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RMACS Software Requirements Specification

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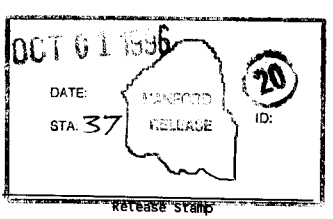
Abstract: This document defines the essential user (or functional) requirements of the Requirements Management and Assured Compliance System (RMACS), which is used by the Tank Waste Remediation System program (TWRS). RMACS provides a computer-based environment that TWRS management and systems engineers can use to identify, define, and document requirements. The intent of the system is to manage information supporting definition of the TWRS technical baseline using a structured systems engineering process. RMACS has the capability to effectively manage a complete set of complex requirements and relationships in a manner that satisfactorily assures compliance to the program requirements over the TWRS life-cycle.



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1.0 INTRODUCTION

The purpose of this document is to define the essential user (or functional) requirements of the Requirements Management and Assured Compliance System (RMACS), which is used by the Tank Waste Remediation System (TWRS) program and is managed by Westinghouse Hanford Company (WHC) for the U.S. Department of Energy (DOE). Most of the RMACS user requirements in this document were taken from an acquisition plan (WHC-93-209614) used to purchase RDD-100[1] in 1993. An evaluation of existing systems engineering support software tools at the time resulted in the purchase of RDD-100 for the RMACS. This document supports bringing RMACS into compliance with system configuration management documentation requirements.

1.1 PURPOSE

The primary objective of RMACS is to provide a computer-based environment (i.e., tool set) that TWRS management and systems engineers can use to identify, define, and document requirements. RMACS has the capability to effectively manage a complete set of complex requirements and relationships in a manner that satisfactorily assures compliance to the program requirements over the TWRS life-cycle. The intent of the system is to manage information supporting definition of the TWRS technical baseline using a structured systems engineering process.

1.2 SCOPE

RMACS is one of a set of systems engineering support systems designed to directly assist management and staff in their analysis and management of the requirements of the TWRS program. The complete TWRS systems engineering tool set has been divided into three general areas; RMACS, Integrated Dynamic Modeling and Management System (IDMMS), and Information Management System (IMS).

Only the RMACS system is the subject of this Software Requirements Specification (SRS).

Future work scope being planned for the RMACS and the other systems engineering tools is a fully-integrated system with communication between RMACS, IDMMS, and IMS. This system will integrate a complete set of TWRS system knowledge for systems engineers, managers, and customers to use to analyze, model, and integrate TWRS information and activities. This comprehensive information system provides a basis for technical and management decision making.

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[1] RDD-100 is a registered trademark of Ascent Logic Corporation

1.3 OVERVIEW

WHC has been directed by the U.S. Department of Energy, Headquarters (DOE-HQ) to conduct its operations on a full systems engineering basis. Systems engineering is a process developed to organize and manage highly complex missions. This approach has been successfully applied in areas such as defense, complex manufacturing, and space exploration. In all likelihood, no other proven formal method is applicable to the situation at Hanford, which includes performing the activities of mission analysis, functional analysis, requirements analysis, parametric analysis, and alternative analysis.

To comply with the DOE-HQ directive, the TWRS program, a primary subsystem of the long-term, highly complex Hanford clean-up mission, has created a TWRS systems engineering group that is divided into several primary functional groups to provide systems engineering support tools and to perform systems engineering management, strategic analysis, and planning activities.

The systems engineering process is a highly structured management activity and involves the interaction of organization, physical environment, political environment, science, and technology. To effectively manage such a diverse amount of information, WHC systems engineering support groups identified the requirement for an automated software system to manage complex sets of requirements, provide accurate information, and provide traceability. Additionally, for future use, it is desirable for the requirements system to support a broad range of related systems engineering activities; evaluating, analyzing, grouping, connecting, categorizing, storing, and communicating information and data that relate to the TWRS program.

During 1993, TWRS personnel conducted an evaluation of the possible options available to acquire a computer-based software system to meet the RMACS requirements. The evaluation included: use of existing government software, use of existing vendor products (i.e., commercial off-the-shelf [COTS] software) in-house development from scratch, outside vendor development from scratch, in-house modification of existing software, and vendor product modification of COTS software. No suitable existing government software was located that could be used without modification. Modification of existing government software and vendor software, outside vendor development and in-house development of the software was considered but the high cost made these approaches unfeasible. Several COTS products were identified, each of which partially filled the RMACS requirements and certain products that filled all mandatory requirements. It was decided to purchase a COTS product and work around any deficiencies.

A market survey was consequently undertaken to locate potential vendors for a software product on which to build RMACS. A goal of the market survey was to find a commercial software product usable for both the prototype and the production version of RMACS. This factor was deemed to be particularly important, considering the likely complexity of the product and the accompanying long learning curve.

Potential vendors were identified and invited to WHC in fiscal year (FY) 1993 to demonstrate their requirements management software products. Four vendors were found to have products that merited further investigation as the foundation for RMACS.

To determine the capability of these software products, a list was prepared of 85 questions divided into 6 major areas for the vendors. Surveyors then visited the site of each vendor and obtained answers to the questions from their personnel. The majority of questions involved viewing the software product in actual operation to verify the vendor responses. In the end, a decision was made to purchase the RDD-100 systems engineering support software tool suite.

1.4 DEFINITIONS

Below is a list of acronyms and terms used within this document:

CAE	Computer Aided Engineering
CASE	Computer Aided Systems Engineering
COTS	Commercial Off-The-Shelf
DOE-HQ	U.S. Department of Energy, Headquarters
GUI	Graphical User Interface
HLAN	Hanford Local Area Network
IDEF0	Input control output mechanism DEFinition type 0 diagrams
IDMMS	Integrated Dynamic Modeling and Management System
IMS	Information Management System
RDBMS	Relational Database Management System
RMACS	Requirements Management and Assured Compliance System
SRS	Software Requirements Specification
TWRS	Tank Waste Remediation System
WHC	Westinghouse Hanford Company

2.0 GENERAL DESCRIPTION

RMACS is a software system for comprehensive requirements management. It is a user-friendly computer-based system that will primarily be used by systems engineering management and staff to perform a number of requirements related tasks. The tasks will range in complexity from very detailed systems engineering analysis to checking the requirements of a specific component in the system. The system will allow use by all stakeholders associated with the TWRS Program.

2.1 PRODUCT PERSPECTIVE

Requirements management and compliance monitoring activities supporting the systems engineering process are performed by large organizations that are controlling complex projects. Due to the massive volume of requirements that are applicable to the TWRS area, a computer-based system must be used. A system to support the systems engineering process is being defined within WHC and given the name RMACS. Through a Graphical User Interface (GUI), RMACS will allow participants in the TWRS program to store, manipulate, and obtain the requirements information necessary to assist the TWRS management and engineers in the application of the systems engineering process to the TWRS domain. In other words, this means accomplishing the TWRS mission.

The intent of the RMACS is to manage information generated from a structured systems engineering process in support of defining the baseline system. This includes information generated from the following activities:

- Functional analysis and decomposition
- Requirements analysis and allocation
- Development of derived requirements
- Allocation of requirements to functions and components
- Development of a system architecture
- Iterative refinement of the architecture into an operating system

In the future, the TWRS RMACS system should integrate with all sources of requirements that will apply to the TWRS Program. At this time, there is a Hanford Site activity that has taken responsibility for this integration activity for the complete site. When this source of requirements is available TWRS RMACS should interface with it, as well as all other site databases that have relevant TWRS data. Also, other organizations on site will be working with and making decisions about system requirements that impact the TWRS Program. RMACS should interface with these various processes.

Conceptually, the RMACS system will be comprised of various software packages, which are required to provide for input, storage, management, viewing, and reporting of TWRS requirements information. These separate software packages, which would comprise a total RMACS system, may be; vendor COTS, vendor TWRS unique software, Hanford-developed software, or government-developed software.

As an outgrowth from the work on the RMACS project requirements, but not specified as requirements for the RMACS system, the TWRS SE Risk Management and Modeling group gained additional information beyond that solely needed to perform requirements management. The additional information allowed group members to automate systems engineering process activities involving the production of Input control output mechanism DEFinition type 0 (IDEF0) diagrams, N-squared diagrams, and executable behavior diagrams. In turn, through behavior diagrams, a discrete event dynamic simulation of a modeled system can be performed.

2.2 PRODUCT FUNCTIONS

RMACS supports the complete system level design and development process.

The primary boundary for RMACS is the TWRS systems engineering functional domain. RMACS will be used to assist the TWRS systems engineering group with all requirements management and compliance monitoring activities. These activities include:

- Requirements identification
- Requirements grouping
- Requirements allocation
- Requirements capture
- Requirements traceability
- Requirements compliance
- Requirements relationships
- Requirements application
- Requirements change control
- Other necessary activities

All these activities will directly support the production and maintenance of the Functional Requirements Baseline, Technical Requirements Baseline, Design Requirements Baseline and Interface Control Documents, as well as verification that the deployed system satisfied the stated requirements. TWRS RMACS will support the system throughout its entire life-cycle.

It is desirable that the computer system that hosts RMACS be an open system that allows users maximum flexibility of tool integration in order to accomplish the solution of systems engineering problems. This computer hardware and software system should interface with other systems that follow major computer industry standards.

RMACS shall have sitewide connectivity. This means that with proper authorization, a user can access RMACS for specific functions from any designated workstation on a site. RMACS shall conform to industry standards for connectivity. RMACS shall also conform to proper security and access requirements.

2.3 USER CHARACTERISTICS

RMACS users are a very heterogeneous group; job-skill requirements vary considerably from data entry to detailed analysis and ad-hoc queries; system use varies from occasional (even once a year use) to daily use. All users will require training on the system.

All system users will be identified by name and other identification methods, functions authorized to perform, and data authorized to view. This enrollment information will be entered upon management approval.

Initial RMACS users are Systems Engineering engineering/analyst staff, Systems Engineering management, Systems Engineering clerks, TWRS customer staff.

2.4 GENERAL CONSTRAINTS

Due to time considerations and the extremely high cost of software development, the decision was made to base RMACS on a commercially available software product requiring as little customization or development as possible.

2.4.1 Comply with WHC Approval Designator Identification

Through a review of WHC-CM-3-5, *Document Control and Records Management Manual*, Section 12.7, "Approval of Environmental, Safety, and Quality Affecting Documents," which provides coverage of Quality, DOE, Safety, and Environmental approval designation, the Approval Designator of this acquisition has been determined to be N/A.

2.4.2 Comply with WHC Software and Quality Assurance Standards

This SRS is written using the guidelines identified in WHC-CM-3-10, *Software Practices*, Appendix F, and WHC-CM-4-2, *Quality Assurance Manual*, QR-19, "Software Quality Assurance Requirements."

2.4.3 RMACS Shall be Expandable

RMACS shall have adequate expansion capability to meet future growth requirements, peak load performance requirements, and increasing numbers of users.

2.4.4 User Response Time Perception

RMACS shall respond to a user in an expedient manner. Simple requests (i.e., data retrieval, data updating, and small queries) are acted upon quickly, while more involved requests, which include complex queries, take longer. The consistency of response times of comparable requests shall be the guiding principle.

The number of terminals in use at any time will impact the system response time. The system response time is also impacted by how a terminal accesses RMACS, because terminals may access RMACS through a direct connection or through a Local Area Network (LAN). Network delays will impact response time.

2.4.5 Near Real Time Processing

RMACS shall update the database and have that information ready for retrieval as soon as possible after a transaction request has been made by an authorized individual. A transaction request reflecting any change shall be made as soon as possible after the event. A change is triggered by a user transaction or a change to the database. All activities that affect the status of the database shall be reported.

2.4.6 Flexibility, Extensibility, and Maintainability

RMACS hardware shall be configured in such a way as to promote flexibility of change and ease of extensibility. The software must be designed to be flexible to changing requirements and to be extensible. The software shall be designed for ease of maintenance.

2.5 ASSUMPTIONS AND DEPENDENCIES

Areas of general uncertainty and areas where more information may be needed are addressed in this section. These areas are:

- Currently, numerous report formats exist within the TWRS organization. No standard report formats have been agreed upon by the various groups.
- The many formats, data types, and protocols used by many different groups make standard data input impossible without additional pre-processing.
- The site has multiple organizational differences. There has been no consensus on acceptable standardization of organizations.

The major assumptions for the RMACS project are:

- A suitable hardware platform will be available
- Suitable software products will be available at the time the application development phase is due to begin
- Local area network protocol definitions will be in place.

Additionally, the commercial product shall have built in functions to produce user customized reports.

3.0 SPECIFIC REQUIREMENTS

The specific functional requirements that must be satisfied by the RMACS software are stated in this section.

Each requirement must also be stated so its achievement can also be objectively validated. Some requirements are intentionally stated in a general fashion, because the specifics will not be known until design time.

3.1 FUNCTIONAL REQUIREMENTS

This section describes the RMACS user and functional requirements.

3.1.1 System Architecture

The RMACS system software architecture shall be Object-oriented.

3.1.2 Additional System Software

The RMACS system shall not require additional software for basic functions.

3.1.3 Objects

RMACS shall provide the capability to define and use objects under the object-oriented architecture.

3.1.3.1 Object Definition by Name. RMACS shall provide the capability to define objects by name.

3.1.3.2 Object Partitioning by Class. RMACS shall provide unlimited user class definition capability.

3.1.3.3 Object Partitioning by Sub-class. RMACS shall provide unlimited user sub-class definition capability.

3.1.3.4 Pre-defined Class and Sub-class. RMACS shall provide a set of pre-defined user class and sub-class definitions.

3.1.3.5 Supplement Pre-defined Class and Sub-class. RMACS shall provide the capability to supplement the set of pre-defined class and sub-class definitions.

3.1.3.6 Object definition by type. RMACS must provide the capability to define and categorize objects by various types for systems engineering.

3.1.3.6.1 Data types - RMACS shall support, as a minimum, the following data types:

a. enumerated list
b. floating point
c. text
d. string
e. date
f. boolean
g. integer
h. symbol

3.1.3.6.2 Text type -
Text data type limited to 256 characters per line.
Text data type allows infinite number of lines.
Text data type can include fonts, bold, italics, etc.
Text data type must allow edit of the text using facilities such as inserting, cutting, and pasting.

3.1.3.6.3 String type -
String data type limited to 256 characters per line.
String data type allows infinite number of lines.
String data type is limited to ASCII

3.1.3.7 Object Attributes. Objects are composed of attributes containing information appropriate for the object type.

3.1.3.7.1 Attribute restrictions - All attributes are user defined. There shall be no (practical) limits to the number of attributes defined for an object.

3.1.3.7.2 Attribute validation - The value of a particular attribute must be validated according to its data type when entered or changed.

3.1.3.8 Object Manipulation by Name. RMACS must be able to store and manipulate a large number of objects by name.

3.1.3.9 Object Creation. RMACS shall allow objects to be created interactively at the master RMACS console.

3.1.3.10 Object Loading/Unload. RMACS shall allow objects to be loaded from/unloaded to text files containing documents.

3.1.3.10.1 Load/Unload type - The capability must be provided to unload all objects of a type from RMACS. The capability must be provided to reload the objects into the system, by type.

3.1.3.10.2 Load/Unload modifications - RMACS must support the loading of modifications to documents already stored in the system. The capability must be provided to unload documents which have had the attributes of type modified.

3.1.3.11 Document Format and Parsing. Documents pertaining to TWRS may exist in a wide variety of formats. It is desired that RMACS provide the ability to describe and parse the documents automatically. Input/output format, data set, parsing, etc. is currently done manually.

3.1.3.12 Object Linking. RMACS must allow objects of the same or different types to be linked together according to named relationships.

3.1.3.12.1 Linking relationships - RMACS must allow the user to define named relationships for linking objects together.

3.1.3.12.2 Linking targets - RMACS must allow the user to define possible targets for all objects. An example of such a relationship is to link a requirement to each of the TWRS functions satisfying it in part or in whole. Another example is to link each consecutive pair of objects from a document together, allowing the original document to be reproduced from the system in some form.

3.1.3.12.3 Linking removal - RMACS must allow links between objects to be removed interactively. When an object is deleted, all links to other objects are automatically removed.

3.1.3.13 Object Organization. RMACS shall provide the capability to organize objects.

3.1.3.13.1 Hierarchical organization - Objects of a specific type shall be organized into one or more hierarchies.

3.1.3.13.2 Hierarchical numbering - RMACS shall automatically number the objects according to position in the hierarchy.

3.1.3.13.3 Sibling order - RMACS shall automatically maintain the order of siblings.

3.1.3.13.4 Hierarchical subtrees - RMACS must allow entire subtrees in a hierarchy to be moved, copied, or deleted.

3.1.3.13.5 Hierarchical subtree links - Any links to objects of different types must be preserved when moving a subtree to another position in the hierarchy.

3.1.3.13.6 Hierarchical views - RMACS must allow hierarchies to be viewed and manipulated in graphical form.

3.1.4 Object Queries

The capability to select information must be supported. RMACS must be extensible to allow a wide variety of reports supporting the TWRS mission to be produced.

3.1.4.1 Query Capability. RMACS information may be selected in hierarchies or through direct and indirect links.

3.1.4.2 Query Filters. When querying RMACS, the system must allow information to be filtered based on attributes, categories, and boolean expressions, relationships, object information, range checks, behavior diagrams, etc.

3.1.4.3 Query Display. RMACS information may be displayed on the screen or used in generating a report in a text file.

3.1.5 Large Text

RMACS shall be capable of handling large text.

3.1.5.1 Large Text Cut/Paste. RMACS shall be capable of performing cut/paste text from other windows/products.

3.1.5.2 Large Text Edit. RMACS shall be capable of windows functionality for editing.

3.1.5.3 Large Text Bulk Load. RMACS shall be able to perform bulk load from ASCII document (user must provide the parser).

3.1.6 TWRS Paper Links

All of the paper links that now exist in the TWRS requirements management process must be replaced with computer file transfer processes.

- The system must support multi-user access and distribution of the data and information contained in the target databases.
- The system must support file and user security procedures.
- The system must automatically keep track of the changes in the information and data structure.

3.1.7 Graphic Representation

Systems engineers require all the capabilities of RMACS, and also need the tool to automatically produce graphical representations of system behavior.

3.1.7.1 Representation Types. Among these representations, highlighting various aspects of the system being modeled, are IDEF0 diagrams, N-squared diagrams, Behavior diagrams, Function Hierarchy diagrams, and Functional Flow Block Diagrams.

3.1.8 Simulate System

The systems engineering tool must provide the ability to dynamically simulate the behavior of a system. This allows a particular model to be verified for correctness at an early stage, resulting in significant cost savings at later stages of development. Dynamic simulation of the system greatly improves the functional analysis process in comparison to a strictly static approach.

3.1.9 Product Maturity

RMACS shall utilize an established software package that is currently in production.

3.1.10 Report Functions

RMACS shall generate pre-defined reports on an on-demand basis at the master RMACS console. A variety of report templates shall be available.

RMACS reports shall be presented electronically, on hard copy, or both as required.

The system shall have the capability to produce ad hoc reports.

3.1.10.1 Pre-defined Reports. RMACS shall prepare pre-programmed and pre-formatted reports. Examples include:

- Periodic
- On-demand
- Computer Security

3.1.10.1.1 IDEFO CHARTS - RMACS shall automatically generate IDEFO charts.

3.1.10.1.2 Functional Flow Block Diagrams - RMACS shall automatically generate Functional Flow Block Diagrams.

3.1.10.1.3 Function Hierarchy Charts - RMACS shall automatically generate Function Hierarchy charts.

3.1.10.1.4 Behavior Diagrams - RMACS shall automatically generate Behavior diagrams.

3.1.10.1.5 Generate Functions and Requirements Report - RMACS shall generate Functions and Requirements reports.

3.1.10.1.6 Other Reports - RMACS shall produce required operations, engineering, and requirements allocation sheets reports.

3.1.10.2 Mix Graphics and Text. RMACS shall provide the capability to mix graphics and text.

3.1.10.3 Postscript Files. RMACS shall provide the capability to include external postscript files.

3.1.10.4 Fonts, etc. RMACS shall provide the capability to specify fonts, bolding, etc.

3.1.10.5 Ad Hoc Query Reports. RMACS shall generate ad-hoc query reports as views by use of a browser. Ad hoc reports will be executed on demand.

3.1.11 Disk Space Optimization

RMACS system shall have the capability for the user to optimize disk space whenever null, empty, or deleted fields exist.

3.1.12 RMACS Usage

RMACS master is the official repository for all TWRS requirements. All data entered into RMACS is done by systems engineering personnel on the master console. End users may communicate information to the data entry area where the data entry personnel complete the data entry into the master. As such, the data entry part of the system is effectively a stand alone system since data entry cannot be directly accomplished from network nodes.

Approved users may make changes to their specific working copies in their working areas. These changes are considered working information until proper authorization allows the changes to be officially entered into the master.

3.2 EXTERNAL INTERFACE REQUIREMENTS

This section describes the external interface requirements, those interfaces that are outside the application software product that is being developed. These external interfaces include interfaces with the user, hardware interfaces, and software interfaces. User interfaces describe the characteristics of the human interface to the system. Hardware interfaces describe the interface of the application software with the hardware, such as devices to be supported and protocols to be used. Software interfaces describe the application software interfaces to the vendor supplied software products, such as the use of a Relational Database Management System (RDBMS).

3.2.1 User Interfaces

The user interface must be an industry standard open interface that allows the integration of a wide range of computer based tools. The interface should be easy to use and have extensive online help.

3.2.1.1 Graphical User Interface. RMACS shall be provide a graphical representation of the systems engineering process displayed on the screen.

3.2.1.1.1 Mouse functions - The user will be able to insert, display, and scroll through the data via the function keys or the mouse, with areas on the screen made available for mouse selection.

3.2.1.1.2 Windows functionality - RMACS shall provide basic windows type functionality including cut/paste capability from other windows/products. Microsoft Windows[2], X-windows[3], or Motif[4] environments shall be used for user interface.

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[2] Windows is a registered trademark of Microsoft Corporation.

[3] X-Windows is a registered trademark of the Massachusetts Institute of Technology.

[4] Motif is a registered trademark of Open Software Foundation, Incorporation.

3.2.1.1.3 Data entry and modification - RMACS shall provide data entry, change, deletion via Functional Flow Block Diagram, IDEFO diagram, Function Hierarchy Diagram, or Behavior diagrams at each workstation in appropriate working areas. Final entry into the official master is only done by communicating the information to RMACS data entry personnel and with proper approval for the change.

3.2.1.1.4 On-line User Aid Function (Help) - RMACS shall provide on-line help to assist the user in performing the assigned tasks.

3.2.1.2 Hardcopy Page Layout and Content. RMACS shall provide appropriate hard copy reports. Reports may be of page or file contents.

3.2.1.3 Optional Representation. Option for the representation of specific systems engineering processes to be displayed and enforced by the computer system.

3.2.1.4 Edit Capabilities for Incoming Data. Data shall be syntax and limit checked, according to established criteria, by RMACS before data is entered into the system master.

3.2.1.5 Users. RMACS users encompass systems engineering engineers/ analysts, systems engineering management, and customer personnel.

3.2.1.5.1 Data Entry - RMACS data entry personnel shall have control and authority to enter, modify, update, and delete data into the master RMACS system. The data that the data entry personnel enter into the master is generated by all of the other RMACS users. Data may be generated and modified by any user in approved copies of the master that have been downloaded into the user's workspace. The modified copies are then communicated back to the data entry personnel. Proper authorization of the data is needed before the data entry personnel enter the data into the master.

3.2.1.5.2 Data viewing - Other RMACS users have the capability to view RMACS data via a "Browser" program.

3.2.2 Hardware Interfaces

All of the software associated with the TWRS RMACS process will be hosted on computing hardware. The hardware needs to meet and conform to major industry standards. These standards include:

- Transmission Control Protocol/Internet Protocol (TCP/IP) communication hardware standards
- Computer architecture
- Network architecture

3.2.2.1 Hardware Platform. The RMACS software shall run on SUN workstations. Optionally, the RMACS software shall run on Macintosh Quadra 950 computers using a node-locked license.

3.2.2.2 Memory Requirements. Each SUN machine shall require at least 32 megabytes (MB) of random access memory (RAM), 64 MB are recommended.

3.2.2.3 Disk Storage Requirements. Disk storage shall have the capacity to contain the operating system, operating software, application code (both development and production), current user data, and audit trail data.

3.2.2.4 Printer Interfaces - RMACS will typically print reports on a dedicated PostScript printer connected via LAN to the Sun Workstation. The system shall allow printing of reports both locally and remotely. Screen image prints would normally be done on printers that are local to the users (i.e. connected to terminal or PC). Preprogrammed and customized reports where output is more voluminous shall be able to be directed to other printers on the network.

3.2.3 Software Interfaces

Software interfaces are interactions between the RMACS system and other software products, such as data management systems, operating systems, graphic support software, or other application systems.

3.2.3.1 Software Products. It is desired that RMACS will interface directly to Computer Aided Engineering (CAE), Computer Aided Systems Engineering (CASE), and other component development and publishing tools.

3.2.3.2 Operating System Requirements. RMACS shall run on current state of the art systems under UNIX and Macintosh operating systems.

3.2.3.3 Virus Requirements. RMACS shall make provisions to guard against any computer viruses that may attempt to enter the system.

3.2.4 Communication Interfaces

The network will be used only to send or receive files between systems.

The workstations will be connected to the Hanford Local Area Network (HLAN) and will transfer files to and from the SUN master workstation.

The files that might be transferred include images and databases, source documents, and reports in postscript or ASCII format. We anticipate that these systems will be used to transfer 10 or less files of size 20 MB or less each week.

TWRS RMACS will support a unique and vital activity in the systems engineering process. In performing these activities the TWRS systems engineers will need access to information generated on the Hanford Site as well as information and data generated other places.

- Establish connection with or prepare a plan to connect with all organizational elements that TWRS systems engineering delivers information to or receives information from.
- Determine data types and data storage needs for TWRS RMACS.
- Determine all necessary logical transforms required to put the information into a usable format.

- All data and information used by or distributed by the TWRS systems engineering organization will be validated and placed in a controlled format.

3.2.4.1 Communication with Hanford Local Area Networks (HLAN). RMACS shall operate on the HLAN.

3.2.4.2 Direct Connection to Source Process Instruments. Not Applicable.

3.2.4.3 Reliable Transport Delivery and Protocols. RMACS shall be set up using industry standard protocols to aid in reliable communication.

3.2.4.4 Personal Computer Workstations HLAN Impact. RMACS shall be capable of interfacing with industry standard personal computers, ie. non UNIX workstation equipment. The protocols necessary for reliable communication and machine operation require environment information, for example: information needed to keep a Windows session operating correctly, to be sent over HLAN. The additional HLAN communications traffic shall not impact overall HLAN performance.

3.3 PERFORMANCE REQUIREMENTS

This section specifies static and dynamic requirements placed on the software or on the human interaction with the software, as a whole.

3.3.1 Access Control Performance Degradation

RMACS access control and security measures shall not degrade the overall operation and response times of the computer and network.

3.3.2 Data Retrieval for Updates

The software shall allow concurrent access to the data by several users on separate machines with normal updating activities performed by RMACS. Response times for retrieving data from RMACS should not be excessive under normal circumstances.

3.3.3 Queries for Information

Ad-hoc query response times will fluctuate based upon the type of query being performed and size of RMACS file(s) being accessed (i.e., a simple and a complex query will be defined and response times defined for each).

Queries are recommended to be kept to a minimum. Time-consuming queries are allowed at a low priority.

3.3.4 Number and Number Size

Recorded numbers are stored in integer or floating point form. Calculated numbers are optionally fixed or floating point.

3.4 DESIGN CONSTRAINTS

This section discusses design constraints imposed on the implementation of the application, including compliance with site standards.

3.4.1 Standards Compliance

Federal Information Processing Standards Publications (FIPS PUBS)

Applicable FIPS: 1-2 and 156

All Data Standards outlined in WHC-CM-3-10 relevant to RMACS will be followed.

3.4.2 Resource Limitations

RMACS shall use a UNIX platform or a Macintosh platform.

3.5 ATTRIBUTES

This section describes the attributes of the system that place specific requirements on the software. These include security and maintenance.

See Sections 3.6.2 and 3.6.14.

3.6 OTHER REQUIREMENTS

This section outlines other requirements. Because of their unique nature, these requirements are addressed in separate categories. These areas do not fit any of the categories previously addressed.

3.6.1 Data

Valid RMACS data, which has been entered with proper authorization, shall be used to update the master database, presenting an up-to-date database to users (i.e., data will not be collected for batch or periodic updating).

3.6.2 Operations

RMACS is expected to be used for systems engineering within WHC for a period of 10 years.

3.6.2.1 Maintenance. Software maintenance will be acquired throughout the RMACS life cycle. There is an annual maintenance fee for each RMACS license and includes telephone technical support.

3.6.2.2 RMACS upgrade. It is likely that the tool will be updated by the vendor a number of times during that period. Maintenance includes upgrades to RMACS and telephone technical support.

3.6.3 Site Adaptation

RMACS shall be installed at WHC in Richland, Washington.

3.6.4 Options

RMACS product options analysis was completed and a market survey was done in 1993. Each of the options and products did not meet requirements, was not in production, or the cost estimate was too high for implementation.

3.6.5 Scheduling

RMACS shall be used during all shifts, with the highest usage during the day. Scheduling for data entry to the RMACS master is coordinated with Systems Engineering. Backups and long processes requiring extensive system resources should be done during non-peak use periods.

3.6.6 Reliability and Recovery

Reliability and recovery capabilities will be handled by operational procedures.

3.6.6.1 Backup. RMACS shall have data backup capability.

3.6.7 Audit

Applicable WHC audit will verify RMACS acquisition documentation.

3.6.8 Priorities

Not applicable.

3.6.9 Transferability

Not applicable.

3.6.10 Conversion

Conversion of existing databases data will be done through description and parsing described in Object Load/Unload.

3.6.11 Testing and Acceptance Criteria

The RMACS testing process encompasses testing the correct conversion of data from one database to another. System functions such as input and reports have been extensively tested by commercial users and shall not receive an exhaustive test. Testing shall include actual processing conditions for part of test. Detail test plan, definition, acceptance criteria, and reports will be defined in the system test plan, WHC-SD-WM-TP-431, Revision 0, "Test Documentation for Converting TWRS Baseline Data from RDD-100 Version 3.0.2.2 to Version 4.0.3."

3.6.11.1 Acceptance Criteria. Acceptance of the software was and will be by demonstration of its ability to satisfy the requirements.

3.6.12 Documentation

RMACS documentation shall be developed according to Westinghouse Hanford Company standards and ANSI/IEEE software engineering standards that apply.

3.6.13 Training

All RMACS users shall receive training on the system and its supporting software. The degree of training for individuals will depend upon their particular needs. For the casual user, only training on the browser itself is needed. Day-to-day users need formal training on the system, including input, output, and query.

3.6.14 Security and Privacy

RMACS will not permit any by-pass of existing security safeguards. RMACS will use host-access control to protect the system from unauthorized access. In addition, controls should be in place to prevent access to specific functions that the user should not have access. Security and privacy measures shall be nearly transparent to the user.

3.6.14.1 Network Security. RMACS shall not by-pass network security provisions.

3.6.15 Integration Plan

The RMACS system integration shall be defined by the following:

3.6.15.1 Installation Plan. The installation plan shall be completed on-site by systems engineering personnel.

3.6.15.2 System Location. The software will be installed on Sun Workstations and/or Macintosh computers located in buildings as identified on each purchase requisition.

3.6.15.3 Facility Addition/Modification. Not applicable.

3.6.15.4 Parallel Operation. Not applicable.

3.6.15.5 Equipment Replacement/Removal. Not applicable.

3.6.15.6 Custodian or Technical Representative. Systems Engineering will define personnel by name, location, and phone number. As a minimum, a UNIX administrator and a master database administrator will be identified.

4.0 REFERENCES

WHC-CM-3-10, *Software Practices.*

WHC-CM-4-2, *Quality Assurance.*

WHC-93-209614, "Acquisition of RDD-100 for RMACS," dated August 25, 1993.

WHC-SD-WM-TP-431, "Test Documentation For Converting TWRS Baseline Data From RDD-100 Version 3.0.2.2 to Version 4.0.3," Revision 0.

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