KEKB Control System

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and

KEKB Controls Group

KEKB Control System Design

- ◆ System Requirements

- ◆ Constraints

- ◆ Basic Concepts

- ◆ System Architecture

System Requirements

- ◆ **Sources**

  - ● **Equipment Groups**

    - Magnet and Power Supply
    - RF
    - Beam Monitor
    - Vacuum
    - Beam Transport

  - ● **Operations Group**

  - ● **Accelerator Physicists**

  - ● **Controls Group**

System Requirements

- Requirements

  - All the data that are possible to take should be taken.

  - All the data that are taken should be saved for later analyses.

  - All the operation should be recorded for later inspection.

  - All the machine parameters and information about the machine components should be stored in the database.

  - The man-machine interface should be operator-friendly.

  - The programming environment should be programmer-friendly.

  - The overall response time to an operator's request should be less than a second.

Constraints

◆ Reuse CAMAC as equipment interface

◆ Schedule

- Control Systems Final Design .... December, 1995
- Removal of MR equipment .... January, 1996
- Start Control Systems Installation .... September, 1996
- Complete Control Systems Installation ...... March, 1998
- KEKB Commissioning .... December, 1998

◆ Man-Power

- 12 KEKB Controls Group Members
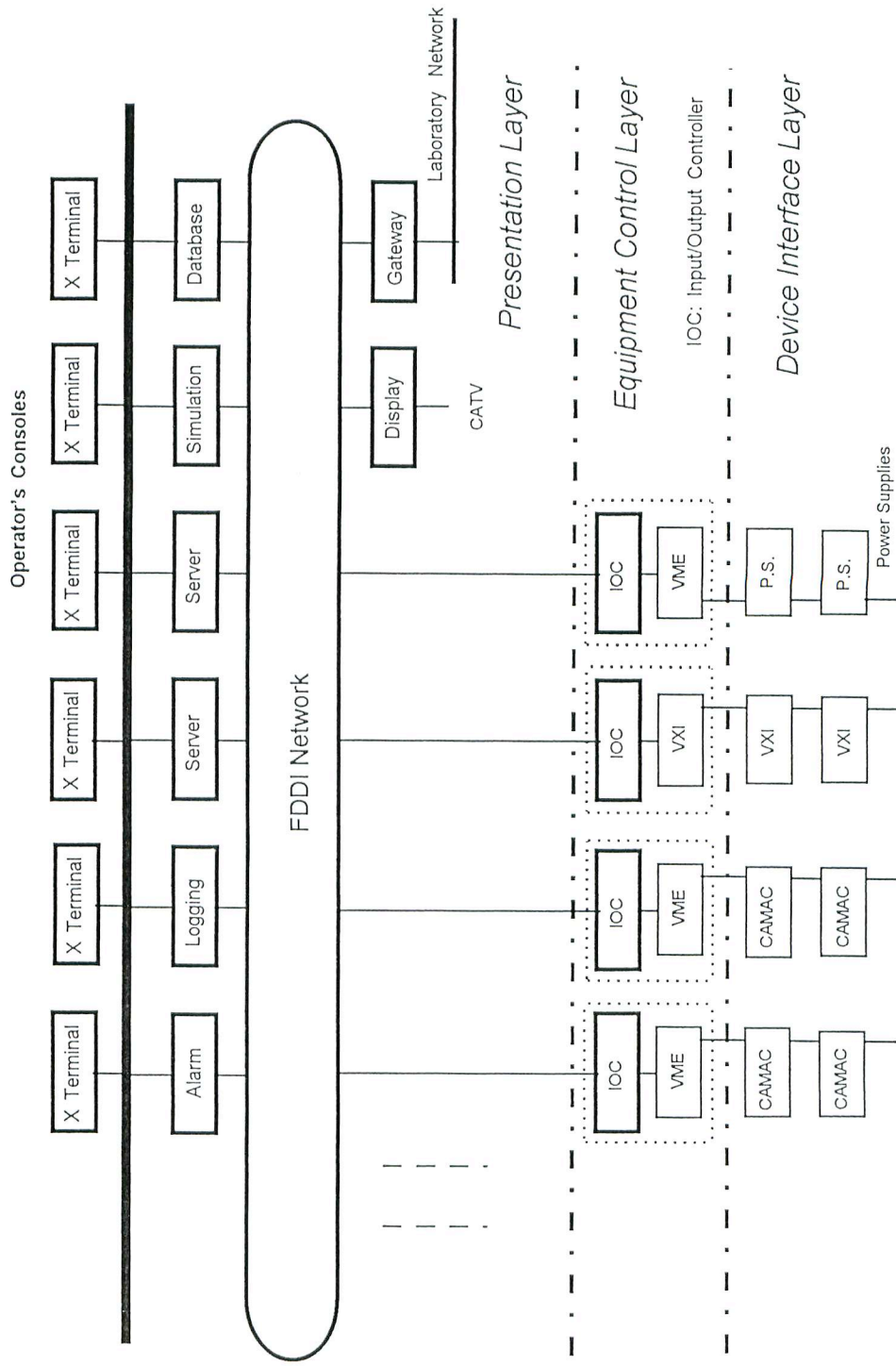- 11 Linkmen from Other Groups

Basic Design Parameters

- ◆ Number of Control Points ~ 50,000
- ◆ Data Taking Rates 0.01 ~ 100 Hz
- ◆ Required Response Time ~ 1 sec.

- ◆ Number of BPMs ~ 800
- ◆ Number of Steering Magnet PSs ~1,800
- ◆ Number of B-, Q-, Sx-Magnet PSs ~ 340

System Architecture

- ◆ **System Configuration**

Standard Model Architecture

◆ **Presentation Layer**

- **Operator's Consoles**
  - X Window
- **Database Management**
  - ORACLE, SYBASE
- **Alarm Generation/Recording**
- **Data Logging**
- **Data Display**
  - CATV Network
- **Simulation**
  - SAD Program
- **High-Speed Network**
  - FDDI, Distributed Shared-Memory Network, etc.
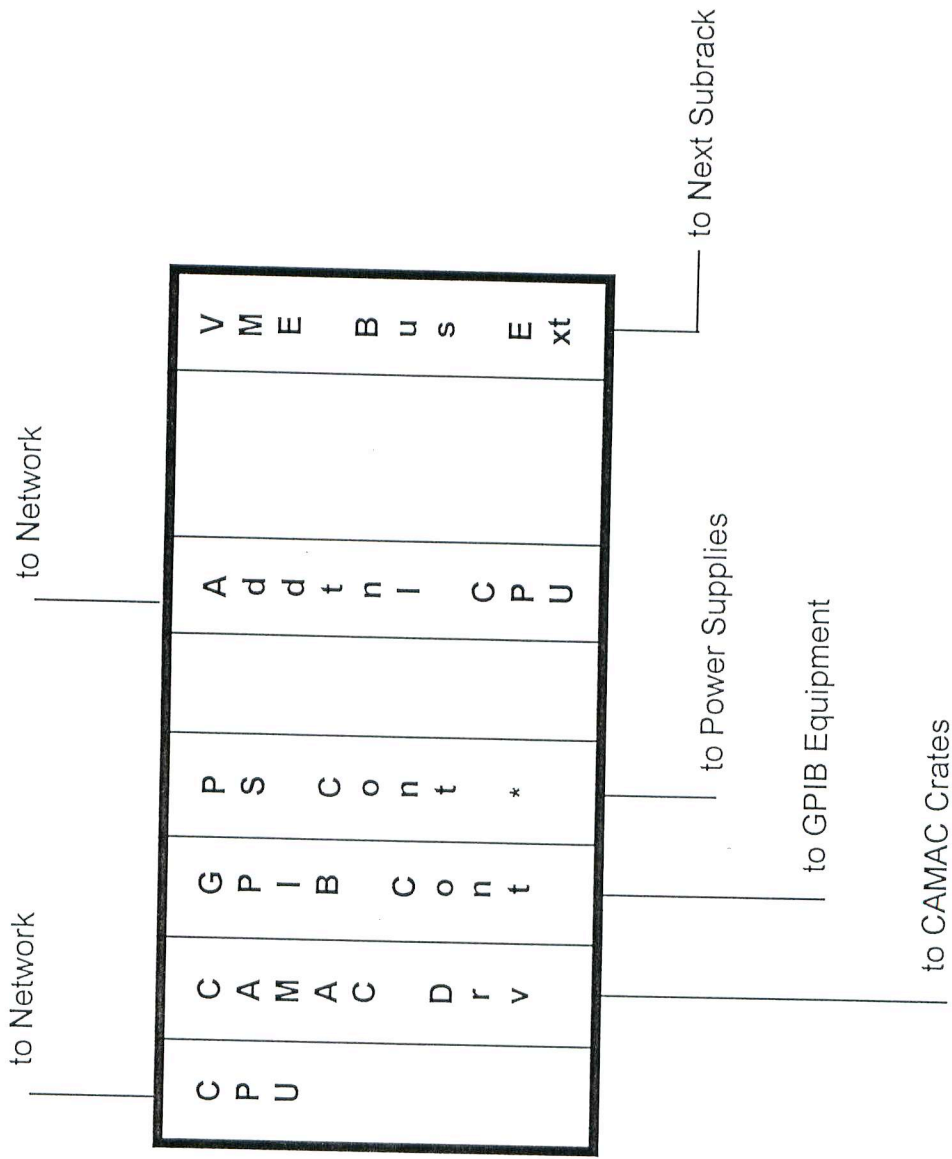- **Gateway to KEK Laboratory Network**

Standard Model Architecture

◆ **Equipment Control Layer**

  ● **Standard Interface**
    ◈ VME, VXI, GPIB, etc.

  ● **Computers**
    ◈ Workstation + VME
    ◈ VMEbus Board-Computer

  ● **Operating System**
    ◈ VxWorks, Windows NT, etc.

  ● **Data Input/Output Interface**
    ◈ CAMAC, GPIB, Power Supply Interface

◆ **Device Interface Layer**

  ● **Standard Interface**
    ◈ CAMAC, VXI, GPIB, etc.

Input Output Computer

◆ Configuration

to Network

to Network

C P U	C A M A C	G P I B	C o n t	P S	C o n t *		A d d t n l	V M E	B u s	E xt
	D r v						C P U			

to CAMAC Crates

to GPIB Equipment

to Power Supplies

to Next Subrack

* under development

Basic Numbers of the Control System

- Number of Server Workstations   2
- Number of Workstations   ~ 10
- Number of IOCs(VME Subracks)   ~ 60
- Number of CAMAC Crates   ~ 100
- Number of X-Terminals(Consoles)   ~ 10
- Number of X-Terminals(Others)   ~ 50

What is EPICS?

- ◆ Experimental Physics & Industrial Control System
  - ● Originated from Los Alamos National Laboratory
  - ● Worldwide Collaboration
    - ❖ APS at ANL
    - ❖ CEBAF
    - ❖ ALS and Gamasphere at LBL
    - ❖ STAR at BNL
    - ❖ RF Control at SLAC
    - ❖ Cryogenic System Control at DESY
    - ❖ TESLA Injector at Saclay and DESY
    - ❖ KECK Observatory in Hawaii
    - ❖ MIT Bates
    - ❖ Duke FEL at Duke University
    - ❖ GEMINI
    - ❖ Etc.

Hardware supported by EPICS

- **Workstations**
  - Sun, HP
- **IOCs**
  - Microprocessors which run VxWorks
    - 680x0, Alpha, etc.
- **Interfaces**
  - VME
  - VXI
  - CAMAC
  - GPIB
  - PLCs
    - Allen Bradley, Siemens, etc.
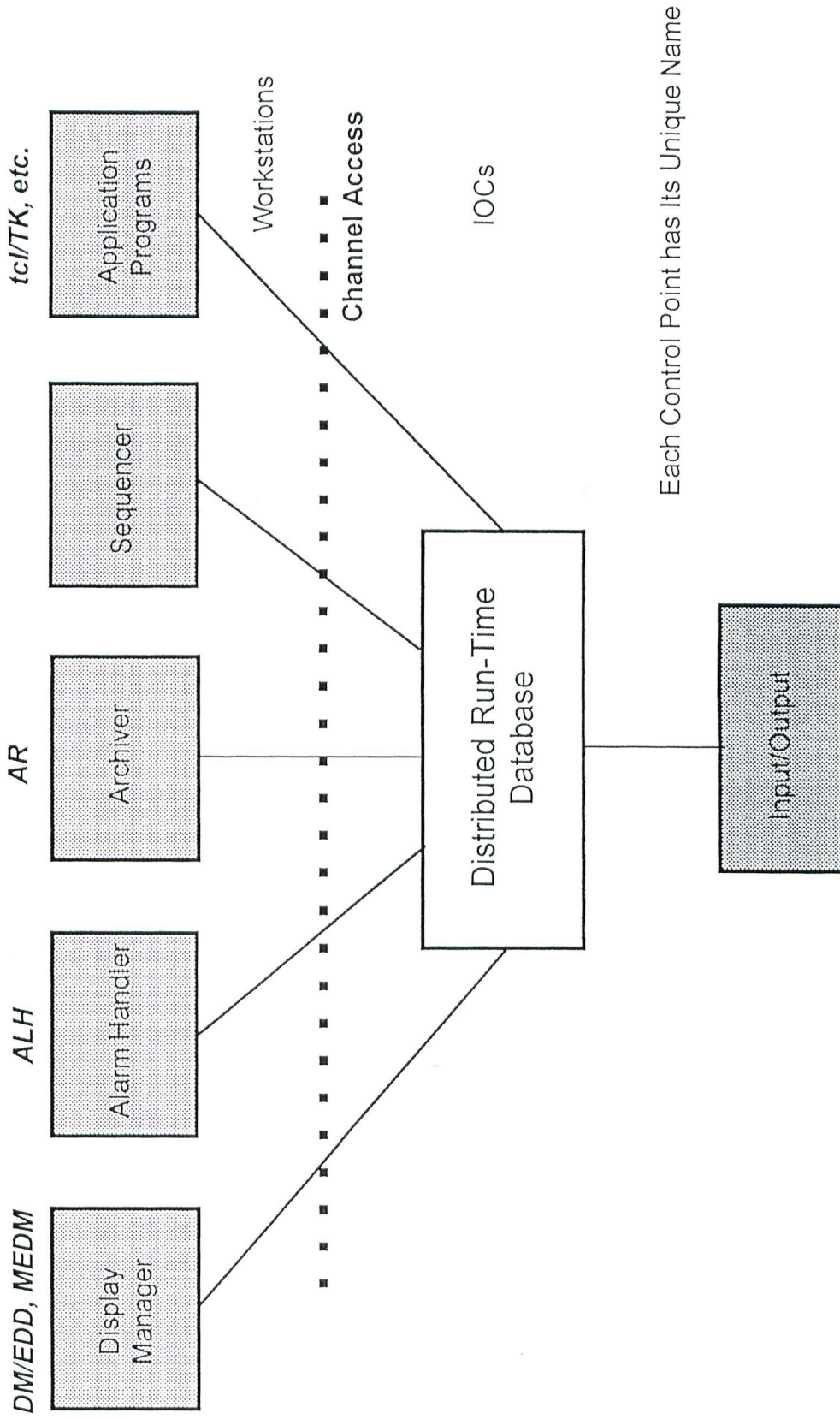
Software used with EPICS

- **Presentation Layer**
  - X-Window and Motif Window
  - DM/EDD(Display Manager/Display Editor)
  - MEDM for designing screens
  - PV-WAVE, Labview, Wingz
  - NODAL
  - tcl/TK
  - ObjectStore(Object Oriented Database System)
  - cdev(Control Device)
- **IOC Layer**
  - DCT(Database Configuration Tool)
  - GDCT(Graphical DCT)
  - BURT(Backup and Restore Tool)

EPICS Architecture

◆ **Functional Configuration**

DM/EDD, MEDM

ALH

AR

tcl/TK, etc.

- Display Manager
- Alarm Handler
- Archiver
- Sequencer
- Application Programs

Workstations

Channel Access

IOCs

Distributed Run-Time Database

Input/Output

Each Control Point has Its Unique Name

KEKB Controls

EPICS Architecture

◆ Functional Configuration

DM/EDD, MEDM — Display Manager

ALH — Alarm Handler

AR — Archiver

Sequencer

tcl/TK, etc. — Application Programs

Workstations

cdev

Channel Access

IOCs

Distributed Run-Time Database

Accessed by Pointing Objects

Input/Output

KEKB Controls