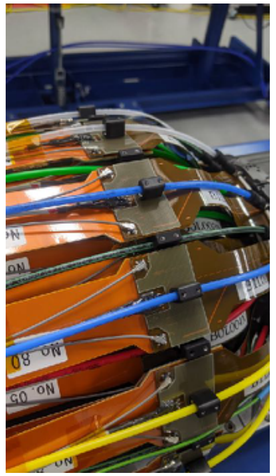
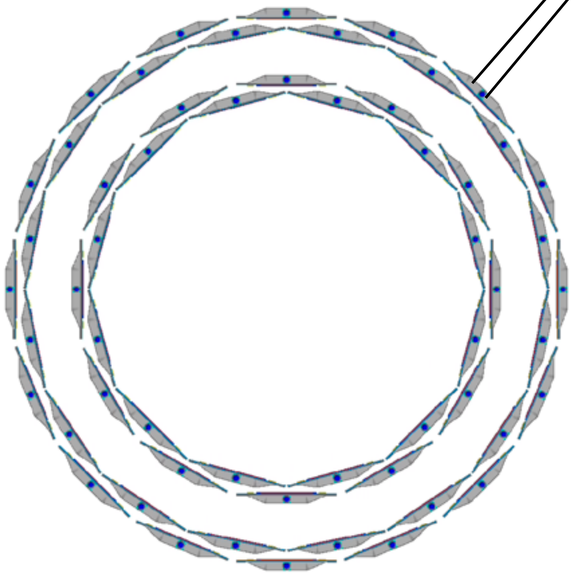
Status of INTT HV app

G. Nukazuka (RBRC)

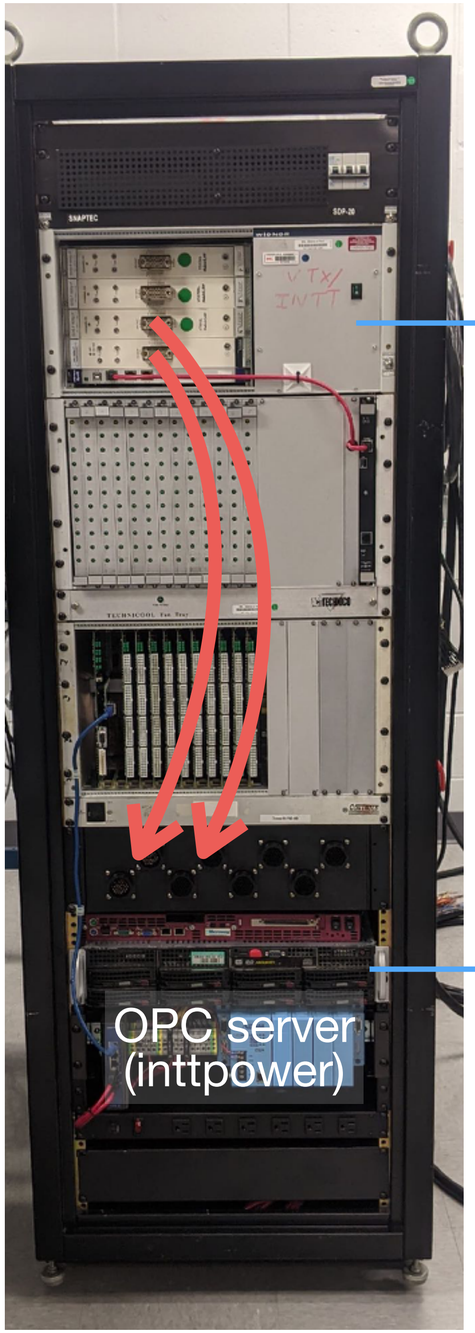
HV of INTT in the Silicon lab





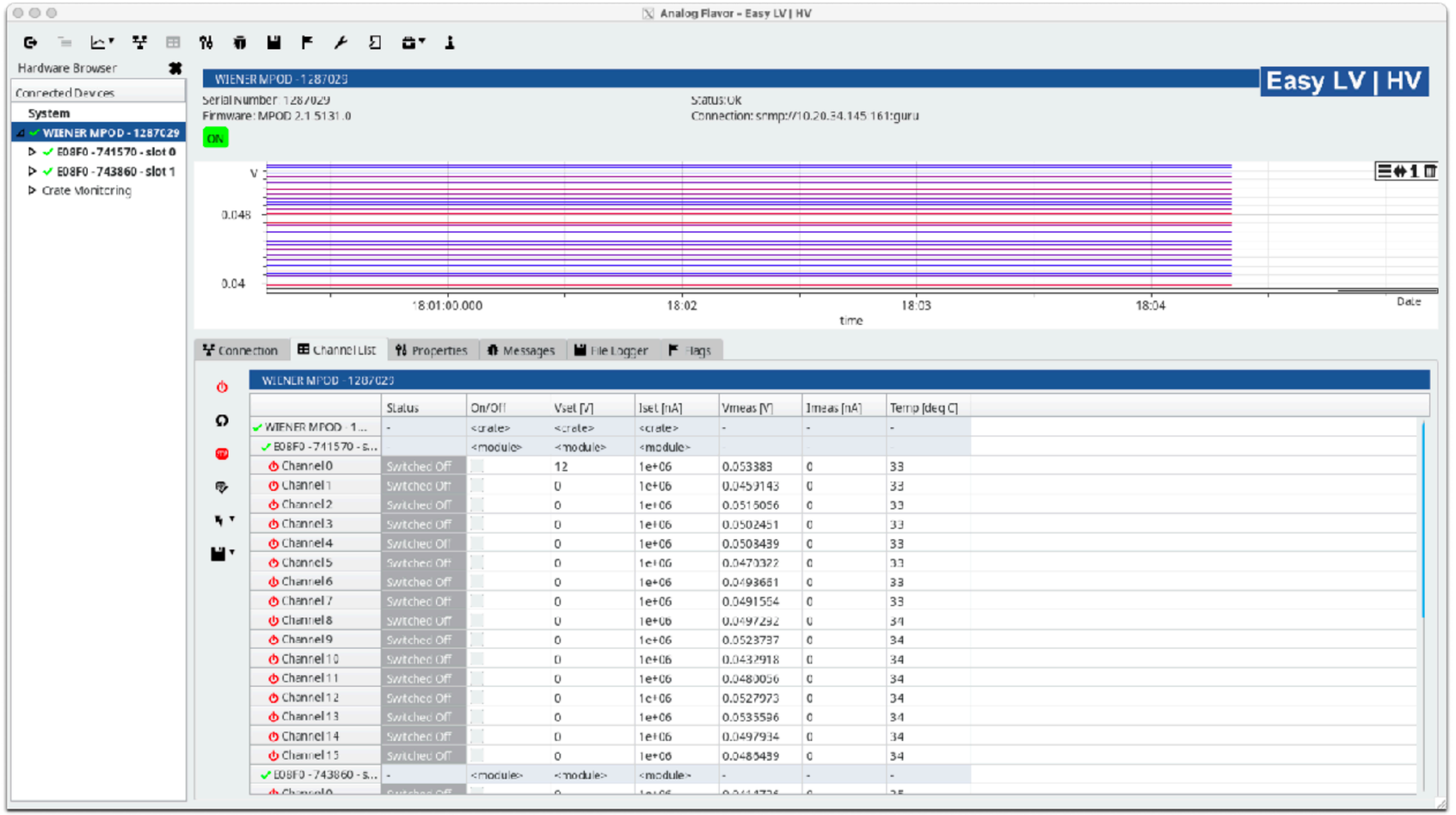
8 channels

8 channels



LAN cable

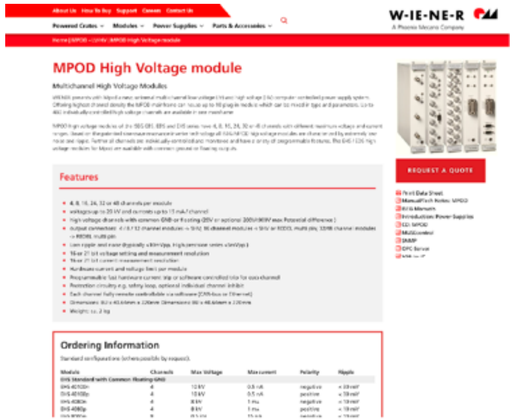
Current operation in the silicon lab



The commercial GUI app is used. It's run in the OPC server and communicates with the MPOD through the router with LAN cables.
Normally, we run it over SSH.

MPOD

We need to know about the Mpod module more



https://www.wiener-d.com/product/mpod-hv-module/

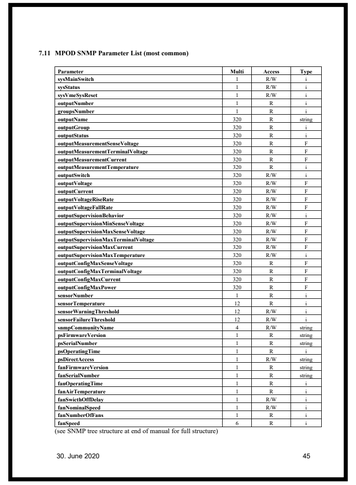
MPOD HV & LV

Power Supply System

Technical Manual

30. June 2020 Version 3.2

https://wiki.sphenix.bnl.gov/index.php/Bias_Power_System



7.11 MPOD SNMP Parameter List (most common)

Parameter	Multi	Access	Type
sysMainSwitch	1	R/W	i
sysStatus	1	R/W	i
sysVmeSysReset	1	R/W	i
outputNumber	1	R	i
groupsNumber	1	R	i
outputName	320	R	string
outputGroup	320	R	i
outputStatus	320	R	i
outputMeasurementSenseVoltage	320	R	F
outputMeasurementTerminalVoltage	320	R	F
outputMeasurementCurrent	320	R	F
outputMeasurementTemperature	320	R	i
outputSwitch	320	R/W	i
outputVoltage	320	R/W	F
outputCurrent	320	R/W	F
outputVoltageRiseRate	320	R/W	F
outputVoltageFallRate	320	R/W	F
outputSupervisionBehavior	320	R/W	i
outputSupervisionMaxSenseVoltage	320	R/W	F
outputSupervisionMaxSenseVoltage	320	R/W	F
outputSupervisionMaxTerminalVoltage	320	R/W	F
outputSupervisionMaxCurrent	320	R/W	F
outputSupervisionMaxTemperature	320	R/W	i
outputConfigMaxSenseVoltage	320	R	F
outputConfigMaxTerminalVoltage	320	R	F
outputConfigMaxCurrent	320	R	F
outputConfigMaxPower	320	R	F
sensorNumber	1	R	i
sensorTemperature	12	R	i
sensorWarningThreshold	12	R/W	i
sensorFailureThreshold	12	R/W	i
snmpCommunityName	4	R/W	string
psFirmwareVersion	1	R	string
psSerialNumber	1	R	string
psOperatingTime	1	R	i
psDirectAccess	1	R/W	string
fanFirmwareVersion	1	R	string
fanSerialNumber	1	R	string
fanOperatingTime	1	R	i
fanAirTemperature	1	R	i
fanSwitchOffDelay	1	R/W	i
fanNominalSpeed	1	R/W	i
fanNumberOfFans	1	R	i
fanSpeed	6	R	i

(see SNMP tree structure at end of manual for full structure)

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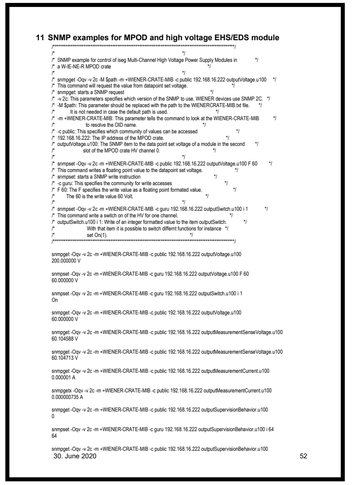

11 SNMP examples for MPOD and high voltage EHS/EDS module

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https://file.wiener-d.com/documentation/MPOD

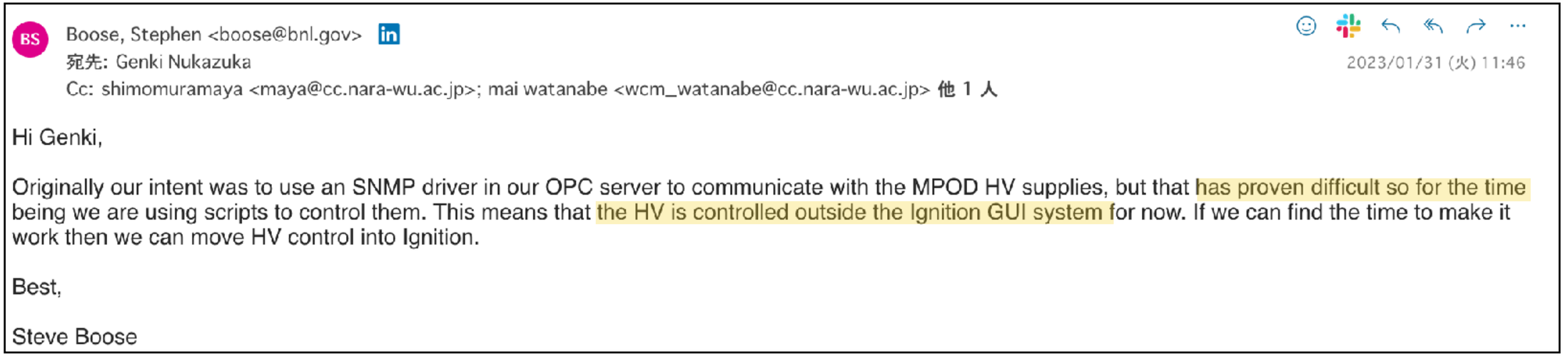
Requirements for the HV application

We need to define the requirements for the application.

- Turning HV ON/OFF
  - All
  - each ROC
  - each channel
  - ? each half-ladder
- Configuration of operation
  - Operation voltage
  - Voltage limit
  - Current limit
  - Ramping speed
  - ? Different configuration for each ch/half-ladder/ROC?
- Monitoring
  - Voltage and current for each channel
  - Visualization by graphs
  - ? any other parameters?
- Operation logs
  - Timestamp and operation
  - Voltage and current
  - ? Are they stored in the sPHENIX database?
- Misc
  - Shifter/Expert mode
- It should work in 1008, and the silicon lab

Before starting…

The sPHENIX standard framework Ignition (designer) is used for LV GUI.
SNMP protocol is used for communicating with MPOD, but



Boose, Stephen <boose@bnl.gov>
宛先: Genki Nukazuka
Cc: shimomuramaya <maya@cc.nara-wu.ac.jp>; mai watanabe <wcm_watanabe@cc.nara-wu.ac.jp> 他 1 人
2023/01/31 (火) 11:46

Hi Genki,

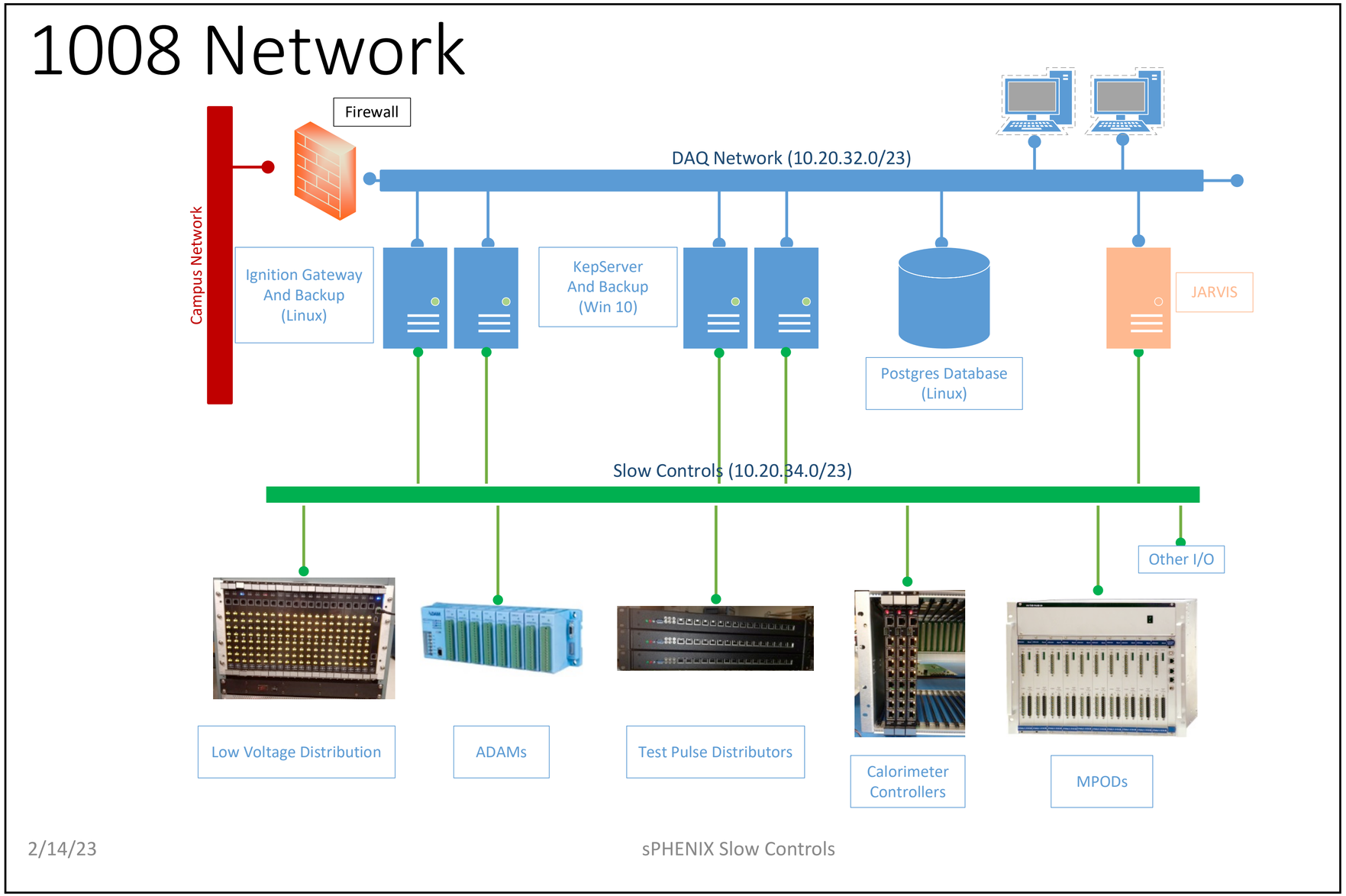
Originally our intent was to use an SNMP driver in our OPC server to communicate with the MPOD HV supplies, but that has proven difficult so for the time being we are using scripts to control them. This means that the HV is controlled outside the Ignition GUI system for now. If we can find the time to make it work then we can move HV control into Ignition.

Best,

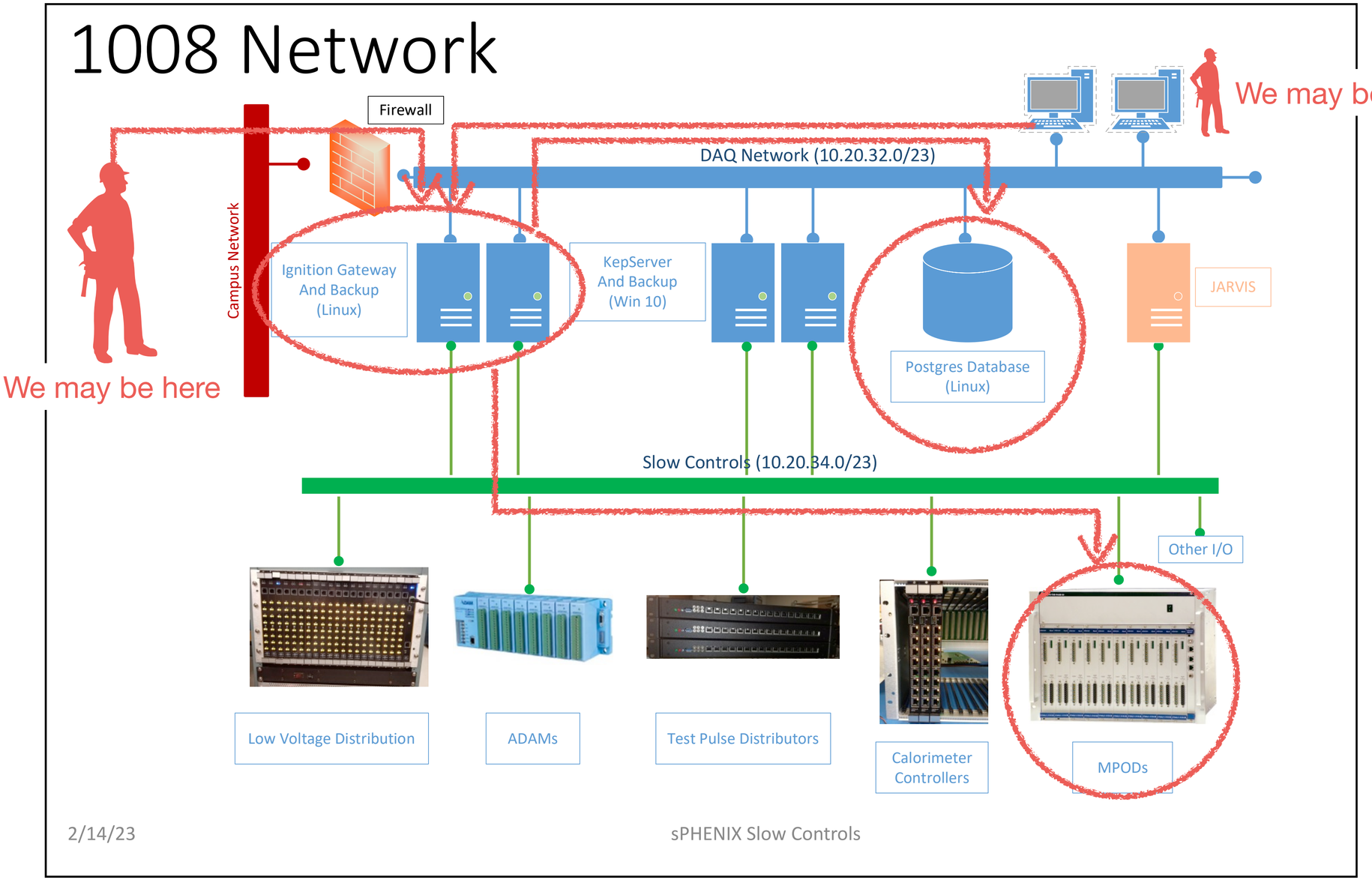
Steve Boose

Currently, it may be good to start without Ignition, so I used what I could use.
When we can handle SNMP with Ignition, we may migrate to Ignition.

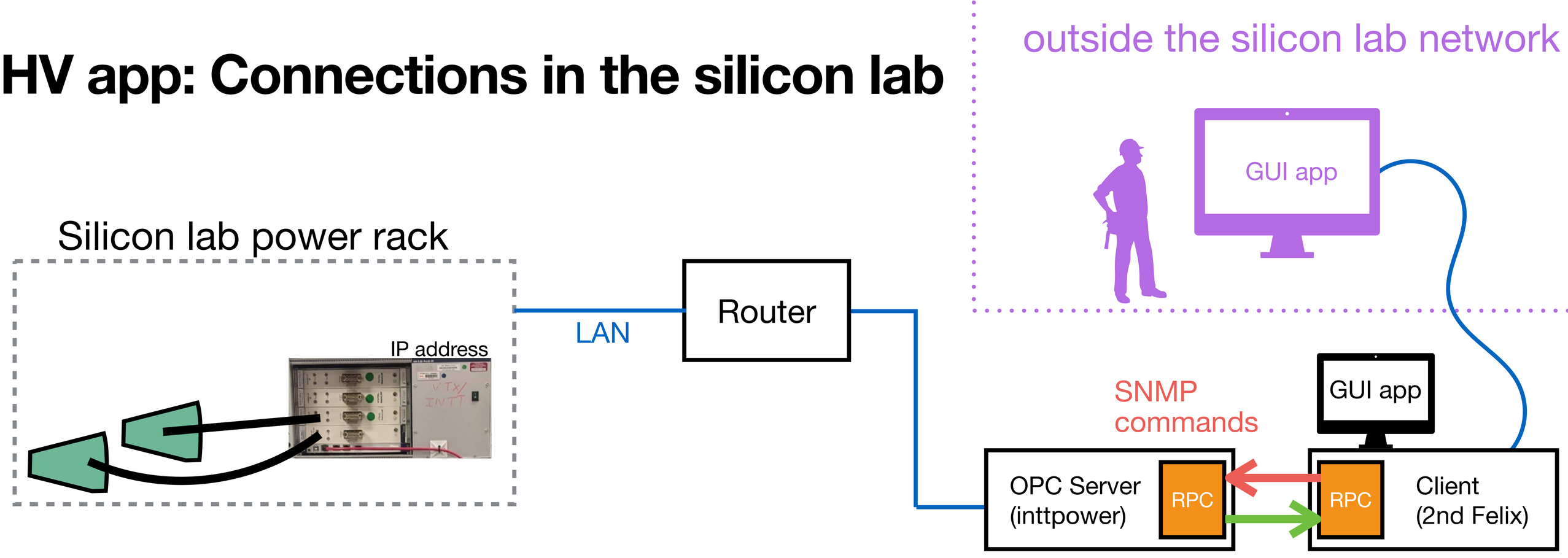
HV app : Connections in 1008



HV app : Connections in 1008



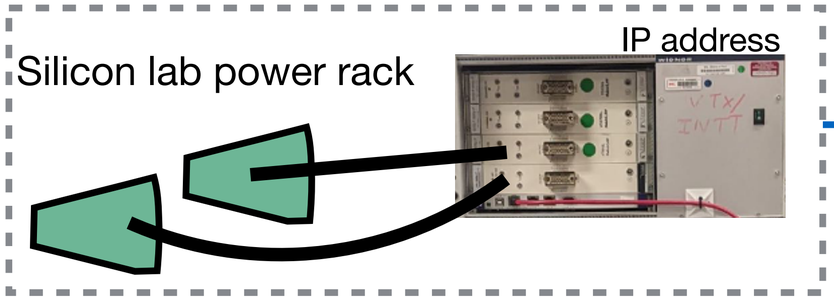
HV app: Connections in the silicon lab



The GUI is launched in INTTDAQ. It may be run over SSH.
INTTPOWER, the OPC server in the power rack, has access to the MPOD. I didn't try launching GUI in INTTPOWER.

Similarly to INTT ExpertGUI, I hired RPC to control MPODs from client PCs. RPC may not be needed in 1008 because the linux machine can access to the MPODs directly.

HV app: both cases



LAN

Router

outside the silicon lab network

SNMP commands

GUI app

SSH

OPC Server (inttpower)

RPC

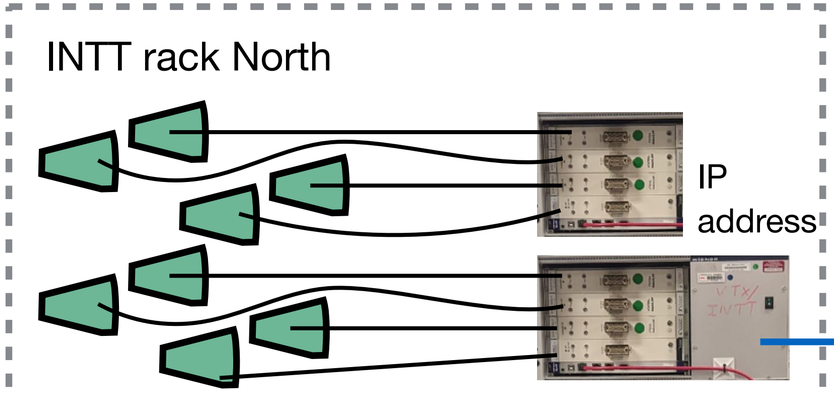
RPC

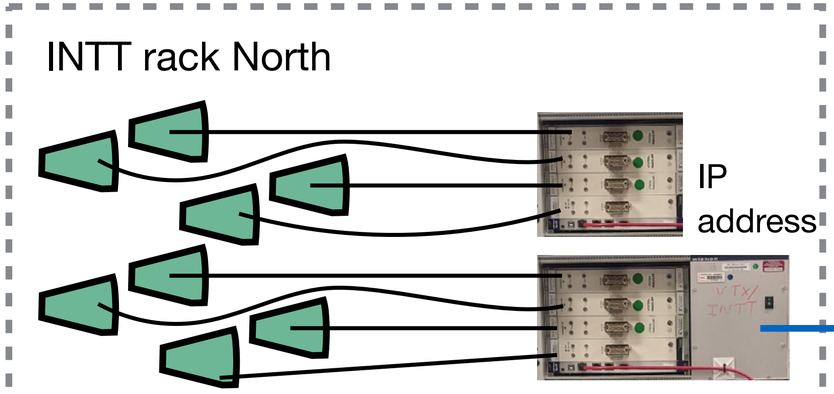
Client (2nd Felix)

Status, voltage, etc.

in the silicon lab

in 1008





←SNMP commands

Linux

SSH

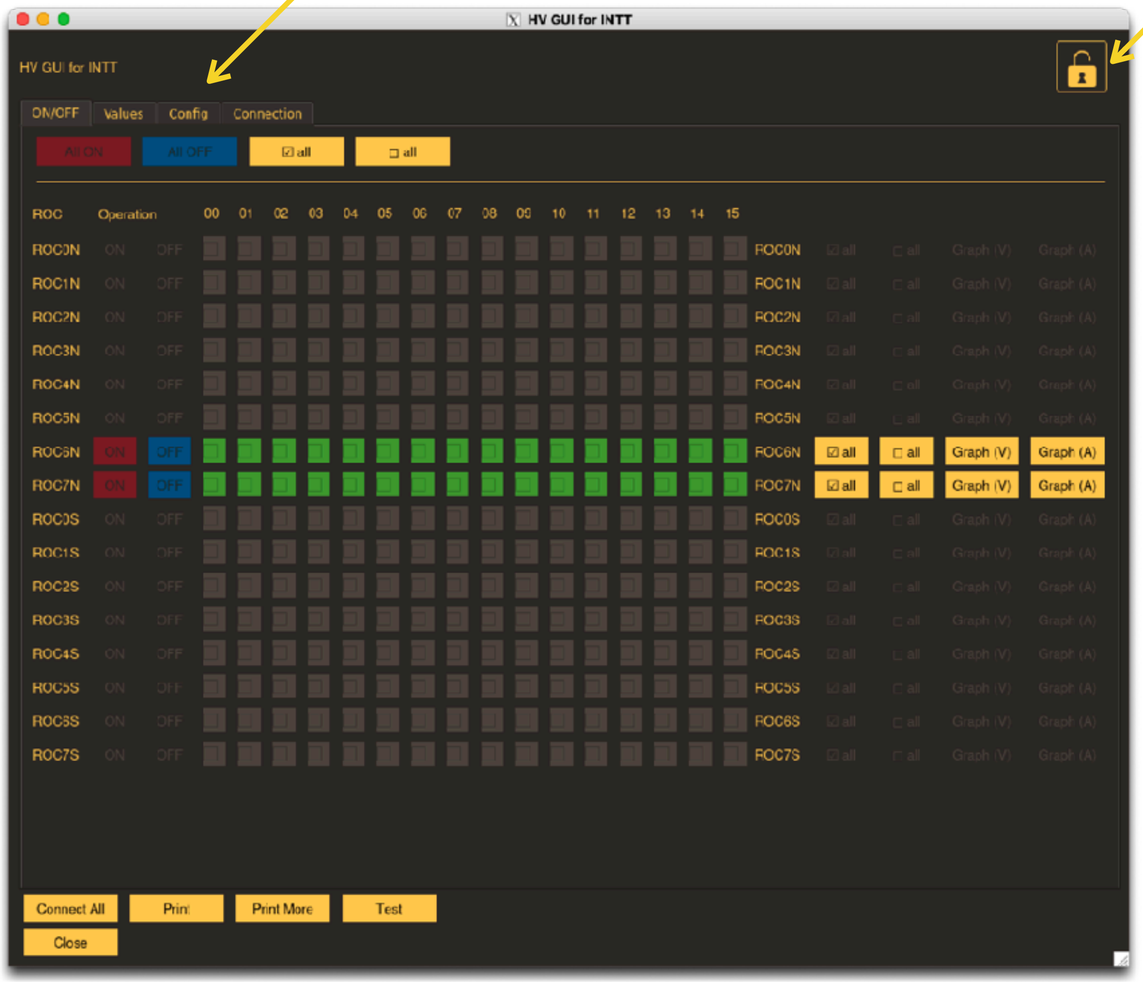
Status, voltage, etc. →

The GUI

HV_GUI.py

Tab grouping

Shifter/Expert mode



Language: Python3

Library: PySimpleGUIQt

A wrapper of PyQt. The standard python library TKinter (or PySimpleGUI) is too slow to use over SSH.

RPC: gRPC (same as INTT ExpertGUI), ver 1.49.1

The latest version (1.52.0) has a problem…

SNMP to MPODs

libMpod.py and HV_server.py

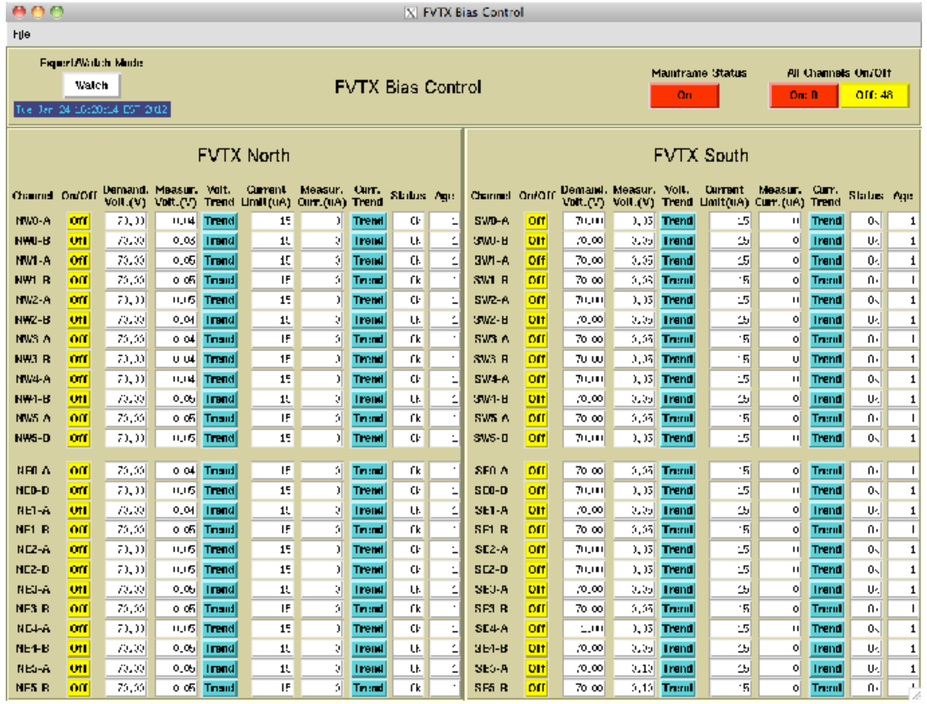
I modified Maki's library (intt@inttpower:~/power/snmp/header.py).

Basically, the library does shell commands, for example

```
snmpget -Oqv -v 2c -m +WIENER-CRATE-MIB -c guru 10.20.34.145 outputMeasurementSenseVoltage.u15
```

The GUI: Overview page is needed…

Not implemented yet…
It should show the brief status of HV.
For example:



Information MPOD module by module should be shown though each module has 16 channels.
We need to define parameters to be shown: status (for example: what is good/bad?)

The GUI：Network configuration

HV_connection.py

Configuration file (should be taken from the sPHENIX database)

Connection information for each MPOD module.

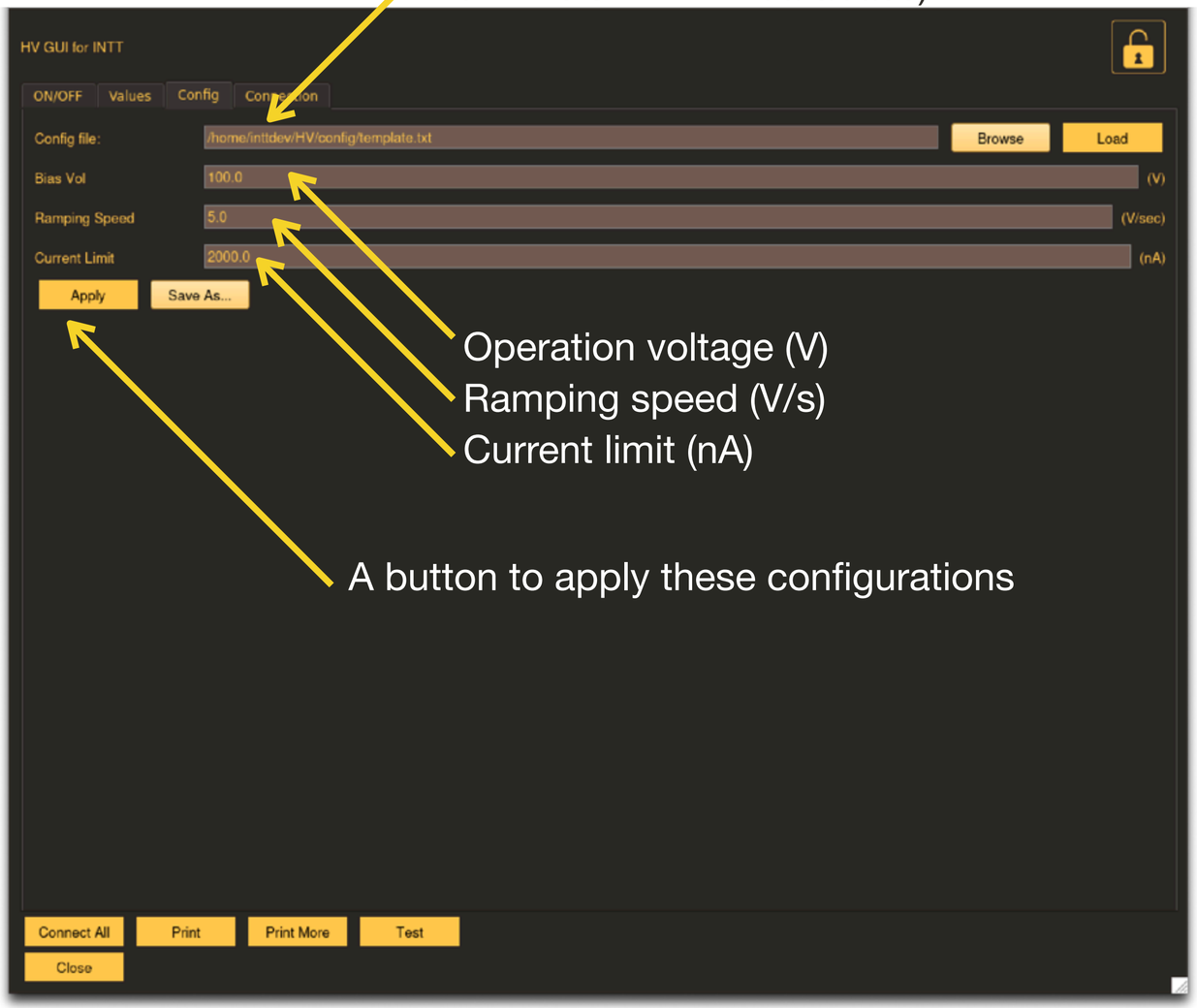
```
1  ##################################
2  #                                #
3  # Connection configuration       #
4  #                                #
5  ##################################
6
7  ROC0N not_used
8  ROC1N not_used
9  ROC2N not_used
10 ROC3N not_used
11 ROC4N not_used
12 ROC5N not_used
13 ROC6N not_used
14 ROC7N 10.20.34.145  161 0
15 ROC0S not_used
16 ROC1S not_used
17 ROC2S not_used
18 ROC3S not_used
19 ROC4S not_used
20 ROC5S not_used
21 ROC6S not_used
22 ROC7S not_used
```

slot3 →
slot2 →
slot1 →
slot0 →

The GUI: Operation configuration

HV_config.py

```
1  ################################
2  #                              #
3  # Configuration for HV         #
4  #                              #
5  ################################
6
7  # voltage [value (V)]
8  voltage   100
9
10 # speed [value (V/sec)]
11 speed 5
12
13 # current_limit [value (nA)
14 current_limit   2000
```



All parameters available should be shown in this tab.
All modules get the same parameters for the moment. Is it OK?

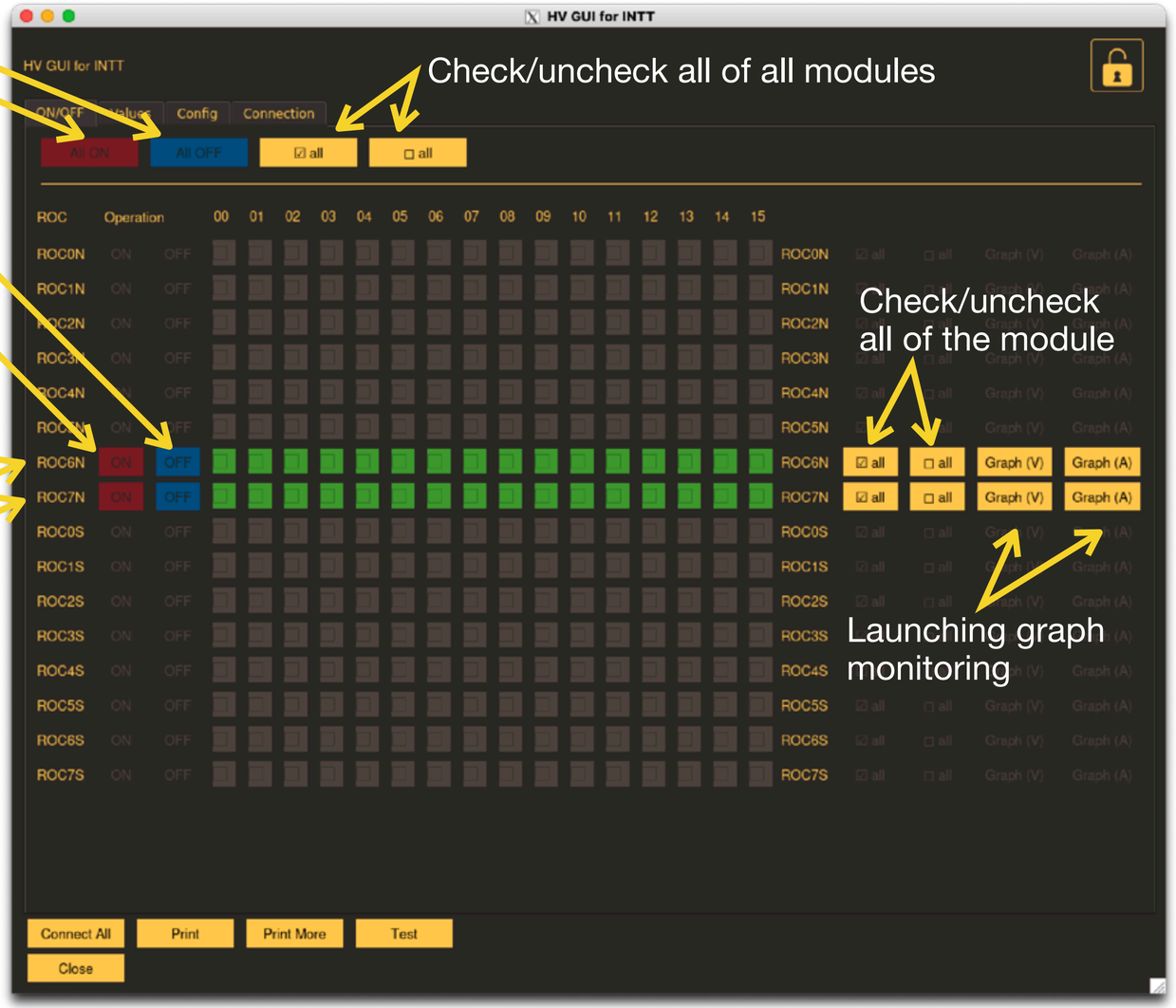
The GUI: ON/OFF

HV_on_off.py

ON/OFF buttons for checked channels of **all modules**

ON/OFF buttons for checked channels of **the module**

Only active modules are enabled

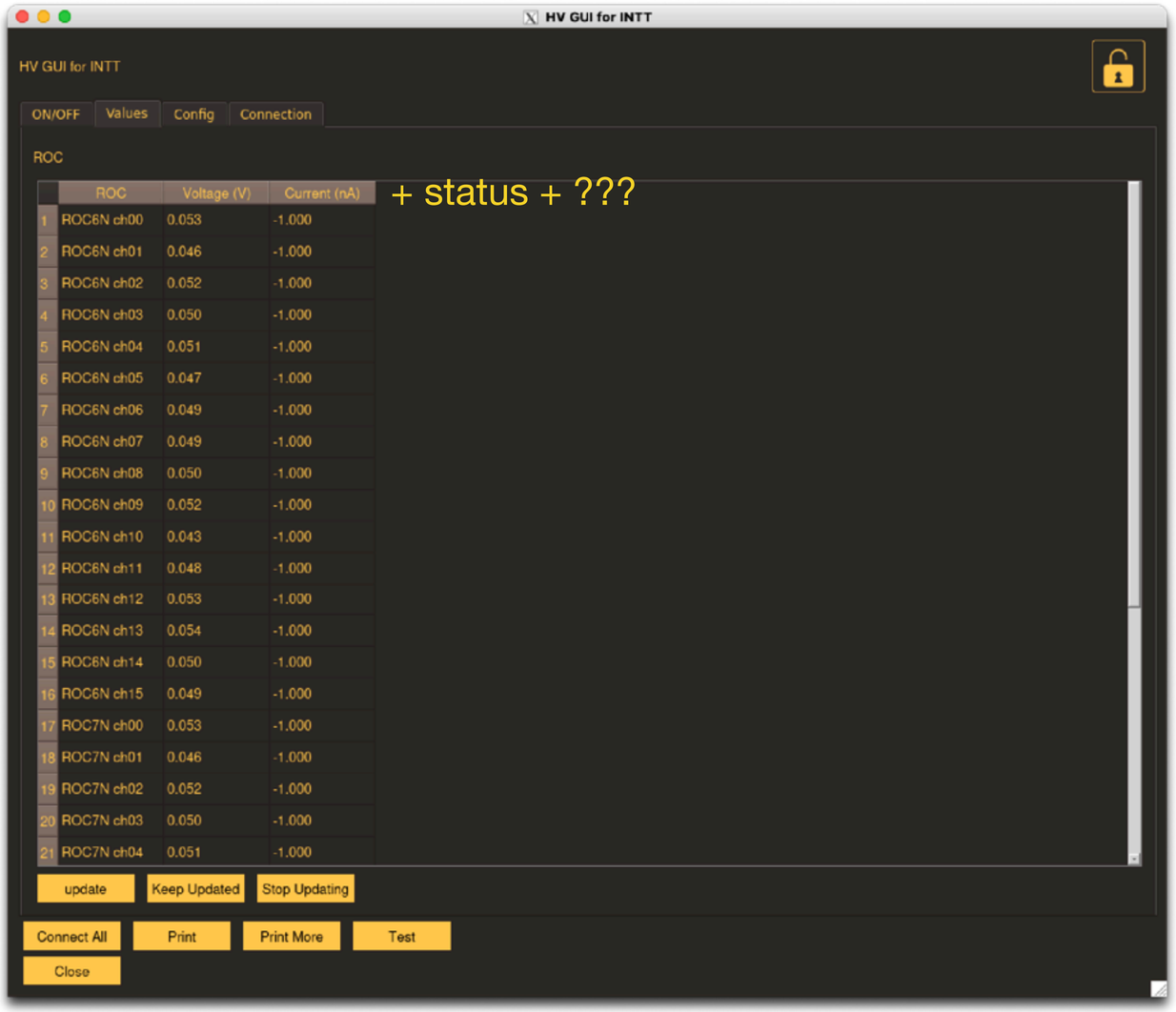


☐ : not operated
☑ : to be operated
☐☑ : It's ON now.
☐☑ : It's OFF now.

☐ is a status indicator + selection of operated channels.
I'm not sure whether it's a good idea or not.

The GUI: Monitoring values

HV_value_viewer.py



	ROC	Voltage (V)	Current (nA)
1	ROC6N ch00	0.053	-1.000
2	ROC6N ch01	0.046	-1.000
3	ROC6N ch02	0.052	-1.000
4	ROC6N ch03	0.050	-1.000
5	ROC6N ch04	0.051	-1.000
6	ROC6N ch05	0.047	-1.000
7	ROC6N ch06	0.049	-1.000
8	ROC6N ch07	0.049	-1.000
9	ROC6N ch08	0.050	-1.000
10	ROC6N ch09	0.052	-1.000
11	ROC6N ch10	0.043	-1.000
12	ROC6N ch11	0.048	-1.000
13	ROC6N ch12	0.053	-1.000
14	ROC6N ch13	0.054	-1.000
15	ROC6N ch14	0.050	-1.000
16	ROC6N ch15	0.049	-1.000
17	ROC7N ch00	0.053	-1.000
18	ROC7N ch01	0.046	-1.000
19	ROC7N ch02	0.052	-1.000
20	ROC7N ch03	0.050	-1.000
21	ROC7N ch04	0.051	-1.000

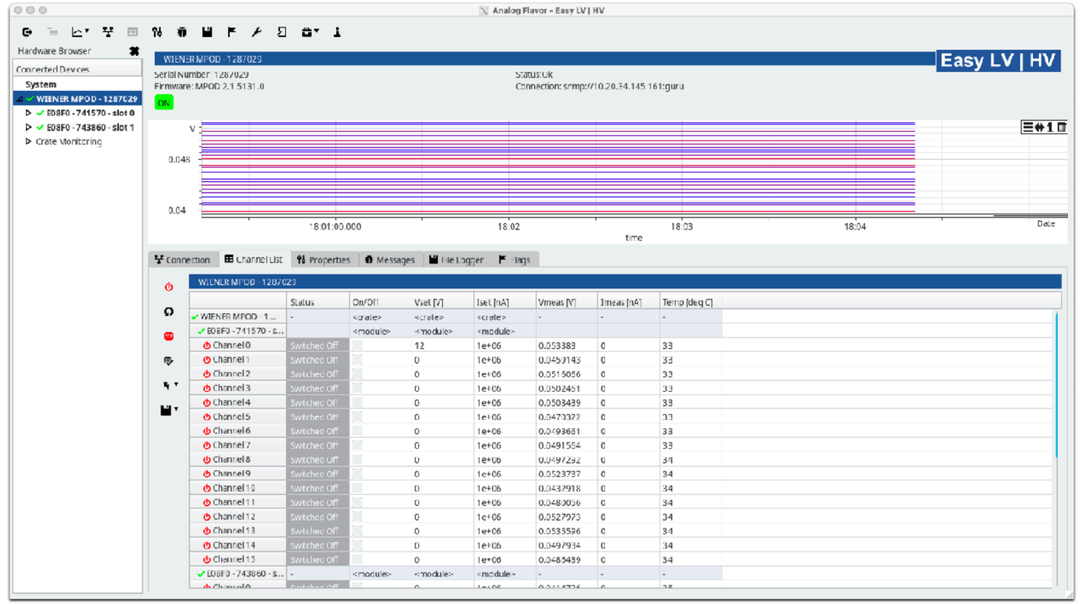
We need to see the values.

Is there a better idea to show so many values?

The GUI: Visual monitoring

Monitoring voltage and current by graphs is necessary, but…

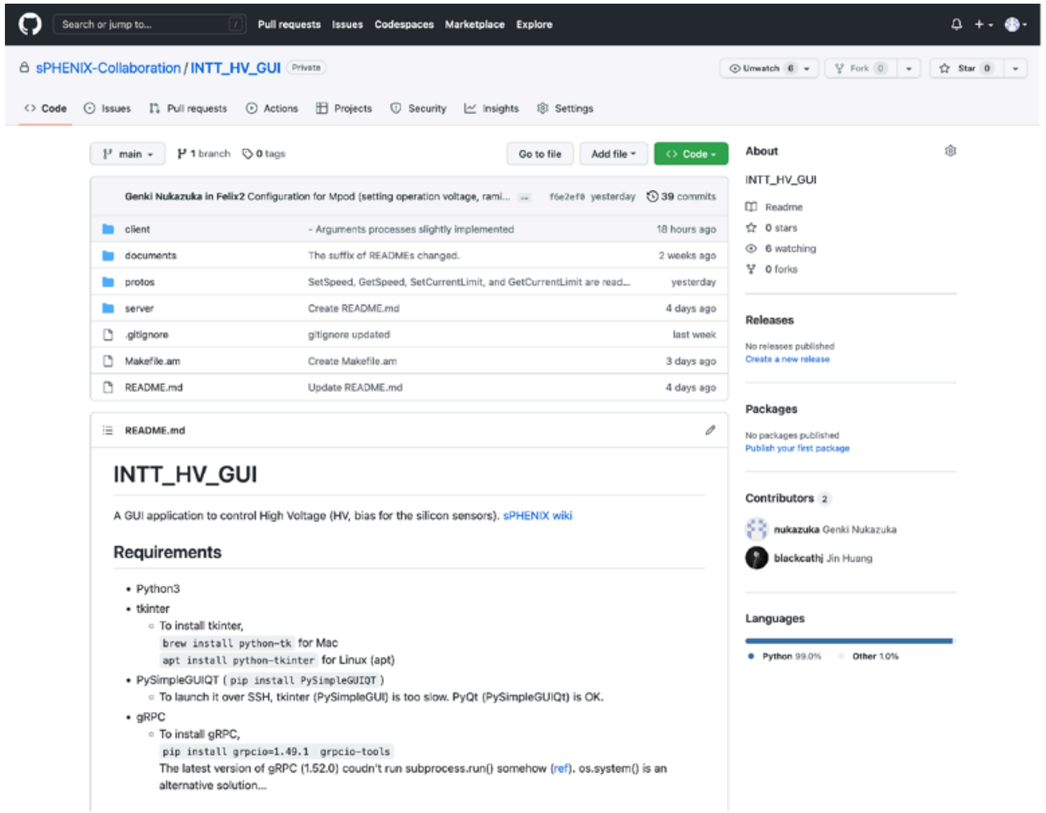
- Is data (voltage, current. etc.) saved to the database?
- What should be monitored?
  - ROC by ROC? individual window for voltage and current?
- Technical choice?
  - Ignition designer
  - Python Matplotlib
  - ROOT
  - PostogreSQL + Grafana



HV GUI：GitHub? BNL GitTea?

I made a private repository for the INTT HV app in GitHub under the INTT_developer team.
According to many people, even if it’s private, crucial information, such as IP address, shouldn’t be uploaded to GitHub.
→ not convenient

These can be loaded to GitTea by BNL…



The HV app: Status

- ☑ UI: ver1 made
- ☑ communication with MPOD: done
- ☑ Reading voltage: done
- ☑ Setting/Reading operation voltage: done
- ☑ Setting/Reading current limit:
- ☑ Turning ON/OFF: done
- ☑ Pilot operation at the silicon lab: ongoing
- ☐ Reading current: not yet
- ☐ Testing emergency flag: not yet
- ☐ Status indicator: not yet
- ☐ Monitoring voltage/current: partially done
- ☐ Making a database: not yet
- ☐ Connection to the database: not yet
- ☐ Monitoring tool: not yet