
COACK

Development of Generalized Device Layer for the COACK System

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Contents

Software architecture for control system

Human interface layer

Operation console

LabVIEW, ActiveX component, …

Control layer

Control manager

COACK, Database, …

Device layer

Active interface

PLC, GPIB, WE7000, …

Purposes and features of the development

Reduction of the overall development burdens

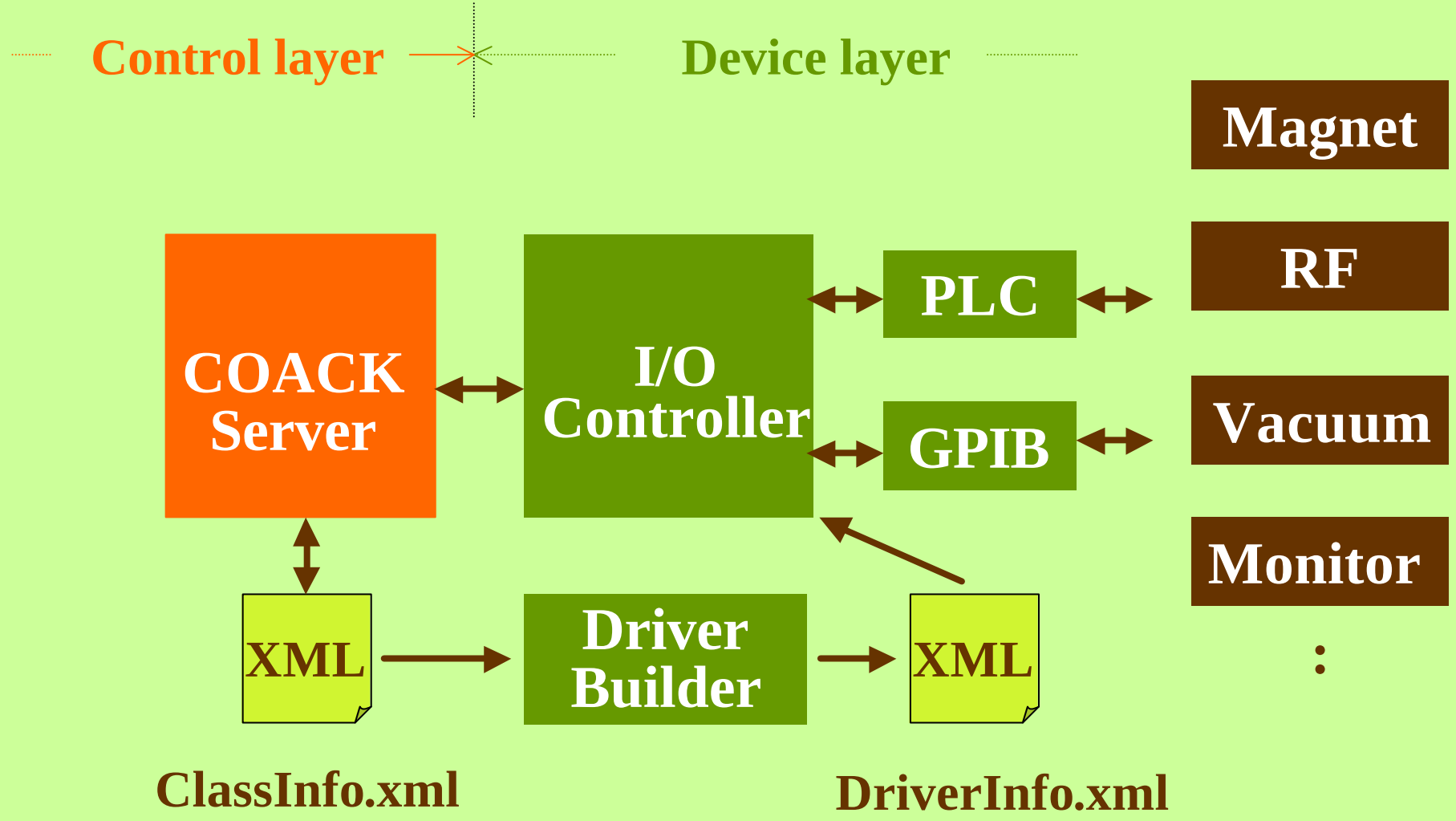
- Construction budget, manpower, a period of time, ..

More sophisticated software in collaboration

XML is used to express the control information

- Hierarchically structured data
- Accelerator components, Interface specifications, control procedures and protocols

Structure of the device layer



Element and attribute list in XML document

Element	Attribute	Example
Driver		
Interface	DriverClass	PLC/GPIB
Instrument	PLC InstrumentID IpAddress PLCType GPIB InstrumentID BoardNo GpibAddress Initialize	 YEW01 130.34.61.97 YOK.FA.E HP01 0 1 *RST;:INIT:CONT ON
Node	NodeID DeviceClass NodeName	ND01 Linac.Magnet.Q Q1

Element	Attribute	Example
Instance	PLC	
	InstanceID	INS01
	Property	Current
	AccessMode	Write/Read
	PropertyValue	
	RelayAddress	D00001
	DataType	Binary+Sign
	BitLength	16
	RelayValue	
	DeadBand	0.05
	RapidTime	1000 (mSec)
	RapidValue	0.1
	GPIB	
	InstanceID	INS02
	Property	Voltage
	AccessMode	Write/Read
	PropertyValue	
	DeadBand	0.1
	Command	:MEAS:CURR?

```
<?xml version="1.0" encoding="Shift_JIS"?>
-<Driver>
 -<Interface DriverClass="GPIB">
  -<Instrument InstrumentID="HP1" BoardNo="0" GpibAddress="2"
     Initialize="*RST;:INIT:CONT ON">
   -<Node NodeID="ND01" DeviceClass="Linac.Gun" NodeName="Grid">
     <Instance InstanceID="INS01" Property="VoltRef" AccessMode="Write"
       PropertyValue="" DeadBand="" Command="VOLT ###"/>
     <Instance InstanceID="INS02" Property="Voltage" AccessMode="Read"
       PropertyValue="" DeadBand="5.0" Command="MEAS:VOLT?"/>
     <Instance InstanceID="INS03" Property="HvOnOff" AccessMode="Write"
       PropertyValue="HvOn" DeadBand="" Command="OUTP ON"/>
     <Instance InstanceID="*****" Property="HvOnOff" AccessMode="Write"
       PropertyValue="HvOff" DeadBand="" Command="OUTP OFF"/>
    </Node>
  </Instrument>
 </Interface>
```

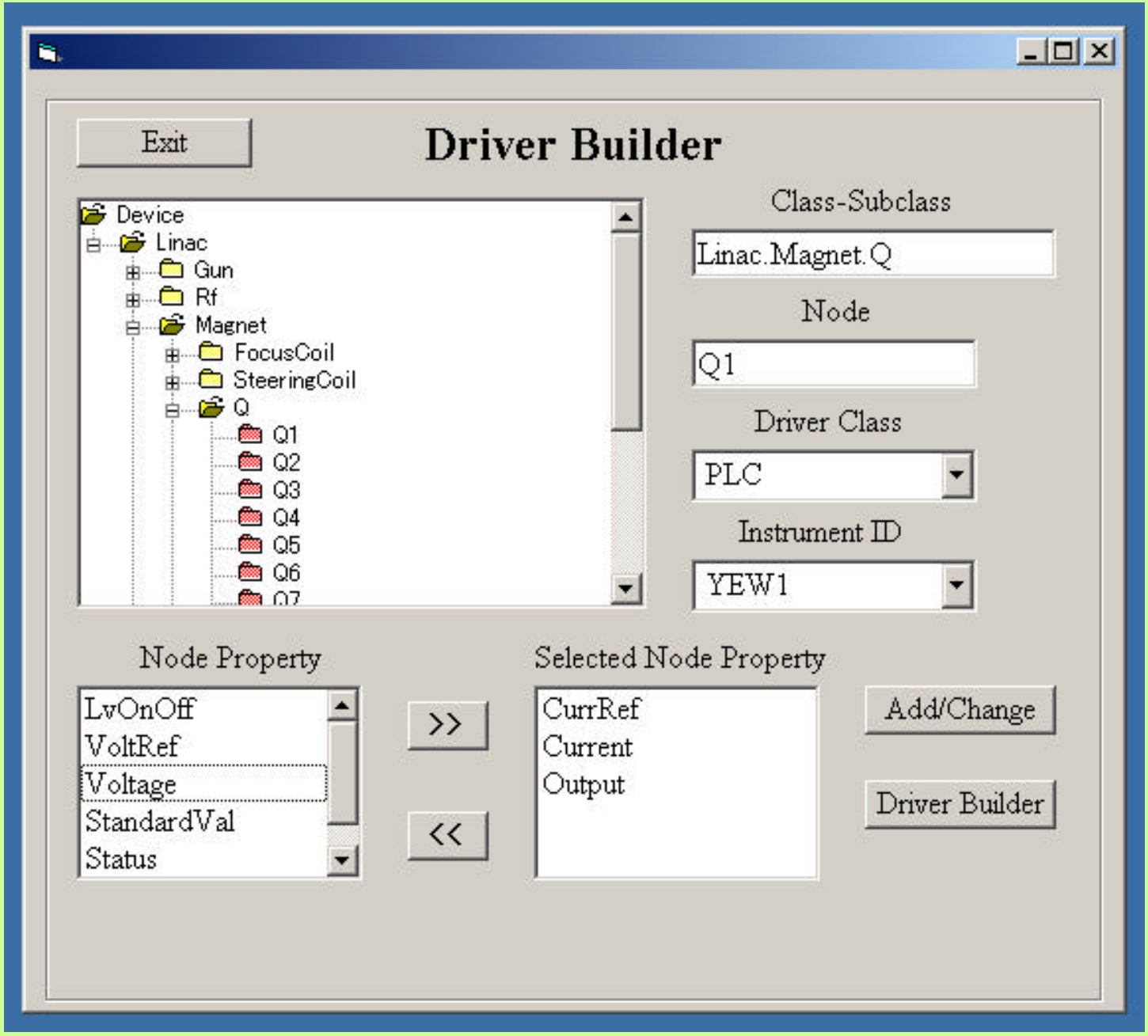
```
-<Interface DriverClass="PLC">
  -<Instrument InstrumentID="YEW1" IpAddress="130.34.61.97"
      PLCType="YOK.FA.E">
    -<Node NodeID="ND01" DeviceClass="Linac.Magnet.Q" NodeName="Q1">
      <Instance InstanceID="INS01" Property="CurrRef" AccessMode="Write"
        RelyAddress="D00004" DataType="Binary+Sign" BitLength="16"
        PropertyValue="" RelyValue="" DeadBand="" RapidTime="" RapidValue=""/>
      <Instance InstanceID="INS02" Property="Current" AccessMode="Read"
        RelyAddress="D00001" DataType="Binary+Sign" BitLength="16"
        PropertyValue="" RelyValue="" DeadBand="0.05" RapidTime="1000"
        RapidValue="0.1"/>
      <Instance InstanceID="INS03" Property="Output" AccessMode="Write"
        RelyAddress="I00001" DataType="Bit" BitLength="1" PropertyValue="On"
        RelyValue="$True" DeadBand="" RapidTime="" RapidValue=""/>
    </Node>
  </Instrument>
</Interface>
</Driver>
```

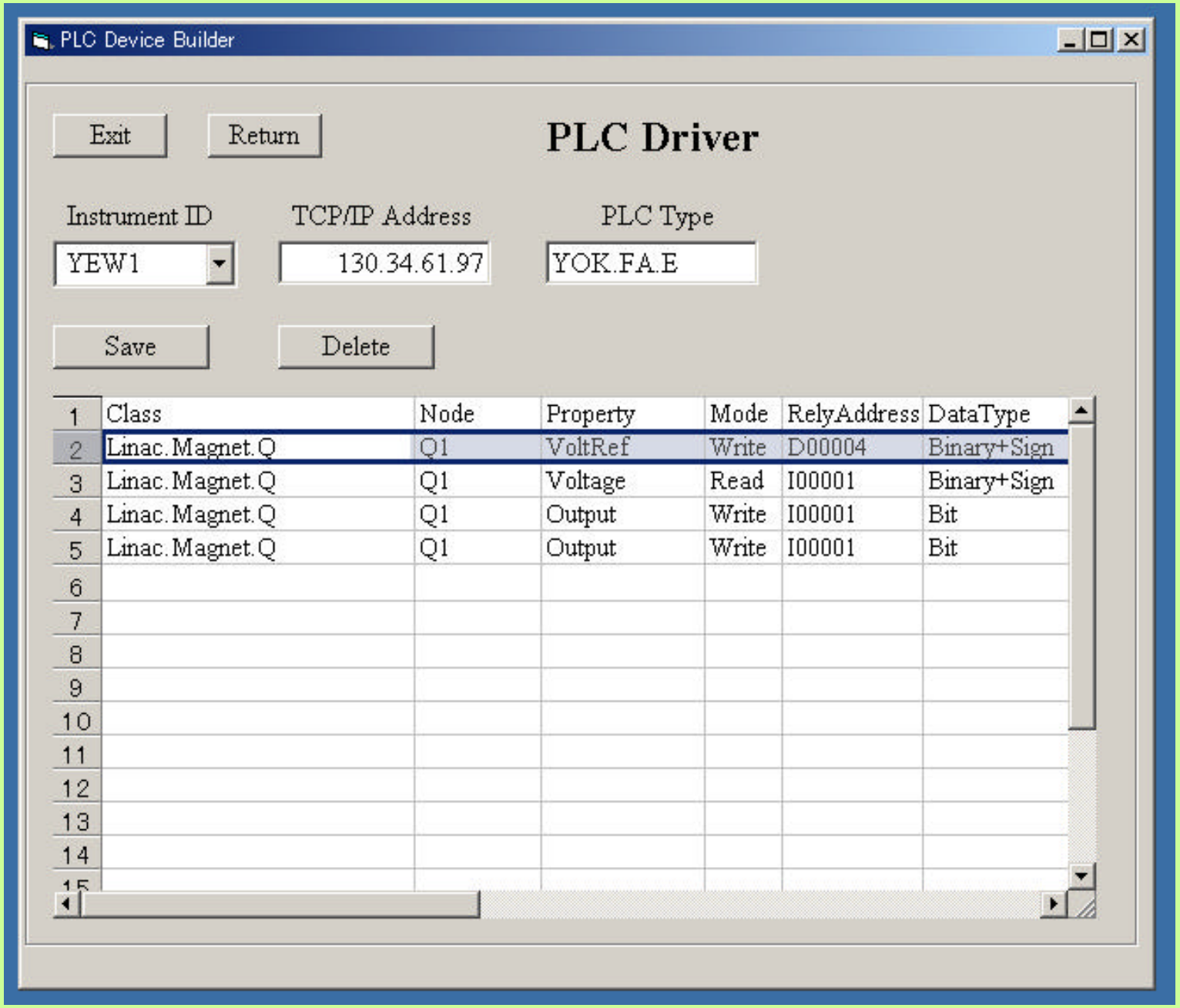
Driver builder

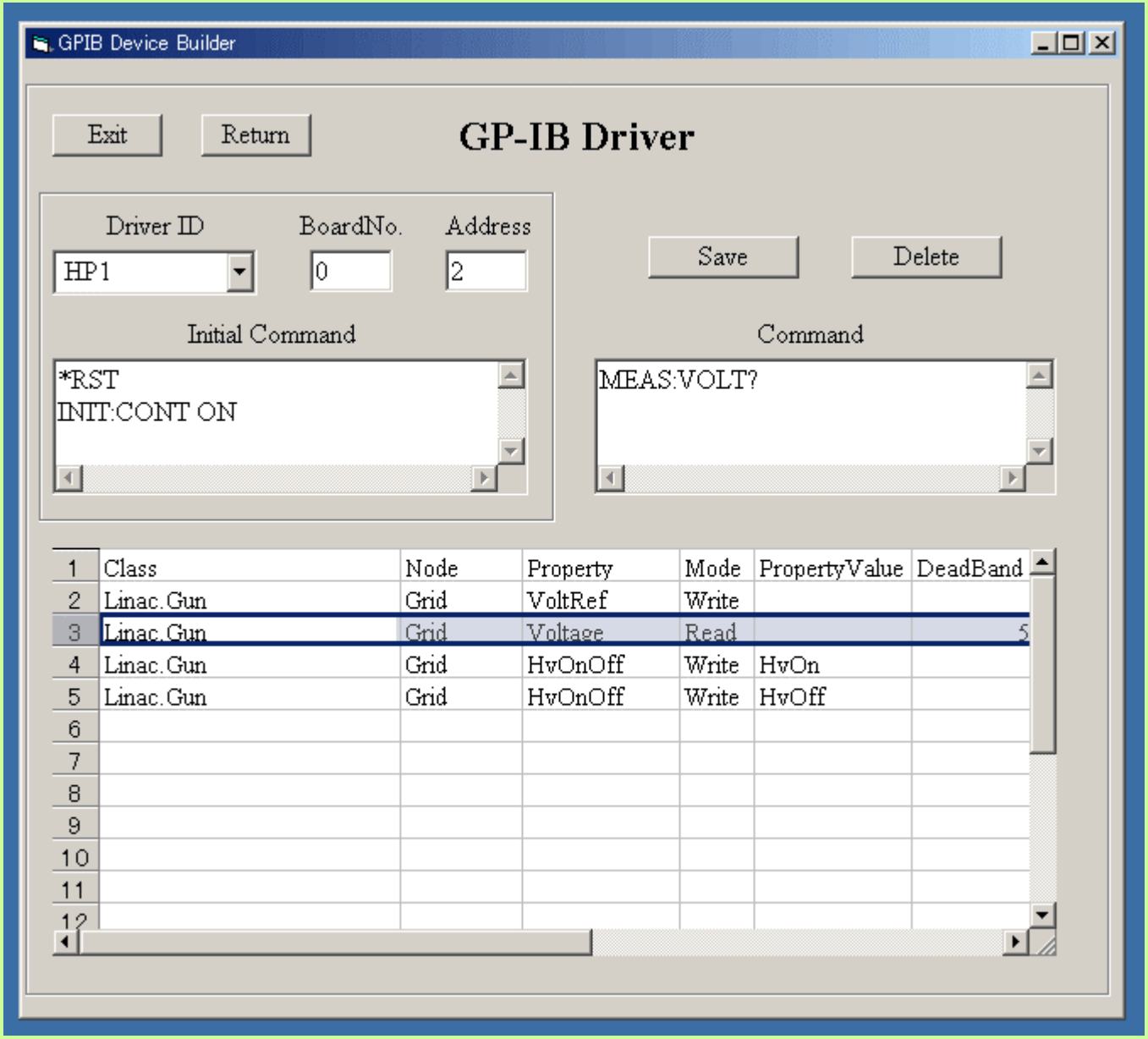
Generates XML document

No knowledge of XML grammar

No special XML editor


Exit
Driver Builder
Device
Linac
Gun
Rf
Magnet
FocusCoil
SteeringCoil
Q
Q1
Q2
Q3
Q4
Q5
Q6
Q7
Class-Subclass
Linac.Magnet.Q
Node
Q1
Driver Class
PLC
Instrument ID
YEW1
Node Property
LvOnOff
VoltRef
Voltage
StandardVal
Status
>>
<<
Selected Node Property
CurrRef
Current
Output
Add/Change
Driver Builder


PLC Device Builder
Exit
Return
PLC Driver
Instrument ID
YEW1
TCP/IP Address
130.34.61.97
PLC Type
YOK.FA.E
Save
Delete
1 Class Node Property Mode RelyAddress DataType
2 Linac.Magnet.Q Q1 VoltRef Write D00004 Binary+Sign
3 Linac.Magnet.Q Q1 Voltage Read I00001 Binary+Sign
4 Linac.Magnet.Q Q1 Output Write I00001 Bit
5 Linac.Magnet.Q Q1 Output Write I00001 Bit
6
7
8
9
10
11
12
13
14
15


GPIB Device Builder
Exit
Return
GP-IB Driver
Driver ID
BoardNo.
Address
HP1
0
2
Save
Delete
Initial Command
*RST
INIT:CONT ON
Command
MEAS:VOLT?
1 Class Node Property Mode PropertyValue DeadBand
2 Linac.Gun Grid VoltRef Write
3 Linac.Gun Grid Voltage Read 5
4 Linac.Gun Grid HvOnOff Write HvOn
5 Linac.Gun Grid HvOnOff Write HvOff
6
7
8
9
10
11
12

IOC functions

Creates driver objects from PLC and GPIB classes

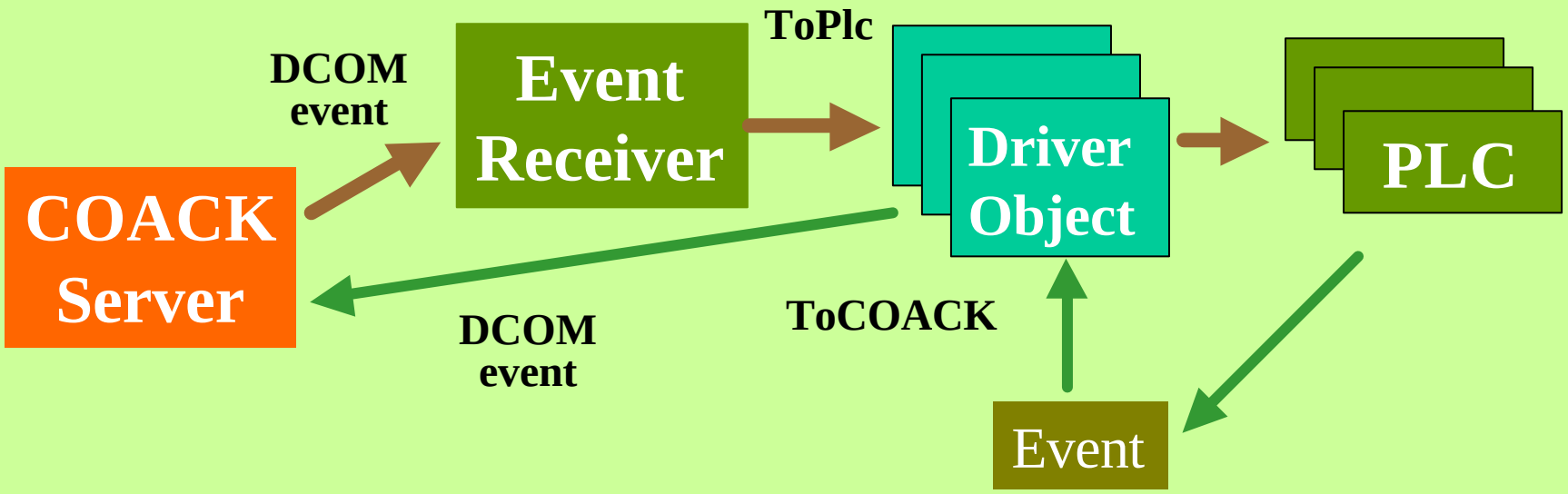
Processes command event from COACK

Informs COACK of accelerator's operation status

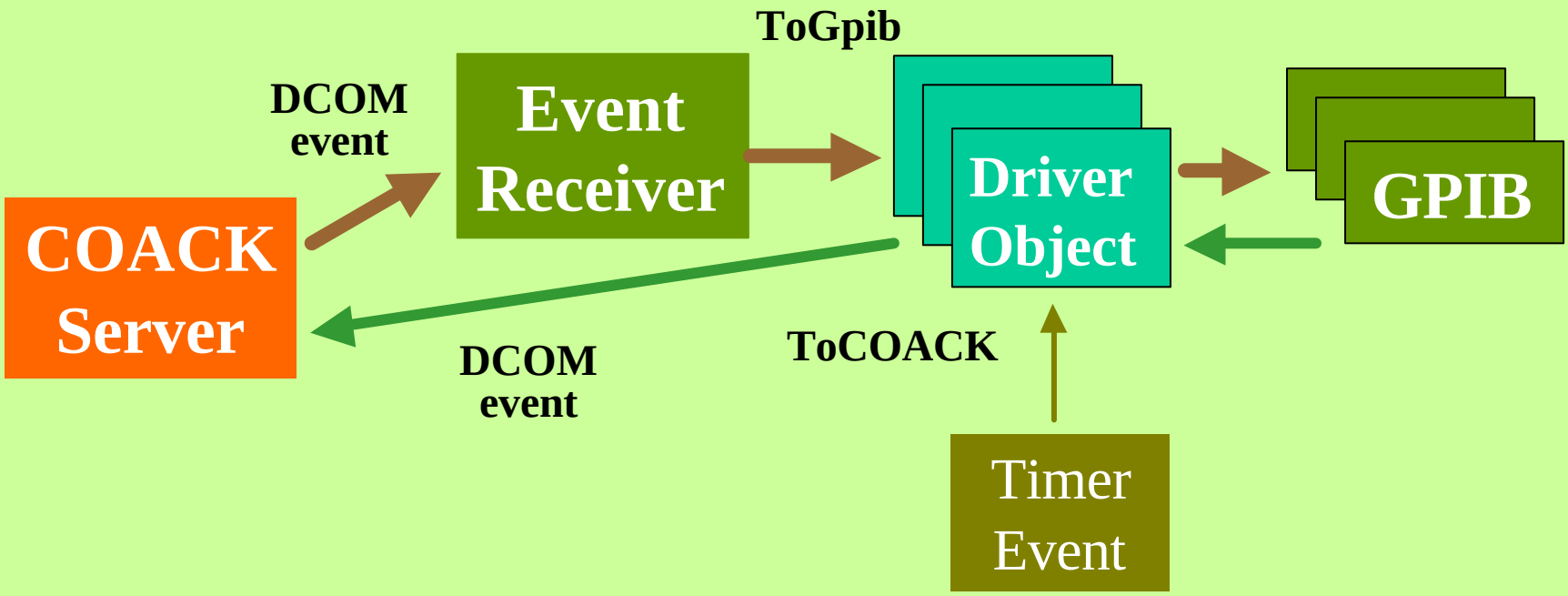
Driver class specifications

Class	Method	Parameter	Definition
Plc	Initialize	Nothing	Initialize PLC
	ToPlc	Property value as variant	Transfer command to PLC
	ToCoack	Changed operation value as variant	Transfer changed operation value to COACK
Gpib	ToGpib	Property value as variant	Transfer command to GPIB
	ToCoack	Nothing	Read operation value and transfer it to COACK

Data flow in the device layer



Data flow in the device layer



Conclusions

Generalized device layer was developed

- XML is useful to describe the device control information

The device layer will be tested

- After running a trial, it will be registered in COACK library and opened

Additions of an alarm monitor function and special software components

- In order to enhance the power of COACK system


COACK