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

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Copies of this report should not be returned unless return is required by security considerations, contractual obligations, or notice on a specific document.
This document establishes the design of Function PRE 11, "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
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:

<table>
<thead>
<tr>
<th>SUBCONTRACTOR</th>
<th>ROLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control Data Corporation</td>
<td>Responsible for the overall Common Data Model design development and implementation, IISS integration and test, and technology transfer of IISS.</td>
</tr>
<tr>
<td>D. Appleton Company</td>
<td>Responsible for providing software information services for the Common Data Model and IDEF1X integration methodology.</td>
</tr>
<tr>
<td>ONTEK</td>
<td>Responsible for defining and testing a representative integrated system base in Artificial Intelligence techniques to establish fitness for use.</td>
</tr>
<tr>
<td>Simpact Corporation</td>
<td>Responsible for Communication development.</td>
</tr>
<tr>
<td>Structural Dynamics Research Corporation</td>
<td>Responsible for User Interfaces, Virtual Terminal Interface, and Network Transaction Manager design, development, implementation, and support.</td>
</tr>
<tr>
<td>Arizona State University</td>
<td>Responsible for test bed operations and support.</td>
</tr>
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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.
SECTION 2
DOCUMENTS

2.1 Reference Documents


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.
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.

```
+-----------+       +-----------+
|           |       |           |
| CDPRE     |       | PS41210   |
|           |       |           |
+-----------+       +-----------+
|           |       |           |
|           |       |           |
+-----------+       +-----------+
|           |       |           |
| PRE11     |       |           |
|           |       |           |
+-----------+       +-----------+
```

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: PREll

<table>
<thead>
<tr>
<th>INPUT</th>
<th>OUTPUT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parcel 1 File Name</td>
<td>Module Status</td>
</tr>
<tr>
<td>Parcel 2 File Name</td>
<td></td>
</tr>
<tr>
<td>Parcel 3 File Name</td>
<td></td>
</tr>
<tr>
<td>Parcel 4 File Name</td>
<td></td>
</tr>
<tr>
<td>Parcel 1 File Control Block</td>
<td></td>
</tr>
<tr>
<td>Parcel 2 File Control Block</td>
<td></td>
</tr>
<tr>
<td>Parcel 3 File Control Block</td>
<td></td>
</tr>
<tr>
<td>Parcel 4 File Control Block</td>
<td></td>
</tr>
<tr>
<td>Source Language</td>
<td></td>
</tr>
<tr>
<td>Current Host</td>
<td></td>
</tr>
</tbody>
</table>

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. PREll 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.

```plaintext
DOCGROUP PS41259 Where-include-file-used List

<table>
<thead>
<tr>
<th>Include File</th>
<th>Module Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>STDIO</td>
<td>CDP11</td>
</tr>
</tbody>
</table>
```
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

<table>
<thead>
<tr>
<th>System Module</th>
<th>Module Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>CLSFIL</td>
<td>CDP11</td>
</tr>
<tr>
<td>STRNOMP</td>
<td>CDP11</td>
</tr>
<tr>
<td>OUTFIL</td>
<td>CDP11</td>
</tr>
<tr>
<td>SPRINTF</td>
<td>CDP11</td>
</tr>
<tr>
<td>ERRPRO</td>
<td>CDP11</td>
</tr>
<tr>
<td>STRCPY</td>
<td>CDP11</td>
</tr>
<tr>
<td>INPFIL</td>
<td>CDP11</td>
</tr>
<tr>
<td>OPNFIL</td>
<td>CDP11</td>
</tr>
</tbody>
</table>

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.
**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.

USE 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:   *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:
---------------
STUDIO
ROUTINES CALLED:
-------------
CLSFIL
STRNCMP
OUTFIL
SPRINTF
ERRPRO
STRCPY
INPFIL
OPNFI

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

CDP1l
---

<table>
<thead>
<tr>
<th>CLSFIL</th>
<th>STRNCMP</th>
<th>OUTFIL</th>
<th>SPRINTF</th>
<th>ERRPRO</th>
</tr>
</thead>
</table>

CDP1l........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."