Introduction of COACK to the HIBP Control

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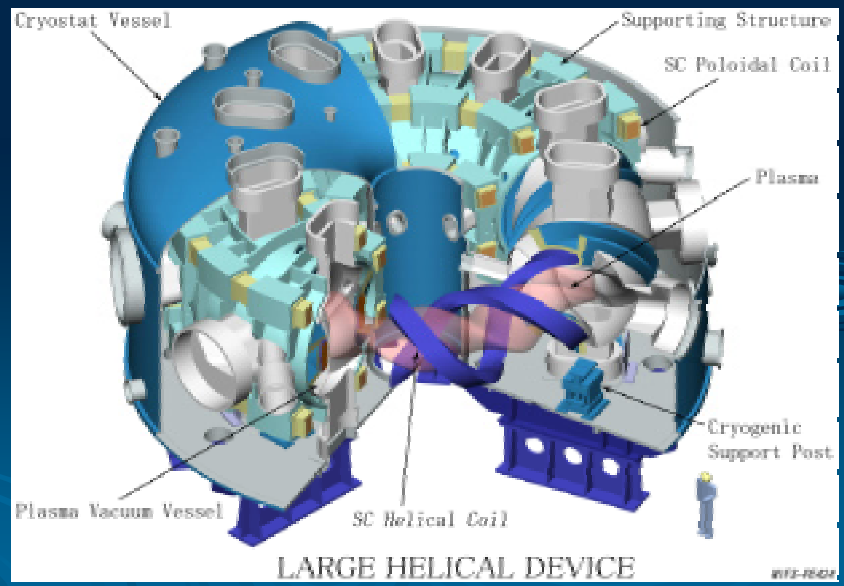
Large Helical Device (LHD) Project

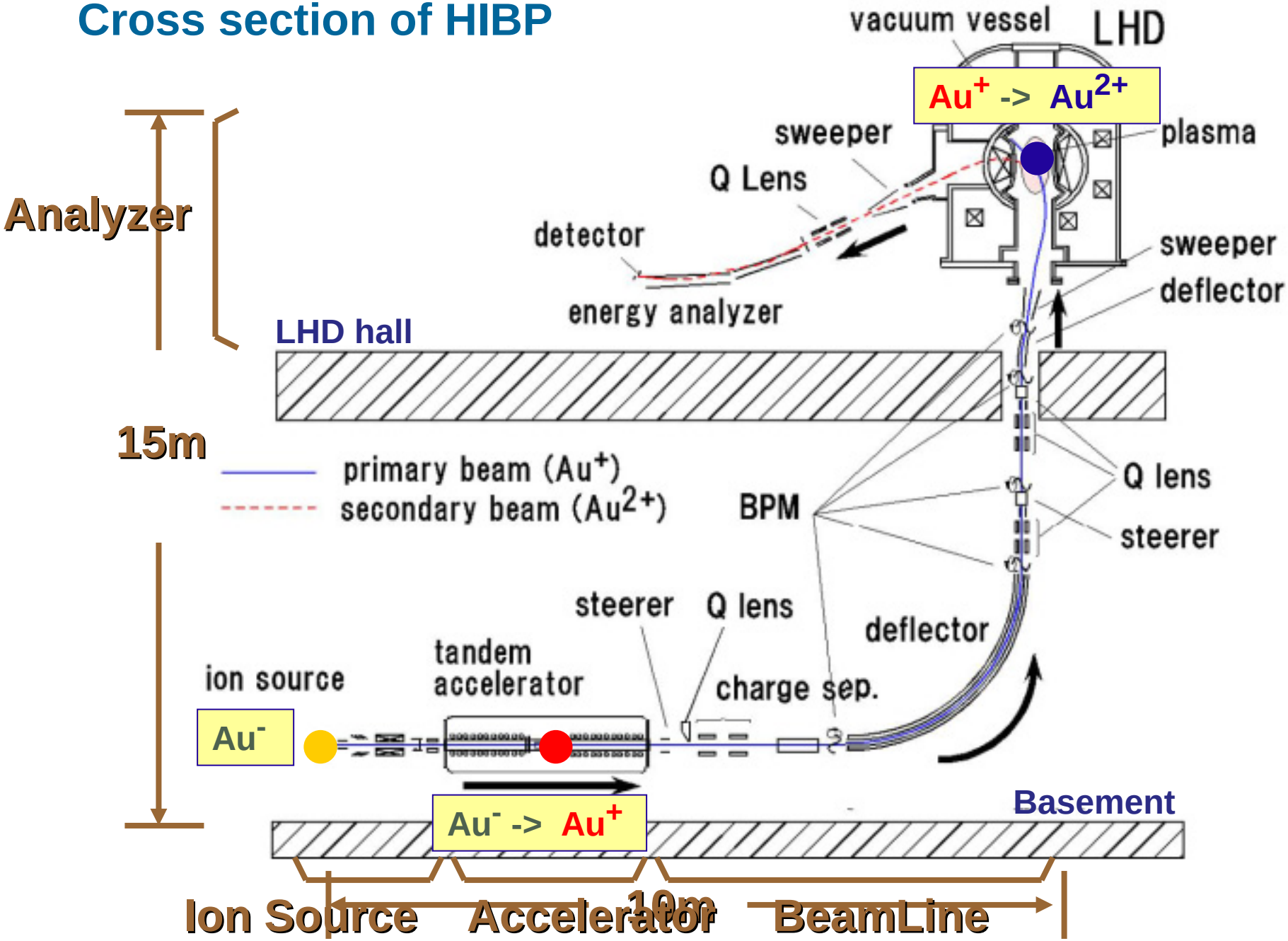
- The mission is to develop a scientific basis for stellarator fusion reactor.
- The important feature is a high magnetic field(3-4T) with one of the largest super-conducting magnets in the world.
- The experiment was started in spring in 1998.



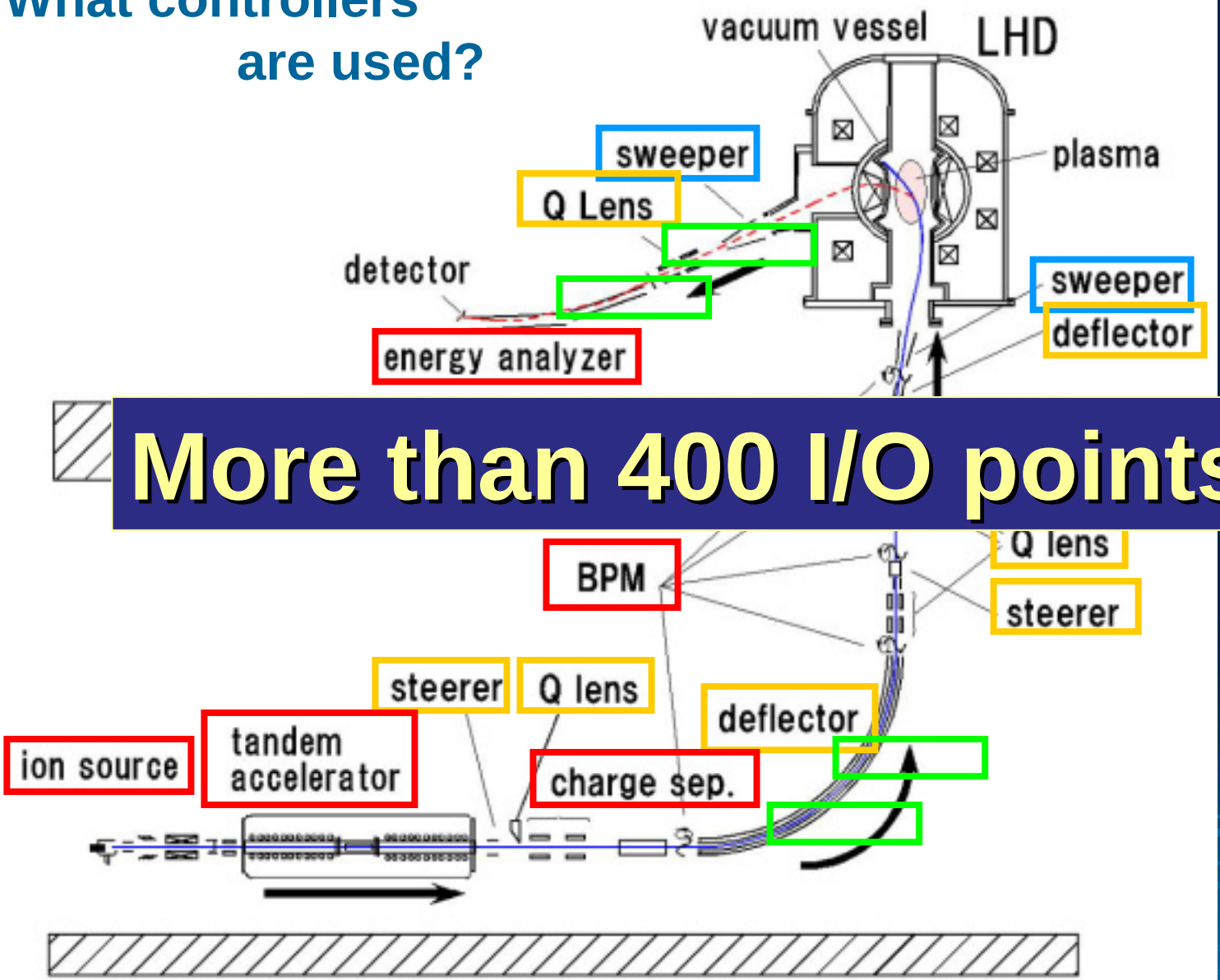
What is the HIBP?

- HIBP = Heavy Ion Beam Probe
- One of the about 50 diagnostic devices
  which belong to LHD.
- The purpose is
  to analyze the local electric field inside the fusion plasma and to research the plasma turbulence of the density and the electric field.

Cross section of HIBP



What controllers are used?



More than 400 I/O points !!

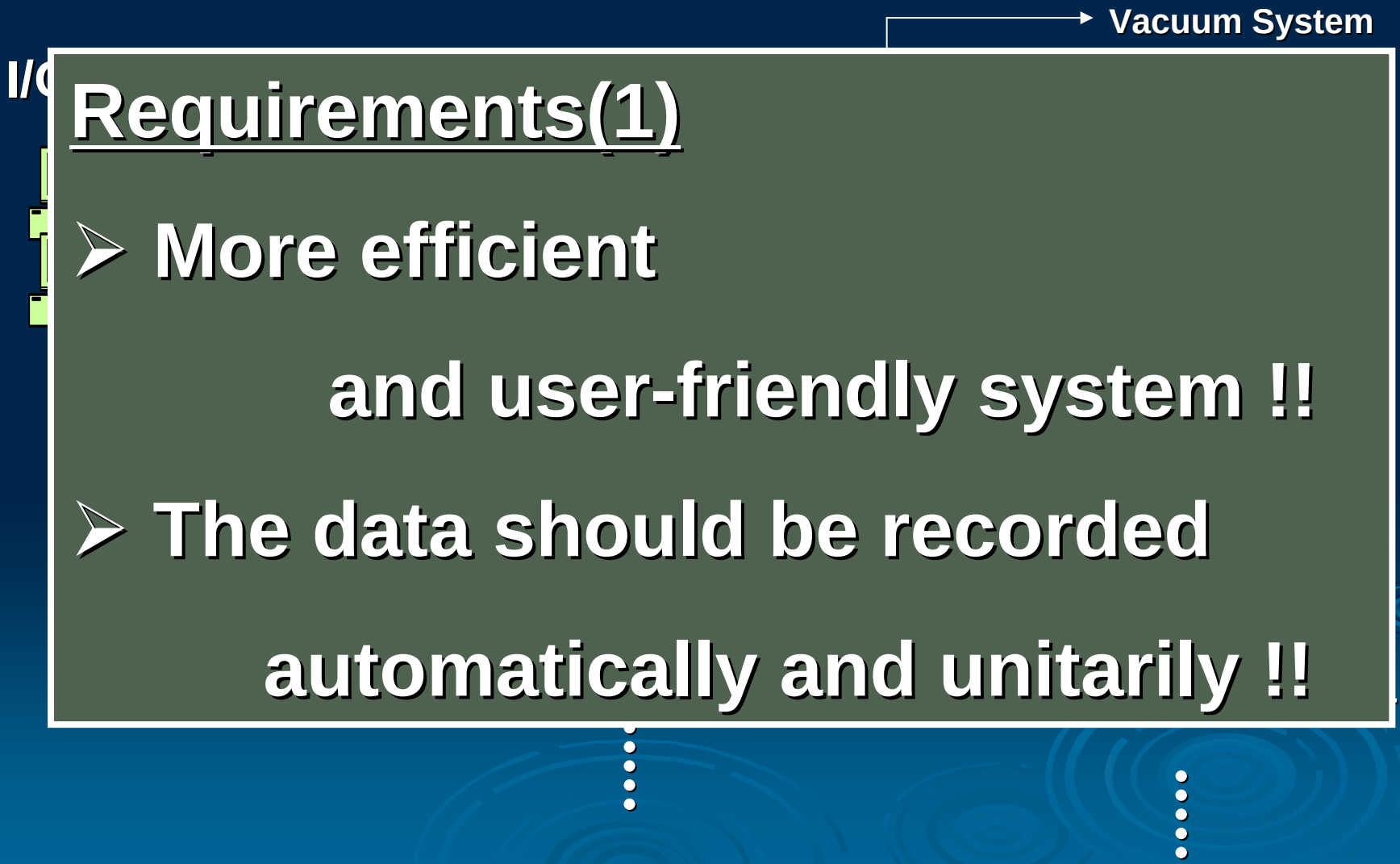
PLC

Func. Generator

CAMAC

Gauge Controller

HIBP control system



Requirements(1)

- **More efficient and user-friendly system !!**
- **The data should be recorded automatically and unitarily !!**

Requirements(2)

We decided to introduce COACK!!

through the network !!

Actual operation is done in the control room.

It's forbidden to enter during the plasma experiment.

What is the COACK?
(Component Oriented Advanced Control Kernel)

Features

- PC based operation management system
- Component oriented system by using DCOM
- Easy development by using Visual Basic

Main Functions

-)
- .....

Please refer to the paper:

"Recent status on COACK project"

I.Abe, M. Mutoh, et al,
PCaPAC2000, Hamburg, October 2000.

What is the step to Introduce COACK?

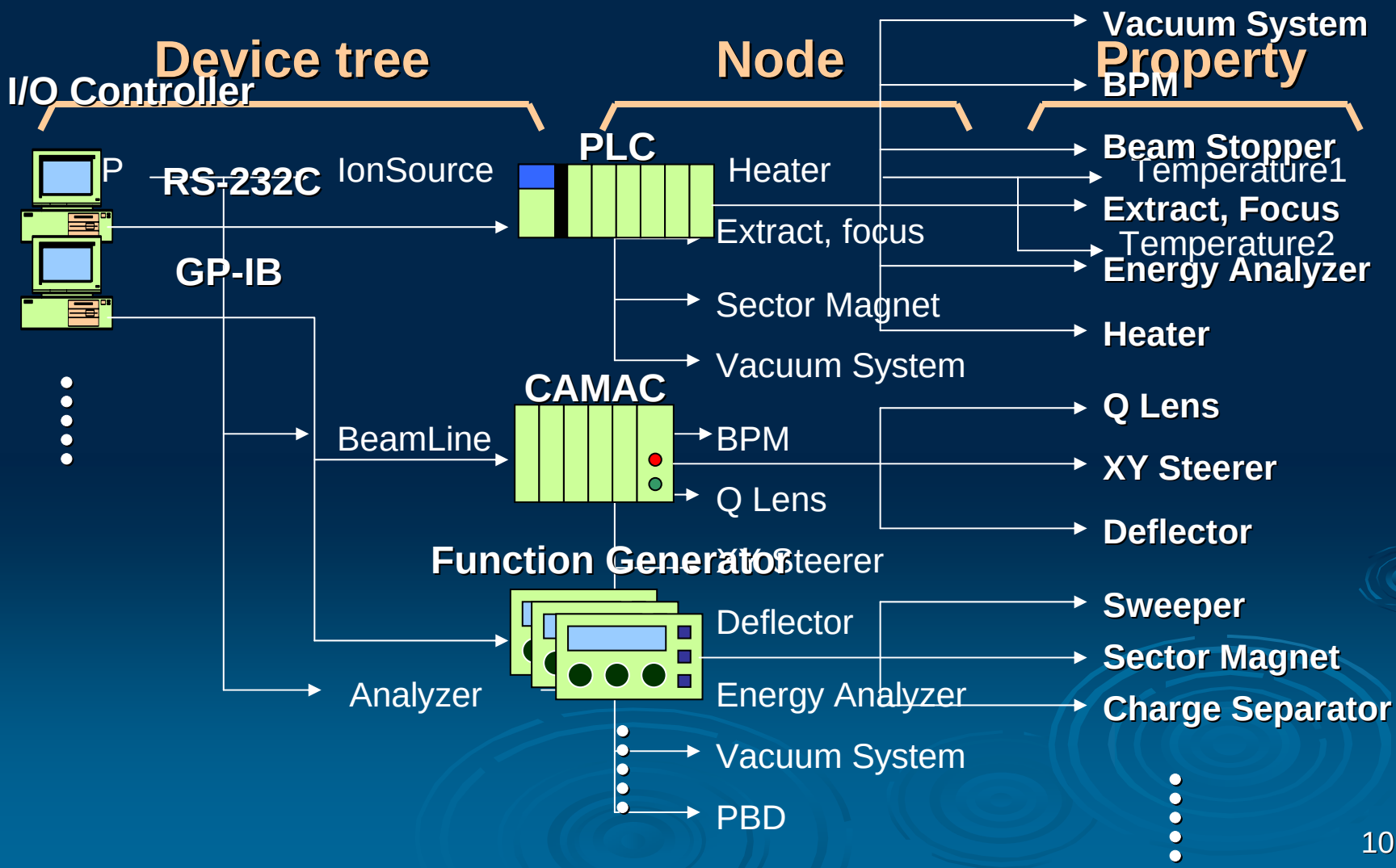
Preparation

- Only the Visual Basic education is required.

Three steps to introduce COACK

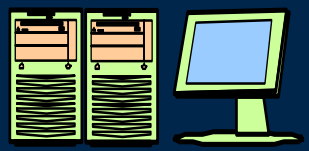
- Step1: Server and Client Installation
- Step2: Make a I/O table and regist it to the server
- Step3: Client programming
  (sample program is available)

Step2: Make a I/O Table and Regist into server



Step2: Make I/O Table and Regist into server

COACK Server



COACK Client
(Operation Terminal)

I/O Controller

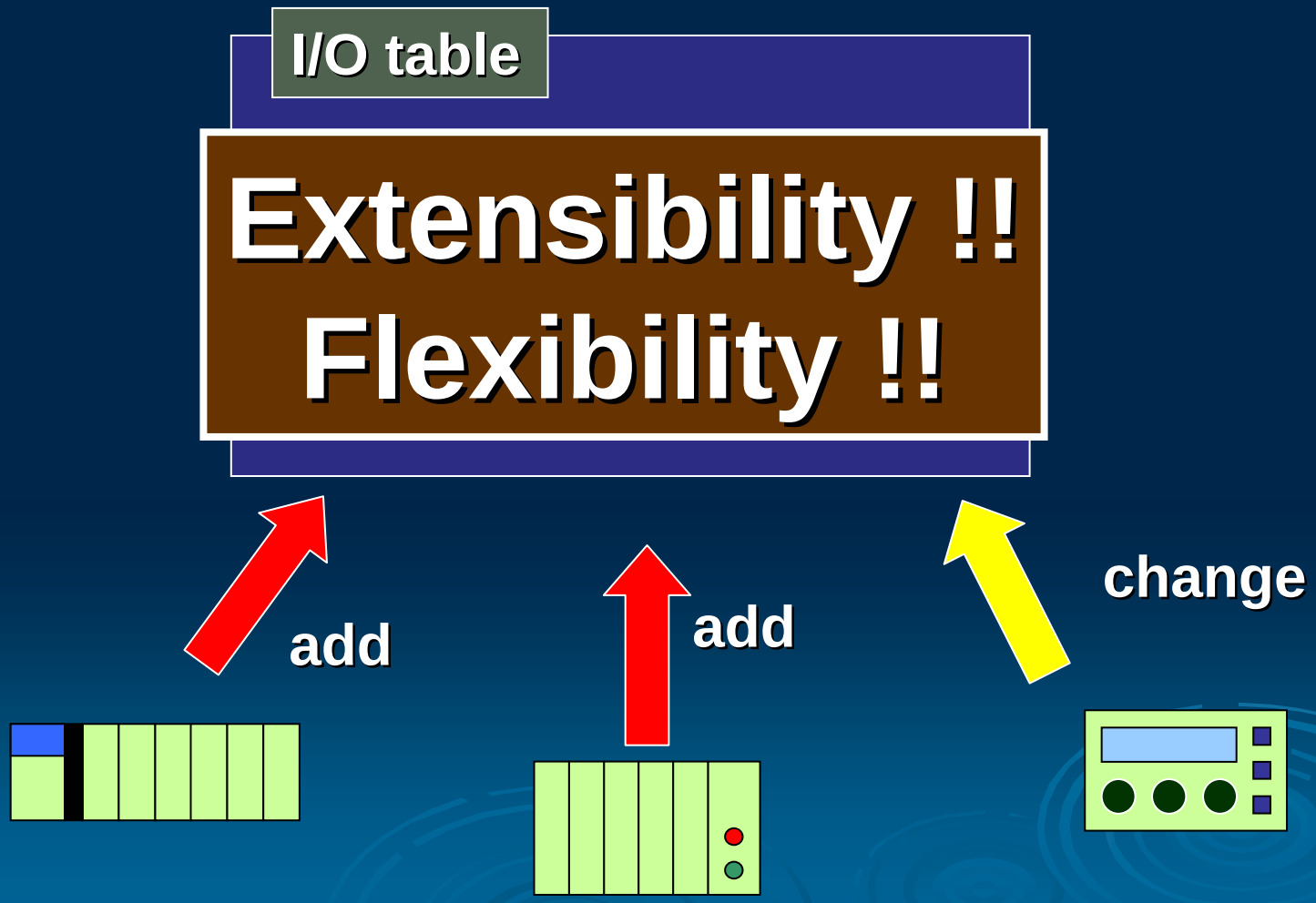
HIBP

I/O table

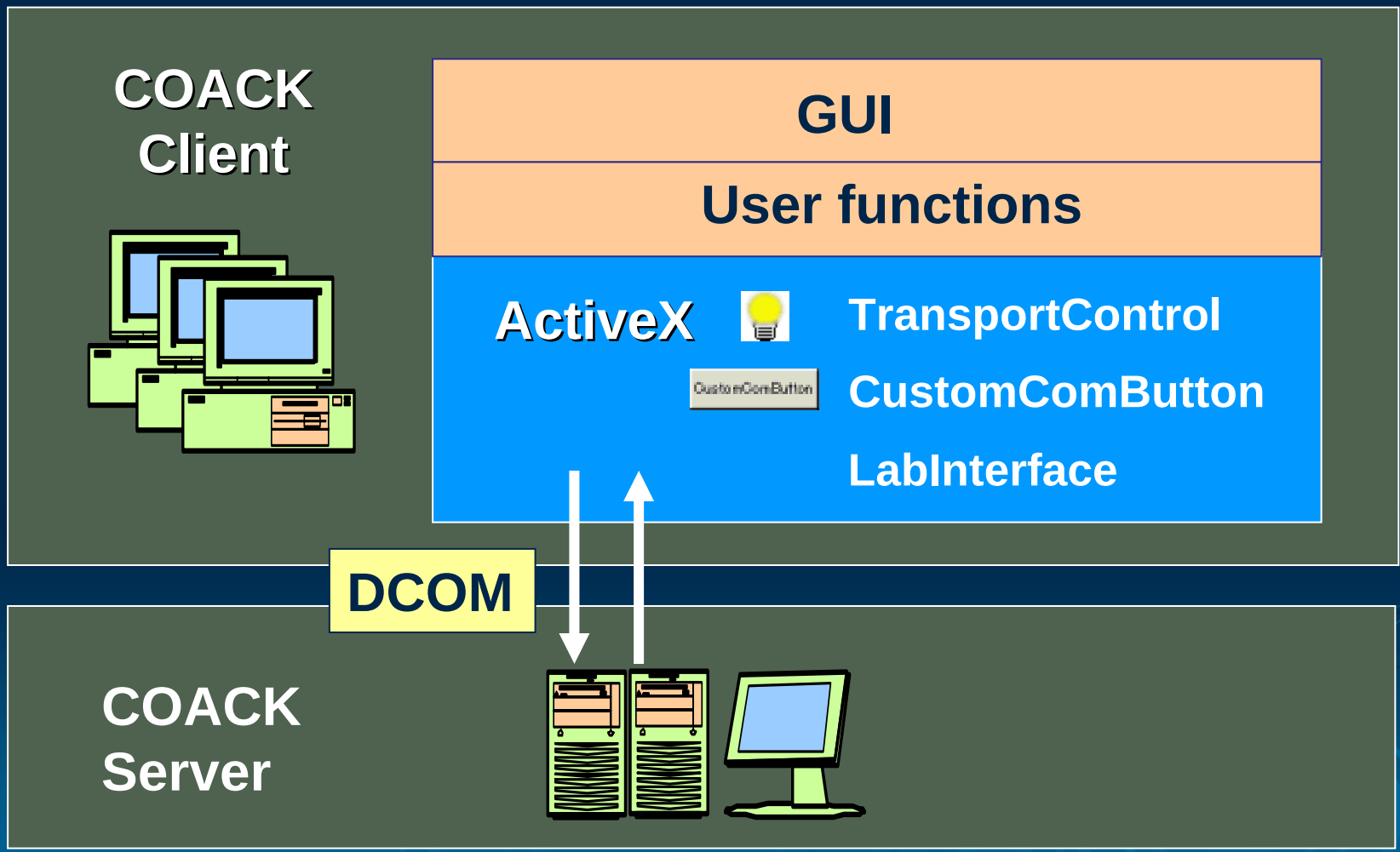
Independent from I/O interface
RS-232C, GPIB

Virtual Machine

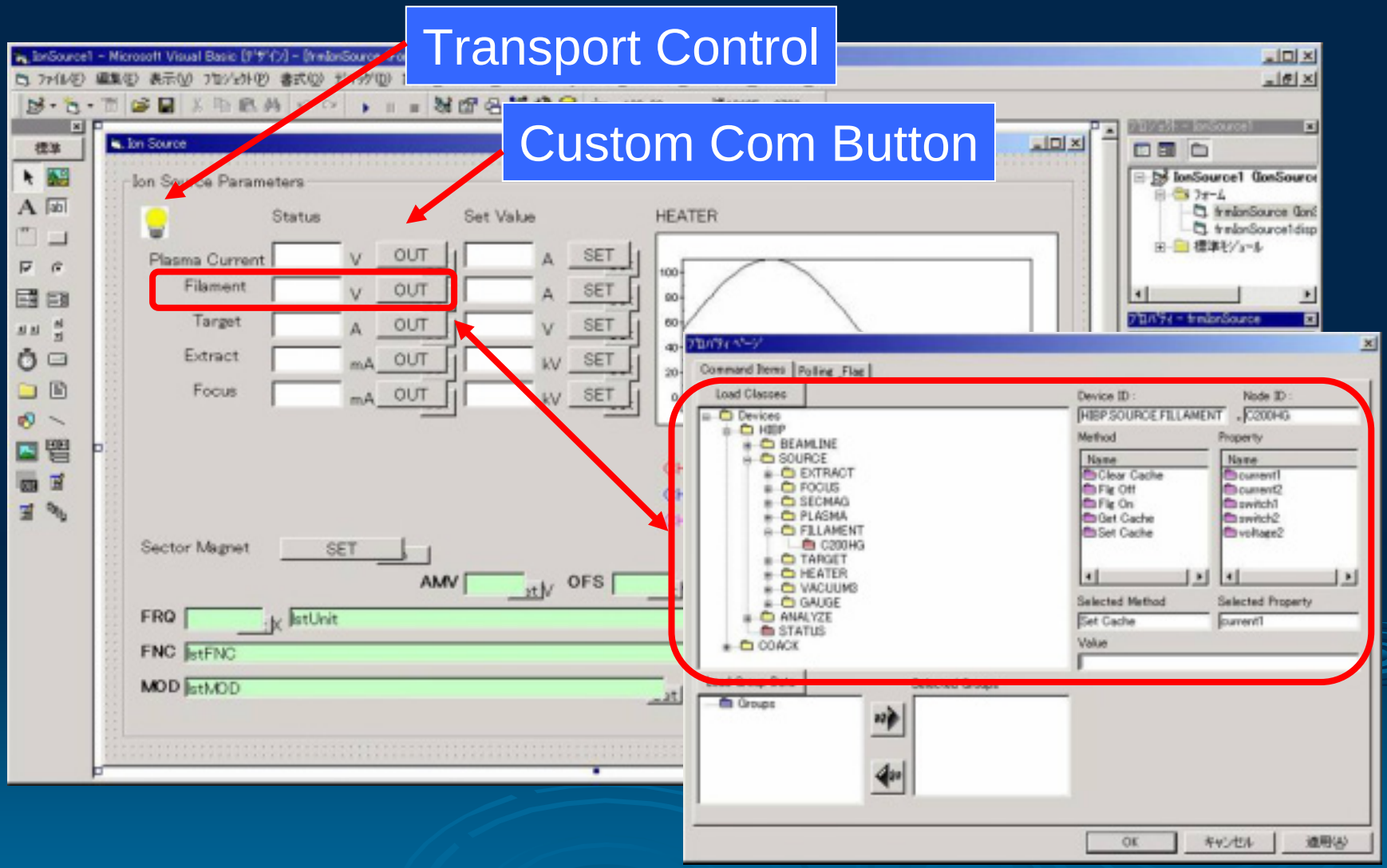
Advantage of the virtual machine



Step3: Client Programming



Step3: Client programming (Visual Basic)



Step3: Programming (Visual Basic)

Example of set value function

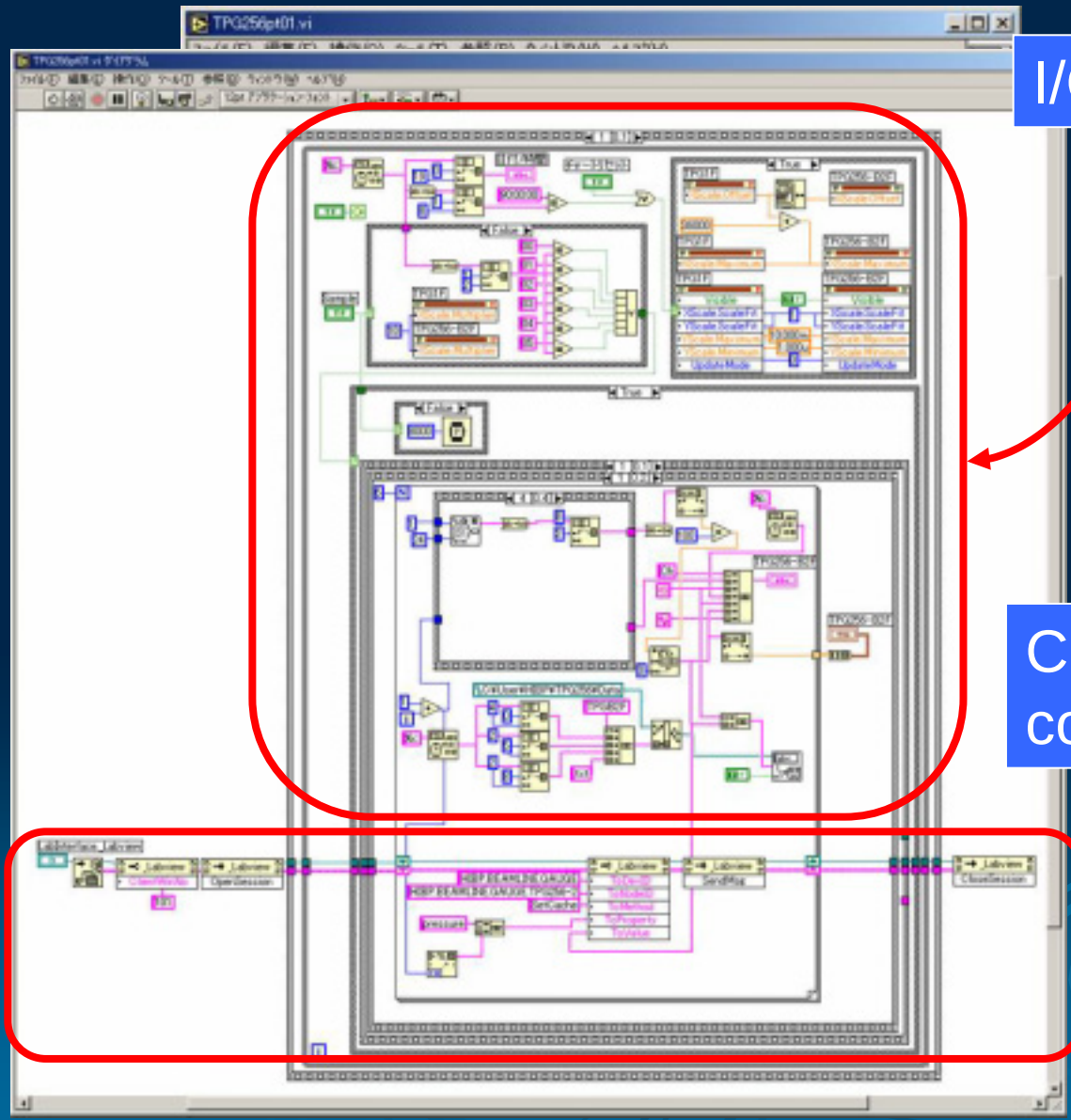
```
Private Sub cmdSetCache_Click()
    'Copy the input value to the property of the CustomComButton
    ccbSetCache .PropertyValue = txtSetValue.Text

    'Execute set value
    ccbSetCache .cmdButton_Click
End Sub
```

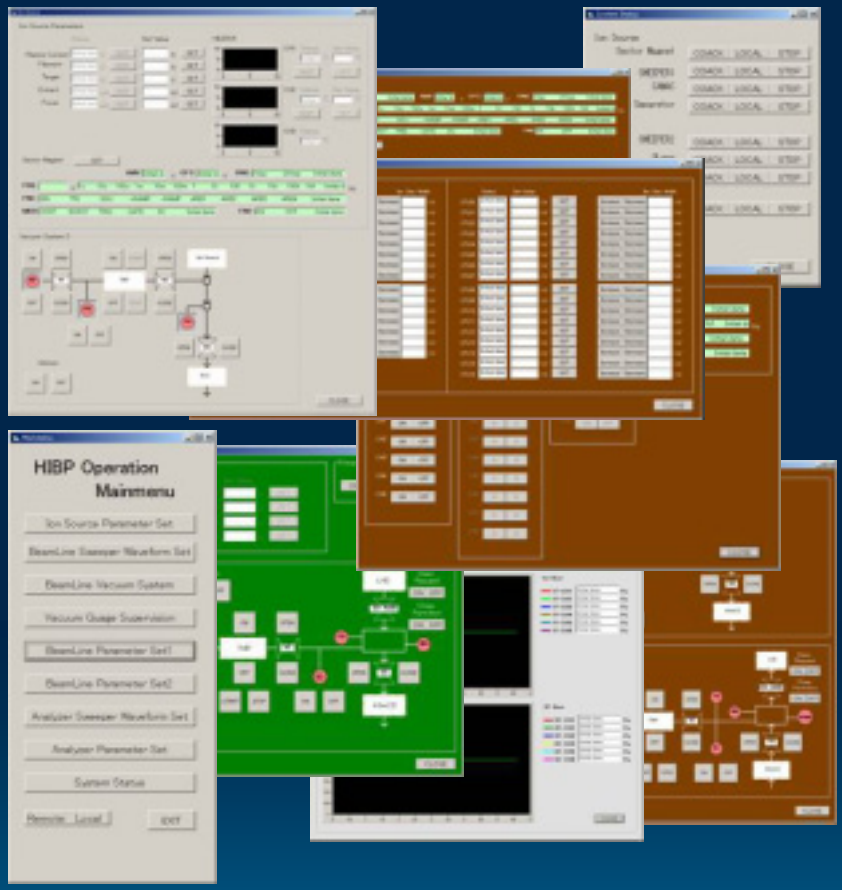
That's all of the client programming!!

The get value and receive event functions are also developed same way .

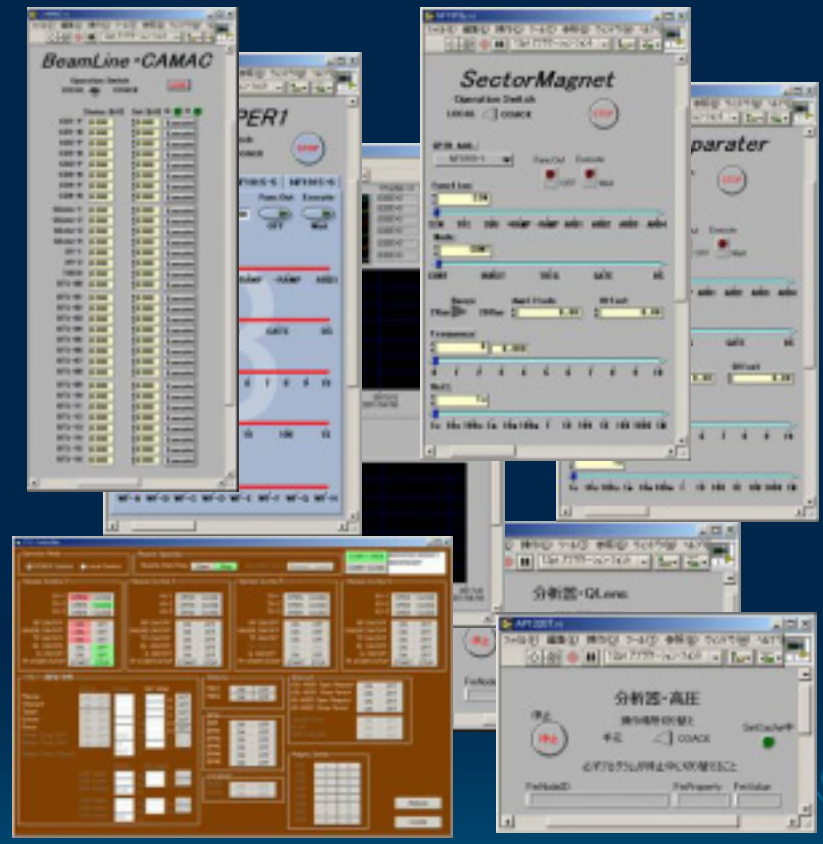
Step3: Programming (LabVIEW)



HIBP Control System



10 Operational Windows



9 I/O Controllers

(Including 2 Virtual Machines)

Conclusion

- We have developed the COACK system along with the construction of HIBP devices.

  We completed the development within 6 months and started the service for available components.
- We achieved integrated control, unitary data management, remote control and improvement of extensibility and flexibility.
- We recognize that the COACK is utilizable not only for an accelerator field but also a nuclear fusion field.
- The introduction to other control system is considered in the near future.