Progress of HIRFL Control System

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Abstract

The HIRFL control system is a distributed one based on the high grade PCs, workstations and servers. The system consists of SFC control station, SSC power control station, SSC beam diagnosis station, SSC vacuum station and RF control station. Each control station is an independent subsystem and a high speed network is used to communicate between control stations. The application programs that are used to control equipment are written in C or C++ and linked into a DDL (dynamic linking library) which is called by standard windows' applications. The operating interface is programmed in OOP programming language C++ or VB and run under Windows/95 Chinese version (next: Windows/NT).

The system was built in 1996. The applications used in control stations have been finished and the system software designing is in progress. Entire control system is going to be finished in the end of 1997.

1 System description

A centralized control system had been used in HIRFL for some years. It was only used to control SSC power supplies and used a VAX/8350 computer as center control machine. The computer had some trouble in some years and the spare parts are very difficult to buy since VAX/8350 is old type. In order to insure the accelerator operating, we have decided to rebuild the system.

A new control system for HIRFL is rebuilding. It is based on a high grade PC workstation and server and a DCS control system. Fig.1 shows the control system network.

It is a two level control architecture. The upper level consists of Central Manage Workstation, server(CMW), Local Control Workstations(LCW) and a high speed network, 100M, is used to interconnect them. The Local Control Workstations (LCW) consist of ECR Ion Source Control Workstation(ECR-CW), SFC, injector, Control Workstations(SFC-CW), SFC Diagnosis Workstation(SFC-DW), Technical Control Workstation (TCW), Radio Frequency Control Workstations(RFCW), SSC Power Supply Control Workstations(SSC-PSCW), SSC Diagnosis Workstation(SSC-DW) and Vacuum Control Workstation(VCW). The lower level consists of CAMAC series loops which were used to control equipment.

2 Hardware upgrade

The computers that were used to control equipment were IBM PC/XT, 286 and IBM PC/AT. The old computers are very difficult to run a high speed network. So we change them to HP Pentium 586/200 workstation and server.

3 Computer network

The HIRFL computer network in HIRFL control system is a Fast Ethernet. The Inter express 100M   12 port stackable HUBs are used in the network. The 3COM's 3C905 100M PCI network adapter is used in each PC workstation and the AMP type 5 cable is used to interconnect between PC workstation and HUB. In order to insure transport correct, the Max distance is limited 90M.

4 Software rebuilding

4. 1 Application programs in LCW

Applications in LCW are written in C or C++. All subroutines have a uniform format, such as subroutine-name (input parameter 1, input parameter 2,output parameter 1,output parameter 2). All the subroutines are linked ,in C++ V4.5 development kit, into a Dynamic Link Library, naming as ECR_CON.DLL for ECR control, SFC_CON.DLL for SFC control, SSC_CON.DLL for SSC power supply control, RF_CON.DLL for RF control, SFC_DIA.DLL for SFC Diagnosis, SSC_DIA.DLL for SSC Diagnosis and VAC.DLL for vacuum control and monitor. All DLLs are stored under the windows/system sub-directory and are called by The Man Machine Interface (MMI) at run time.

4.2 MMI software

The MMI for the control system is a standard Microsoft Windows interface ,programming in visual basic V4.0 and visual C++. It runs under the Windows/95 Chinese version and is operated by a mouse. The multimedia technique is used in the control system to provide the on-line voice help and the equipment operating state information.

5 Control room

There are two control rooms in HIRFL control system, SFC control room (injector control room) and SSC control room. The SFC control room can independently operate in order to extract Ion beam to experiment. There are 3-4 20-inch high resolution color displays located on the SFC control desk and 4 20-inch high resolution color displays located on the SSC control desk.

6 Status and future

The hardware rebuilding in HIRFL has finished. Application programs in LCW have completed and have been used to control equipment. The MMI software has finished and runs under Windows/95.
Many new programming technique, such as OOP, OLE,

DDE, DLL and so on, has been used and a very friendly user interface, GUI, has been supplied (Fig.2). The computer network is running very well. Next step, we will write the CAMAC common subroutine under LAN's environment. The severs are going to put into use and the sever/client construction will be realized. A new powerful database DB2 or ORACLE will be adopted in HIRFL. Multimedia technique have improved the control system .
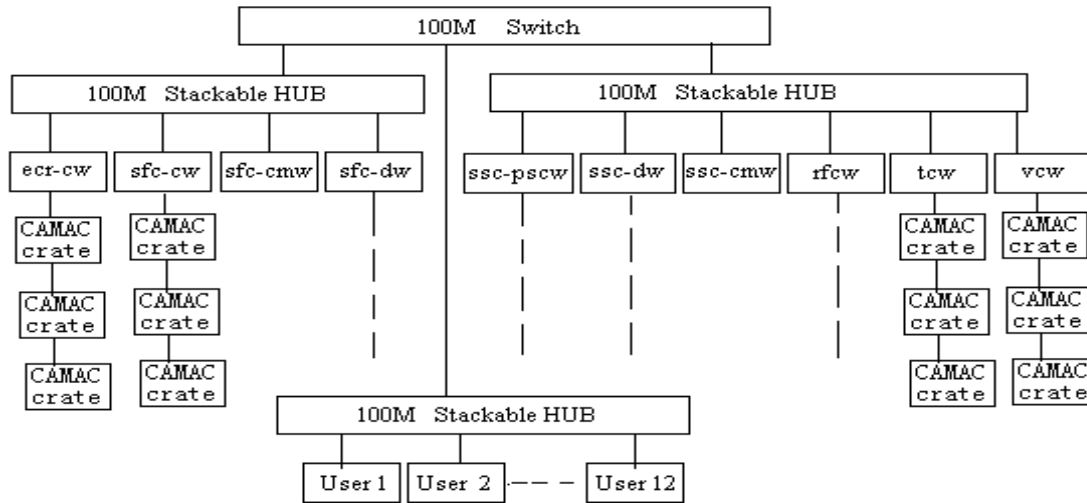

Fig .1 Layout of HIRFL Control System Network

Fig.2 The User Interface on SFC-CW