

MIGRATION OF THE CONFIGURATION DATABASE FOR PSI CYCLOTRON ACCELERATORS

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The Production Configuration Database is running with Oracle Database Server 7.3 on an OpenVMS platform. This system will be migrated to an Oracle Server 9i running on a Linux platform. The Information storage holds data for different subsystems (Device Definition, Device Control Settings, Equipment, Interlock etc.) A new requirement is the configuration of VME-based Device Control. A description of the migration path, the development of new Database Applications and the progress of the project is reported.

INTRODUCTION

The configuration for PACS (Proton Accelerator Control System) at PSI is stored in a relational database system from Oracle. Fig. 1 shows the main components in this context. IOC's (I/O Computers formerly denoted as Front End Computers) are fed with configuration data at their boot time. Control system workstations for development and operation also use database configuration data for starting their applications or making a Device IO access through a shared object library.

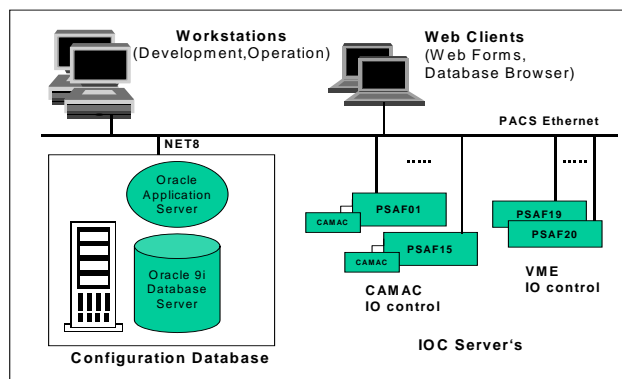


Fig. 1: Architecture of configuration database for the Proton Accelerator Control System (PACS)

For the new database the "Oracle 9i Enterprise Server Engine" running on a Linux platform (Redhat 7.x) has been chosen. In addition on the same machine the "Oracle Application Server" is running as a middle tier to the end user. The main task of this server is to deliver the new Oracle Web Forms to an Intranet Web Client for Database Entry. This server can also be used in the future as a normal Web Server for static or dynamic documentation of our database. The main characteristic with respect to content and to their applications of our configuration database are the following:

Information Areas	<i>Device Definition, Device Control, Equipment, Interlock, TouchPanel</i>
Oracle Applications	Database Maintenance/Entry using Oracle Forms
Client Programs	Database Extraction, Generation and Deployment using PLSQL, Proc*C++, and/or Java Language

Database Browser	A graphical tool for Device Information retrieval (at present implemented as X-Windows Application)
Some Statistics	~3500 Devices ~10500 Device Control (Attributes) ~160 relational database tables ~80 Oracle Form Applications

(1) *Device Definition* holds everything about definitions and organization of all the elements in our accelerator complex as seen by the operator. This may be a bending magnet, quadrupole, profile monitor, a pump etc. Each Device has a unique name (up to 8 characters) according to our Device naming convention and is arranged into machine parts. Each Device is connected to a parent device according to the physical arrangement along the beamline. Device Listings ("Holy List's") may be produced from this information.

(2) *Device Control* is the main data source for our IOC's (front ends) which includes information about Hardware IO address configuration, software driver functionality, parameter settings for analog/digital Device Attributes etc. It also includes special device data for formulas (virtual device control) and for profile monitor control.

(3) *Equipment* means the definition and organisation of installed hardware components in terms of crates, modules and submodules. Each hardware module belongs to one of the supported bus systems VME, CAMAC, ROADC, SPS or CAN.

(4) *Interlock* holds data tables for the description of our Run Permit system. It feeds data input for the Interlock monitor application and for the Interlock Service started at IOC level.

(5) *Touchpanel*, the Main Client Application in the Control Room has it's configuration stored in the central database as well.

New Requirements and Motivation

As described already in [1], the configuration of our IOC's has to support the new VME IO control hardware. The table structure has to be modified. A 2nd task is to support control system data for the Proscan Project in future. The intention is to use a 2nd Oracle Instance running on the same or different platform.

MIGRATION OF SYSTEM

Redesign

Before moving the complete database content, a redesign of our table structure has been done in order to improve the structure with respect to the criteria redundancy and integrity of data. The Software Design Tool (Power Designer) has been used for this purpose. Existing tables have been modified and new tables were introduced for the description of the new VME IO module upgrade. The result is a modified physical table model together with SQL-scripts for the creation of the structures (tables, triggers, views).

DB Setup

A new database setup on a Linux Platform (Redhat 7.x) has been done. The data from our production database (Oracle 7.3, OpenVMS) has been loaded into the prototype step by step using SQL scripts. On the same platform Oracle's Application Server software bundle has been installed and configured for executing Oracles Form Services through the Intranet.

Oracle Form Applications, Webforms

Attribute Name	Modultyp	Driver	Function	IOC	HD	BR	CR	ST	CH	HEXADR
COM	RDC-FUFU/KU/KU	KGCC	2 D	PSAF07	57	1	7	11		0012
HL	RDC-FUFU/KU/KU	KGAI2S10	1 A	PSAF07	57	1	7	11		0014
JCOM	RDC-FUFU/KU/KU	KGCC	2 D	PSAF07	57	1	7	11		0015
IIST	RDC-FUFU/KU/KU	KGCC2	2 D RC	PSAF07	57	1	7	11		0015
IST	RDC-FUFU/KU/KU	KGAI4S10	1 A	PSAF07	57	1	7	11		0011

Fig. 2: New Oracle Web Form for configuration of VME IO cards (carrier boards, IP modules)

The most effort and work has been invested in the migration and development of the Data Entry Form Applications (Fig. 2). The old text based SQL*Forms couldn't be used for the new system. For Development the "Oracle Developer Forms 6i" product is used on a NT-platform. The most complex Data Entry Forms and all of the Applications related to Device Definition and Control have been built so far. In order to build a complex Data Entry Form the data source on the user screen is either based on a single table, an object view or a stored procedure. When the User enters or modifies database records several checks for validation against the actual database are done before the requested entry is committed.

A PLSQL library has been built for using generic functionality. After development the source code is deployed to the platform where the Application Server resides. After compilation the executable may be accessed on the Intranet. All of the Webforms are organised into a Menu System by categories. A User and database role based security check is done before starting a single application.

Database Deployment

XML is a popular data format for several reasons: it is human readable, self-describing and portable. Therefore it is used as data exchange format between our Database Server and the IOC's.

The XML-datafile is generated by a Java Stored Procedure which is triggered and deployed from an Oracle Form Menu option. The datafile contains data for all IOC's and all their IOCServices (like PIOSer, BLKSer, LOOPSer, see [1]). The IOC software is changed in order to parse and process its data at boot time.

For the Client Device Access Library another method for data exchange has been taken over from the old system. With the help of a "ProC*" application" a C-Source listing is generated from our database. After extraction, this output must be deployed, compiled and linked into a platform specific shared library (OpenVMS, Linux).

For the *TouchPanel* Application the generation and deployment of configuration data is performed by a new JavaStoredProcedure application.

CONCLUSION AND OUTLOOK

A prototype of the new database system for PACS has been established on a Linux platform. All the data tables from the running system have been loaded and migrated into a new structure.

The most important applications for Database Entry (Oracle Web Forms) have been developed. Application programs for extraction and deployment of configuration data have been prepared. These applications produce data in XML-Format or pure ASCII text format.

The following tasks are scheduled for the year 2003:

- (1) Completion of Migration for Interlock, Equipment
- (2) Development of a new database browser
- (3) Bringing the system into production
- (4) Database for PROSCAN

REFERENCES

- [1] D. Anicic et al, Replacement of Magnet Power Supplies Control and Field-bus for the PSI Cyclotron Accelerators, PSI Scientific and Technical Report 2001, Volume VI.