



O. V. Lounasmaa
Laboratory

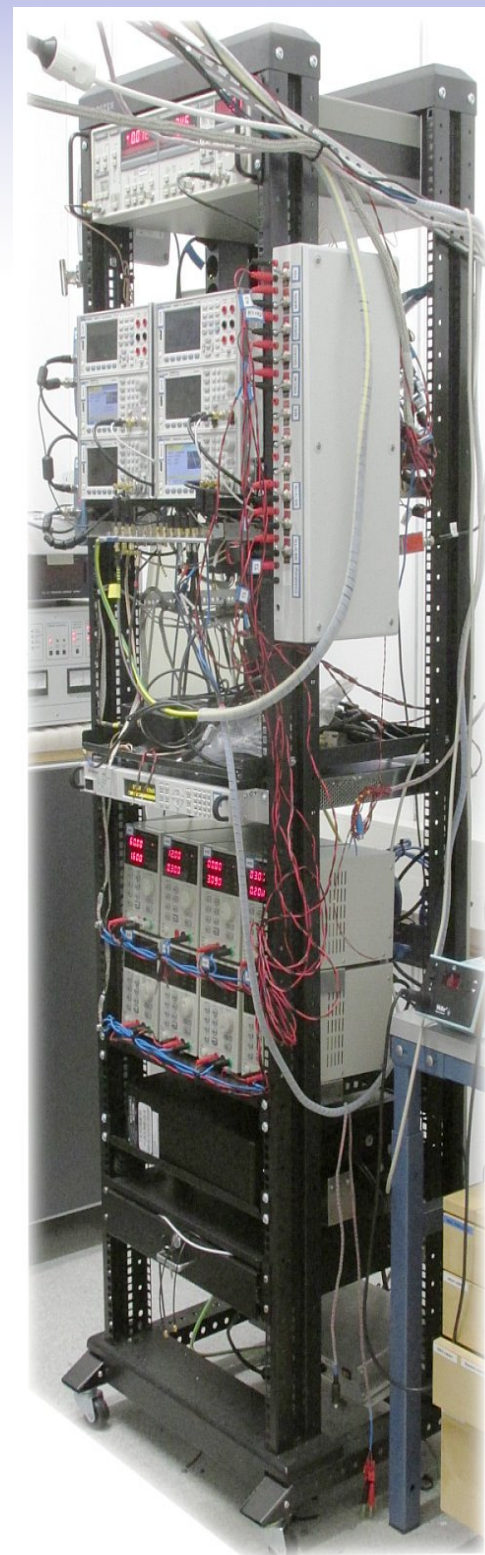
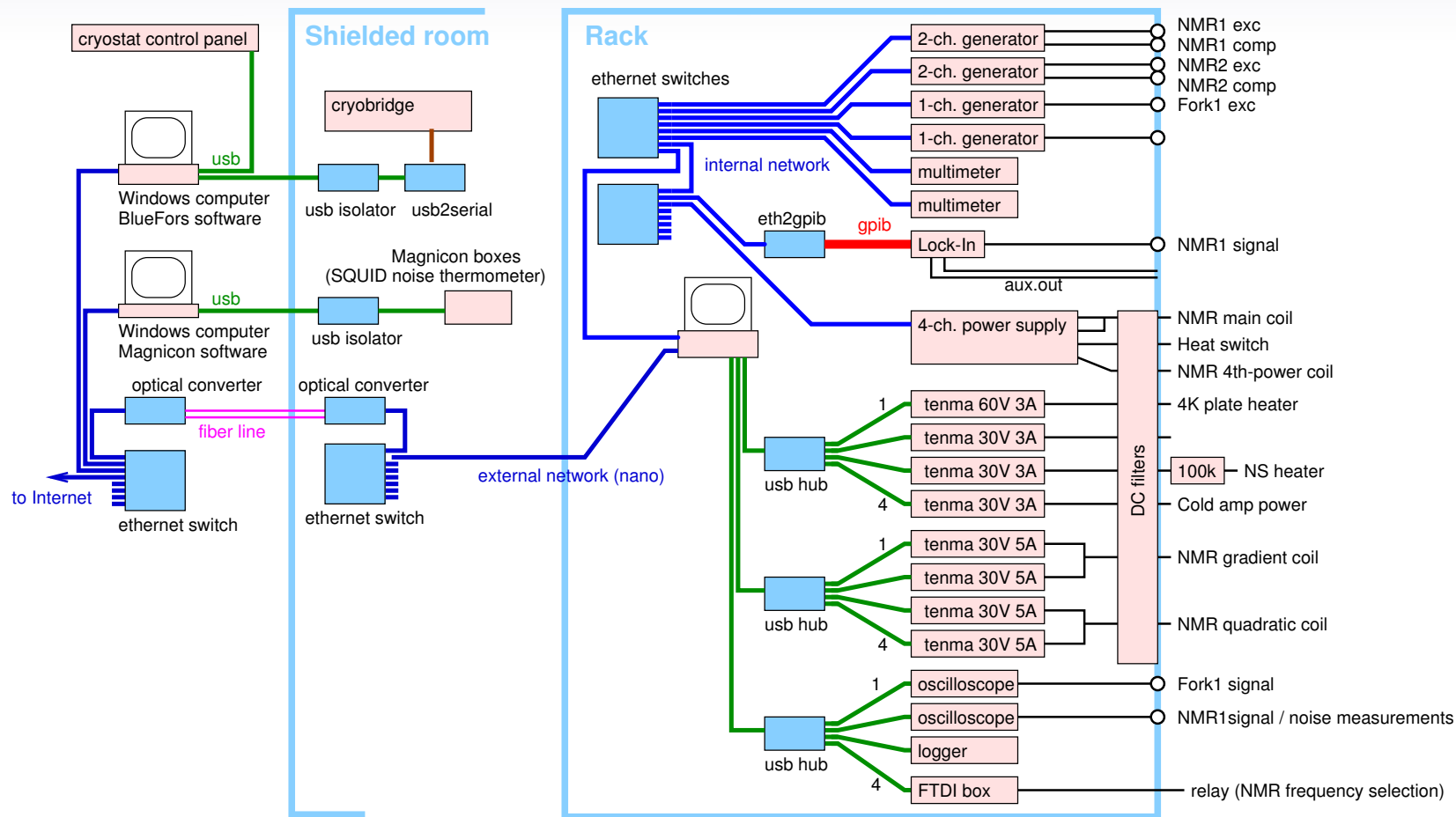


Aalto University

Software system for ^3He NMR experiments

Vladislav Zavjalov

Hardware



Device library

<https://github.com/slazav/tcl-device>

TCL language:

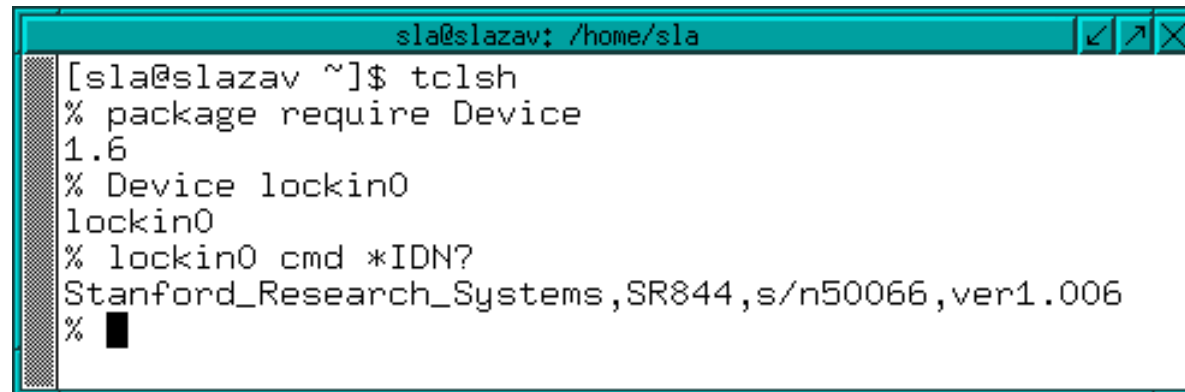
- easy to make graphical interfaces
- used in ROTA (some programs can be used)
- good for interaction between programs

Main idea: programs do not care about how devices are connected.

Program can just open a device, send a command and get an answer.

Other features:

- error handling
- IO locks
- user locks
- timeouts
- logging



```
sla@slazav: /home/sla
[sla@slazav ~]$ tclsh
% package require Device
1.6
% Device lockin0
lockin0
% lockin0 cmd *IDN?
Stanford_Research_Systems,SR844,s/n50066,ver1.006
% █
```

Device library – configuration

```
mc [nano@slazav_exp.localdomain]:/etc
devices.txt  [-M--]  0 L:[  1+ 2   3/ 52] *(110 /2657b)  10[*][X]
# device driver          parameters
#-----
lockin1  gpib_prologix  gpib0:8      # SR844 lock-in
demag    gpib_prologix  gpib0:25     # oxford PS

gen1     lxi_scpi_raw   gen1         # 1-ch generator 1
gen2     lxi_scpi_raw   gen2         # 1-ch generator 2
dgen1    lxi_scpi_raw   dgen1        # 2-ch generator 1
dgen2    lxi_scpi_raw   dgen2        # 2-ch generator 2
mult1    lxi_scpi_raw   mult1        # Keysight 34461A multimeter
mult2    lxi_scpi_raw   mult2        # Keysight 34461A multimeter

osc1     spp              pico_rec -d FR735/028 # picoscope 4224
osc2     spp              pico_rec -d ER245/039 # picoscope 4224
db_exp   spp              graphene -i
db_local spp              graphene -i -d .

ps0      lxi_scpi_raw   ps0          # Keysight PS frame
pst1     tenma_ps      /dev/pst1   # tenma PS
pst2     tenma_ps      /dev/pst2   # tenma PS
pst3     tenma_ps      /dev/pst3   # tenma PS
pst4     tenma_ps      /dev/pst4   # tenma PS
pst5     tenma_ps      /dev/pst5   # tenma PS
pst6     tenma_ps      /dev/pst6   # tenma PS
pst7     tenma_ps      /dev/pst7   # tenma PS

1Help  2Save  3Mark  4Re~ac  5Copy  6Move  7Se~ch  8De~te  9Pu~Dn 10Quit
```

Graphene database

<https://github.com/slazav/graphene>

Main idea: you can put a few numbers or text with a timestamp into a database. Then you can extract data for any time range

Features:

- based on BerkleyDB
- integer, floating point or text values
- nanosecond-precision timestamps
- multi-column numerical values
- fast access to data, interpolation, downsampling
- command line interface
- http interface for web-applications (Grafana viewer)

DeviceRole library

https://github.com/slazav/tcl-device_role

Main idea: program can use a device in some simple role, without a knowledge about its model and command set.

Program can just open a device "as a voltage source", and run "set voltage" method.

Existing roles and supported devices:

power_supply – a power supply with constant current and constant voltage modes

- * Keysight N6700B frame with N6762A or N6762A modules
- * Korad/Velleman/Tenma 72-2535, 72-2540, 72-2550 power supplies

dc_source – a simple DC voltage source

- * Korad/Velleman/Tenma power supplies
- * SR844 lock-in (auxiliary outputs)
- * Keysight generators (1 and 2 channels)

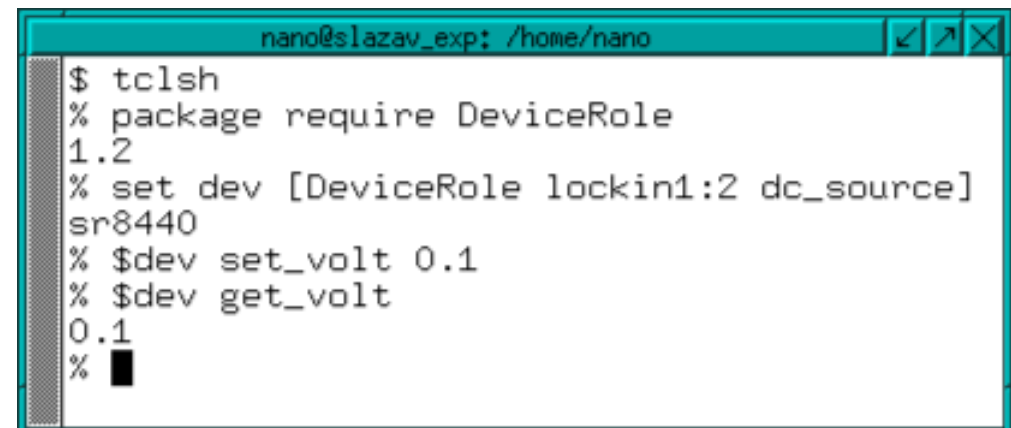
ac_source, noise_source

- * Keysight generators (1 and 2 channels)

gauge – a gauge device

- * SR844 lock-in
- * Keysight multimeters

q



```
nano@slazav_exp: /home/nano
$ tclsh
% package require DeviceRole
1.2
% set dev [DeviceRole lockin1:2 dc_source]
sr8440
% $dev set_volt 0.1
% $dev get_volt
0.1
% █
```