

# Development and Current Status of the Control System for 150 MeV FFAG Accelerator Complex

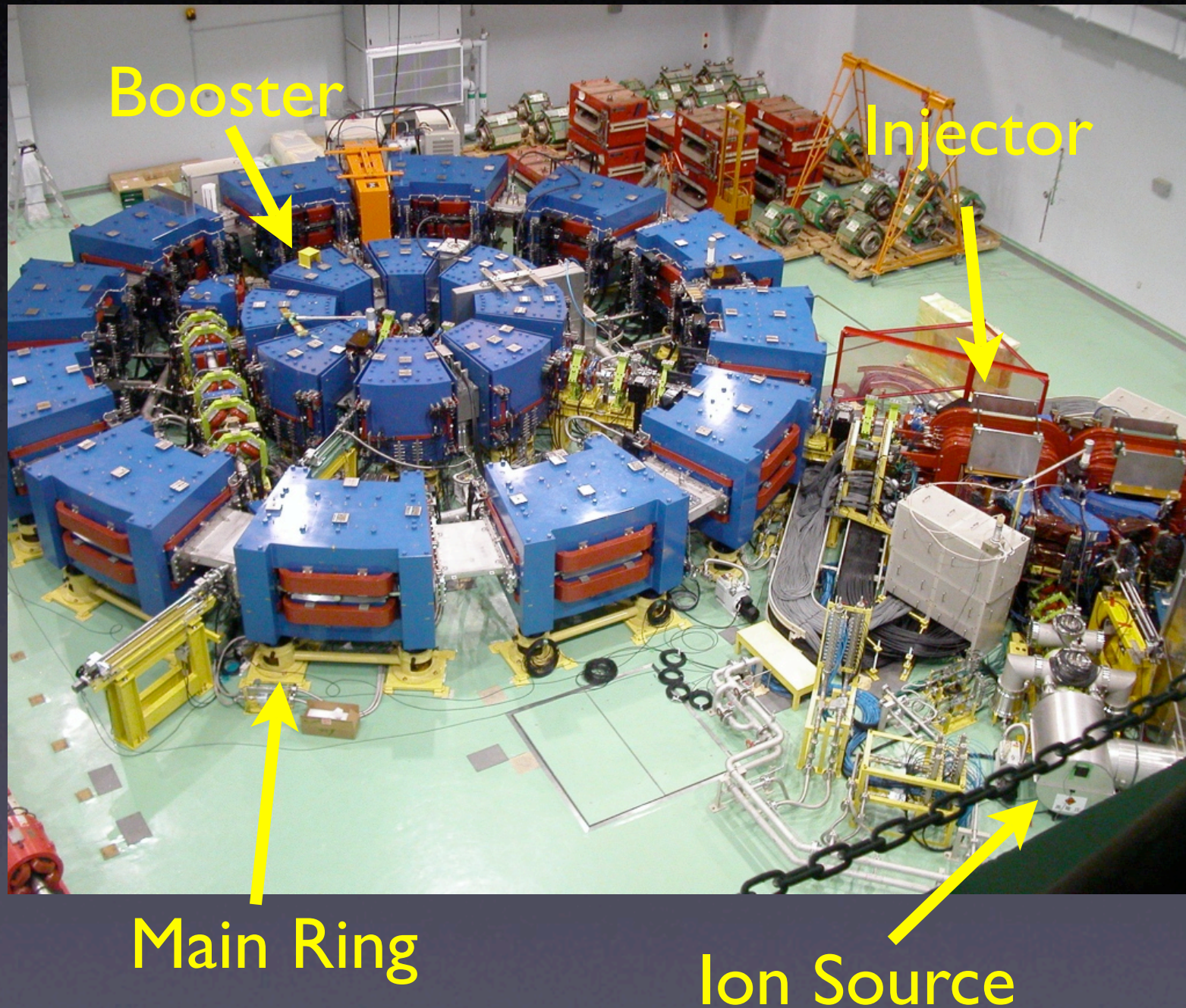
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Research Reactor Institute, Kyoto Univ.

A. Osanai, Graduate School of Technology, Kyoto Univ.



# FFAG at KURRI

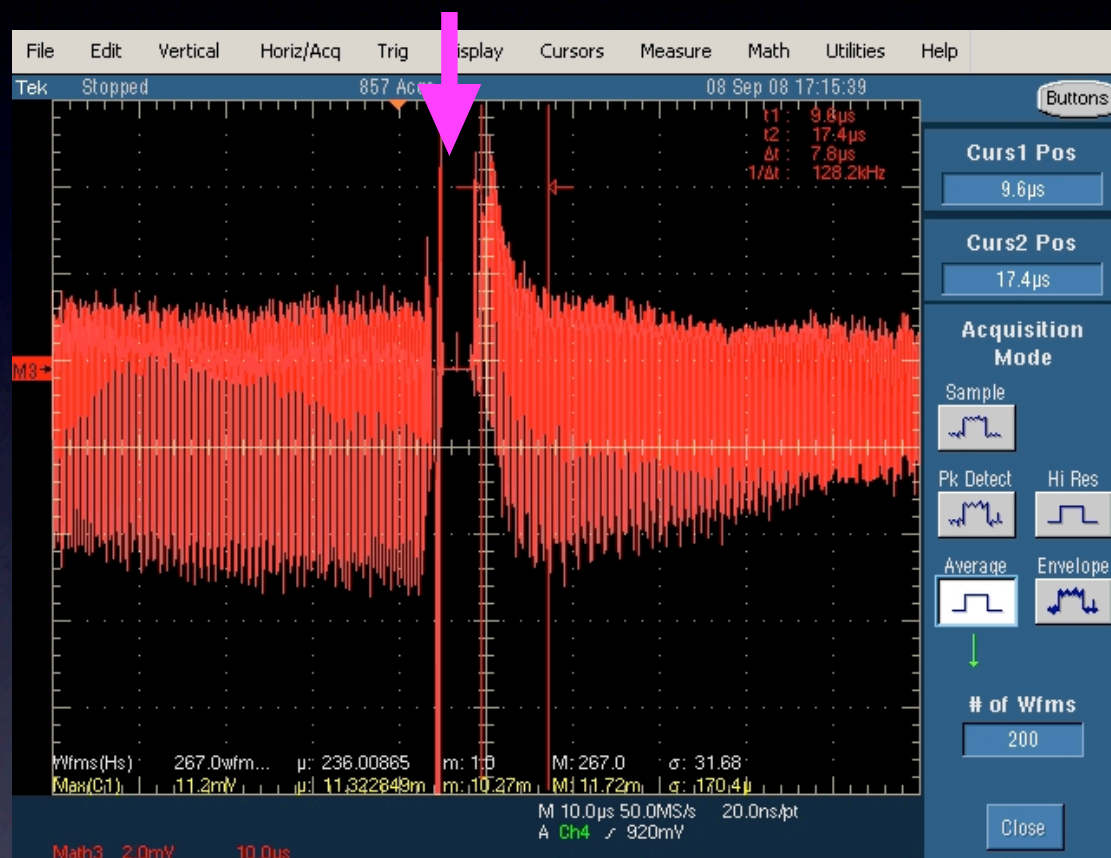


- Proton Driver for ADS Study
- $E_p = 20 \sim 150 \text{ MeV}$



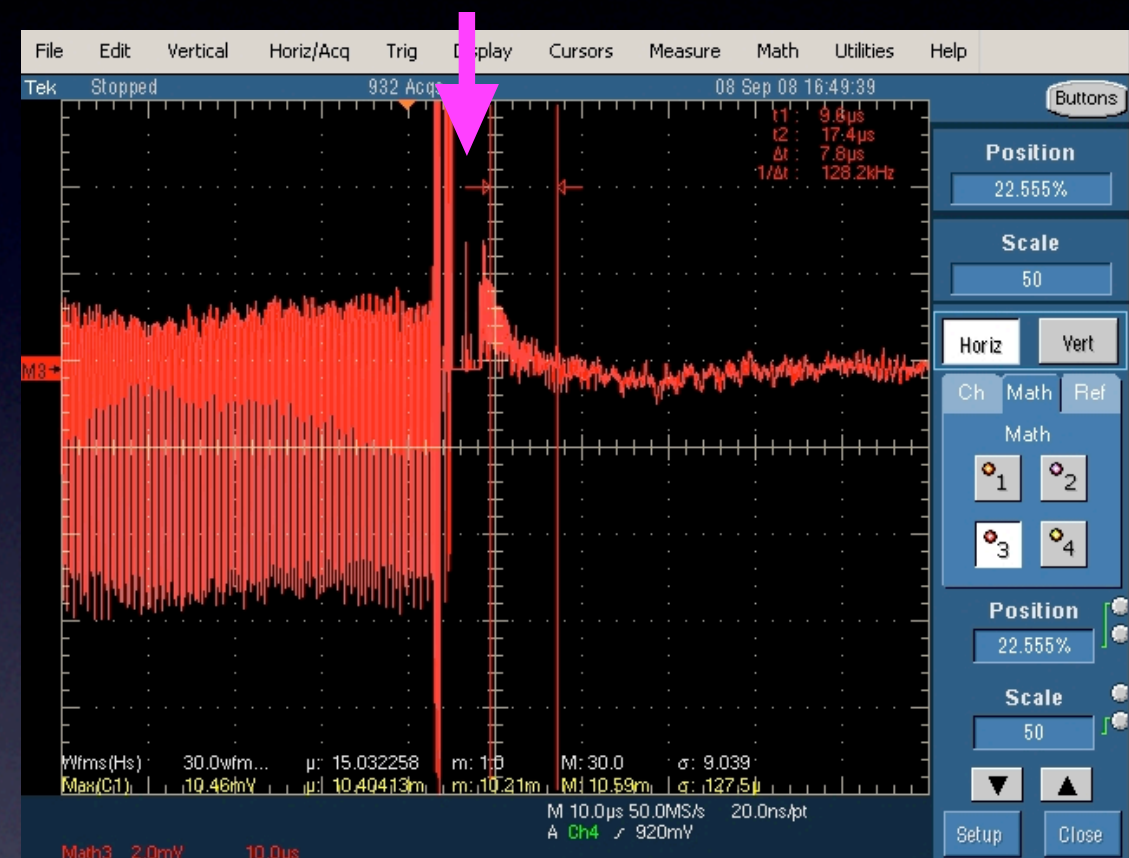
# Extraction Trial

Kicker Fire



Out of Phase

Kicker Fire



In-phase Kick

Injection to Septum Magnet for Extraction

# Control System for FFAG Complex

IP Network

High Flexibility

LabView

Easy Development  
Multi-Platform

PLC

Low Cost, High Reliability  
Driver-Free



# Framework

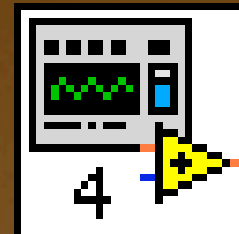
PLC



Communication

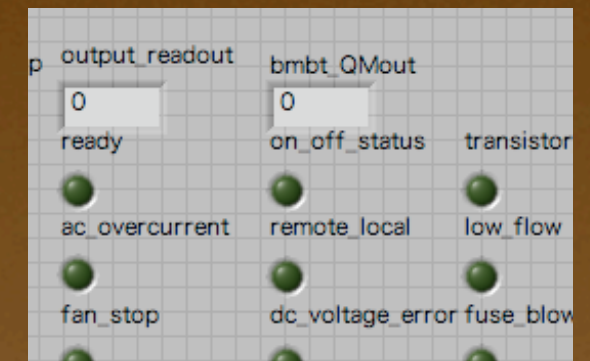
Communication

vi



refer/update

Global Variables



refer/update



MMI

LabView

Database

る箇所(要検討)、青字は要確認

コメント	信号名	アドレス	ビット	入
検出電流値	output_readout	100	1	入
準備完了	ready	101	0	入
交流過電流	ac_overcurrent	101	1	入
ファン停止	fan_stop	101	2	入
扉開	door_open	101	3	入
初期化中	running_initz	101	4	入
初期化完了	finished_initz	101	5	入
異常一括信号(1つでもオン)	error_summary	101	6	入
電源ON/OFFステータス	on_off_status	102	0	入
予備		102	1	入
remote/local	remote_local	102	2	入
直流電圧異常	dc_voltage_error	102	3	入
ブリッジ異常	bridge_error	102	4	入
過電流	over_current	102	5	入
過電圧	over_voltage	102	6	入
過熱	over_heat	102	7	入
トランジスタ異常	transistor_error	102	8	入
断水(冷却水低下)	low_flow	102	9	入
リセット	Force Run	102	10	入

Devices





# Recent Progress

- Developments in DAQ System
- “Software PLC”
- Applications to Other Facilities



# DAQ System

- Simple DAQ with LabView

Data Record by Writing to Local File

- DAQ Based on MyDAQ

Poster Presentation by Osanai (This Afternoon)

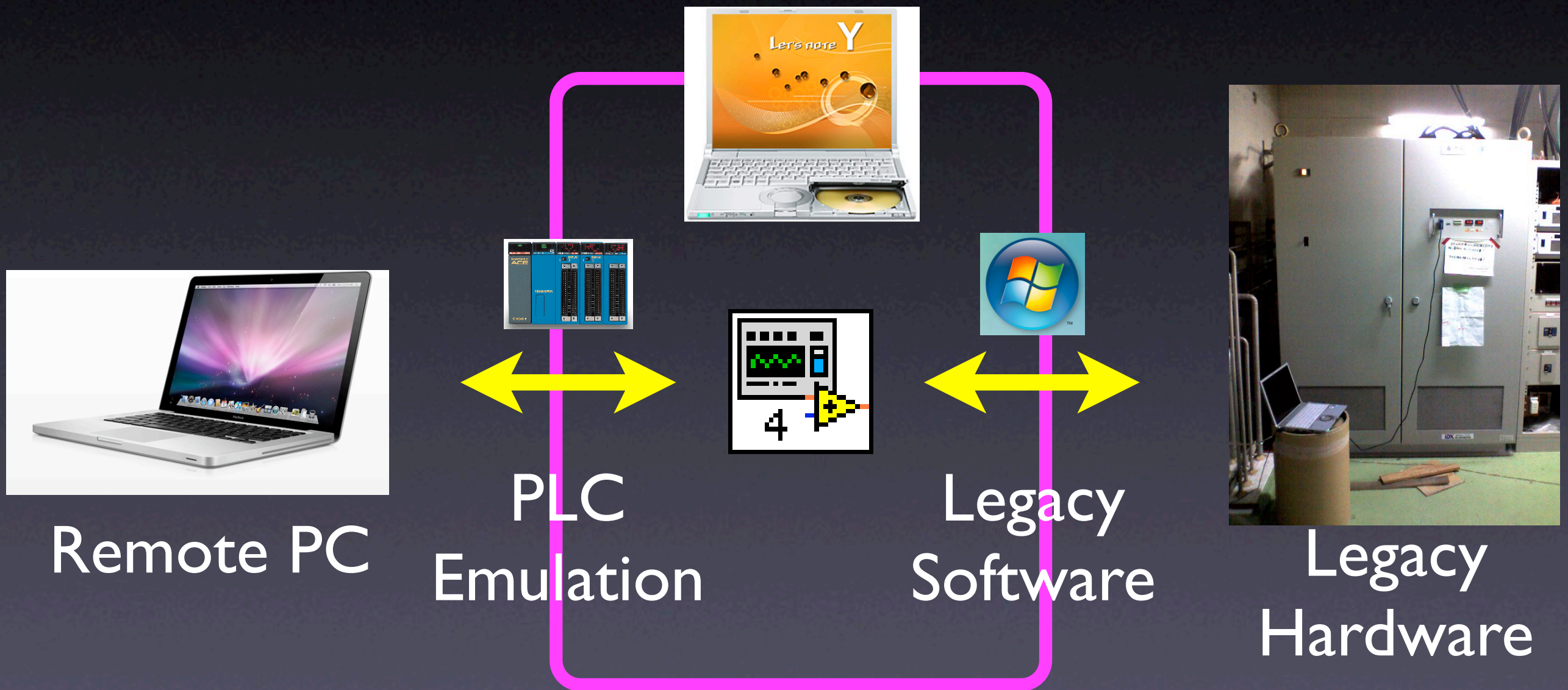
- Originally Developed DAQ

DAQ VI, Apache, MySQL, php



# “Software PLC”

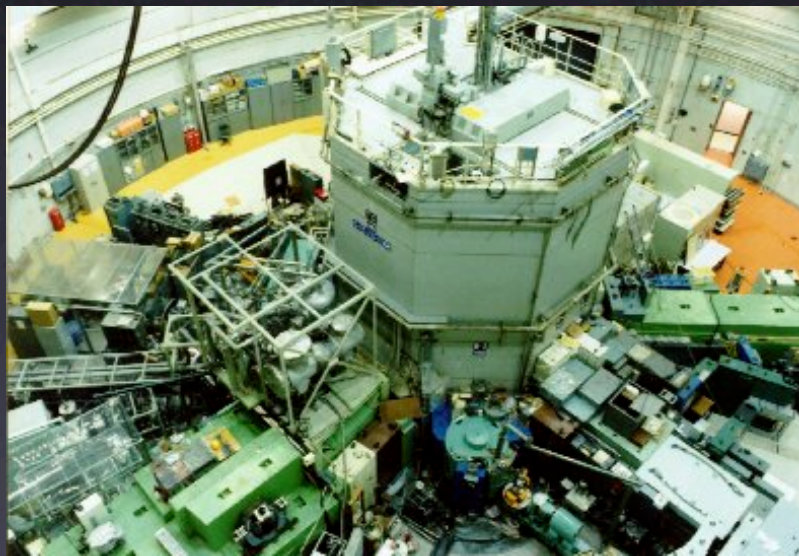
# Compatibility towards Legacy Hardwares





# Applications

## Neutron Irradiation System

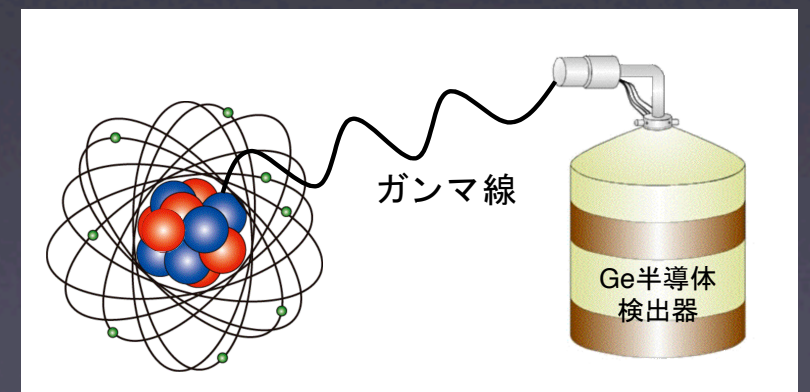
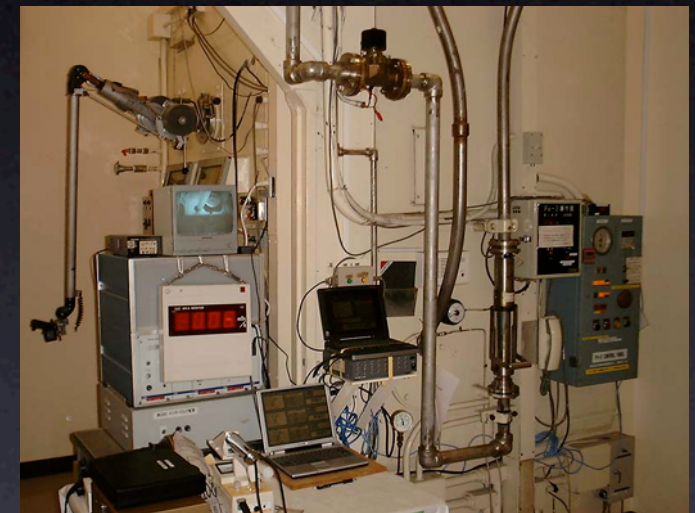


Neutron Absorption  
at Reactor Core

Push in



Push back

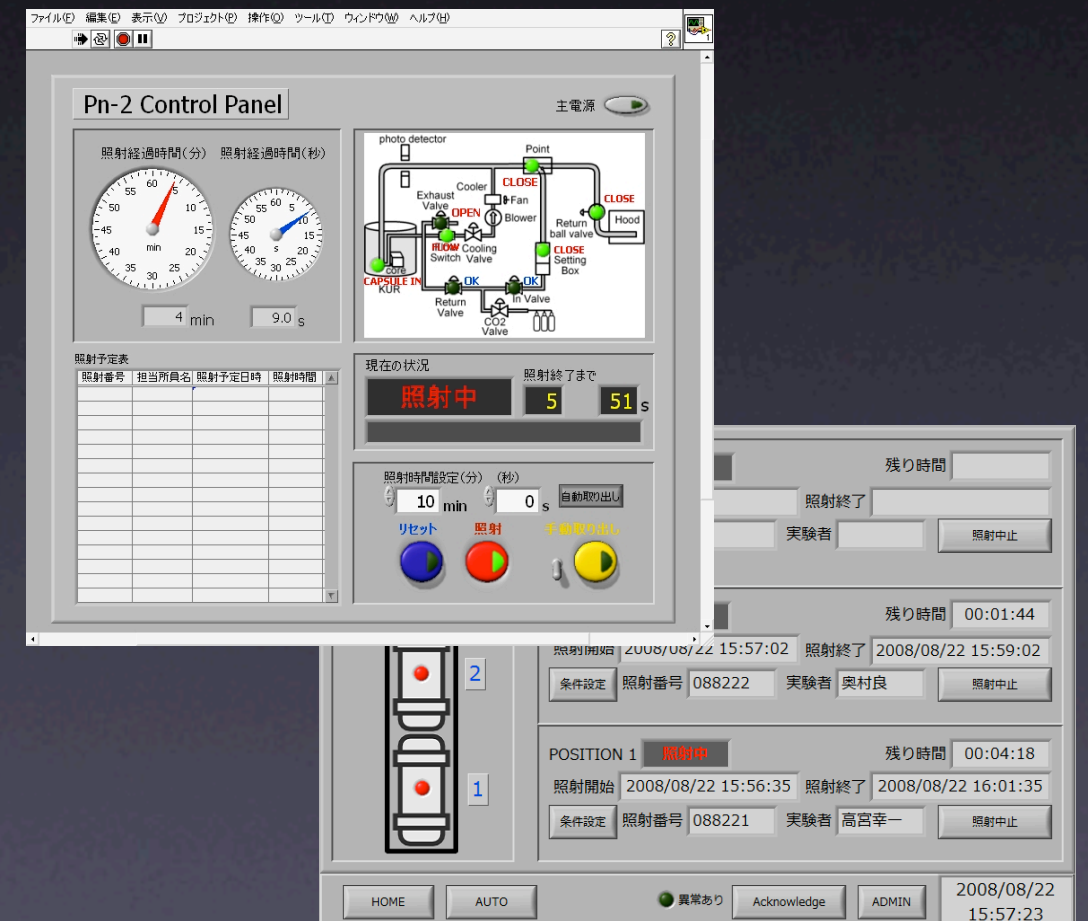


Directly Affects Stability of Reactor Operation



# Upgrade

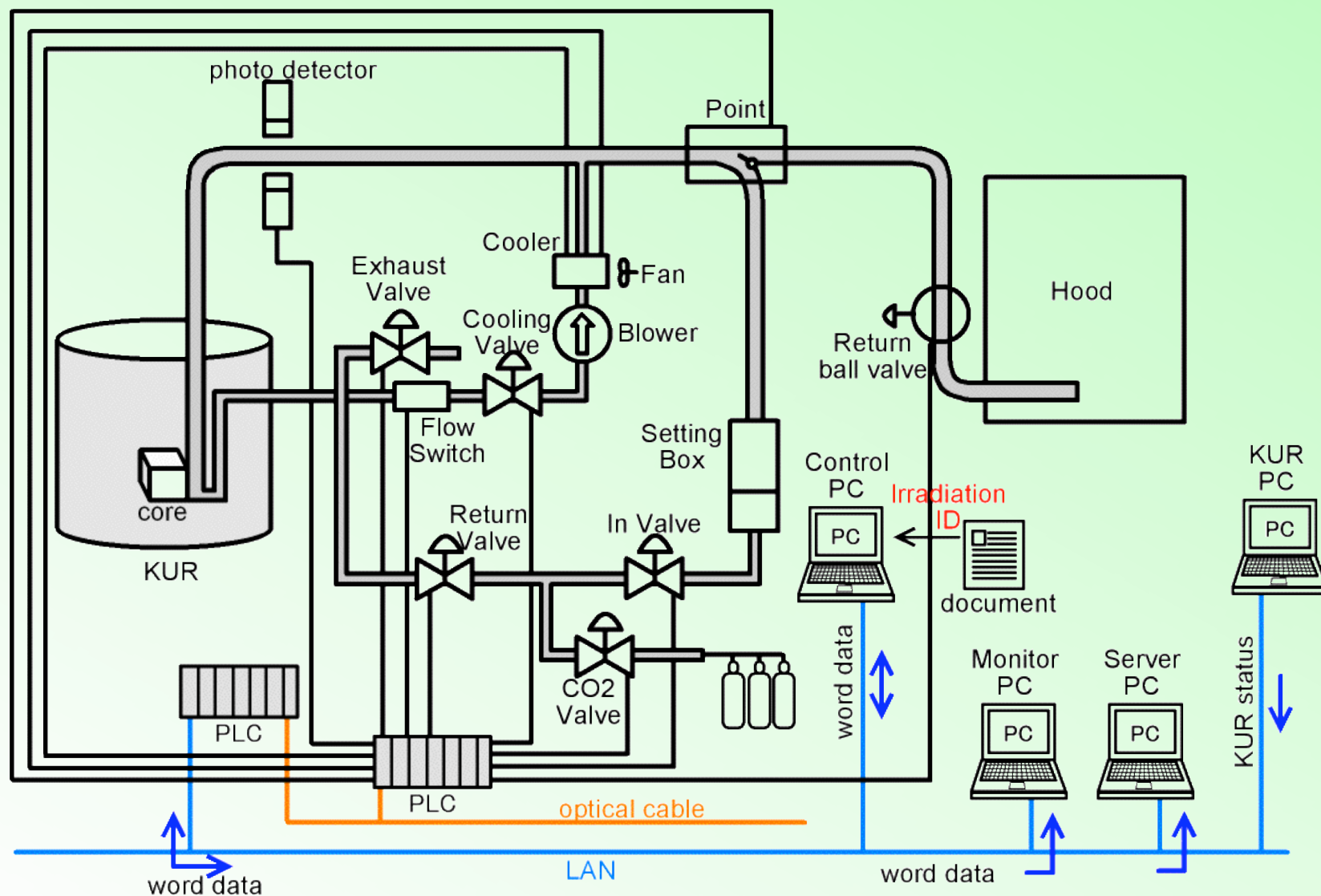
## Old Hardwiring System is Replaced



More User-Friendly, Higher Flexibility



# MySQL+Apache

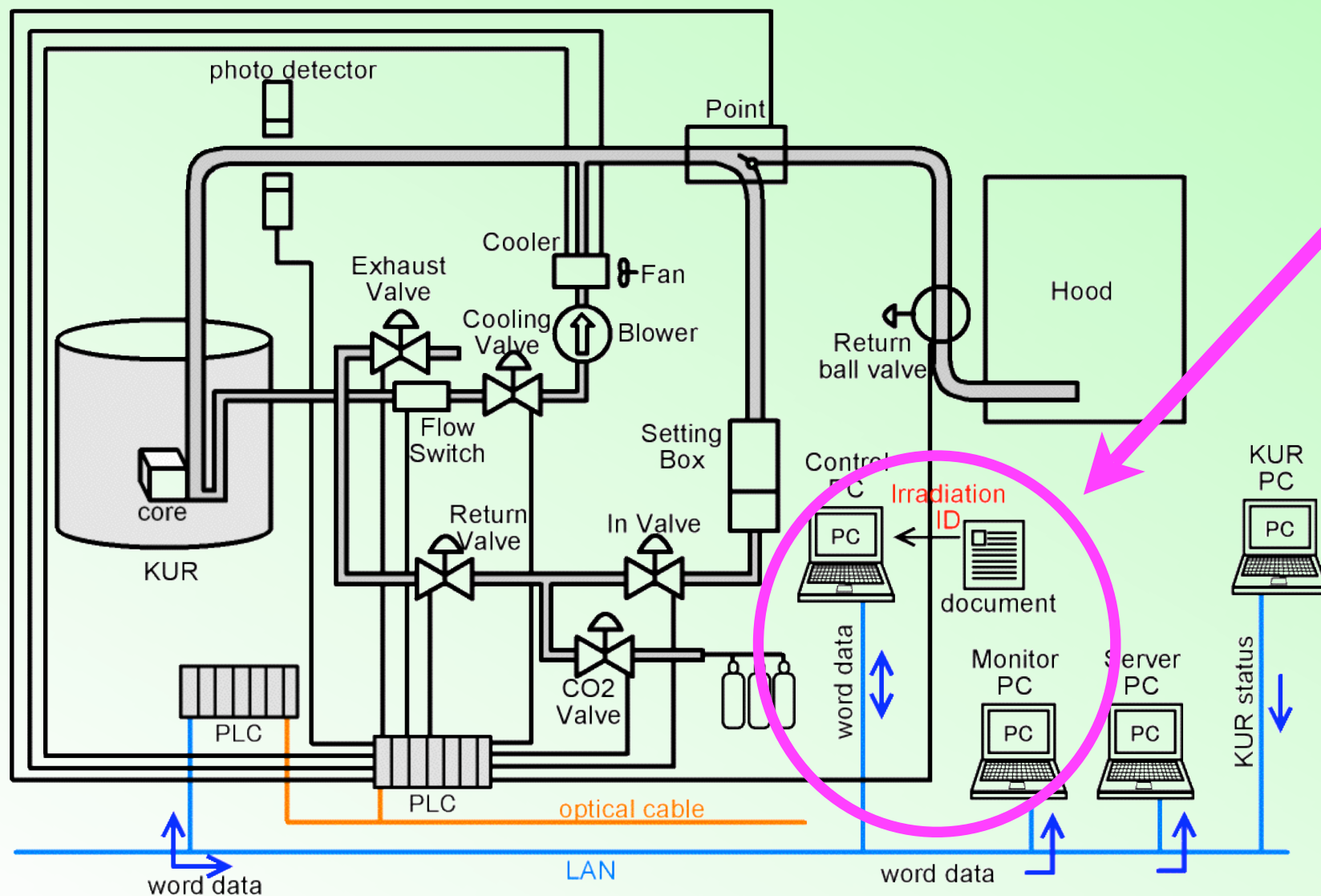




# Enhancements

MySQL+Apache

Web Based Monitoring  
& RI Tracking

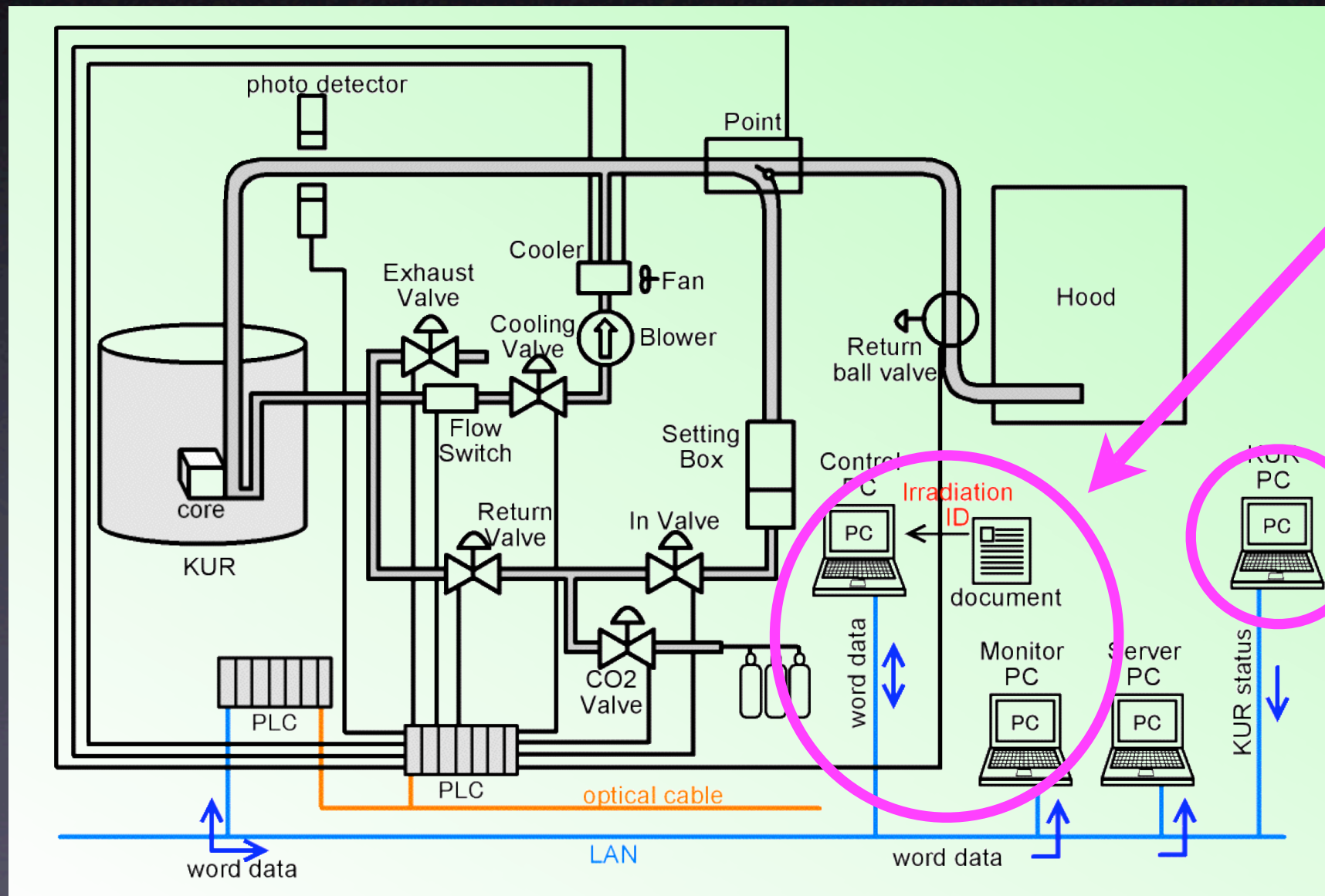




# Enhancements

MySQL+Apache

Web Based Monitoring  
& RI Tracking



Co-operative  
Operation with  
Control System  
of Reactor



# Review of Our Development



# Development Team

- Two Scientists (Physics, Chemistry)
- One Graduate Student (Accelerator Physics)
- Three Technicians (Nuclear Reactor)

Little Experience on Accelerators



# Problems in Small Institutes

- Limited Human Resource

  - No Special Staffs for Development

  - Insufficient Skills

  - Difficult to Establish/Maintain Own K.B.

- Limited Budget

  - Difficult to Buy New Hardware or License

- Time Deficit



# Our Solution

- Open Interface Based on Commercial Environment
- Minimized Training
- Cheap, Common Hardware
- Scalability, Simplicity



# Cheap, Common

- LabView

Compatibility toward Future, Multi-Platform

- PLC

Durable, Cheap

K.B. in Other Institute(KEK etc.)

- Windows, Mac OS

Common, Less Training

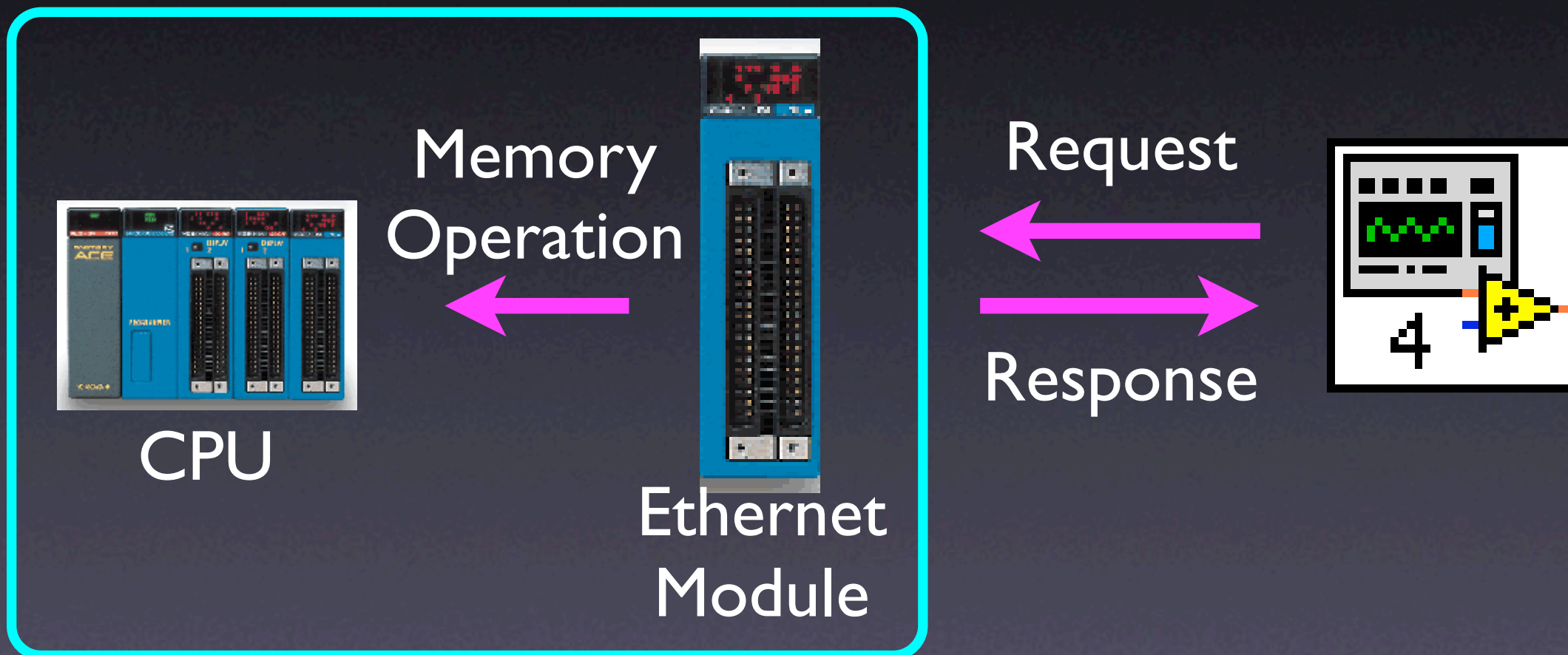


# How Simplified?

Database without Setup

FA-M3R

LabView

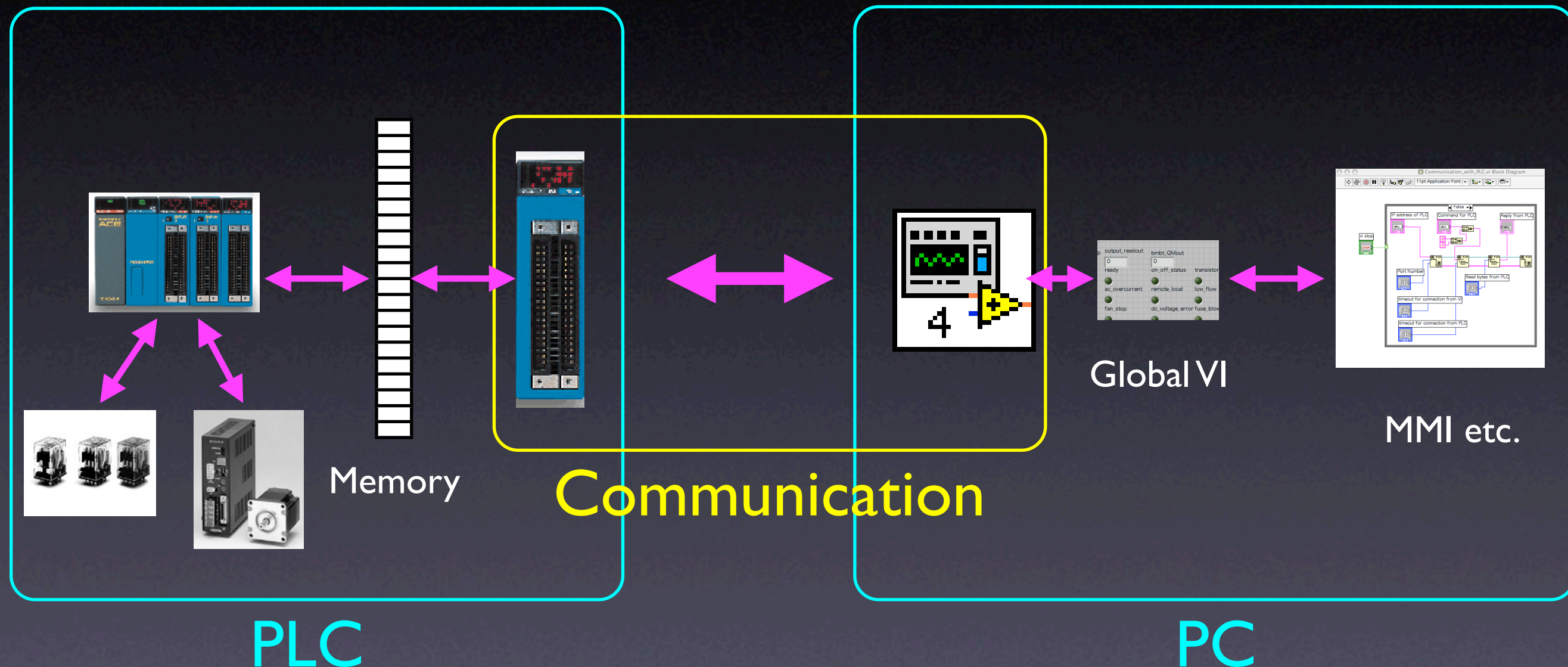


No CPU Programming for Memory Read/Write  
As Far As Initiated Externally



# Clear Separation

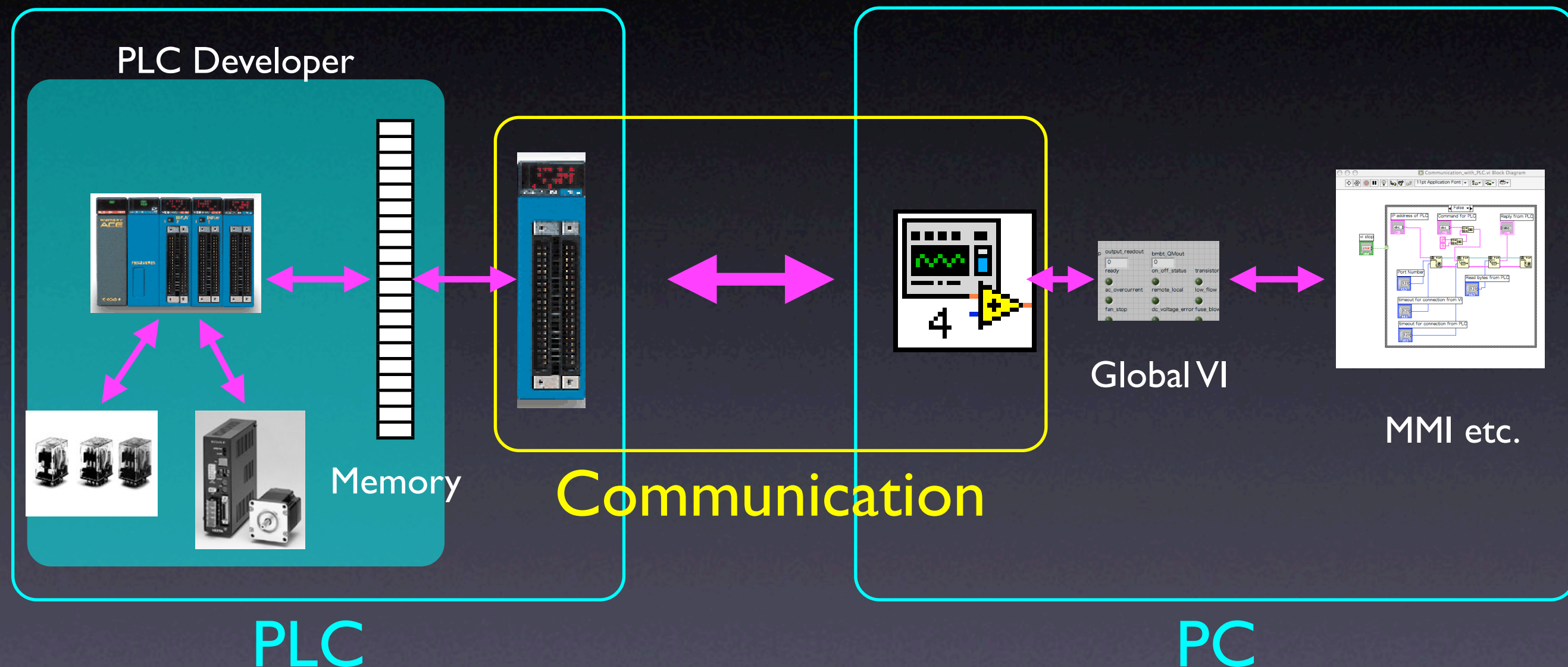
Covering, Limiting the Function





# Clear Separation

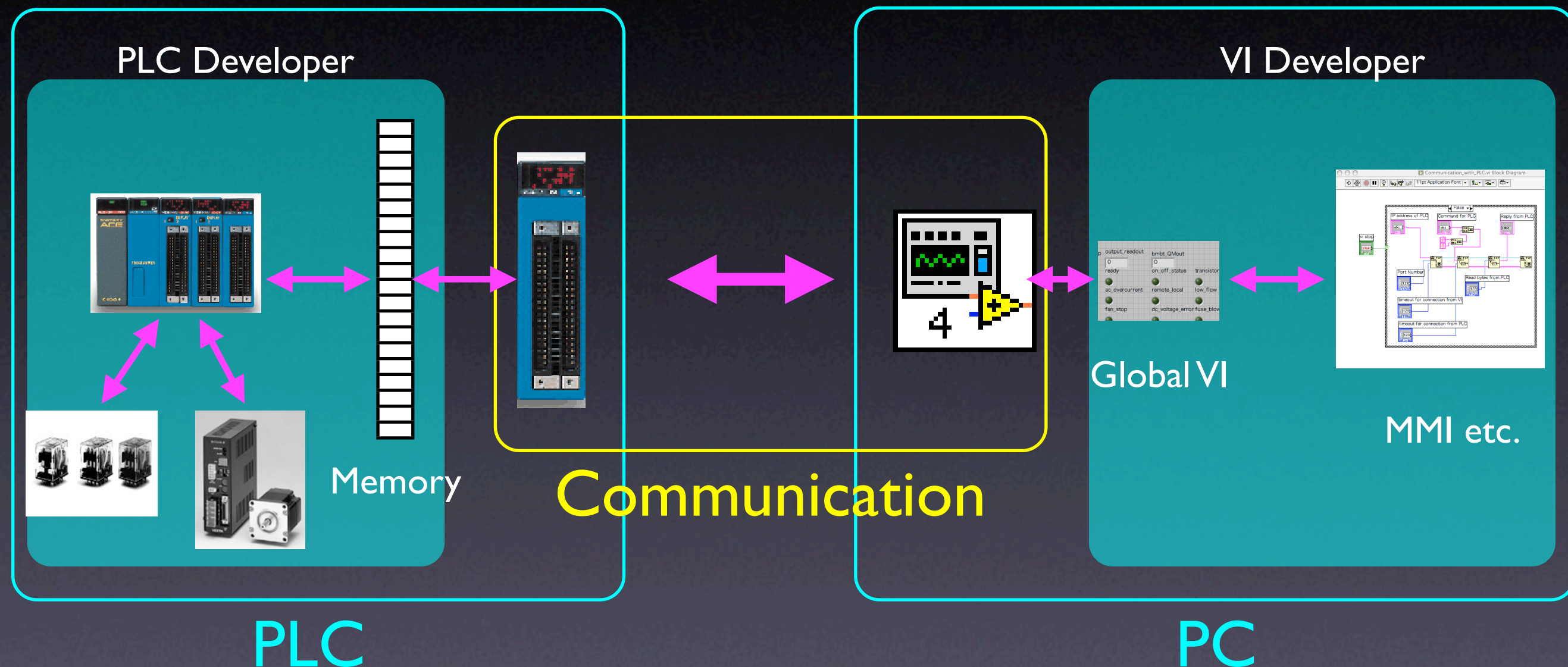
Covering, Limiting the Function





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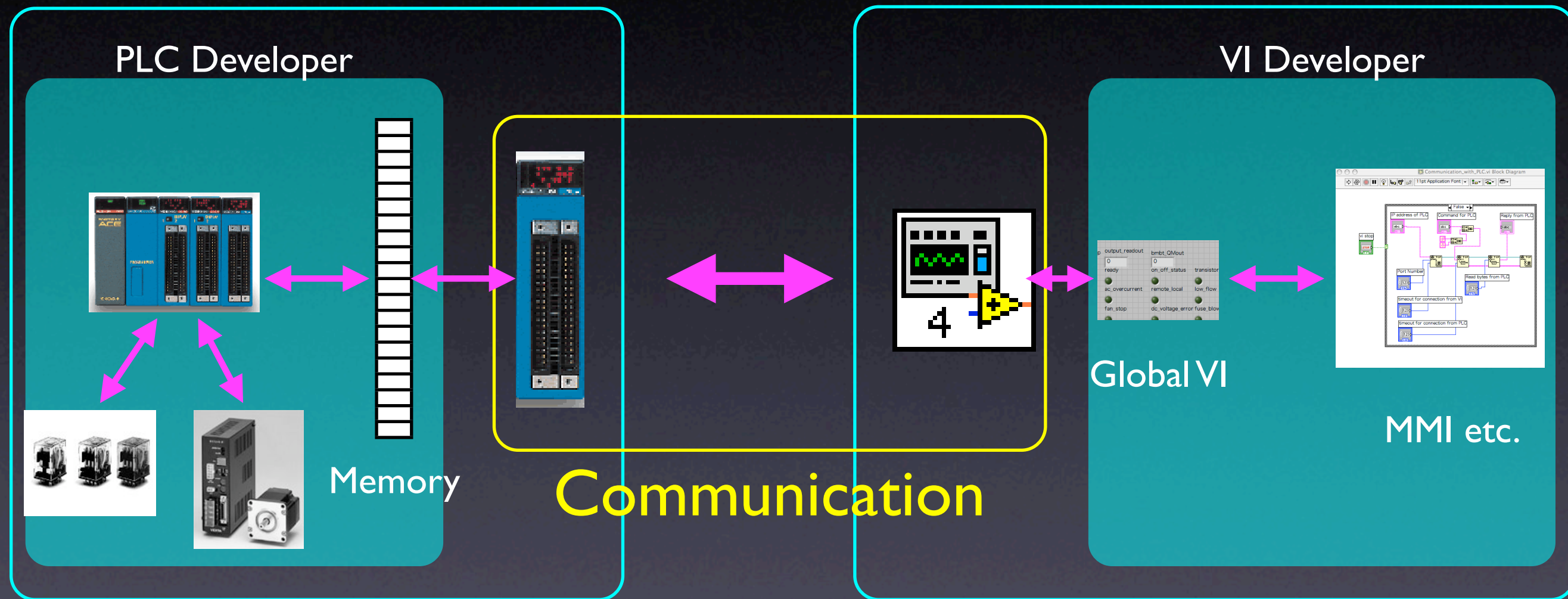
Covering, Limiting the Function





# Clear Separation

Covering, Limiting the Function



PLC

PC

The screenshot shows an Excel spreadsheet with multiple columns and rows of data, representing an allocation table. The data includes various numerical values and text labels, organized in a structured manner.

Excel File

Allocation Table



# Needs in Small Institutes

- Smooth Transfer of Success  
in the Fore-Front of PC-based Control System
- Easiness is Superior to Highest Performance
- Competitive Price Other Than in License Fee
- Common, Long Supported Environment

Subset of Control System Environment  
Based on Popular Commercial Environment