

WRDC-TR-90-8007
Volume V
Part 23

AD-A250 460



INTEGRATED INFORMATION SUPPORT SYSTEM (IISS)
Volume V - Common Data Model Subsystem
Part 23 - Neutral Data Manipulation Language (NDML) Precompiler
Build Source Code Product Specification

M. Apicella, J. Slaton, B. Levi

Control Data Corporation
Integration Technology Services
2970 Presidential Drive
Fairborn, OH 45324-6209



September 1990

Final Report for Period 1 April 1987 - 31 December 1990

Approved for Public Release; Distribution is Unlimited

MANUFACTURING TECHNOLOGY DIRECTORATE
WRIGHT RESEARCH AND DEVELOPMENT CENTER
AIR FORCE SYSTEMS COMMAND
WRIGHT-PATTERSON AIR FORCE BASE, OHIO 45433-6533



92-13375

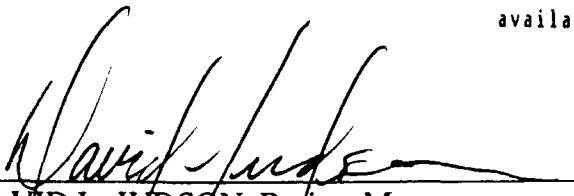
92 5 19 043

NOTICE

When Government drawings, specifications, or other data are used for any purpose other than in connection with a definitely related Government procurement operation, the United States Government thereby incurs no responsibility nor any obligation whatsoever, regardless whether or not the government may have formulated, furnished, or in any way supplied the said drawings, specifications, or other data. It should not, therefore, be construed or implied by any person, persons, or organization that the Government is licensing or conveying any rights or permission to manufacture, use, or market any patented invention that may in any way be related thereto.

This technical report has been reviewed and is approved for publication.

This report is releasable to the National Technical Information Service (NTIS). At NTIS, it will be available to the general public, including foreign nations


DAVID L. JUDSON, Project Manager
WRDC/MTI
Wright-Patterson AFB, OH 45433-6533

25 July 91
DATE

FOR THE COMMANDER:


BRUCE A. RASMUSSEN, Chief
WRDC/MTI
Wright-Patterson AFB, OH 45433-6533

25 July 91
DATE

If your address has changed, if you wish to be removed from our mailing list, or if the addressee is no longer employed by your organization please notify WRDC/MTI, Wright-Patterson Air Force Base, OH 45433-6533 to help us maintain a current mailing list.

Copies of this report should not be returned unless return is required by security considerations, contractual obligations, or notice on a specific document.

Unclassified

SECURITY CLASSIFICATION OF THIS PAGE

REPORT DOCUMENTATION PAGE				
1a. REPORT SECURITY CLASSIFICATION Unclassified			1b. RESTRICTIVE MARKINGS	
2a. SECURITY CLASSIFICATION AUTHORITY			3. DISTRIBUTION/AVAILABILITY OF REPORT Approved for Public Release; Distribution is Unlimited.	
2b. DECLASSIFICATION/DOWNGRADING SCHEDULE				
4. PERFORMING ORGANIZATION REPORT NUMBER(S) PS 620341259			5. MONITORING ORGANIZATION REPORT NUMBER(S) WRDC-TR- 90-8007 Vol. V, Part 23	
6a. NAME OF PERFORMING ORGANIZATION Control Data Corporation; Integration Technology Services		6b. OFFICE SYMBOL (if applicable)	7a. NAME OF MONITORING ORGANIZATION WRDC/MTI	
6c. ADDRESS (City, State, and ZIP Code) 2970 Presidential Drive Fairborn, OH 45324-6209			7b. ADDRESS (City, State, and ZIP Code) WPAFB, OH 45433-6533	
8a. NAME OF FUNDING/SPONSORING ORGANIZATION Wright Research and Development Center, Air Force Systems Command, USAF		8b. OFFICE SYMBOL (if applicable) WRDC/MTI	9. PROCUREMENT INSTRUMENT IDENTIFICATION NUM. F33600-87-C-0464	
8c. ADDRESS (City, State, and ZIP Code) Wright-Patterson AFB, Ohio 45433-6533			10. SOURCE OF FUNDING NOS.	
11. TITLE (Include Security Classification) ↑ See block 19 Specification			PROGRAM ELEMENT NO. 78011F	PROJECT NO. 595600
			TASK NO. F95600	WORK UNIT NO. 20950607
12. PERSONAL AUTHOR(S) Control Data Corporation: Apicella, M. L., Slaton, J., Levi, B., Pashak, A.				
13a. TYPE OF REPORT Final Report		13b. TIME COVERED 4 / 1 / 87 - 12 / 31 / 90	14. DATE OF REPORT (Yr., Mo., Day) 1990 September 30	
15. PAGE COUNT 17				
16. SUPPLEMENTARY NOTATION WRDC/MTI Project Priority 6203				
17. COSATI CODES			18. SUBJECT TERMS (Continue on reverse if necessary and identify block no.)	
FIELD	GROUP	SUB GR.		
1308	0905			
19. ABSTRACT (Continue on reverse if necessary and identify block number) This document establishes the design of Function PRE11, "Build Source Code", one of the major functions of the Configuration Item "Precompiler" to be built and formally accepted by the ICAM program office. BLOCK 11: INTEGRATED INFORMATION SUPPORT SYSTEM Vol V - Common Data Model Subsystem Part 23 - Neutral Data Manipulation Language (NDML) Precompiler Build Source Code Product Specification				
20. DISTRIBUTION/AVAILABILITY OF ABSTRACT UNCLASSIFIED/UNLIMITED x SAME AS RPT. DTIC USERS			21. ABSTRACT SECURITY CLASSIFICATION Unclassified	
22a. NAME OF RESPONSIBLE INDIVIDUAL David L. Judson			22b. TELEPHONE NO. (Include Area Code) (513) 255-7371	22c. OFFICE SYMBOL WRDC/MTI

FOREWORD

This technical report covers work performed under Air Force Contract F33600-87-C-0464, DAPro Project. This contract is sponsored by the Manufacturing Technology Directorate, Air Force Systems Command, Wright-Patterson Air Force Base, Ohio. It was administered under the technical direction of Mr. Bruce A. Rasmussen, Branch Chief, Integration Technology Division, Manufacturing Technology Directorate, through Mr. David L. Judson, Project Manager. The Prime Contractor was Integration Technology Services, Software Programs Division, of the Control Data Corporation, Dayton, Ohio, under the direction of Mr. W. A. Osborne. The DAPro Project Manager for Control Data Corporation was Mr. Jimmy P. Maxwell.

The DAPro project was created to continue the development, test, and demonstration of the Integrated Information Support System (IISS). The IISS technology work comprises enhancements to IISS software and the establishment and operation of IISS test bed hardware and communications for developers and users.

The following list names the Control Data Corporation subcontractors and their contributing activities:

<u>SUBCONTRACTOR</u>	<u>ROLE</u>
Control Data Corporation	Responsible for the overall Common Data Model design development and implementation, IISS integration and test, and technology transfer of IISS.
D. Appleton Company	Responsible for providing software information services for the Common Data Model and IDEF1X integration methodology.
ONTEK	Responsible for defining and testing a representative integrated system base in Artificial Intelligence techniques to establish fitness for use.
Simpact Corporation	Responsible for Communication development.
Structural Dynamics Research Corporation	Responsible for User Interfaces, Virtual Terminal Interface, and Network Transaction Manager design, development, implementation, and support.
Arizona State University	Responsible for test bed operations and support.

TABLE OF CONTENTS

		Page
SECTION 1.0	SCOPE	1-1
1.1	Identification	1-1
1.2	Functional Summary	1-1
SECTION 2.0	DOCUMENTS	2-1
2.1	Reference Documents	2-1
2.2	Terms and Abbreviations	2-1
SECTION 3.0	REQUIREMENTS	3-1
3.1	Structural Description	3-1
3.2	Functional Flow	3-1
3.3	Interfaces	3-1
3.3.1	Inputs/Outputs	3-1
3.4	Program Interrupts	3-2
3.5	Timing and Sequencing Description	3-2
3.6	Special Control Features	3-2
3.7	Storage Allocation	3-2
3.7.1	Database Definition	3-2
3.7.1.1	File Description	3-2
3.7.1.2	Table Description	3-2
3.7.1.3	Item Description	3-3
3.8	Object Code Creation	3-3
3.9	Adaptation Data	3-3
3.10	Detail Design Description	3-3
3.10.1	Where Include File Used List	3-3
3.10.2	Where External Routine Used List ...	3-4
3.10.3	Main Program Parts List	3-4
3.10.4	Module Documentation	3-5
3.10.5	Include File Description	3-8
3.10.6	Hierarchy Chart	3-8
3.11	Program Listings Comments	3-8
SECTION 4.0	QUALITY ASSURANCE PROVISIONS	4-1
4.1	Introduction and Definitions	4-1
4.2	Computer Programming and Test Evaluation	4-1

SECTION 1

SCOPE

1.1 Identification

This specification establishes the design of Function PRE11, "Build Source Code", one of the major functions of the Configuration Item "Precompiler" to be built and formally accepted by the ICAM Program Office. This CI constitutes one of the subsystems of the Common Data Model Processor (CDMP).

1.2 Functional Summary

The purpose of this Computer Program Configuration Item (CPCI) is to combine previously constructed parcels into a modified application process capable of servicing NDML or SQL requests. The following functions will be performed by this CPCI based on the source language of the application:

1. Write contents of parcel 2 onto the first parcel.
2. Write contents of parcel 3 onto the first parcel.
3. Write contents of parcel 4 onto the first parcel.
4. Delete parcels 1, 2 and 3.

Accession For	
NTIS GRA&I	☒
DTIC TAB	☐
Unannounced	☐
Justification	
By	
Distribution/	
Availability Codes	
Dist	Avail and/or Special
A-1	



SECTION 2

DOCUMENTS

2.1 Reference Documents

1. ICAM Documentation Standards: IDS15012000A, 28 December 1981.
2. D. Appleton Co., CDM Administrators Manual; UM620141000, March 1984.
3. D. Appleton Co., CDM1-IDEF, Model of the Common Data Model; CCS620141000, 15 May 1985.
4. D. Appleton Co., Computer Program Development Specification (DS) for ICAM Integrated Support System (IISS) Configuration Item: NDML Precompiler; DS620141200, October 1984.
5. D. Appleton Co., Embedded NDML Programmer's Reference Manual; PRM620141200, March 1985
6. Softech, Inc., NTM Programmer's Guide; UM620140001, July, 1984.
7. Control Data Corp., Computer Program Development Specification (DS) for ICAM Integrated Support System (IISS) Configuration Item: NDDL Command Processor: DS620141100, June 1985.

2.2 Terms and Abbreviations

Attribute Use Class: (AUC)

Conceptual Schema: (CS)

Common Data Model Processor: (CDMP)

Common Data Model: (CDM) Describes common data application process formats, form definitions, etc, of the IISS and includes conceptual schema, external, internal schemas, and schema transformation operators.

Data Field: (DF) An element of data in the external schema. It is by this name that an NDML programmer references data.

Database Management System: (DBMS)

Distributed Request Supervisor: (DRS) This IISS CDM subsystem configuration item controls the execution of distributed NDML queries and non distributed updates.

Domain: A logical definition of legal attribute class values.

Domain Constraint: Predicate that applies to a single domain.

External Schema: (ES)

Forms: Structured views which may be imposed on windows or other forms. A form is composed of fields where each field is a form, item, or window.

Forms Processor: (FP) A set of callable execution time routines available to an application program for form processing.

Internal Schema: (IS)

Integrated Information Support System: (IISS) A test computing environment used to investigate, demonstrate and test the concepts of information management and information integration in the context of Aerospace Manufacturing. The IISS addresses the problems of integration of data resident on heterogeneous databases supported by heterogeneous computers interconnected via a local Area Network.

Mapping: The correspondence of independent objects in two schemas: ES to CS or CS to IS.

Network Transaction Manager: (NTM) Performs the coordination, communication and housekeeping functions required to integrate the application processes and system services resident on the various hosts into a cohesive system.

Neutral Data Manipulation Language: (NDML) A language developed by the IISS project to provide uniform access to common data, regardless of database manager or distribution criteria. It provides distributed retrieved and single node updates.

ORACLE: Relational DBMS based on the SQL (Structured Query Language, a product of ORACLE Corp, Menlo Park, CA). The CDM is an ORACLE database.

Parcel: A sequential file containing section source code of the input application program.

Request Processor: (RP) A COBOL program that will satisfy a retrieval or update NDML subtransaction against a particular Database Management System.

User Interface: (UI) Controls the user's terminal and interfaces with the rest of the system.

Virtual Terminal Interface: (VTI) Performs the interfacing between different terminals and the UI. This is done by defining a specific set of terminal features and protocols which

must be supported by UI software which constitutes the Virtual Terminal Definition. Specific terminals are then mapped against the Virtual Terminal software by specific software modules written for each type of real terminal supported.

SECTION 3

REQUIREMENTS

3.1 Structural Description

A graphic portrayal of this CPCI is included in Section 3.10. This chart shows the hierarchical relationship of each module making up this CPCI. As can be seen, the lower level routines Open, Read and Close the appropriate files. The Delete file interface is used to remove the parcels that were copied into the first parcel.

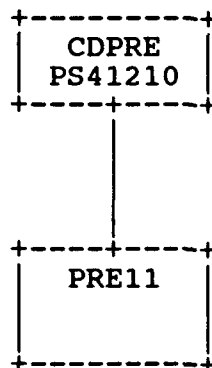
3.2 Functional Flow

This CPCI implements the logic defined in the Development Specification for this CPCI. Details of inputs/outputs and relationships between modules are to be found in Section 3.10.

This CPCI has been designated to operate in a batch or interactive mode. It must operate in the system environment established for IISS; that is, use of the Network Transaction Manager. It must use the ORACLE Database Management System installed on a DEC VAX computer.

3.3 Interfaces

The following diagram depicts interface of PRE11 with other CPCI's in the system.



3.3.1 Inputs/Outputs

The following table depicts the inputs and outputs of this CPCI. A detail description for each item can be found in the DS for this CPCI.

Function: PRE11

INPUT	OUTPUT
Parcel 1 File Name	Module Status
Parcel 2 File Name	
Parcel 3 File Name	
Parcel 4 File Name	
Parcel 1 File Control Block	
Parcel 2 File Control Block	
Parcel 3 File Control Block	
Parcel 4 File Control Block	
Source Language	
Current Host	

3.4 Program Interrupts

Not applicable to this CPCI.

3.5 Timing and Sequencing Description

This module is called under the control of CDPRE, the precompiler control module. PRE11 is called once per successful precompilation of a single user module.

3.6 Special Control Features

Not applicable to this CPCI.

3.7 Storage Allocation

3.7.1 Database Definition

The database used by this CPCI is the Common Data Model (CDM) database. This model is defined by the CDM1, the IDEF-1 model of the CDM, Reference Document Number 3.

3.7.1.1 File Description

No permanent files have been defined for this CPCI. It may use temporary scratch files for such things as generated program source code or temporary query results.

3.7.1.2 Table Description

All tables used by this CPCI have been defined by the Development Specification for this CPCI.

3.8 Object Code Creation

The object code for this CPCI will be created by the system integration test team by using defined IISS Software Configuration Management Procedures. This CPCI will use the "C" language compilers.

3.9 Adaptation Data

This CPCI has been coded using ANSI COBOL and a "standard" subset of the "C" language. The intent was to provide a transportable system. Any system environment supporting this language, a virtual memory management scheme, the COMM and NTM subsystems of IISS and the ORACLE Database Management System should be able to support this CPCI. Every possible attempt has been made to localize and identify any machine or environment dependent modules through the original design of the IISS and application of Configuration Management Procedures.

3.10 Detail Design Description

The following sections have been computer generated for this CPCI.

3.10.1 Where Include File Used List

The following lists each include file in the documentation group and all the modules documented in this specification which include them. The purpose of each module is listed as well.

DOCGROUP PS41259 Where-include-file-used List

Include File -----	Module Name -----
STDIO	CDP11

3.10.2 Where External Routine Used List

The following lists each external function or routine in the documentation group and all the documented modules which call it. The purpose of each module is listed as well.

DOCGROUP PS41259 Where-external-routine-used List

System Module -----	Module Name -----
CLSFIL	CDP11
STRNCMP	CDP11
OUTFIL	CDP11
SPRINTF	CDP11
ERRPRO	CDP11
STRCPY	CDP11
INPFIL	CDP11
OPNFIL	CDP11

3.10.3 Main Program Parts List

The following lists each Main Program in the documentation group and all the modules which are called either by that module itself or by any of the documented modules which it calls. It is possible for a non-main module to be listed more than once if it is called by multiple modules. The called modules, in this case known as program parts, are marked as to whether they are documented here. If so, the phrase "well-defined module" appears by the module name, if not it is an "external routine". The Purpose of the Main Program module is listed as well.

DOCGROUP PS41259 Main Program Parts List

Main Pgm Name -----	Module Name -----	Module Type -----
CDP11	CLSFIL	External routine
	STRNCMP	External routine
	OUTFIL	External routine
	SPRINTF	External routine
	ERRPRO	External routine
	STRCPY	External routine
	INPFIL	External routine
	OPNFIL	External routine

3.10.4 Module Documentation

The following documentation describes information which is specific to each individual module in the documentation group being documented in this specification. It provides a compact way of getting information that would be otherwise buried within each module's source code.

The specific items in this module documentation have the following meanings:

NAME:	Name of program Module.
PURPOSE:	Purpose of Module as detailed in the source code.
LANGUAGE:	Programming language source code is written in. The choices are: VAX-11 FORTRAN C (I/S-1 Workbench 'C') VAX-11 COBOL
MODULE TYPE:	Whether a Program, Subroutine, or Function.
SOURCE FILE:	Name of Source File from file specification.
SOURCE FILE TYPE:	Source File Extension from file specification.
HOST:	Whether this is a host-dependent routine (VAX or IBM) or blank if host-independent.
SUBSYSTEM:	IISS sub-system this file resides in.

SUBDIRECTORY: Sub-directory of that subsystem in which this file resides.

DOCUMENTATION GROUP: Name of documentation group of which this source file is a member.

DESCRIPTION: A description of the module as obtained from the source code.

ARGUMENTS: The arguments with which this routine is called if it is a Subroutine or a Function.

INCLUDE FILES: A list of all the files that are included into this module as well as their purposes.

ROUTINES CALLED: Subroutines or Functions, either documented or external, called by this module, if any.

CALLED DIRECTLY BY: The documented routines which call this module, if any.

USED IN MAIN PROGRAM(S): The documented Main Programs which contain this module in their parts list according to the list in section 3.10.3.

The Module Documentation is arranged alphabetically according to Module Name.

DOCGROUP PS41259 Module Documentation

NAME: CDP11
PURPOSE: CDP11 APPENDS PARCL2, PARCL3, PARCL4 TO THE PARCL1
LANGUAGE: C
SOURCE FILE: CDP11
SOURCE FILE TYPE: C
HOST:
SUBSYSTEM: CDM
SUBDIRECTORY: NDML

DESCRIPTION:

MODIFIED 04/01/86 TO NULL TERMINATE FILE NAME ARGUMENT
MODIFIED 02/18/88 USE FIOPS FOR UNIX REHOST.

SYNOPSIS

```
C
--
CDP11(PARCL1,PARCL2,PARCL3,PARCL4,FCB1,FCB2,
FCB3,FCB4,LANGUAGE,FILE_HOST,RET-STATUS) ;
COBOL      --      CALL "CDP11"          USING
                                           PARCL1,
                                           PARCL2,
                                           PARCL3,
                                           PARCL4,
                                           FCB-1,
                                           FCB-2,
                                           FCB-3,
                                           FCB-4,
                                           LANGUAGE,
                                           FILE-HOST,
                                           RET-STATUS.
```

INPUT:

```
CHAR      *PARCL1;
CHAR      *PARCL2;
CHAR      *PARCL3;
CHAR      *PARCL4;

INT      *FCB1 ;
INT      *FCB2 ;
INT      *FCB3 ;
INT      *FCB4 ;
CHAR      *LANGUAGE ;
CHAR      *FILE_HOST ;
```

OUTPUT:

```
CHAR      *RET-STATUS ;
```

DESCRIPTION

CDP11 -- CDP11 APPENDS PARCL2, PARCL3,PARCL4 TO THE PARCL1
SO THE PARCL1 WILL BE A COMPLETE PROGRAM.

ARGUMENTS:

PARCL1	CHAR *
PARCL2	CHAR *
PARCL3	CHAR *
PARCL4	CHAR *
FCB1	INT *
FCB2	INT *
FCB3	INT *
FCB4	INT *
LANGUAGE	CHAR *
FILE_HOST	CHAR *
STATUS	CHAR *

INCLUDE FILES:

STDIO

ROUTINES CALLED:

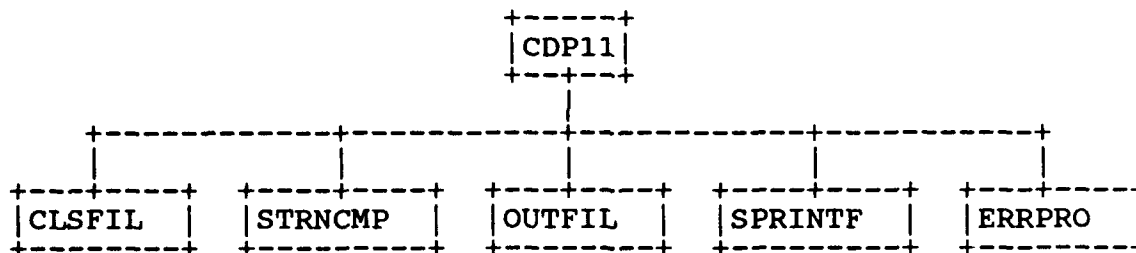
CLSFIL
STRNCMP
OUTFIL
SPRINTF
ERRPRO
STRCPY
INPFIL
OPNFIL

3.10.5 Include File Descriptions

The following list contains a purpose and description of each include file in the documentation group as specified in the source code. The language it is written in is also given.

3.10.6 Hierarchy Chart

1



CDP11.....1
CLSFIL
ERRPRO
OUTFIL
SPRINTF
STRNCMP

3.11 Program Listings Comments

This information is contained in the Module Descriptions in section 3.10.

SECTION 4

QUALITY ASSURANCE PROVISIONS

4.1 Introduction and Definitions

"Testing" is a systematic process that may be preplanned and explicitly stated. Test techniques and procedures may be defined in advance, and a sequence of test steps may be specified. "Debugging" is the process of isolation and correction of the cause of an error.

"Antibugging" is defined as the philosophy of writing programs in such a way as to make bugs less likely to occur and when they do occur, to make them more noticeable to the programmer and the user. In other words, as much error checking as is practical and possible in each routine should be performed.

4.2 Computer Programming Test and Evaluation

The quality assurance provisions for test consists of the normal testing techniques that are accomplished during the construction process. They consist of design and code walk-throughs, unit testing, and integration testing. These tests are performed by the design team. Structured design, design walk-through and the incorporation of "antibugging" facilitate this testing by exposing and addressing problem areas before they become coded "bugs."