Control System

Takeshi WADA
Sigeki FUJIWARA
Toru FUKUI
Kazuo KOBAYASHI
Takemasa MASUDA
Atsushi TAKETANI
Ryotaro TANAKA
Weimin XU
Akihiro YAMASHITA

1. Introduction

The construction of control system of the SPring-8 is continuing. The design stage of the control hardware was finished and development is accelerated. The VME system of magnets and rf systems has partially installed in the storage ring. A pipe of air blown fiber system has been settled along with the SPring-8 accelerators. We have finished the basic design of the control software, and developments of some of server processes have started. The conceptual design of the database has started recently.

We have installed the prototype control software in the real control system of the magnet power supplies, and confirmed that the basic control scheme worked successfully on the real system.

2. Hardware

There are six node systems in the FDDI network, which locate in the control room, the injector room, A, B, C, and D zones. We selected NETbuilder II for the injector room node, and LANplex 2501 for all the other nodes. The LANplex 2501 combines Ethernet switching, FDDI switching, and Ethernet-FDDI transparent bridging as well as intranetwork routing. It increases Ethernet performance through segmentation. The NETbuilder II is a bridge/router between different protocol LAN's. It supports FDDI, Ethernet, Apple Talk, DECnet, and IPX.

3. Control Software

3.1 Control Software Scheme

We have finished the design of the control software by introducing a client/server architecture. Figure 1 shows the software scheme.[1] The Inter Process Communication (IPC) and the Remote Procedure Call (RPC) are used for the communication within a EWS and over the network, respectively.

The equipment access is performed as follows: An operator command is created by using GUI and sent to the Message Server (MS). The MS will forward the received message to Access Server (AS) after checking its syntax and access control status. The AS parses the message and resolves the destination of the message. A composite sequence is analyzed here in the AS and messages are sent to the Equipment Manager (EM) running on the CPU board in VME system.[2] The equipment group, e.g. magnet, rf, vacuum etc., has its own AS. The EM is a core process which manages VME devices connected to equipment controllers.

We have an additional cyclic data-acquisition path to get the status of equipment's. The Poller process running on the VME CPU board sends pre-registered messages to the read-only EM to get the equipment status. The data is stored on a memory by the Poller and taken by the Collector server process on the same board. After collection the data is sent to the Collector client process on the operator console and finally saved in the on-line data base by the DBMS.

3.2 Device Drivers

The HP-RT device drivers and API's functions are developed for VME boards such as DI, DO, TTL, DI/O, AI, PTG, GP-IB, and RIO(Remote I/O). The drivers access the devices through SWSM (System Wide Shared Memory) mechanism. The API's are the only way to access and control the devices from application programs.[3]

4. Database

We introduce a commercial relational database management system (RDBMS), SYBASE SQL server 10. SYBASE was

chosen for its on-line performance as well as it's functionality of a replication server. Replication server running on server machines can manage the consistency of the data both on the primary and secondary servers. Users of off-line applications or not critical users for the accelerator operation are allowed to assess to the secondary server only. This access control reduces the load of the primary server which is already heavy-loaded by the operation database management. The replication server system plays an important role as a backup server as well.

5. Human-machine interface

We are using a commercial GUI builder, X-Mate, for developing the operator interface. The look and feel of the X-Mate is based on the Motif1.2 with X11 protocol.

The X-Mate provides good developing environment with a comfortable editor. Users are able to make widgets in WYSIWYG without knowing the Motif programming technique. An interface part of the application program has to be written into the call-back routines.

6. R&D

We have installed the prototype control software in the real control system of the magnet power supplies, and confirmed that the basic control scheme (GUI-MS-AS-EM and SYBASE) worked successfully on the real system. An operator used the GUI panel to control power supplies and the data taken by the EM was stored to the database by using SYBASE.

The conceptual design of the parameter database has started. The performance of writing an on line database was measured by using preliminary databases.

References

[1] R. Tanaka et al., "Control System of the SPring-8 Storage Ring" Proc. Int. Con. on Accelerator and Large Experimental Physics Control System, Chicago, Oct. 30 - Nov. 3, 1995 (to be published).

[2] A. Taketani et al., "Equipment Manager of the VME Control System for the SPring-8 Storage Ring", ibd.

[3] T. Masuda et al., "Development of Device Drivers on Real-Time UNIX for the SPring-8 Storage Ring", ibd.

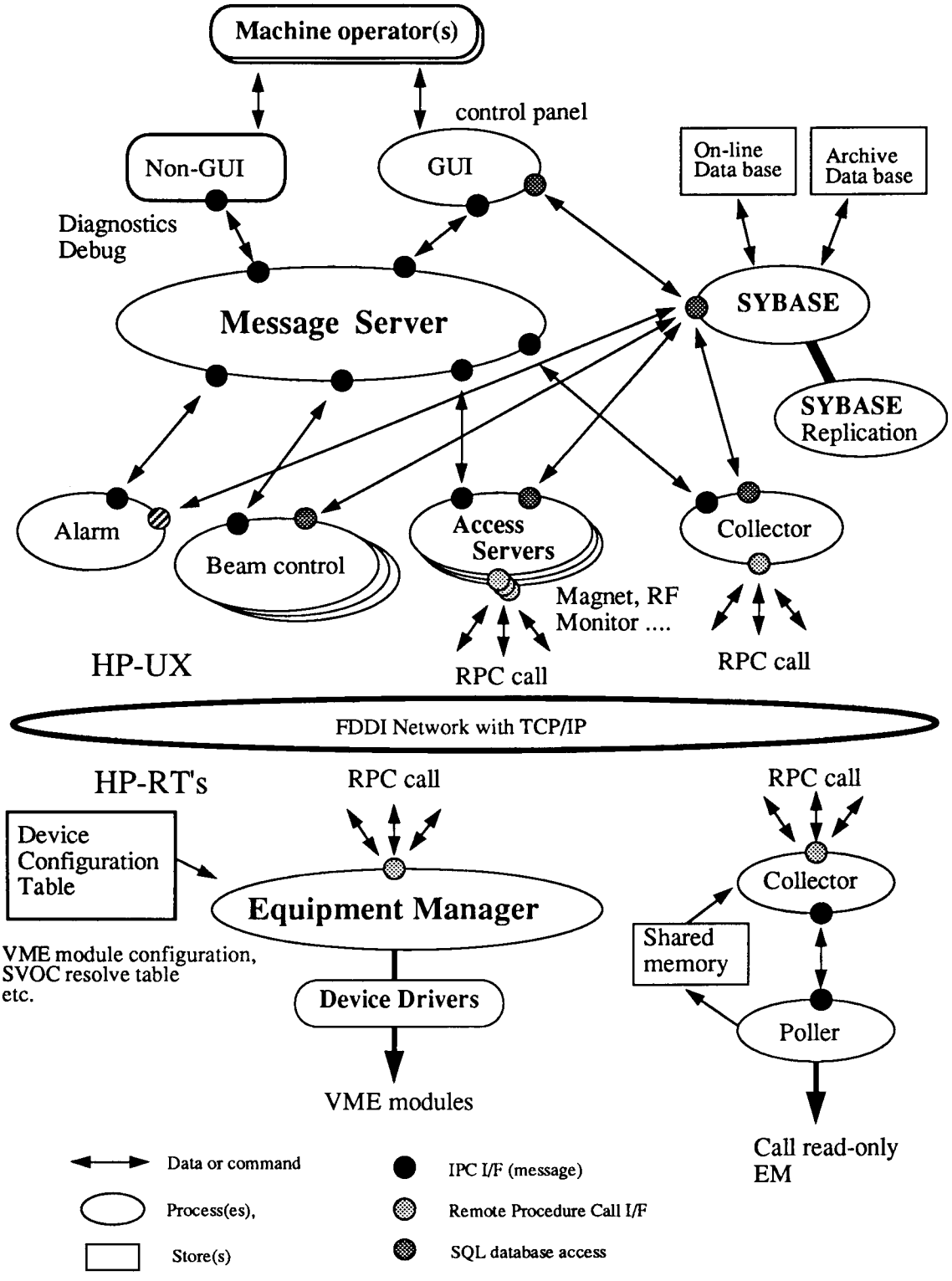

Fig.1 The software structure of the control system