

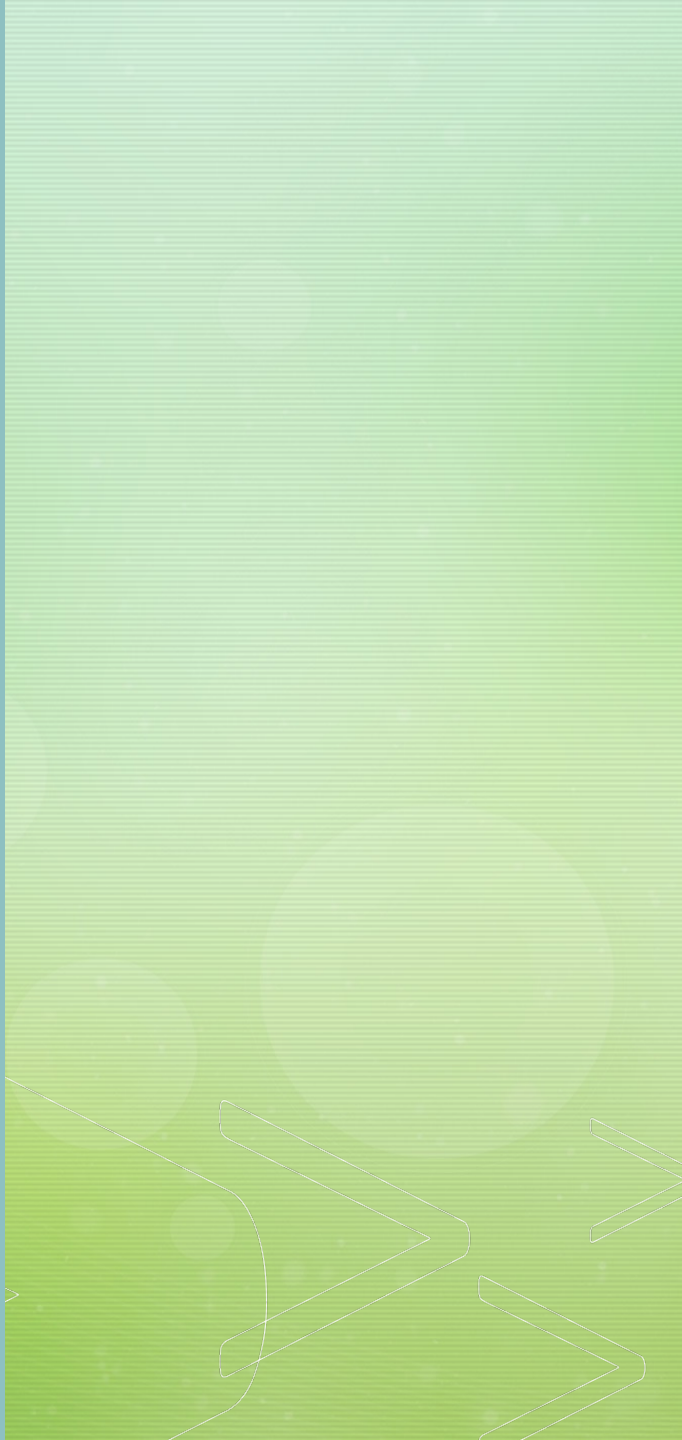
Yasuhiro Inamura

J-PARC center

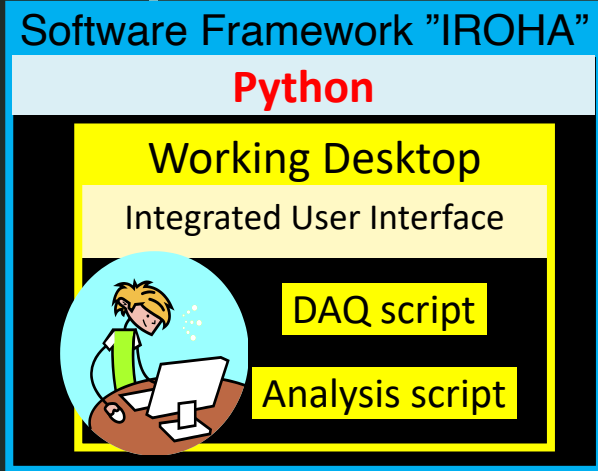


Control of Instrument at J-PARC, MLF

on a view point of software and UX



History of MLF computing environment



Analysis (Data reduction): Manyo-Lib
 "Working Desktop:WD" design
 DAQ software with LabVIEW@KENS

Standardized event mode DAQ
 DAQ Middleware

Viewer of Manyo-lib data-container

Working Desktop and "SW framework" developments

Client-Server model (XML/http), GUI, data I/O

Instruments' software commissioning

Analysis specified event data

Database prototyping

Experiment Scheduler

IROHA

Data Red "Manyo-Lib"

Common L

Instruments sp

Powder Diff. S

Chopper

Res. Stress

Experimental control

Common Librar

Device control

DAQ-Middleware

IROHA2

Start developing IROHA2
 only instrument control
 → Release

2002

Construction J-PARC

2003

Construction MLF building

2004

2005

2006

Construction Neutron instruments

Linac accelerated first beam

2007

Completion of MLF

3GeV RCS accelerated proton

2008

First neutron beam

First muon beam, User operation

2009

Beam power 120kW

2010

Beam power will be 200kW

2014

2015

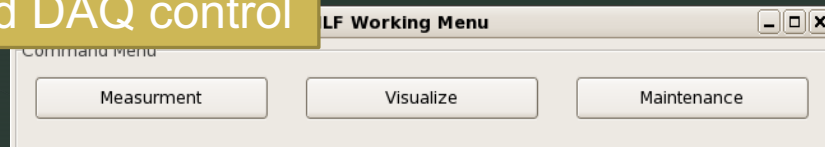
Japanese "IROHA" is the ABC's in English, in other words, "IROHA" is the basics of all MLF software.

IROHA

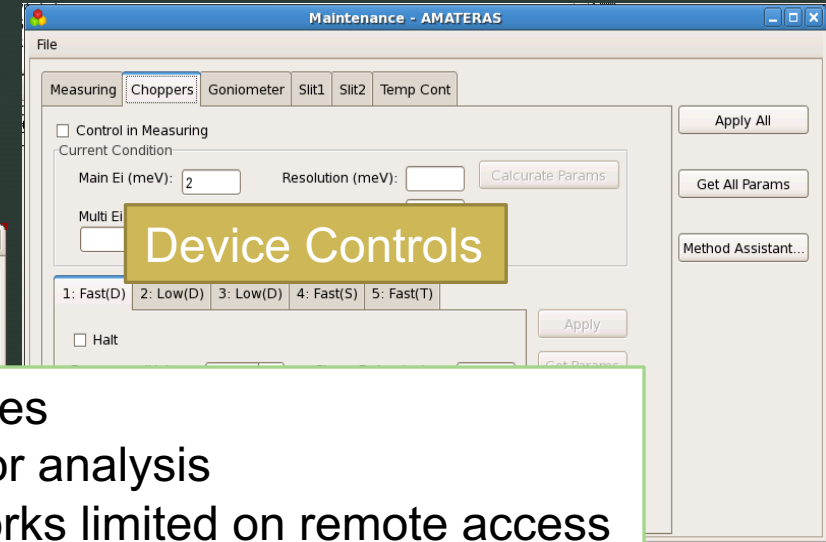
Software Framework for both instrument control and data analysis

- Server-Client model through XML/HTTP protocol
- Language : Python base
- GUI : wxPython
- Developed by outsourcing

IROHA menu and DAQ control

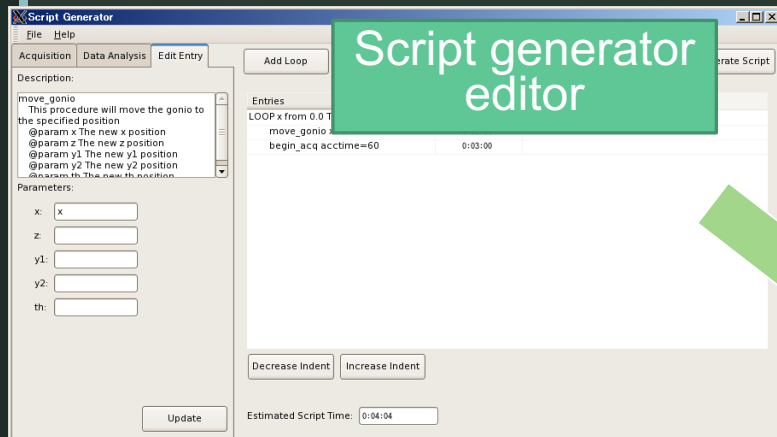


Device Controls



- Too complicated to manage by ourselves
 - Add / remove devices, functions for analysis
- GUI applications are not stable and works limited on remote access

Experiment Scheduler on IROHA

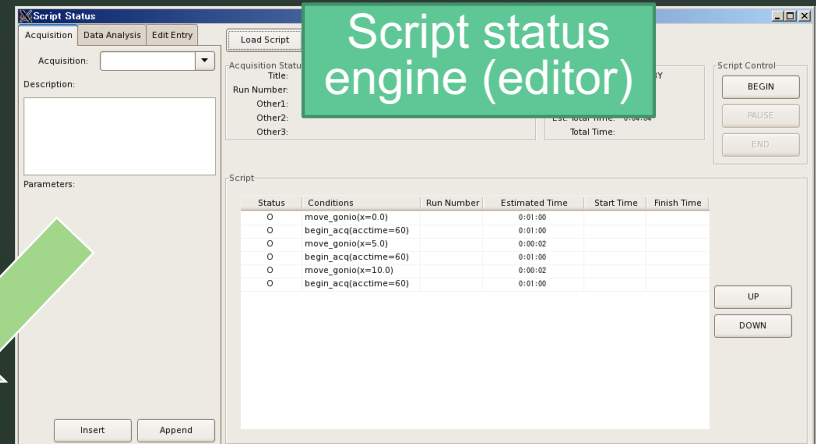
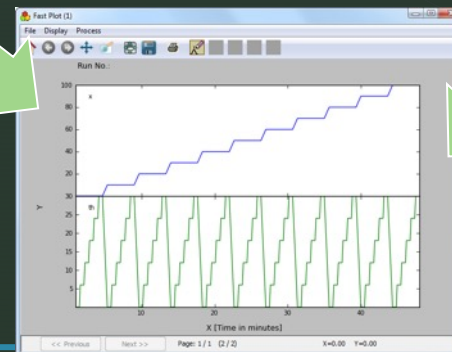


Script generator editor

Script written in XML



Parameter graph



Script status engine (editor)

Development with Matt Clarke / ISIS ~2010

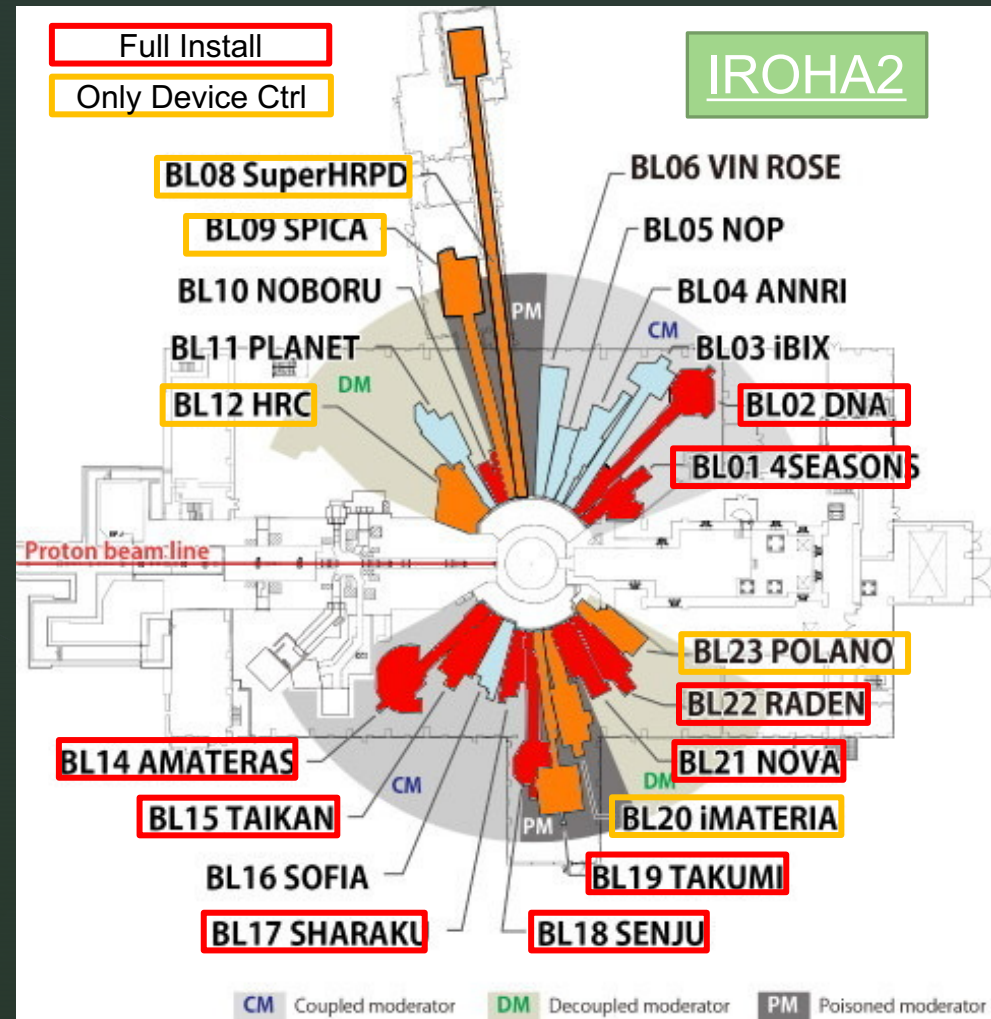
IROHA2 a standard software to control instrument in MLF

Features

- Server-Client model through XML / HTTP
- Python based
 - But not easy to convert IROHA device control modules to IROHA2 ...
- All servers can be controlled from Web browser
- Adopted by a lot of BL
 - But it takes long time to replace
- Development by outsource basically

Servers

- Control Instrument and do a measurement
 - Device Control Server(s)
 - Management Server or other system
- Improvement on UX for a measurement
 - Sequence Server
 - Integrate Server



Device Control server

Device
- Flan
mar
- Mar

non API to be

The screenshot shows a web browser window at 10.107.14.107 displaying the J-PARC Device Control server interface. The top navigation bar includes links for various devices: Device Server, LS340, Gonio-1, Slit1, Slit2, Gonio-2, Gonio-TL, Gonio-comCCT, LS350-1Out1, LS350-1Out3, LS350-2Out1, LS350-2Out3, Gonio_SampleExStick, Gonio-ICE2K, and Gonio-SS2K. There are 'Admin' and 'help' buttons on the right.

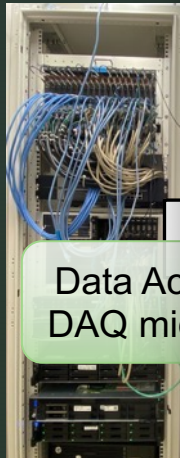
On the left, a sidebar contains the following menu items: Edit Params, Edit DevInfo, Edit Logging, and Development.

The main content area is divided into two panels:

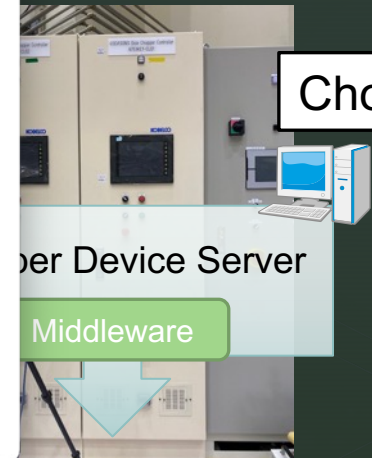
- LS340 Device Status:** A table showing the current status of the LS340 device.
- Edit LS340 Device Parameters:** A form for configuring device parameters.

Name	Value
name	LS340
status	Ready
params-param-state	Not Ready
params-param-alarm_code	000
params-param-idn	LSCI_MODEL340_342910_061407
params-param-set_temperature	290.00
params-param-temperature	263.40
params-param-temperature_a	263.40
params-param-temperature_b	265.98
params-param-residue_time	0
params-param-sensor	A
params-param-control	1

Name	Value
params-tpmct-sensor	A
params-tpmct-control	1
params-tpmct-range	0
params-tpmct-temperature	290.00
params-tpmct-tolerance	8.00
params-tpmct-eqtime	0
params-tpmct-rampOn	0
params-tpmct-rampRate	0.1
params-tpmct-pid	0050.0,0020.0,0010



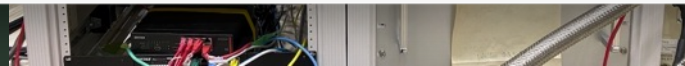
Data Ac
DAQ mi



Choppers

ber Device Server

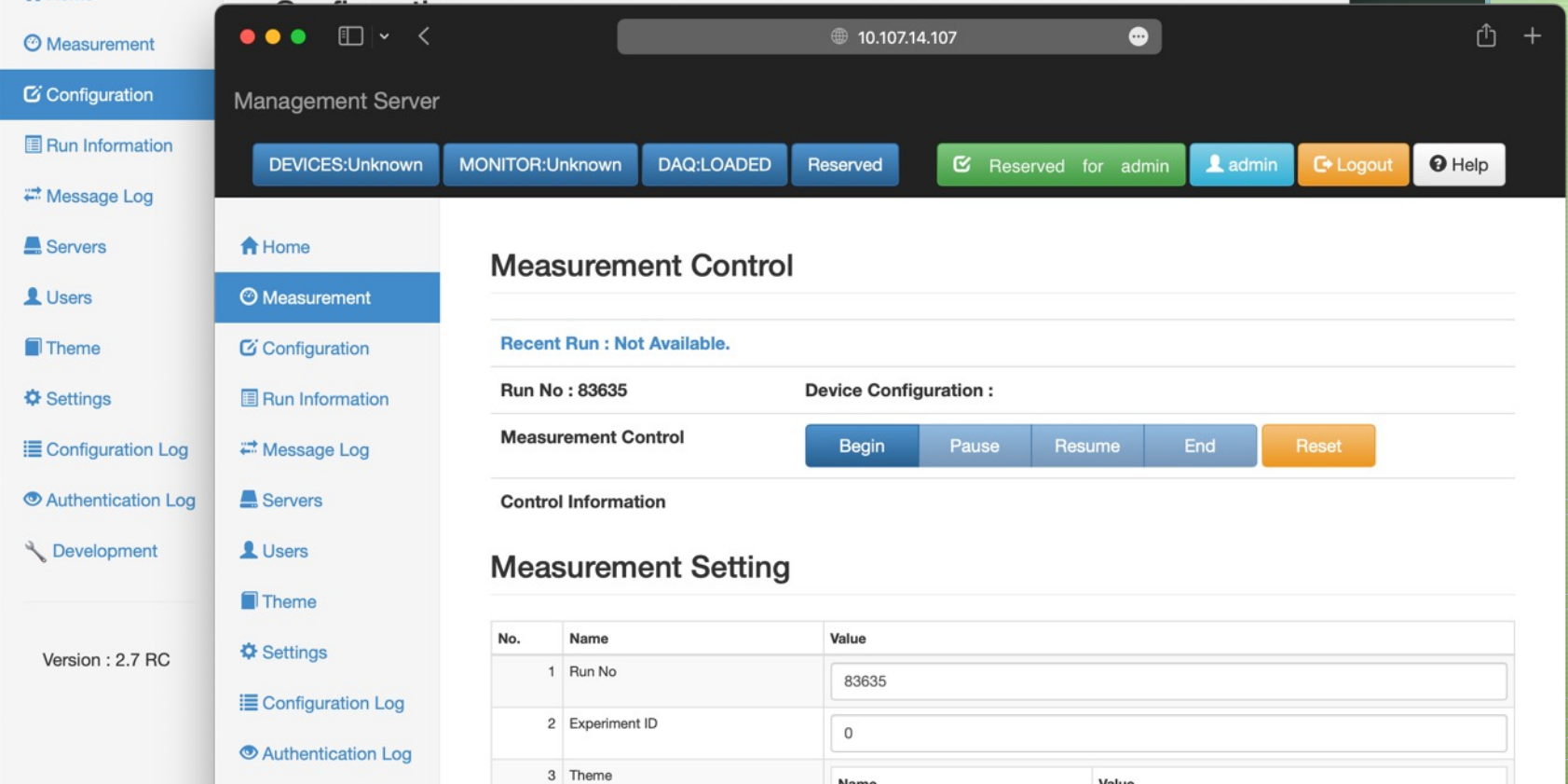
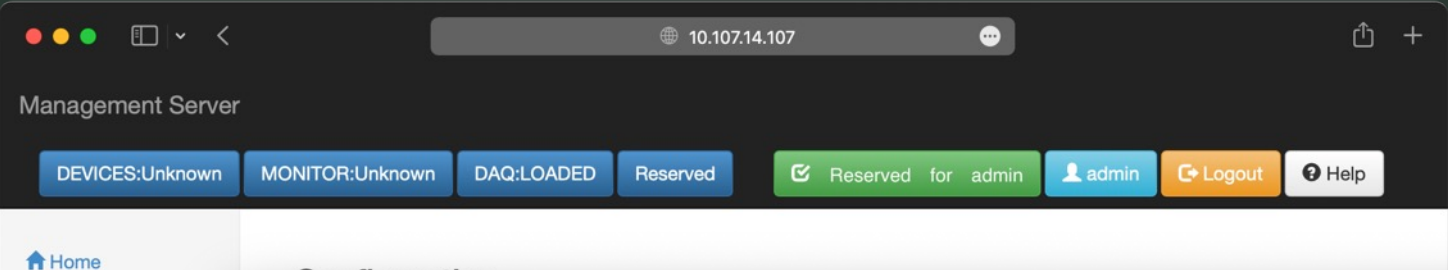
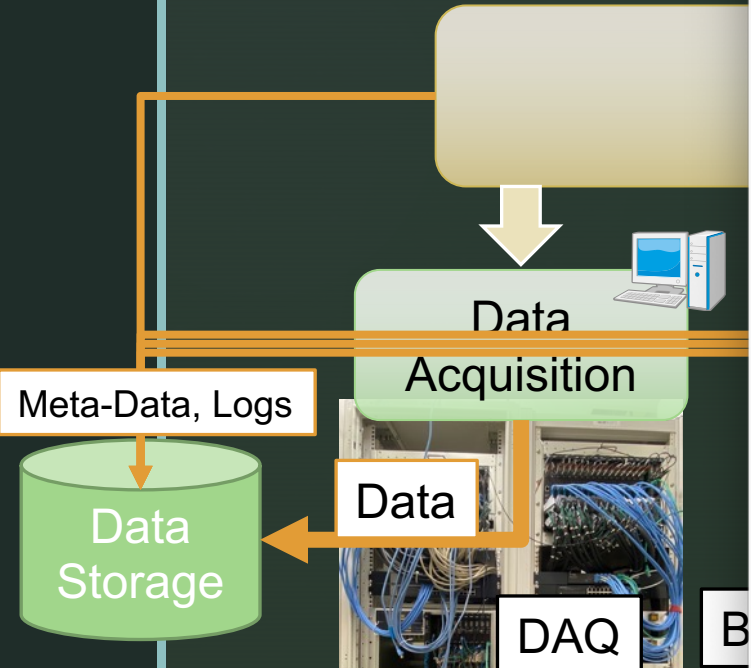
Middleware



Management server

Management of a measure

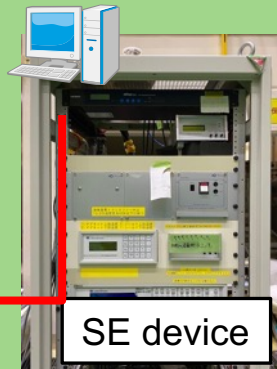
- Begin/End of DAQ and r
- Configurations of device
- Direction of place to stor
- Meta-data for a measure



Use case for common devices

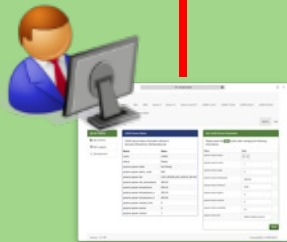
Connection between device server and management server is not tight

Sample Environment Area

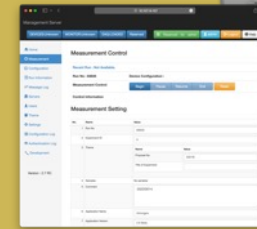


SE device

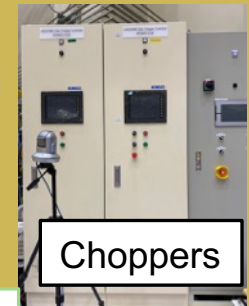
- Testing
- Preparation
- Pre-setting



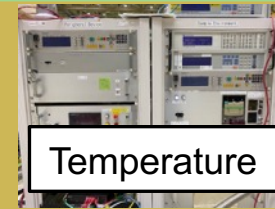
Beam Line Area



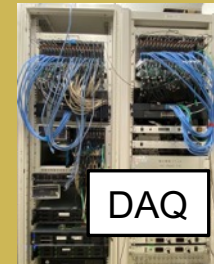
Management Server or other system



Choppers



Temperature



DAQ

1. Connect Network
2. Change configuration on Management system

Sequence server

Executes commands sequence step-by-step

- Commands are prepared beforehand on Web interface
 - To set devices' parameters, start measuring with DAQ
- Easy to create, save and reload sequence by users own
- Users can see the progress of commands sequence

Sequence

The screenshot shows the Sequence Server web interface. At the top, the status is "Run: Not Running" and "System status: Reserved". The "Script Editor" is active, showing a file named "YInamura_Test" with a list of commands: "wait", "daq_run", and "wait". The "wait" command at the bottom is selected, showing its arguments: "timeout=300, return=".

Sequence Server | Run: Not Running | +Release | Run status: None | System status: Reserved | admin

Script Editor | Lock

File | Reload

Edit

Commands

- CH01
- CH02
- CH03
- CL04
- CL05
- LS340
- LS350
- SE7TMagnet
- Slit
- WaitingBeamCurrent
- WaitingExactTime
- daq_begin
- daq_end
- daq_run
- daq_wait_end
- loop

File: YInamura_Test

Script | Check | Save | Save as | Revert

[Do/Skip]	Name	Arguments
	script	
<input checked="" type="checkbox"/>	wait	timeout=60, return=
<input checked="" type="checkbox"/>	daq_run	kickerCount=, timeout=600, return=
<input checked="" type="checkbox"/>	wait	timeout=300, return=

The screenshot shows the Sequence Server web interface in a running state. The status is "Run: YInamura_Test.i2s" and "System status: Running". The "Run No" is 83635. The "Booked Scripts / Add Commands" section shows a table of commands with their start and end times.

Sequence Server | Run: YInamura_Test.i2s | +Release | Run status: Running in Facade | System status: Running | admin

Start | Pause | Resume | Abort | Run No: 83635

Booked Scripts / Add Commands

Auto scroll | Save | Clear sequence | Graph

Sequence | Check Sequence

[Do/Skip]	Name	Arguments	Start	End
	sequence			
<input checked="" type="checkbox"/>	wait	timeout=60, return=	2022-10-10 19:37:49	
<input checked="" type="checkbox"/>	daq_run	kickerCount=, timeout=600, return=		
<input checked="" type="checkbox"/>	wait	timeout=300, return=		

Integrate server

Watch status and control all devices in one

- Shows current status of each devices
- Users can change parameters permitted by staffs

Run Info

Inst	AMR	Date/Time	2018-06-11 20:50:17
Ex ID	0	Theme ID	---
Run No	25369	Sample ID	---
Status	Measuring	System User	admin
Kickers	1172895	Session User	admin

Sequence Info

Status	Succeeded	Started	2018-06-07 22:43:20
Detail	Succeeded	Estimated End	2018-06-07 22:45:26
Step	2/2	End	2018-06-07 22:45:26
Facade	wait	Duration	0:02:06

Device Panels

- Expand
- Collapse
- Select Device

LS340 Ready

Name	Current	Setting
temperature [K]	3.171	1.000
temperature_a [K]	3.171	
temperature_b [K]	4.150	
sensor	A	A
date	2018-06-12 10:38:57	
range	0	
tolerance	8.000	
rampOn	0	
rampRate	0.6	

Integrate server

Management

Slit Device Server

Temperature Device

Beam Slit Controller

LakeShore340 Ready

Name	Current	Setting
temperature [K]	115.03	115.03
sensor	A	A
control	1	1
range		5
tolerance		5.00
eqtime		5

Name	Current	Setting
state	Ready	
temperature_a [K]	115.03	
temperature_b [K]	97.45	
residue_time	0	
date	2018-06-12 10:38:53	

Graph: Temperature A | Temperature B

Device Server

Choppers

Other features and next

Other features

- Static html output
 - Not-control mode to watch status from outside of J-PARC
- Device log collection and visualization
 - ElasticSearch + Graphana
- Cooperation with DB for PI and sample information
 - To merge PI and sample information with meta data from IROHA2
- Live data reduction server
 - Data analysis and visualization on measuring working with IROHA2
 - Integrate Server can show the plot produced by this server

Next is IROHA3 ?

We must start to design next generation of IROHA2. (will include EPIC system ?)