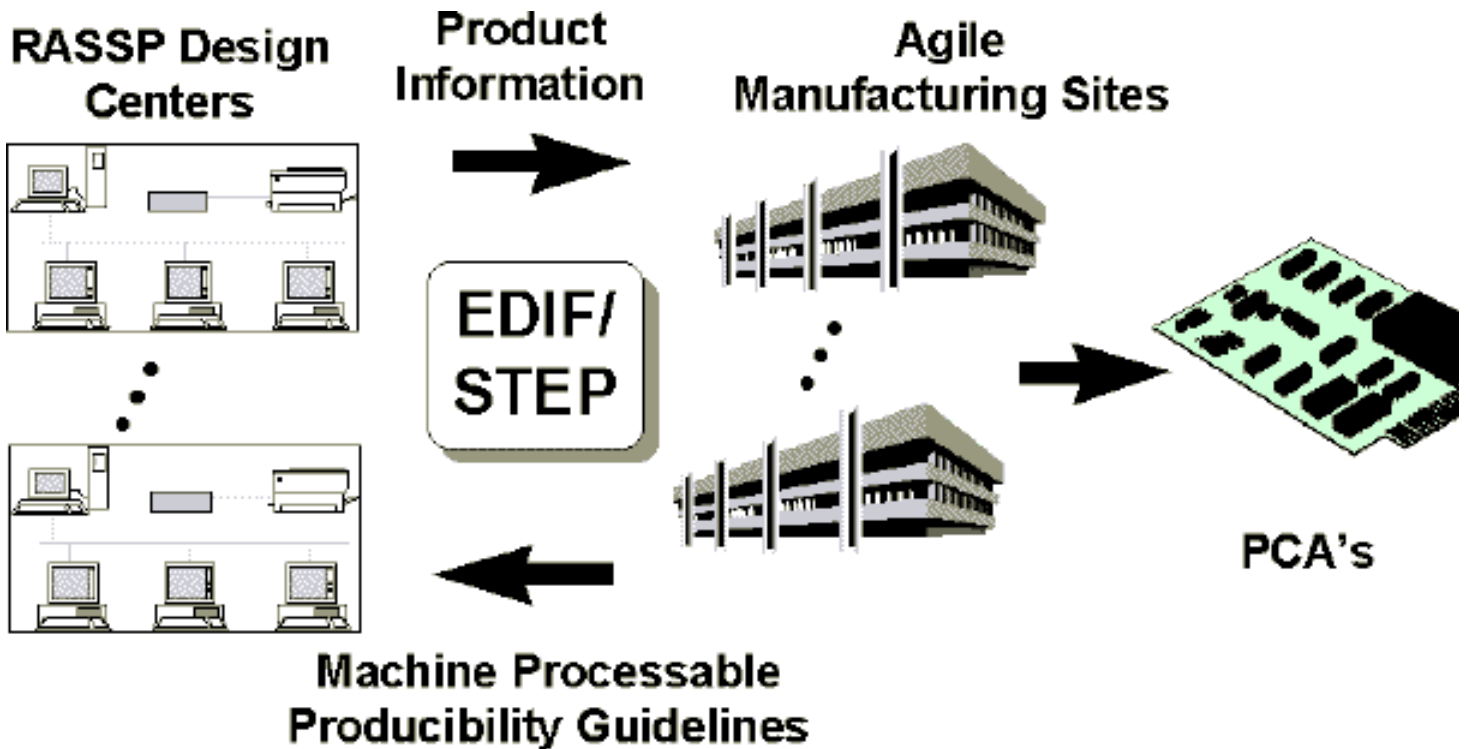
• Adobe Acrobat Reader	• FrameMaker 5
• Insoft Communique	• Interleaf 6
• JRS NetSyn	• LMC Price
• LogicVision	• Mail Tool
• Mathworks MatLab	• MCCI Autocode
• MGC AccuSim II	• MGC AutoTherm
• MGC Design Architect	• MGC Design Architect LMS
• MGC Design Manager	• MGC FabLink
• MGC Layout	• MGC QuickFault II
• MGC QuickPath II	• MGC QuickSim II
• MGC QuickVHDL	• MGC QvPro
• MSI FMECA	• MSI MTBF
• MSI MTTR	• MSI R&A
• NeoCad Bit Shell	• NeoCad Graphical Editor
• NeoCad Map Shell	• NeoCad Par Shell
• NeoCad Trace Shell	• Netscape 3.0
• ObjectGEODE	• Omniview PMW
• ProE	• RDD?
• Savantage Savansys	• SCRA Producibility Advisor
• Showme Video Conference	• Summit VisualHDL
• Synopsys Design Analyzer	• Teradyne VITG
• Text Editor	• VTM TOP
• WABI	• WAVES Testbench Tool

**Table 2 - 2:** RASSP CAD Tool Encapsulations

Detailed information on the Syntax and semantics of the tool encapsulation files is provided in [\[TOOLENCAP\\_96\]](#), the Tool Encapsulation Specification.

### 2.3.4 Manufacturing Interface

To achieve the goal of first-pass manufacturing success, the [RASSP Manufacturing Interface](#) (Figure 2 - 7) provides seamless integration of design and manufacturing as well as supporting an IPDE. By enabling real time design interaction between engineering and manufacturing, the Manufacturing Interface allows virtual and real prototypes to be produced quickly, and with significantly improved quality. The RASSP Manufacturing Interface effort encompassed several related industry efforts including: industry funded PDES, Inc. Electrical project, the ATP-funded PreAmp program, the DARPA-funded ASEM MCM efforts, the TRP-funded CommerceNet program, and others.



**Figure 2 - 7:** RASSP Manufacturing Interface

The Manufacturing Interface is composed of several distinct tools. The Manufacturing Resource Editor (MRE) is used to capture the capabilities of a manufacturing facility in standard form. The Mentor-to-STEP Data Converter tool is used to convert Mentor design files into standard STEP files. The STEP product data is used by a Producibility Advisor in conjunction with manufacturing capability information captured by the MRE to determine any issues against the design based on the manufacturing production line chosen. The product data and manufacturing capabilities are also used by the Process Planner to create a manufacturing process plan. Manufacturing and design engineer interaction via the Web-based Access Mechanism and collaboration tools enables rapid resolution of issues at early design phases. More detailed information on the RASSP Manufacturing interface is provided in [Manufacturing Interface Application Note](#)

### 2.3.5 Reuse Data Management System (RDMS)

Reuse data management within the Enterprise Framework involves the release, cataloging, and searching of reusable design objects. Sources of reusable design objects include CAD tool libraries, CAD tool independent libraries, vendor component data books, and design objects created within a design organization. The approach for reuse data management consists of:

1. developing methodologies for design-for-reuse and design-with-reuse
2. developing reuse classification hierarchies or ontologies to classify both the various types of design objects and the descriptive data associated with those objects
3. developing a Reuse Data Manager (RDM) that implements the reuse class hierarchies, facilitates integration of legacy data into a reuse repository using knowledge based approaches, and provides search mechanisms for efficient access to reuse design objects distributed across a virtual enterprise

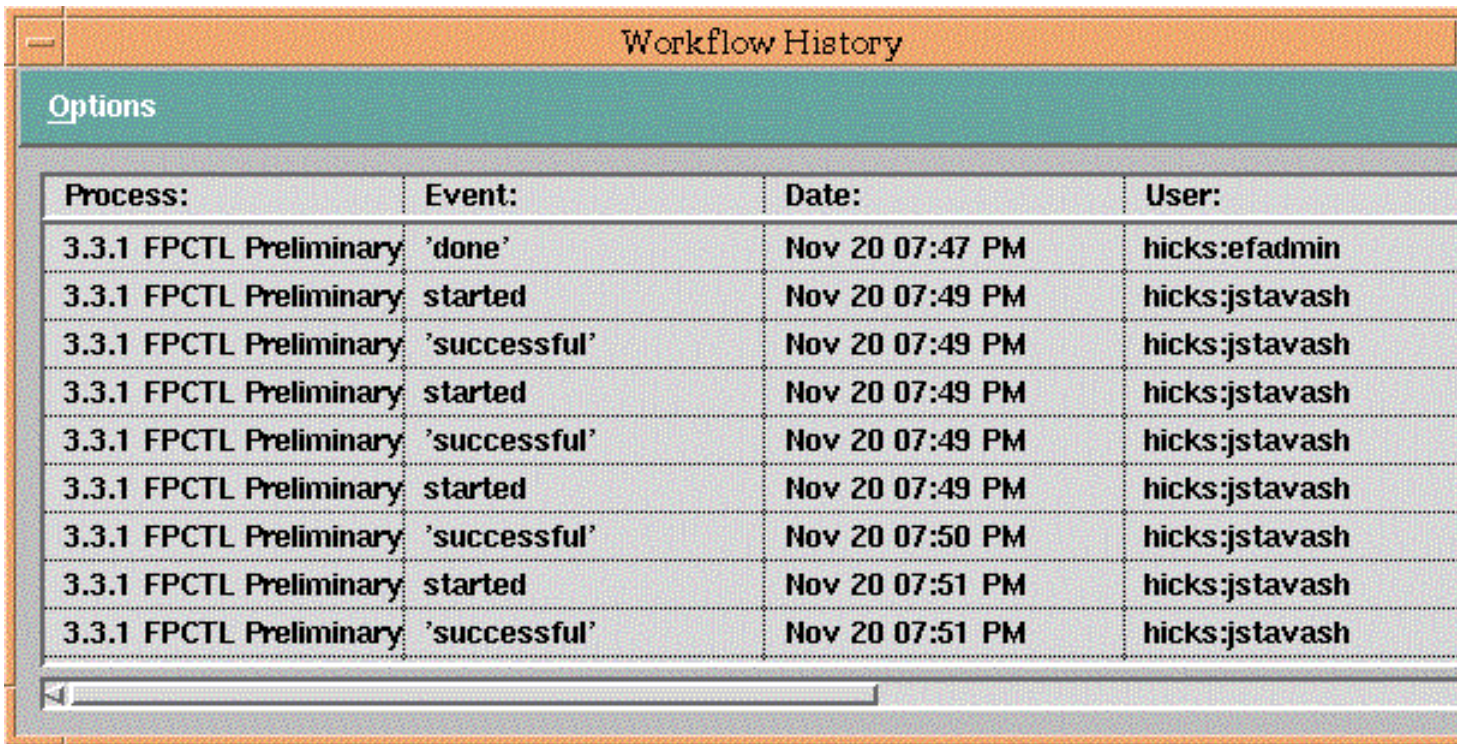
A prototype of the Reuse Data Manager was developed by Sandpiper Software, Inc. (point of contact [Elisa Finnie](#) [(408) 868 - 9731]) used to demonstrate distributed access to multiple distributed repositories of VHDL models in April 1998. The core technologies developed by Sandpiper Software, Inc. will be offered as commercial products in late 1998. More detailed information on the RASSP reuse strategy, the architecture of the Reuse Data Manager, and VHDL model

application and other applications is provided in [Reuse Application Note](#)

### 2.3.6 Metrics

Metrics collection and analysis capabilities are provided with the RASSP enterprise framework, to provide improved program management capabilities in collection and analysis of key productivity metrics. Metrics capability enables better identification of bottlenecks and problem areas in the current design processes, facilitates updates of the design process to improve cycle time, and aids in verification of the anticipated productivity improvements.

The Workflow Management System records the project history, which includes the workflow task names, the start and stop time of each workflow task, user names associated with tasks, and task completion status as indicated in figure 2 - 8. In addition, the Workflow Management System tracks the scheduled start & stop dates for each workflow task, information on the relationship of scheduled events and actual events is readily available to project engineers and managers. The status logs from the Workflow Management System are also exportable in a formatted text for use by other project tools such as MS Project.



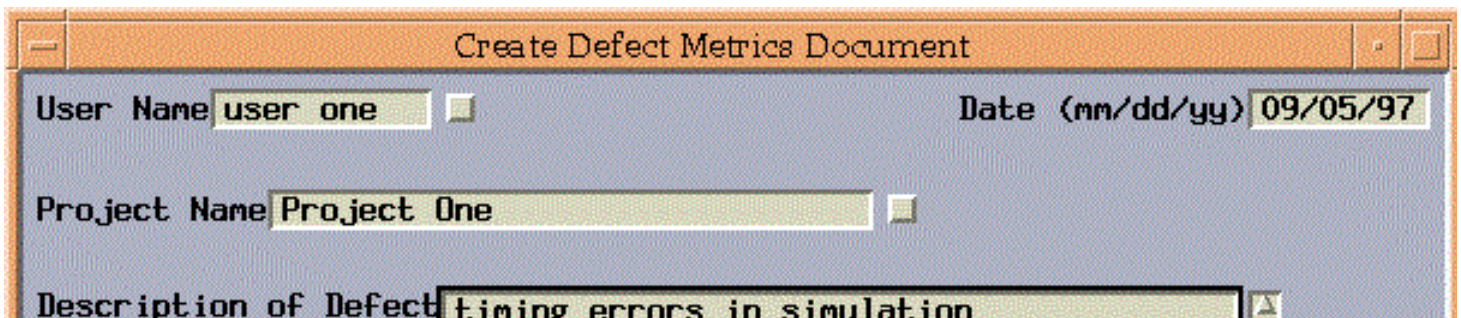
The screenshot shows a window titled "Workflow History" with an "Options" header. Below the header is a table with four columns: Process, Event, Date, and User. The table contains nine rows of data, all for the process "3.3.1 FPCTL Preliminary". The events alternate between "done", "started", and "successful". The dates are all on Nov 20, and the users are either "hicks:efadmin" or "hicks:jstavash".

Process:	Event:	Date:	User:
3.3.1 FPCTL Preliminary	'done'	Nov 20 07:47 PM	hicks:efadmin
3.3.1 FPCTL Preliminary	started	Nov 20 07:49 PM	hicks:jstavash
3.3.1 FPCTL Preliminary	'successful'	Nov 20 07:49 PM	hicks:jstavash
3.3.1 FPCTL Preliminary	started	Nov 20 07:49 PM	hicks:jstavash
3.3.1 FPCTL Preliminary	'successful'	Nov 20 07:49 PM	hicks:jstavash
3.3.1 FPCTL Preliminary	started	Nov 20 07:49 PM	hicks:jstavash
3.3.1 FPCTL Preliminary	'successful'	Nov 20 07:50 PM	hicks:jstavash
3.3.1 FPCTL Preliminary	started	Nov 20 07:51 PM	hicks:jstavash
3.3.1 FPCTL Preliminary	'successful'	Nov 20 07:51 PM	hicks:jstavash

Figure 2 - 8: Workflow Manager Project History

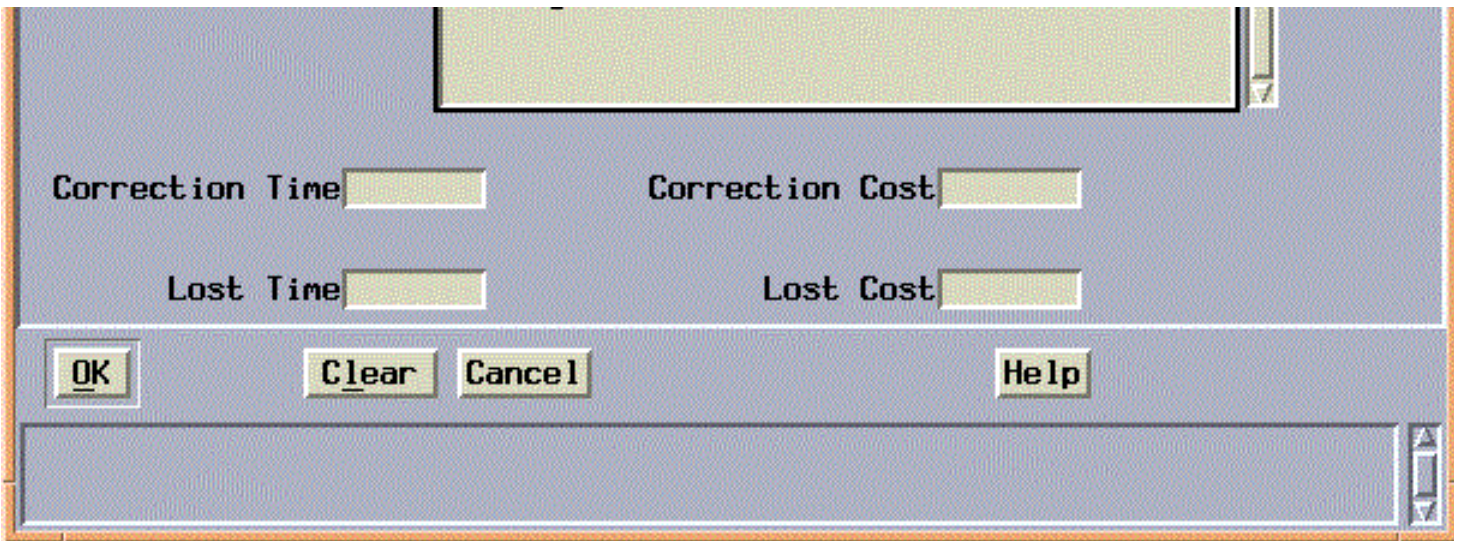
The logging information is recorded in a transaction file. Additional post processing is performed using this information to produce summary reports detailing specific metrics associated with persons, CAD tool, and process steps. Total time spent in a CAD tool is a metric of interest which is derived from the status logs.

In addition to the Workflow Management metrics collection, a metrics support utility was developed for the Product Data Management System. This supports additional metrics such as: design defects, reuse data and personal logs. Figure 2 - 9 and 2 - 10 illustrate the custom user interface screens supporting this utility.



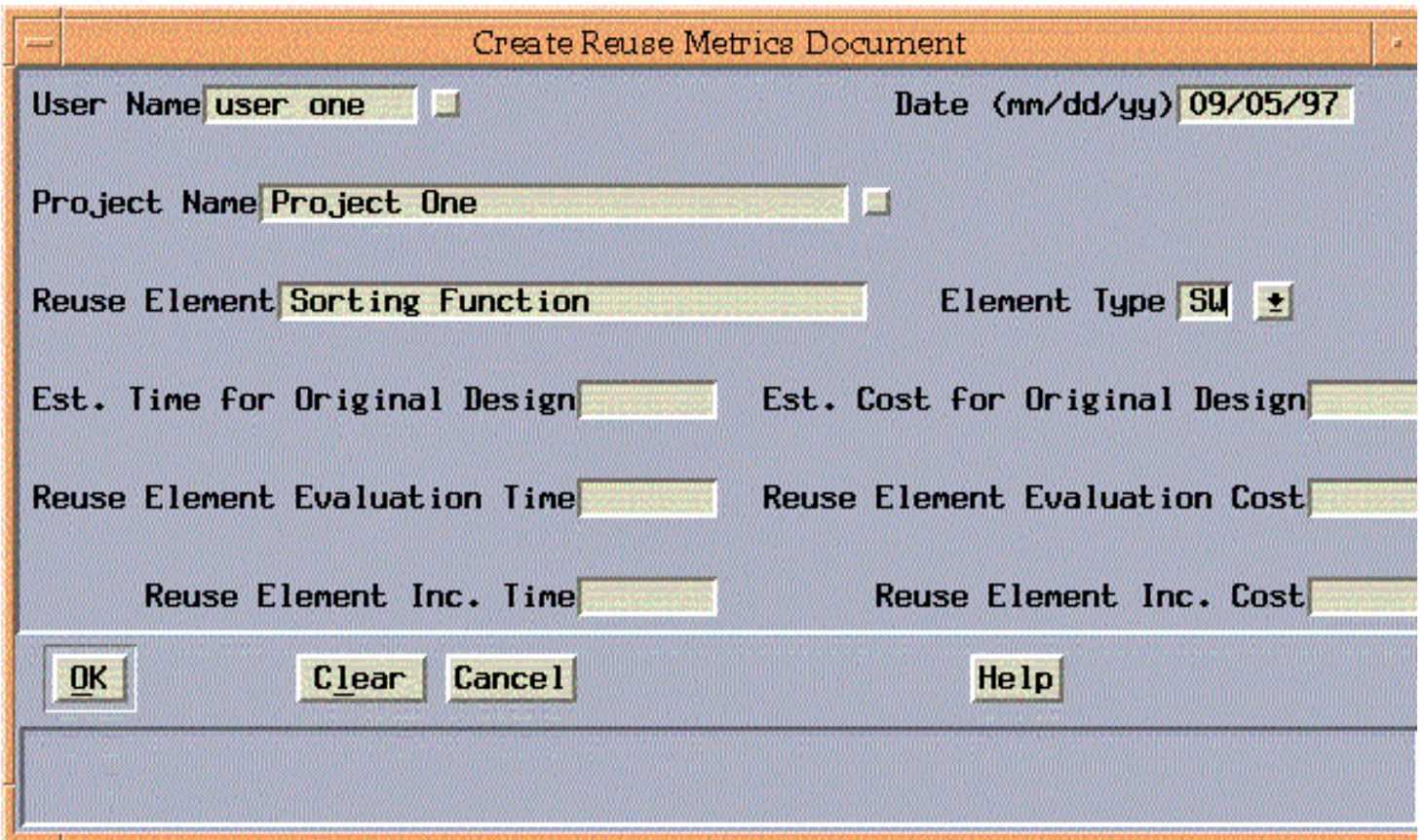
The screenshot shows a form titled "Create Defect Metrics Document". It has three input fields: "User Name" with the value "user one", "Date (mm/dd/yy)" with the value "09/05/97", and "Project Name" with the value "Project One". Below these is a text area for "Description of Defect" containing the text "timing errors in simulation".





**Figure 2 - 9:** Defect Metrics Screen

The Metaphase screen for defect information includes the date, user's name, project name, description of the defect, and the time and cost associated with correcting that defect.



**Figure 2 - 10:** Reuse Metrics Screen

The Metaphase screen for reuse information includes the date, user's name, project name, reuse element, the element type, and the time and cost associated with incorporating that reuse element into the current project.

# RASSP Enterprise Framework Appnote

## 3.0 Summary

The RASSP enterprise system provides significant capability for enabling large productivity gains for signal processing teams - from 1.2 X up to 4X in conjunction with other RASSP tools and processes. The results of the enterprise framework are available either commercially or directly from the developers. The core enterprise tools are available from Intergraph Corporation (Workflow Management and Product Data Management system). Sandpiper Software for the Reuse Data Management system, and SCRA or a designee will provide commercial access to the manufacturing interface tools. Significant concepts associated with the enterprise framework include:

- Tools and tool frameworks integrated into an enterprise environment
- Program execution control using workflows
- Integrated workflow / data management functionality
- Engineering reuse support
- Concurrent engineering team support
- Integrated design engineering and manufacturing

Key benefits include a practical approach to apply process technology in an engineering environment; capability for users to plan and manage complex products; improvements in reuse implementation through an integrated distributed strategy, and a 5-10X improvement in the design to manufacturing interface.



# RASSP Enterprise Framework Appnote

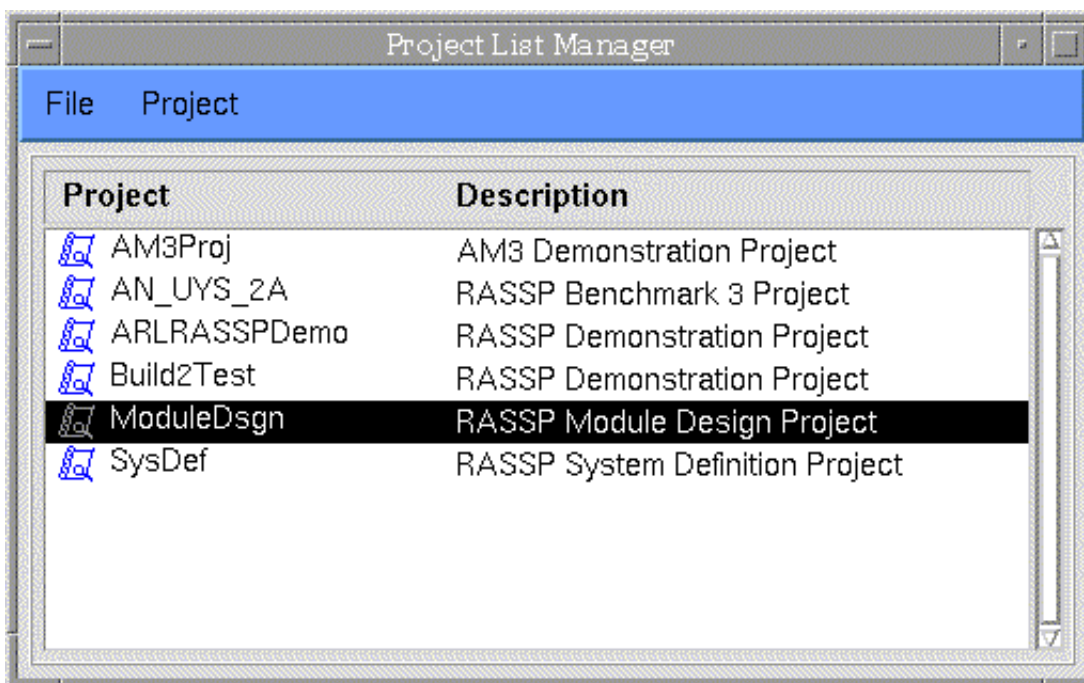
## 4.0 System Demonstration

This section presents a demonstration of the RASSP Enterprise System. The demonstration will execute a module design workflow to design the FPCTL module for the RASSP benchmark 3 program.

The RASSP Enterprise System is invoked by entering the following command at the prompt:

```
> projlist &
```

This brings up the Project List Manager as shown in figure 4 - 1. The Project List Manager contains a listing of all the projects the user is assigned to. Users are assigned to projects by the RASSP System Administrator. A project is selected and executed by placing the cursor over the project name and double-clicking the left mouse button. Figure 4 - 1 shows the RASSP Module Design Project has been selected.



**Figure 4 - 1:** Project List Manager

When a project is selected and executed, the DMM Displayer and the AIM Home Collection windows are displayed as shown in figures 4 - 2 and 4 - 3. The DMM Displayer contains the workflow that is attached to the project being executed. Since the RASSP Module Design Project was selected in the Project List Manager, the workflow contained in figure 4 - 2 is the workflow that's attached to that project. The AIM Home Collection window is the user interface to the PDM tool.

Workflows in DMM are executed by placing the cursor on a task that's "startable" and double-clicking the left mouse button. "Startable" tasks are highlighted with a dashed green border. This invokes the task and runs the "autoscript" and "toolpad" utilities. Autoscript is a custom developed utility, which enables DMM to communicate with the AIM PDM tool, for the check-out and check-in of business items. When a workflow task is invoked, the business items defined for that task are checked-out of the AIM PDM tool and placed in either the user's private work location or the shared work location. If the business item is defined as shared, it is checked-out into the shared work location. If the business item is defined as private, it is checked-out into the user's private work location. Business items are defined as shared when multiple engineers need access to it within the same workflow task. Such is the case with a Mentor Graphics design database or an RDD - 100 design database. Business items are defined as private when only one user per workflow task needs access to the data. AIM business items are defined, for each task, when the workflow is being developed in DMM Builder.





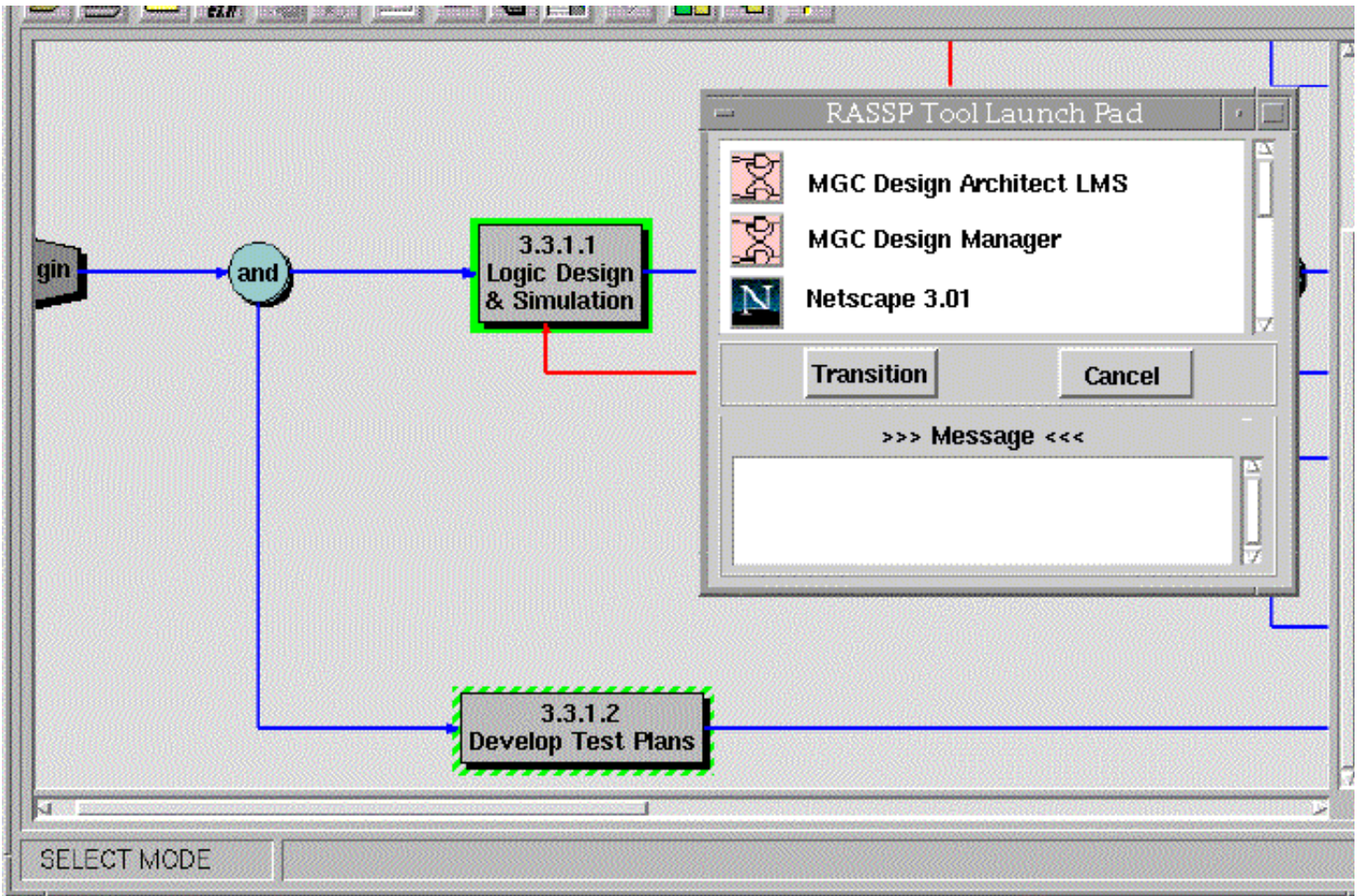


Figure 4 - 2: DMM Displayer

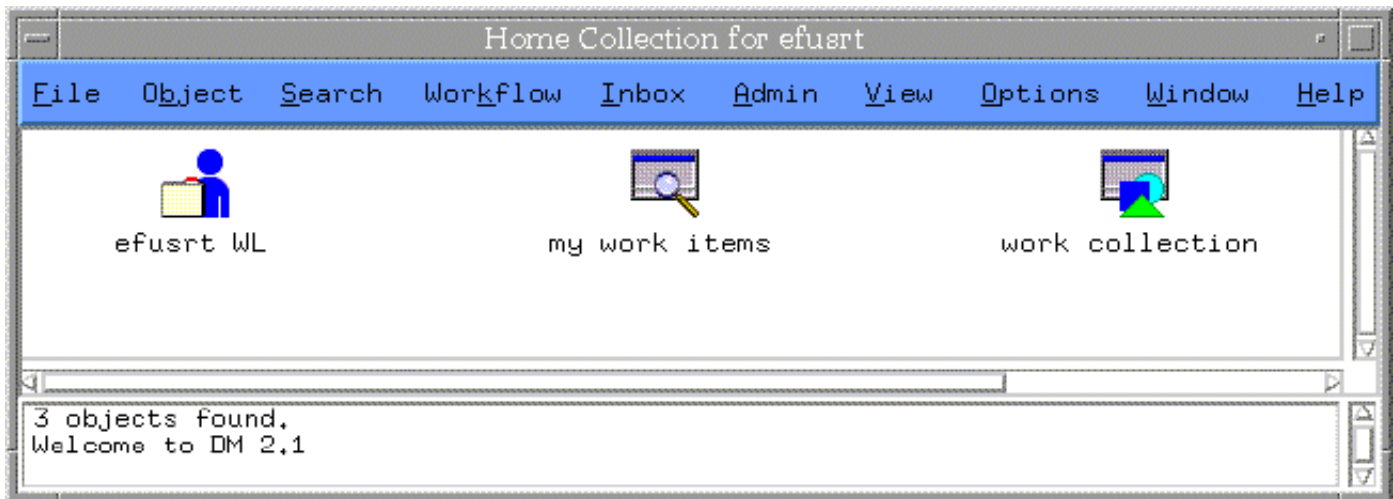
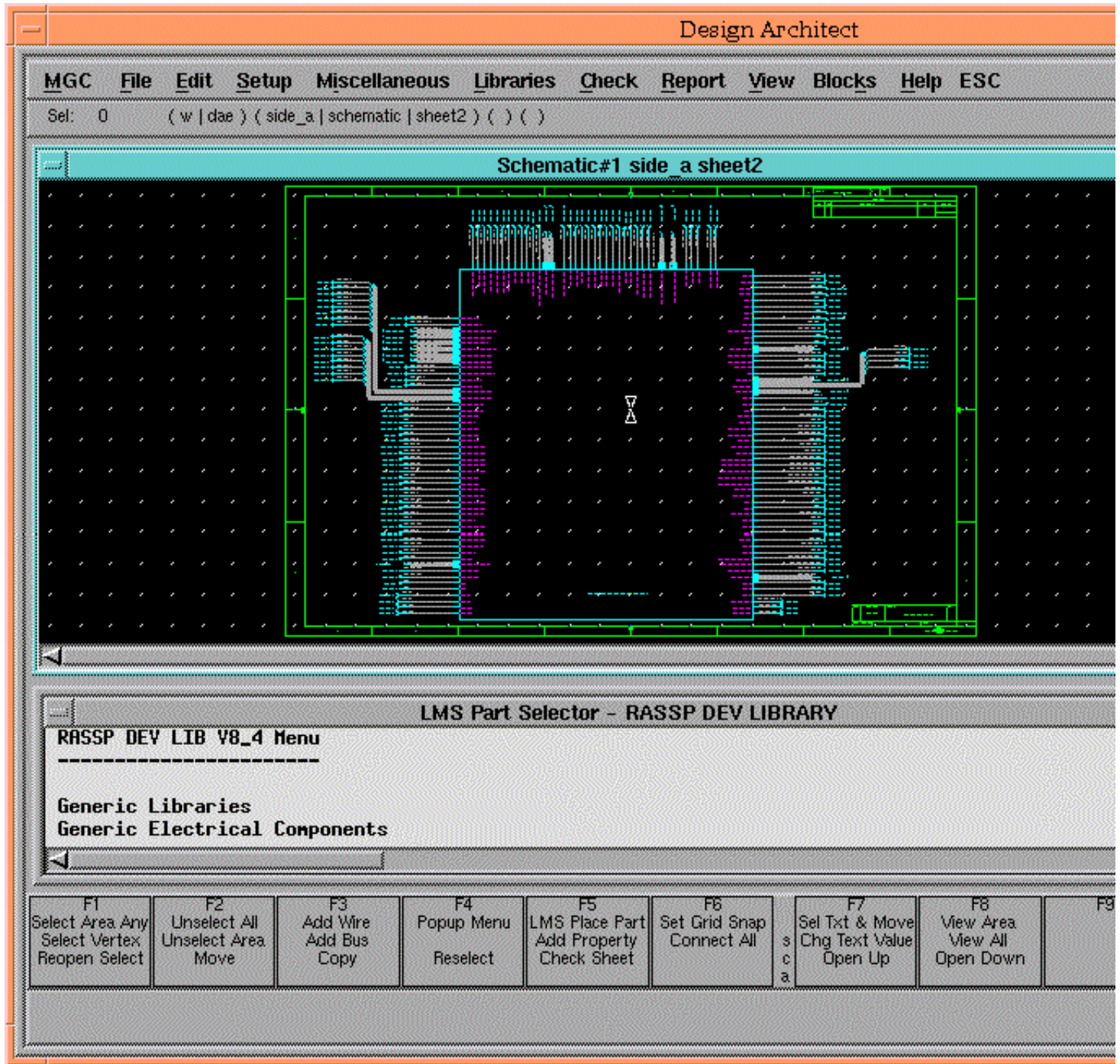


Figure 4 - 3: AIM Home Collection

When the autoscript utility has successfully completed, the toolpad utility is executed. The toolpad utility is also a custom developed utility which will display the RASSP Tool Launch Pad. If the autoscript utility does not complete successfully, the toolpad utility will not be invoked. Instead, error messages will be printed in the shell window from which the Enterprise System was invoked. The RASSP Tool Launch Pad contains a list of CAD tools that may be invoked for that task. Figure 4 - 2 shows the Tool Launch Pad for workflow task 3.3.1.1 Logic Design & Simulation. The CAD tools that have been encapsulated for this task include MGC Design Architect LMS, MGC Design Manager, and Netscape 3.01. To invoke these CAD tools from the Tool Launch Pad, place the cursor on the CAD tool's icon and single click the left mouse button. The encapsulated CAD tools can be invoked as often as necessary. The "Messages" window at the bottom of the RASSP Tool Launch Pad is where any error messages associated with the invocation of the CAD tools will be displayed. Figure 4 - 4 shows the MGC Design Architect LMS tool which was invoked by single-clicking on that tool's icon. Once the tool is



invoked, it is used to design the FPCTL module as shown in figure 4 - 4.



**Figure 4 - 4:** MGC Design Architect LMS

When all the work has been completed for the "in-progress" task, the workflow is transitioned by placing the cursor on the "Transition" button, within the RASSP Tool Launch Pad, and single-clicking the left mouse button. This causes the DMM Notification window to be displayed, from which an exit status must be selected. Figure 4 - 5 shows the DMM Notification window that's displayed after pressing the "Transition" button on the RASSP Tool Launch Pad. Since workflow task 3.3.1.1 Logic Design & Simulation has only a successful exit path, it's already highlighted by default. Simply place the cursor on the "Notify" button and single-click it with the left mouse button. This will invoke the autoscript utility again to check the business items back into the AIM PDM tool along with any and all new data files that were produced as a result of this task. It will also automatically generate and send email to the project leader informing him that the workflow task has been completed. When the business item check-in has completed, the workflow will transition to the next task. Placing the cursor on the "Cancel" button in either the DMM Notification window or the RASSP Tool Launch Pad and single-clicking the left mouse button will terminate the execution of the toolpad utility. If this happens, the toolpad can be re-invoked by simply double-clicking on the "in-progress" workflow task. Also, the workflow cannot be transitioned while CAD tools are still running. If an attempt is made to transition the workflow while a CAD tool is still running, an error message will be displayed prompting the user to first exit the CAD tools.



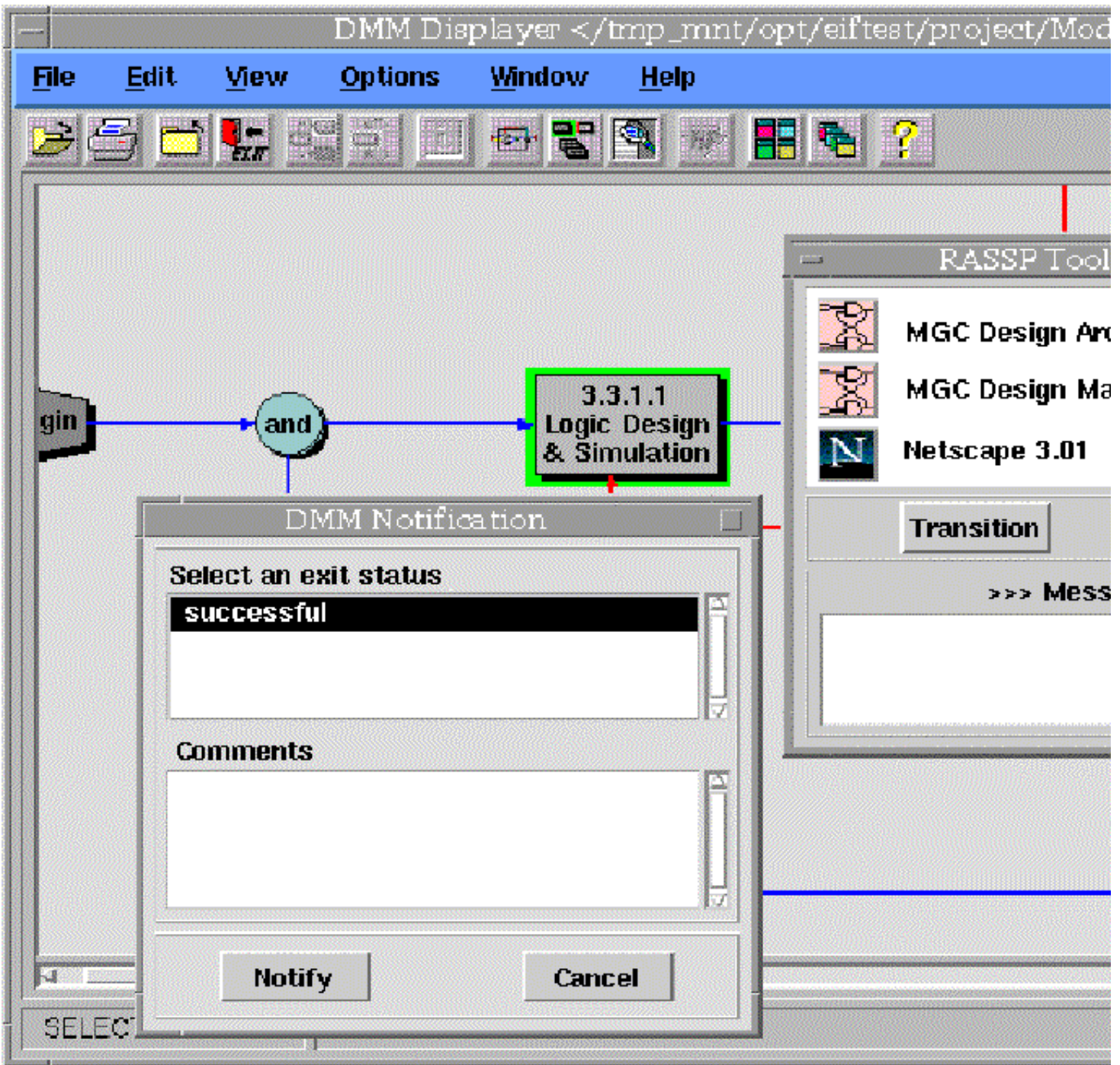
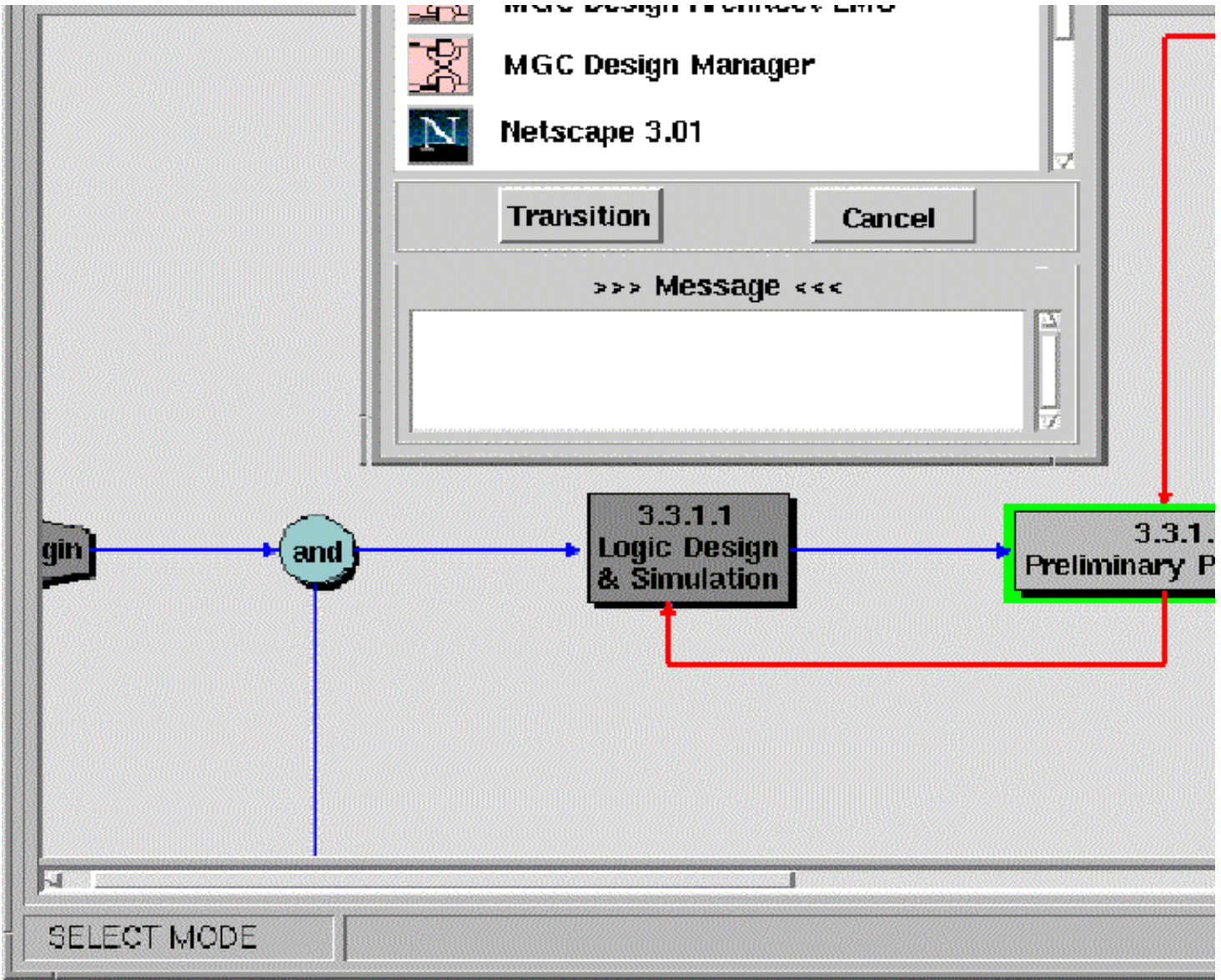


Figure 4 - 5: DMM Notification Window

Figure 4 - 6, shown below, indicates the workflow has been transitioned to task 3.3.1.3 Preliminary Placement. Notice that task 3.3.1.1 Logic Design & Simulation has changed to a dark gray color. This indicates that task has been completed. Figure 6 also indicates that task 3.3.1.3 Preliminary Placement is already "in-progress" and the RASSP Tool Launch Pad is displayed listing the available CAD tools. Encapsulated CAD tools for this task include MGC Design Manager, MGC Layout, and Netscape 3.01.

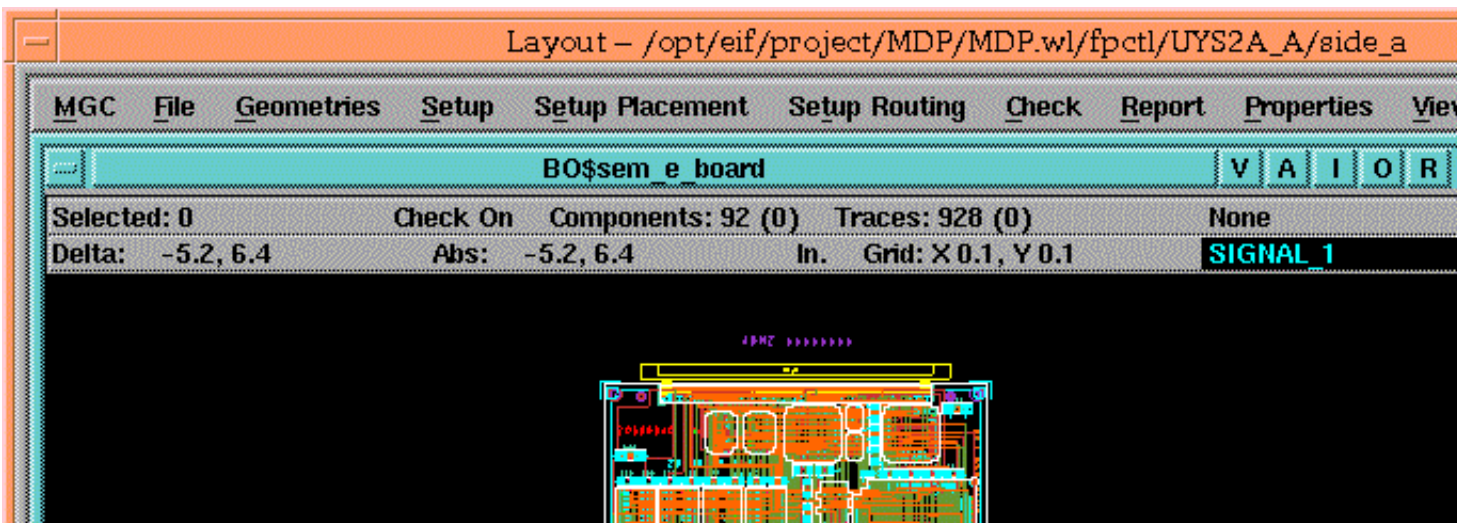






**Figure 4 - 6:** Transitioned workflow

Figure 4 - 7 shows the MGC Layout tool which was invoked by single-clicking on that tool's icon. Once the tool is invoked, it is used to perform the layout of the FPCTL module as shown in figure 4 - 7.









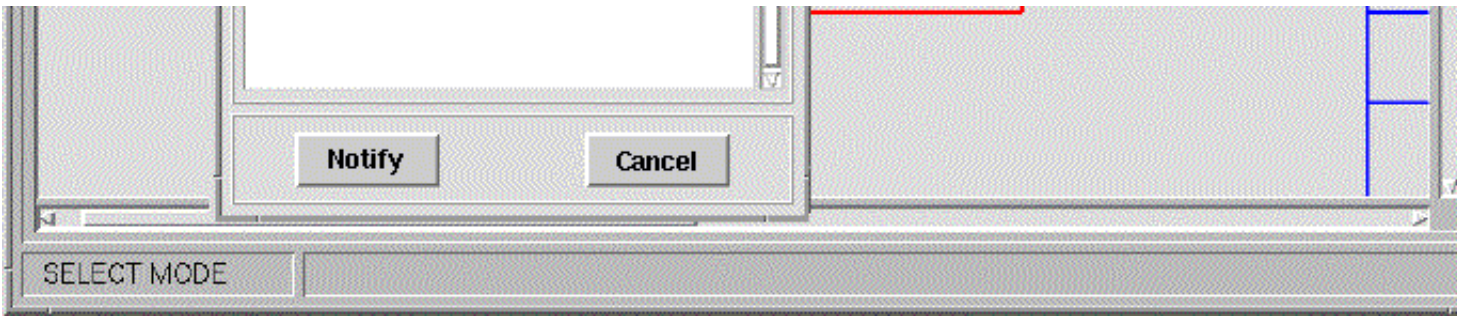


Figure 4 - 8: Successful and Failure Exits

The next group of workflow tasks, shown in figure 4 - 9, are the different types of simulation and analyses that need to be performed on the module design. They are aligned vertically to indicate parallelism in the design process. Tasks 3.3.1.4 Manufacturing Analysis, 3.3.1.5 Thermal Analysis, 3.3.1.6 Functional & Timing Analyses, 3.3.1.7 Testability Analysis, and 3.3.1.8 Fault Simulation can all be performed in parallel by different designers. Since the RASSP Enterprise System supports distributed PDTs, it's not necessary for the designers to all be at the same site. Figure 4 - 9 demonstrates this by showing the Tool Launch Pads for tasks 3.3.1.4 Manufacturing Analysis, and 3.3.1.5 Thermal Analysis. Figure 4 - 10 shows the MGC AutoTherm tool which was invoked by single-clicking on that tool's icon for the thermal analysis task. Once the tool is invoked, it is used to perform the thermal analysis of the FPCTL module as shown in figure 4 - 10.

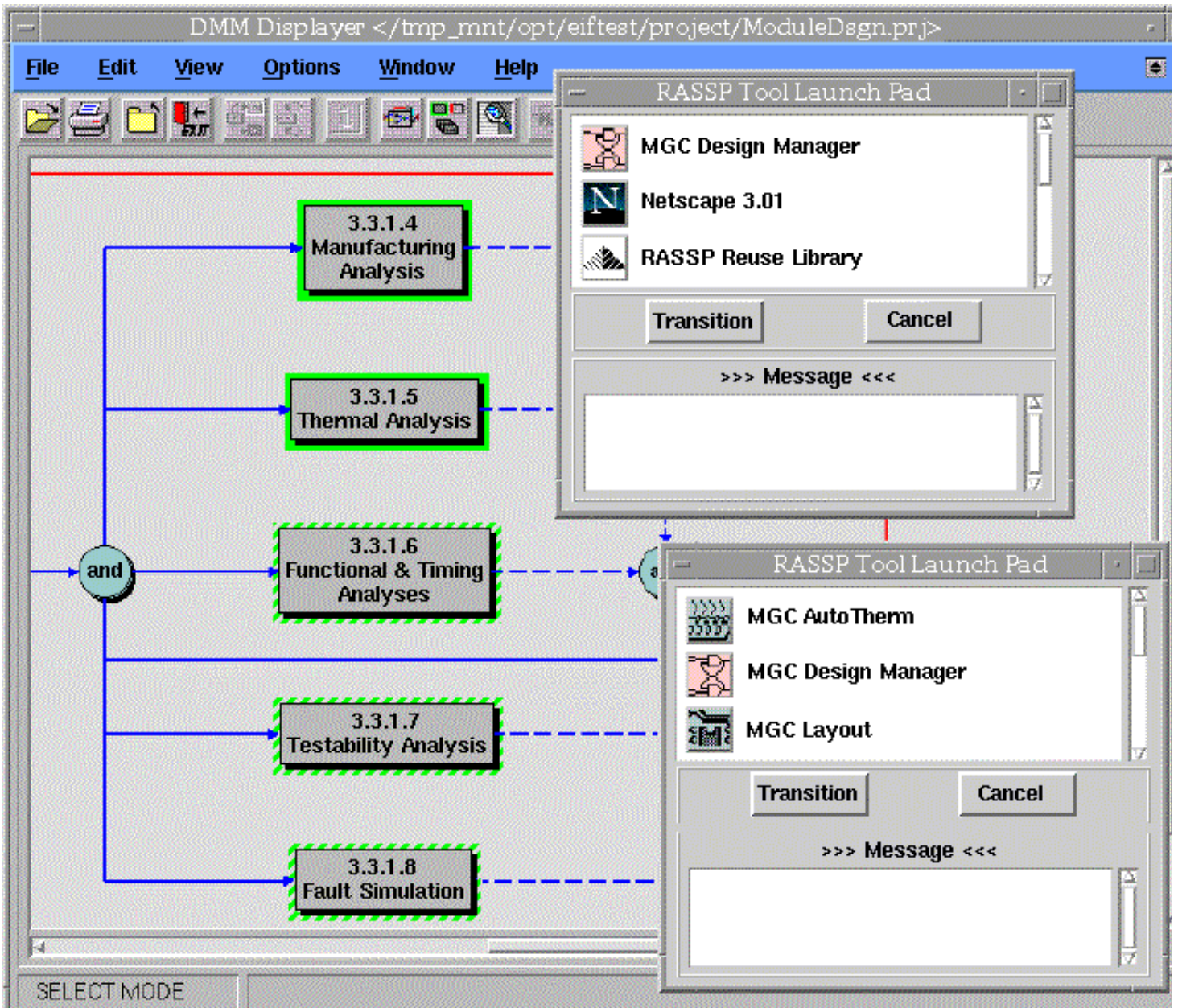




Figure 4 - 9: Parallel Analyses

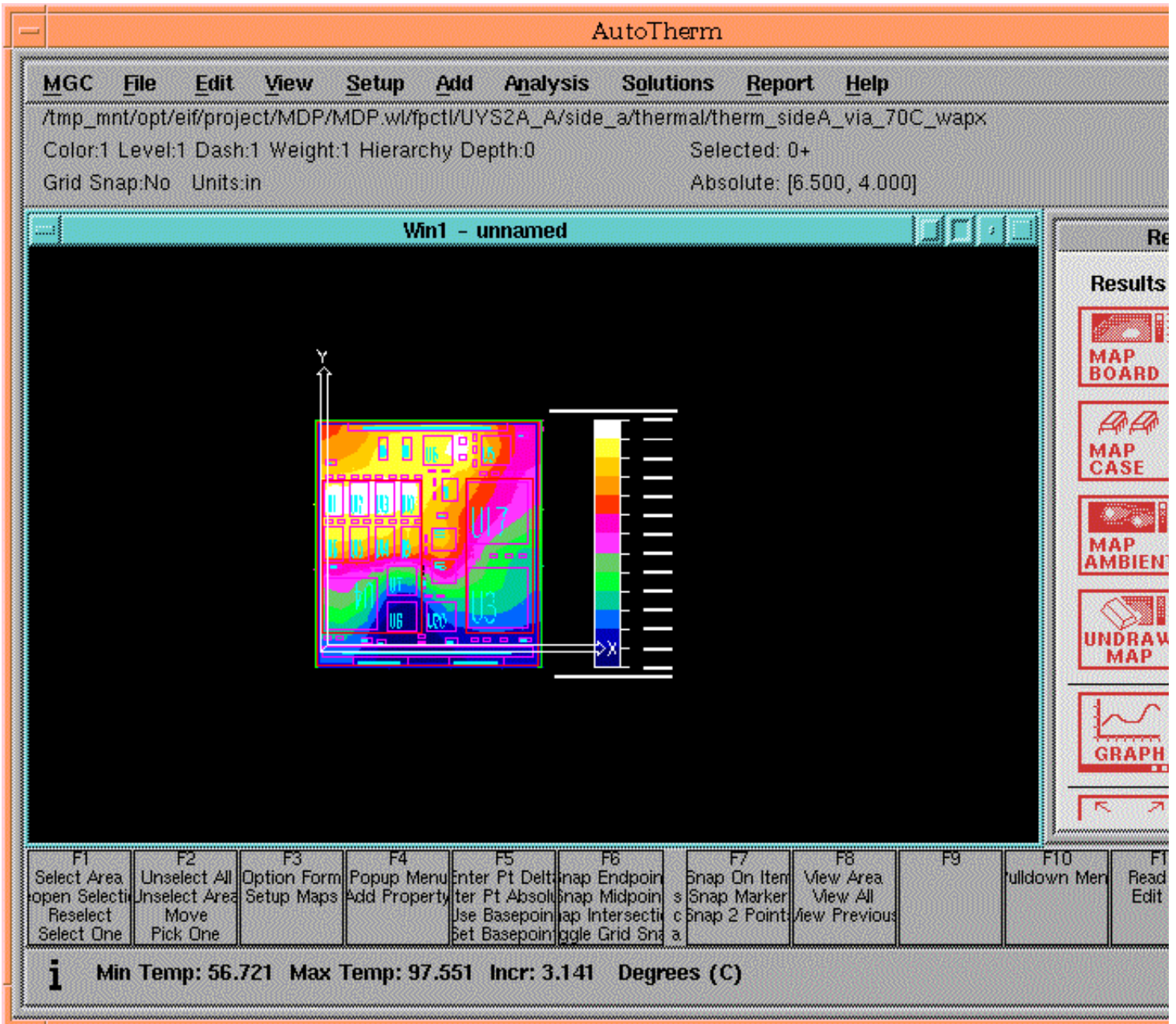


Figure 4 - 10: MGC AutoTherm

Figure 4 - 11 shows the remaining two tasks for the module design workflow. Task 3.3.1.9 Merge Results is the task where the results of the previous parallel analyses are merged together into one version of the design before being checked back into the AIM PDM tool. If there are no problems or issues to resolve, the design is baselined. If there are design issues and/or problems to be corrected, the failure exit from task 3.3.1.9 Merge Results can be taken which will fail the workflow back to task 3.3.1.3 Preliminary Placement. Taking the failback path will reset the parallel analyses tasks back to "startable" which means they will have to be performed again after making the appropriate design changes.





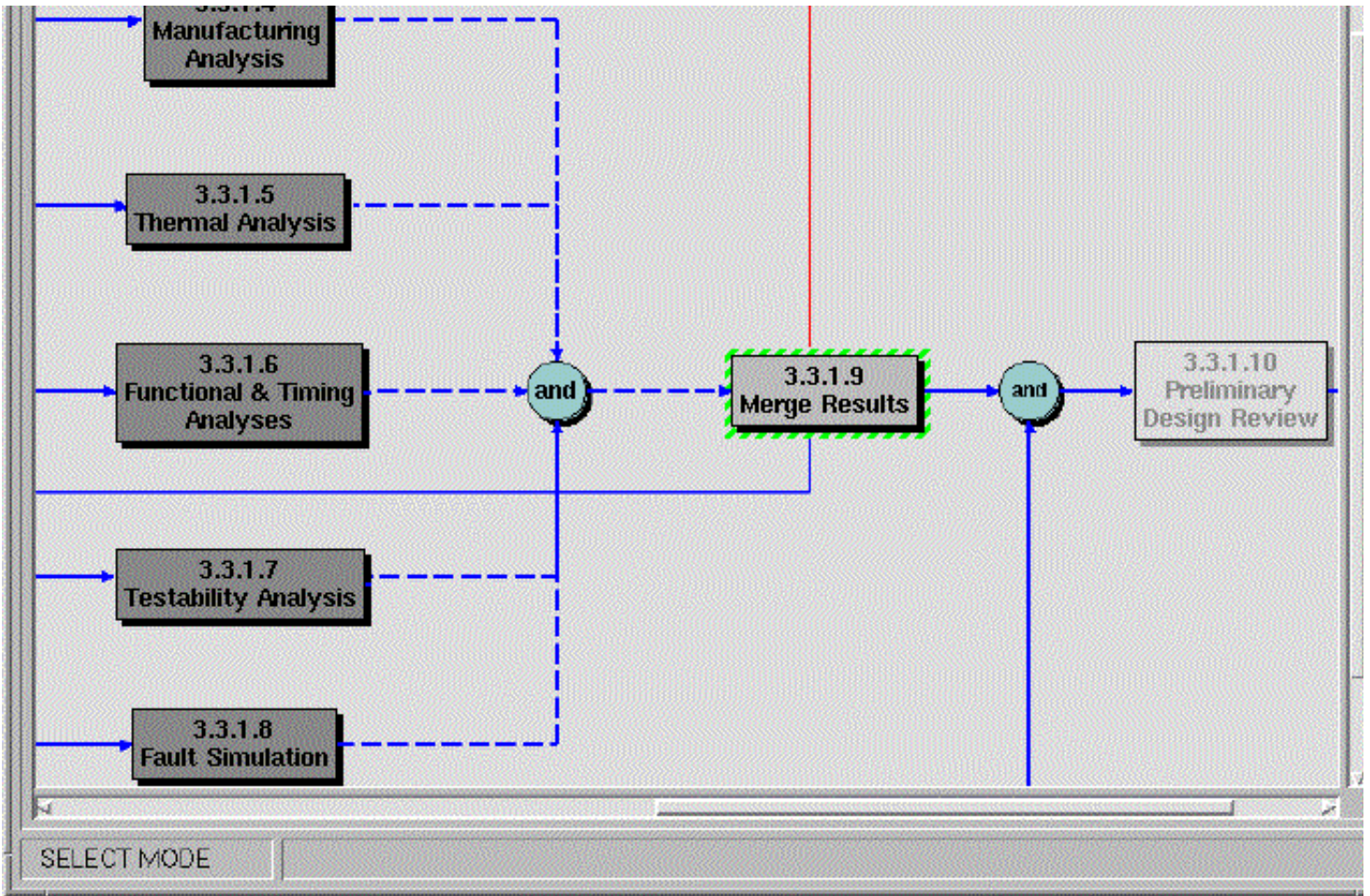


Figure 4 - 11: Merge Results & Design Review

Task 3.3.1.10 Preliminary Design Review is the last workflow task to be performed. This is mostly a management task in which a design review is conducted. At the end of this task, the design is promoted up into the global workspace of the AIM PDM tool.

Workflow History			
Options			
Process:	Event:	Date:	User:
3.3.1 FPCTL Preliminary	'done'	Nov 20 07:47 PM	hicks:efadmin
3.3.1 FPCTL Preliminary	started	Nov 20 07:49 PM	hicks:jstavash
3.3.1 FPCTL Preliminary	'successful'	Nov 20 07:49 PM	hicks:jstavash
3.3.1 FPCTL Preliminary	started	Nov 20 07:49 PM	hicks:jstavash
3.3.1 FPCTL Preliminary	'successful'	Nov 20 07:49 PM	hicks:jstavash
3.3.1 FPCTL Preliminary	started	Nov 20 07:49 PM	hicks:jstavash
3.3.1 FPCTL Preliminary	'successful'	Nov 20 07:50 PM	hicks:jstavash
3.3.1 FPCTL Preliminary	started	Nov 20 07:51 PM	hicks:jstavash
3.3.1 FPCTL Preliminary	'successful'	Nov 20 07:51 PM	hicks:jstavash

Figure 4 - 12: DMM Project History



During project execution, DMM collects project metrics including the Process Name, Event ID, Duration, Actual Start Date, Actual Finish Date, User Name, and Number of Times Run. This information is shown in the Project History table in figure 4 - 12 above. The fields of this history table may be exported to a file for a comma-separated-value file format (.CSV). This file may then be imported into a project management tool such as Microsoft Project for additional project metrics processing.

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Hardcopy only available. Contact Mr. Bill Selvidge at the Intergraph Corporation for copies. [wrselvid@ingr.com](mailto:wrselvid@ingr.com) (205) 730 - 8626.

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