RASSP ENTERPRISE FRAMEWORK APPROACH

FOR MODEL REPOSITORY DEVELOPMENT

FOREWORD

This report has been prepared to describe the approach to be taken in development of the Rapid prototyping of Application-Specific Signal Processors (RASSP) model repository. This report was prepared by the Rockwell Aerospace North American Aircraft Division (NAAD) Advanced Information Engineering (AIE) organization under Subcontract No. P.O. TTM 748357 to Martin Marietta and fulfills the requirements of Work Breakdown Structure element number 1.3.1.3.17.1, entitled Data Dictionary Approach.

1 Introduction

Martin Marietta is developing an enterprise information management infrastructure for its Rapid prototyping of Application-Specific Signal Processors (RASSP) Project. Experience at Rockwell NAAD has determined the complexity of enterprise projects requires models and tools for the understanding of existing processes, the development of improved processes, and the identification and documentation of information required for these new improved processes. These processes and information are key componenets in an enterprise information management infrastructure. Martin Marietta has contracted Rockwell NAAD support in the use of a structured methodology for the development of workflow models, information models, information models, and a RASSP model repository. This report describes the model repository development approach.

1.1 Model Development Approach

The model development approach starts with the creation of the RASSP Methodology Documentation by Martin Marietta (see Figure 1-1). These documents define the processes that a user follows to more rapidly define and implement digital signal processors. Once released, the RASSP Methodology Documents are delivered to Rockwell. The documentation is analyzed to identify activities in the process along with the activities' associated product data. This information is used to develop a time-phased workflow in an extended version of the Integrated Computer Aided Manufacturing DEFinition (IDEF) Number 3 language. The workflow models are then stored in a repository for configuration management purposes. Reports can be generated from the repository for implementing the workflows in Intergraph's Design Methodology Manager workflow tool.

In addition to identifying the activity precedence for a process, the IDEF-3 workflows are also used to identify the product data that will be used to create the information models for RASSP. The information models will describe the meta data about the objects to be configuration managed withing the RASSP program. Following its creation, the information model is stored in the repository for configuraiton management. A relational model is then provided to Intergraph for development of the data

structure to be used in Intergraph's Network File Manager (I/NFM).?

The following sections of this report go into more detail on the model repository.

Figure 1-1. Workflow / Information Model / Model Repository Interaction

2 Rassp Enterprise Model Repository Development

2.1 Model Repository

In its basic definition, a model repository is an automated tool enabling the control and management of information about enterprise process and information models as they are created and modified during their design, implementation, operation, and expansionlife cycle phases. Stored in the repository are such pieces of meta data as origin, description, relationships, usage, responsibility, and format of a model. In its essence, the model repository is a data base itself which stores "data about data."

The model repository does not contain actual product data. It does contatin descriptions of product data from different viewpoints: what product data looks like from a workflow perspective and what product data looks like from a logical perspective.

The RASSP Enterprise Model Repository (REMR) provides a means by which workflow models and information models may be configuration managed. It will be a passive repository ; the repository exists for documentaiton purposes only and is abailable to systems analysts on an import, export, and query basis.

Microsoft's FoxPro Data Base Management System will be used as the underlying data base engine / 4th Generation Language application development environment.

2.2 Purpose

This section documents the approach for the development of the RASSP Enterprise Model Repository. The REMR is a critical component in the RASSP Enterprise Framework. The model repository will capture and configuration manage all workflow (process model) information at the discrete data element level and all information model (EXPRESS schemas) information at the file level. Included in this section is a high level description of the computer system architecture of the repository.

2.3 Functionality

The workflow functionality of the model repository begins with the import of a Process Modeling Language (PML) file. The PML defines a specification for describing a workflow (process model) in a textual format and it is generated by a workflow definition tool or intermediary parser. The PML Specification will be created as part of the REMR Approach. The tool for RASSP workflow definition is TopDown Flowcharter (for Macintosh and Windows-based computers). The import utility of the repository will parse the PML file into a recognizable structure so that the repository may populate its tables and configuration manage the workflow.

The repository will configuration manage workflows at an object level. The set of objects that will be configuration managed are Activities (UoBs), ICOMs, Models, and Schemas. Adding, modifying, and querying process model objects will be available from the graphical user interface of the repository.

The export utility of the repository will export a PML file to describe a workflow in a textual format. The repository will also export a comma seperated value (CSV) file of the workflow. The CSV export file will

be used for automated loading of the RASSP Workflow Manager's (Intergraph's DMM) process rule base.

The configuration management of information models by the repository involves the storage and management of EXPRESS, EXPRESS-G, and IDEF-1X files. The EXPRESS file is an ASCII text file (EXPRESS source code) that describes an EXPRESS object oriented information model. The EXPRESS-G file is a graphical depiction of the entity-relationship implementation model. The IDEF-1X file is a graphical depiction of the entity-relationship implementation model. The repository will store and configuration manage the two different types of EXPRESS files and IDEF-1X file. To accomplish this, the repository will contain meta data regarding the files (e.g., filename, creation date, model name, etc.). The tool for RASSP EXPRESS information model defintion is FirSTEP XG by Product Data Integration Technology, and the implementation model tool is ERwin/ERX by Logic Works.

The functions of the model repository, as described above, are shown in Figure 2-1. The view describes the process that a model may go through and what applications will "touch" or add valure to the model.

Figure 2-1. RASSP Enterprise Model Repository Process

2.4 Computer System Architecture

The design requirements for the model repository are:

1. The REMR must be developed on Microsoft FoxPro for the Macintosh.
2. The REMR capabilities must be developed as separate stand-alone model repository modules.
3. Only one user will need access to the system at a time.

A graphical portrayal of the architecture is shown in Figure 2-2.

Figure 2-2. RASSP Enterprise Model Repository Computer System Architecture

2.5 Model Repository Approach

2.5.1 Model Repository Data Requirements

The data requirements for the RASSP Enterprise Model Repository cover several areas. For workflow definiton, the data requirements, at a minimum, must meet IDEF-3 standards. In addition, the data constructs of a workflow as defined by Intergraph's Design Methodology Manager (DMM) must be known. DMM implements the RASSP Workflows and is a component of the RASSP Enterprise Framework. The DMM data requirements will drive the export of a workflow model from the model repository to the RASSP Workflow Manager (DMM). Additional workflow definition requirements will be identified from the user community (people performing process modeling activities). These requirements include Rockwell - NAAD's extensions to the IDEF-3 methodology.

For the configuration management of information models, the data required to manage the files that represent EXPRESS, EXPRESS-G, and IDEF-1X schemas must be known. The model repository will manage these files in two forms; basic meta data regarding the file and a Binary Large OBject (BLOB) which represents the file itself.

2.5.2 Process Modeling Language (PML)

For a robust model repository, a tool independent language (or format) must be defined so that import and export to and from the repository may be a seamless operation.

Leveraging the IDEF User's Group Interface Definition Language (IDL), IDEF-0 Activity Modeling Language (AML), IDEF-1X Semantic Modeling Language (SML), and IDEF-3 specifications, a process flow textual file format will be defined. This format will serve as the "template" for importing and exporting process models (workflows) to and from the model repository. This template or Process Modeling Language (PML) will be defined in the Backus Naur Form (BNF). The workflow definition tool, TopDown Flowcharter, will generate the physical file (ASCII text) that will be parsed to the PML format.

2.5.3 REMR Application Reference Model

An Application Reference Model (ARM) is an application-specific model employing the user's terminology. Using a specific user's terminology allows for the creation of multiple ARMs containing multiple viewpoints within a single work area. The RASSP Enterprise Framework Team will develop the RASSP-specific ARMs based on the data requirements captured within the RASSP signal processor workflows.

To organize the data requirements for the repository, a logical information model (Application Reference Model) for the repository will be developed. This model represents the user's view of the required data for a workflow and information model repository and will be built using the IDEF-1X methodology. This model shall include the information necessary to capture and configuration manage meta data associated with IDEF-3X workflow models (e.g., activity_version, junction_version, object_state, object_versoin, etc.) and the basic meta data regarding EXPRESS and EXPRESS-G schema files (e.g., filename, creation date, model name, etc.).

Meta data can be considered as the definition or representation of a model. It is the data about data. The instantiated meta data acts as a library of workflow components (UoBs, objects, junctions) within the repository. These components are managed and may be utilized in one or more models. A specific grouping or association of components may be considered a model relationship (i.e., ICOMs for a UoB).

The logical information analysis performed for the USAF Integrated Resource Control System (IRCS) model repository and Rockwell's Engineering Product Data Management (EPDM) Model Repository will be analyzed and leveraged where possible. Existing process modeling concepts developed by the IDEF User's Group (IDL data interchange format, IDEF-0, and IDEF-3) will also be leveraged.

2.5.4 Application Interpreted Model (AIM)

From a functional requirements perspective, and AIM is identical to an ARM. The only difference is that the AIM is defined using the standard terminology found in the RASSP Enterprise Data Model (REDM), whereas the ARM uses terminology from a specific user's point of view. To create the AIM of the RASSP Enterprise Model Repository, the ARM will be mapped to the REDM. This mapping will ensure future enterprise integration of the repository into the RASSP Enterprise Framework.

2.5.5 Physical Data Base and Model Repository Application

The physical data base structure (Implementation Schema) is defined as a point or standalone solution and therefore will be constructed based on the requirements of the ARM with performance, optimization, storage, and data base engine elements taken into consideration. The data base engine elements must be taken into consideration because Microsoft's FoxPro for Macintosh may require certain structures not inherently apparent in the ARM.

All applicable lessons learned from the Air Fore Integrated Design Support (IDS) Integrated Resource Control System (IRCS) model repository physical data base design will be utilized in the development of the physical data base structure and in the development of the model repository application itself.

2.5.6 PML Import/Export Parser

The PML import/export parser is constructed using the requirements from the model repository physical data base and the RASSP PML Specification. The import portion is needed for the importing of workflow files from the PML format into the REMR. Likewise, the export portion is needed to take the REMR workflow format and export it into the neutral PML format. This will give workflow files from the PML format into the REMR. Likewise, the export portion is needed to take the REMR workflow format and export it into the neutral PML format. This will give workflow implementation tools that can import the PML format access to workflows developed in any tool that can export the PML format. This has the benefit of freeing the workflow implementation tools from being dependent upon (held hostage to) any workflow definition tool.

2.5.7 REMR Export Capability to DMM

Population of the DMM knowledgebase with the RASSP Workflows will be performed by extracting the appropriate DMM required information from the model repository. This will be achieved by using the reporting capabilities of Microsoft FoxPro 2.5. The format of the repository export file will be in a comma seperated value (CSV) format and content of the information found within the CSV file will be determined as part of the RASSP DMM development effort.

2.6 Deliverables

Build 0 - None

Build 1 - None

Build 2 - RASSP Enterprise Model Repository for workflow and information model configuration management.

Build 3 - None

Acronym List

AIE - Advanced Information Engineering
AIM - Application Interpreted Model
AML - Activity Modeling Language
AP - Application Protocol
ARM - Application Reference Model
ASIC - Application-specific Integrated Circuit
BLOB - Binary Large Object
BNF - Backus Naur Form
CALS - Continrous Acquisition and Life-cycle Support
CCB - Configuration Control Board
CSA - Computer System Arcchitecture
CSV - Comma Seperated Value
DBMS - Data Base Management System
DMM - Design Methodology Manager
EPDM - Engineering Product Data Management
EPI - Engineering Process Improvement
ICAM - Integrated Computer Aided Manufacturing
ICOM - Input, Control, Output, and Mechanism
IDEF - ICAM DEFinition
IDL - Interface Definition Language
IDS - Integrated Design Support
I/NFM - Intergraph/Network File Manager

IRCS - Integrated Resource Control System
ISO - International Standards Organization
NAAD - North American Aircraft Division
P.D.I.T. - Product Data Integration Technologies
PDCM - Product Data Control Manager
PDES - Product Data Exchange using STEP
PML - Process Modeling Language
RASSP - Rapid prototyping of Application-Specific Signal Processors
REDM - RASSP Enterprise Data Model
REMR - RASSP Enterprise Model Repository
SML - Semantic Modeling Language
STEP - Standard for the Exchange of Product Model Data
USAF - United States Air Force
UoB - Unit of Behavior