Magnet Temperature Measurement LHC

- Balázs Nagy
- Máté Patalenszki

Electronics engineering students @ University of Debrecen

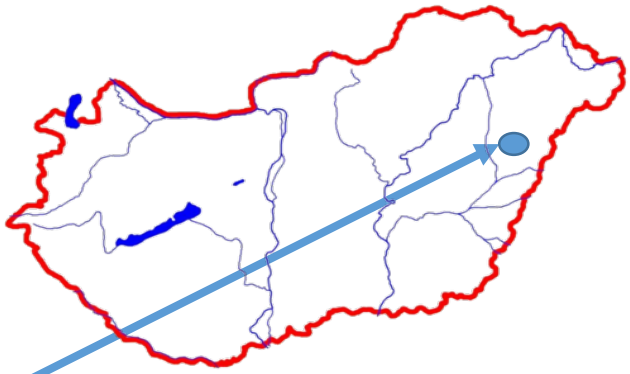
NI Big Physics Summit @ CERN Conference 2016

The Team

• Ádám Papp • Balázs Nagy • Máté Patalenszki	Undergraduate Electronics Engineering Students
• Kornél Sarvajcz • László Kazup	PhD Students
• Angéla Váradiné Szarka Dr	Acc Professor at Dept. of Electrical and Electronic Engineering
• Márta Bajkó	Leader of SM18, CERN
• Maryline Charrondiere	Technician at SM18, CERN

University of Debrecen

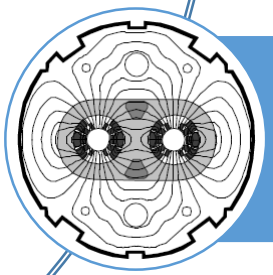
LabVIEW Academy Institution



EuCARD-2

Enhanced European Coordination for Accelerator Research & Development

WP9 13 Work Packages

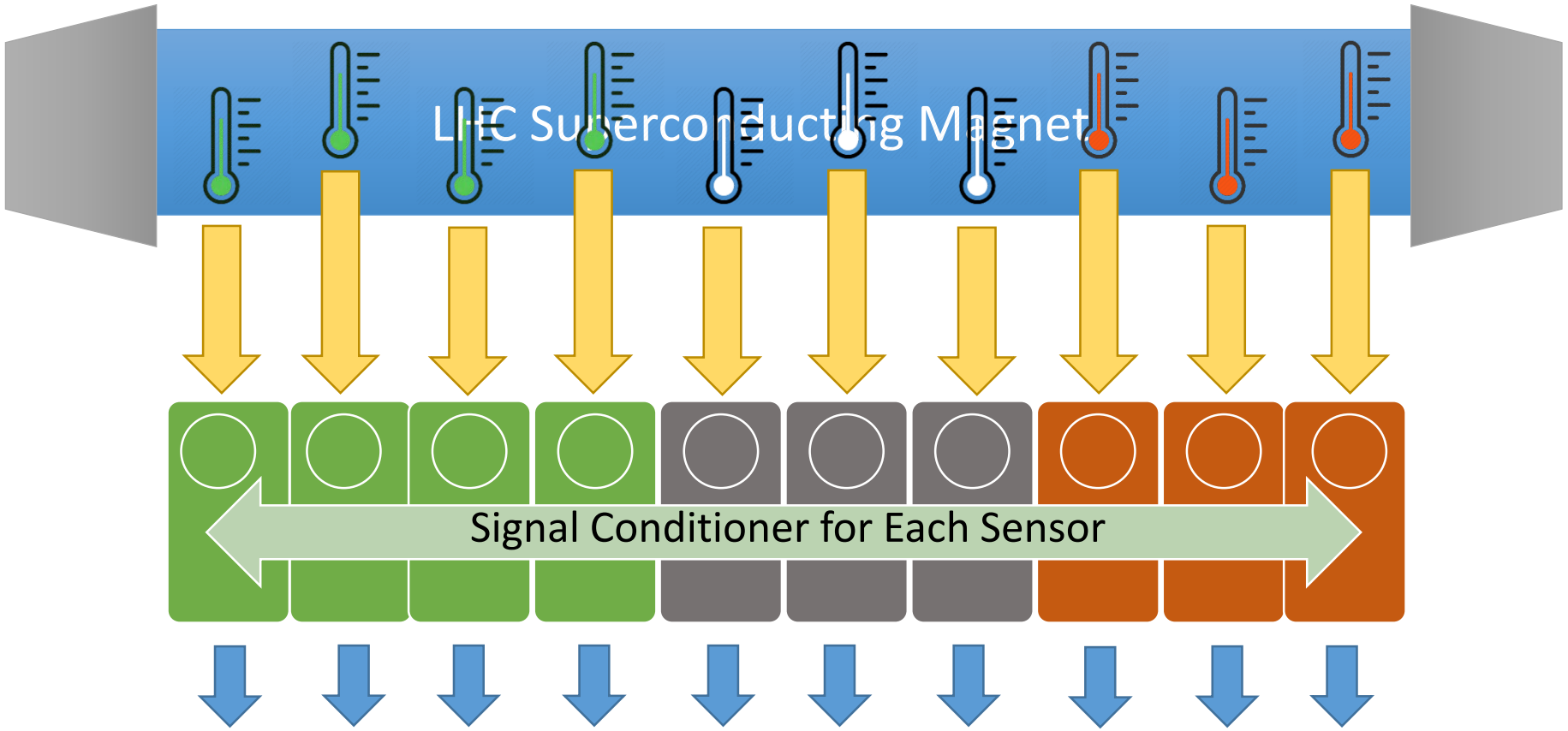


MagNET@CERN

SM18 – Cryogenic Test Facility

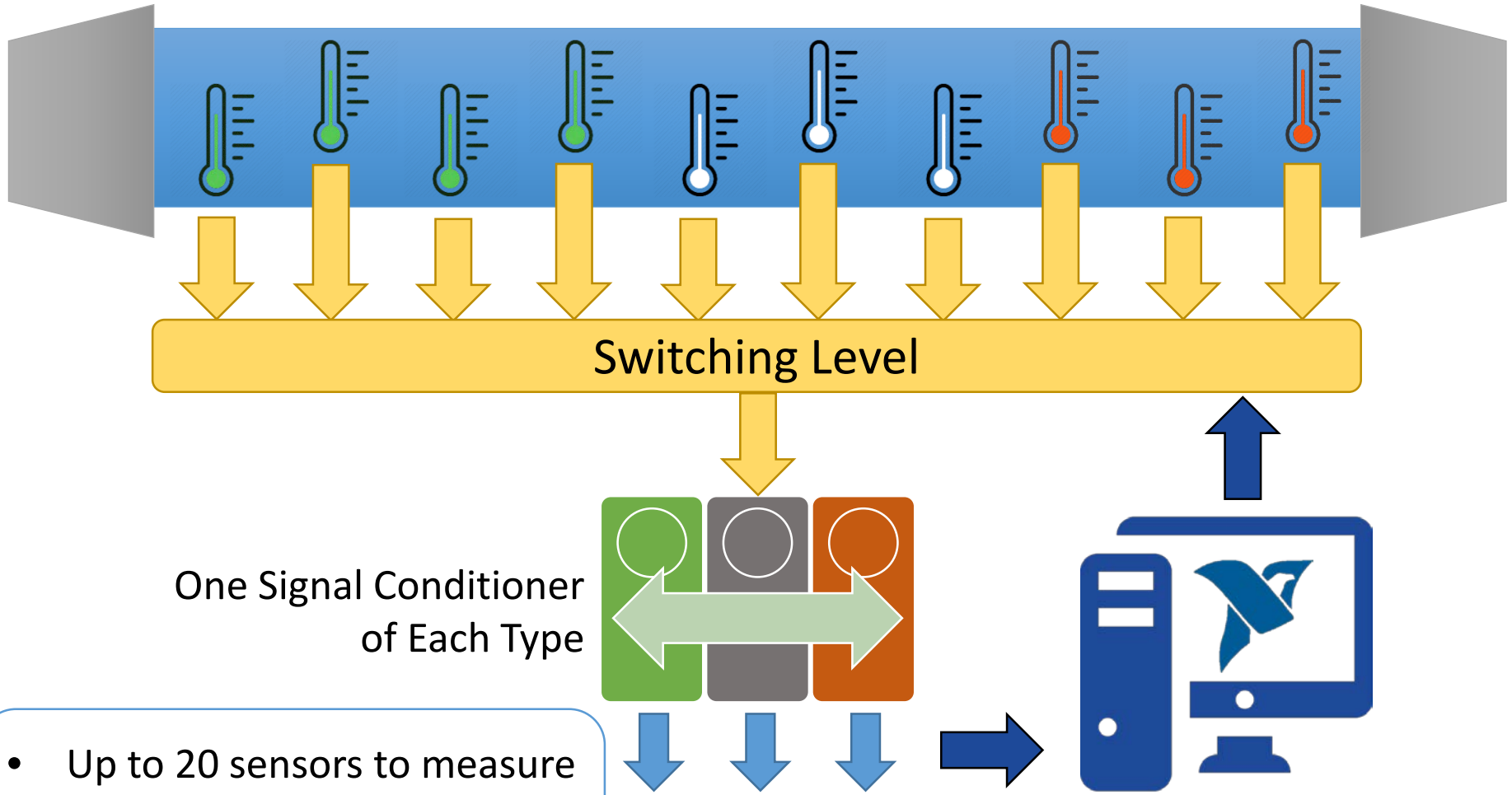
- Testing superconducting magnets & instrumentation
- 10 test benches in horizontal or vertical position
- Test on 1.9°K using up to 20kA current
- Serial and prototype testing

Testing Superconducting Magnets



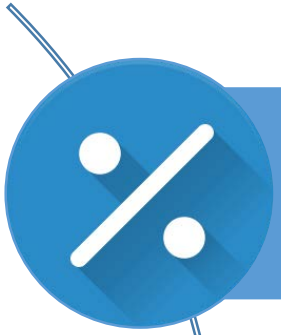
- Up to 20 sensors to measure
- 0.5% accuracy in the whole measurement range

Aim of the Project



- Up to 20 sensors to measure
- 0.5% accuracy in the whole measurement range

Challenges



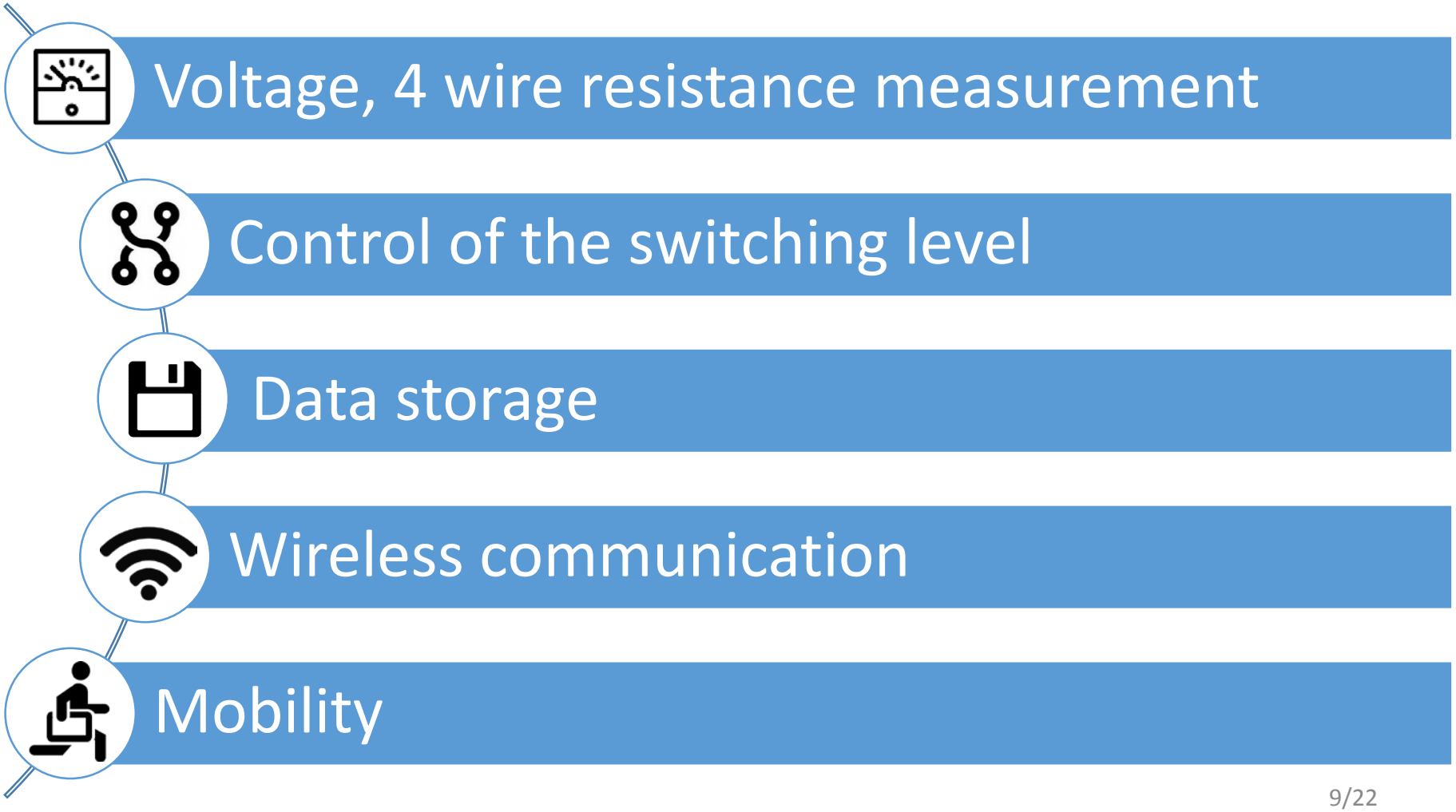
Accuracy: 0.5% in the whole measurement range

3 different measurements on each sensors:

- CERN signal conditioners
- NI DMM 4 wire measurement
- Direct resistance mesurement between each 2 wires

Compact & mobile instrument

NI Hardware - Requirements



NI Hardware - Configurations

PCIe

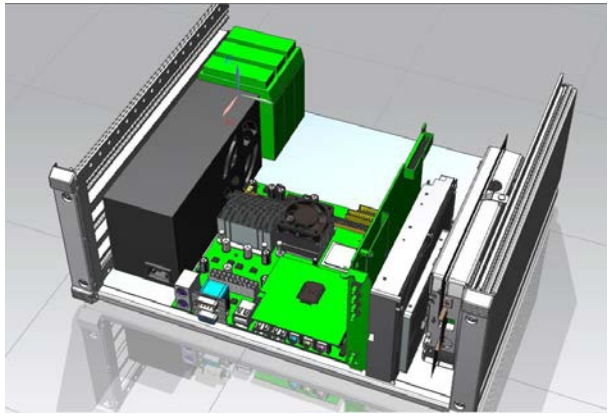
- PC is included in the chassis
- DAQ card
- DMM card

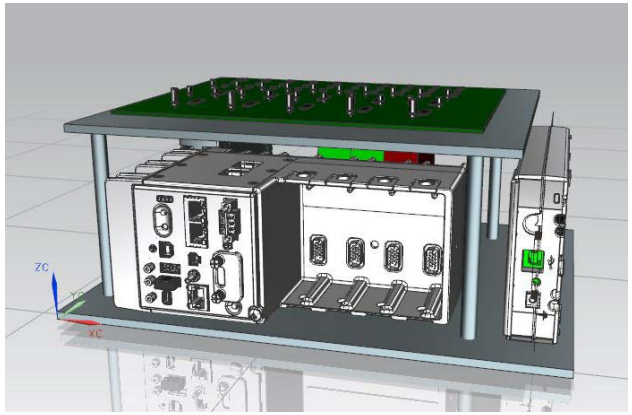
cDAQ

- Controller
- AI module
- DIO module
- DMM (USB)

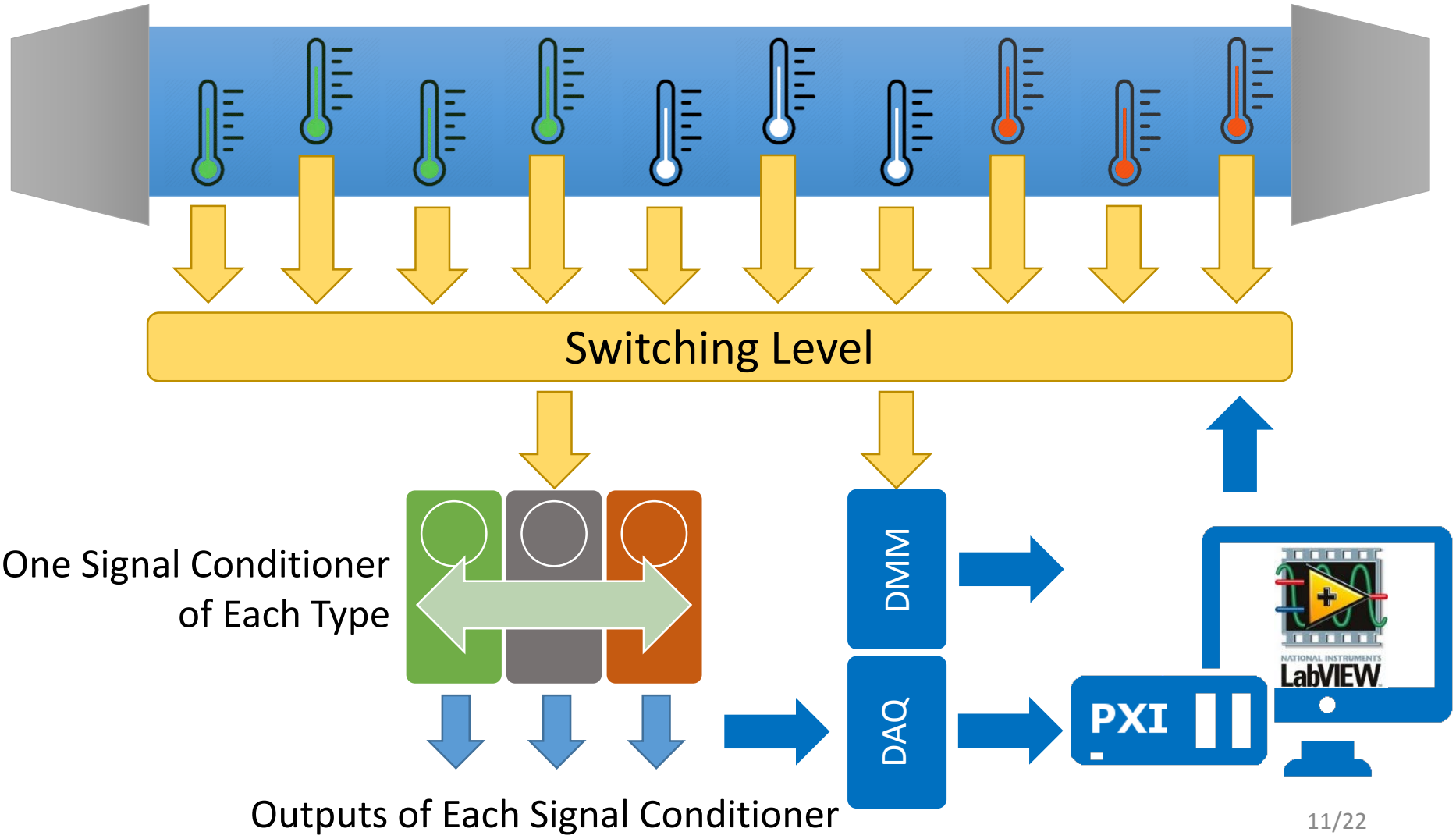
PXI

- Controller
- DAQ card
- DMM card

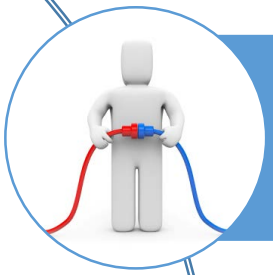




Block Diagram of the Instrument



Hardware – The Switching Level

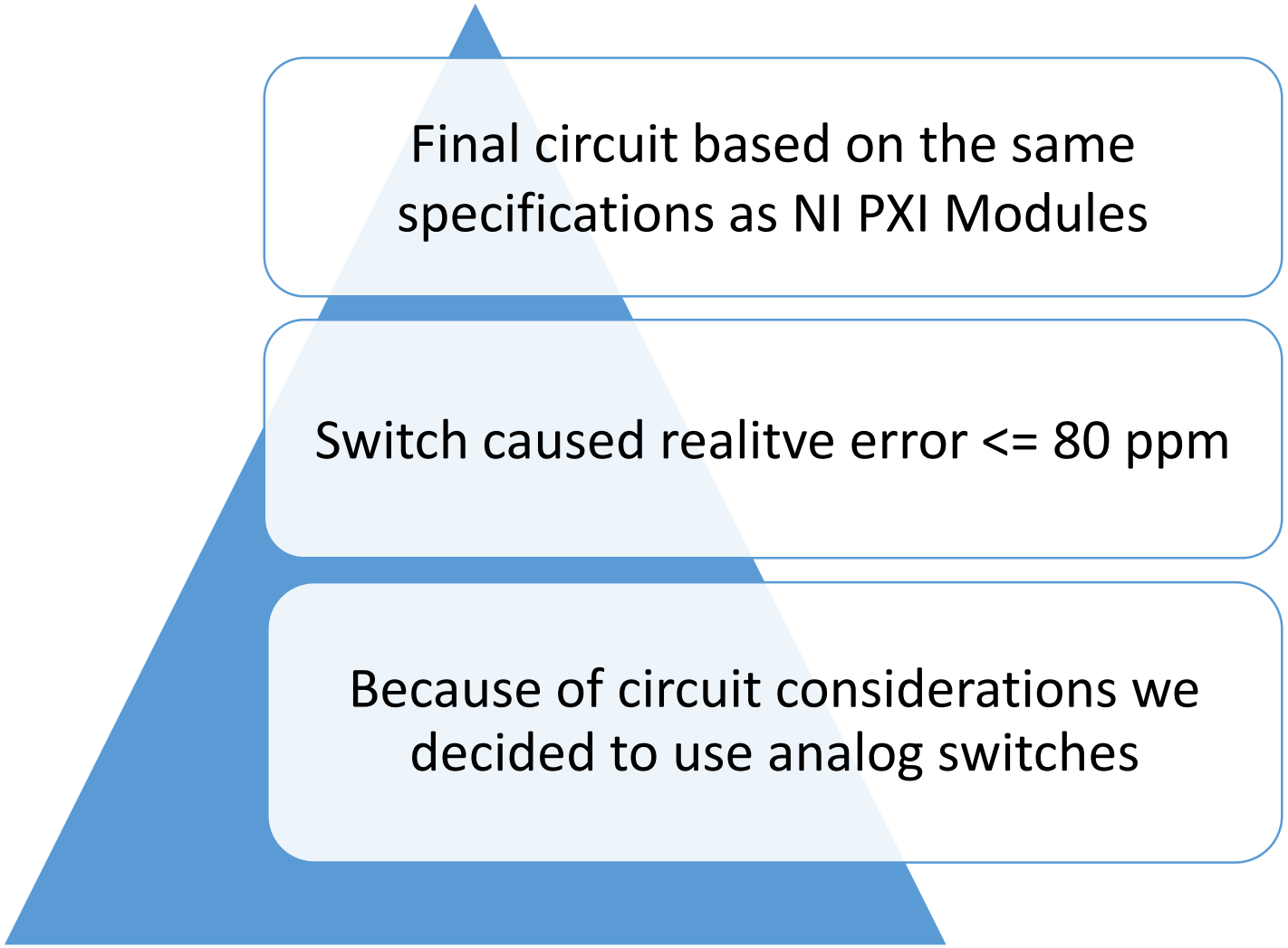


Connecting sensor wires to the appropriate signal conditioner

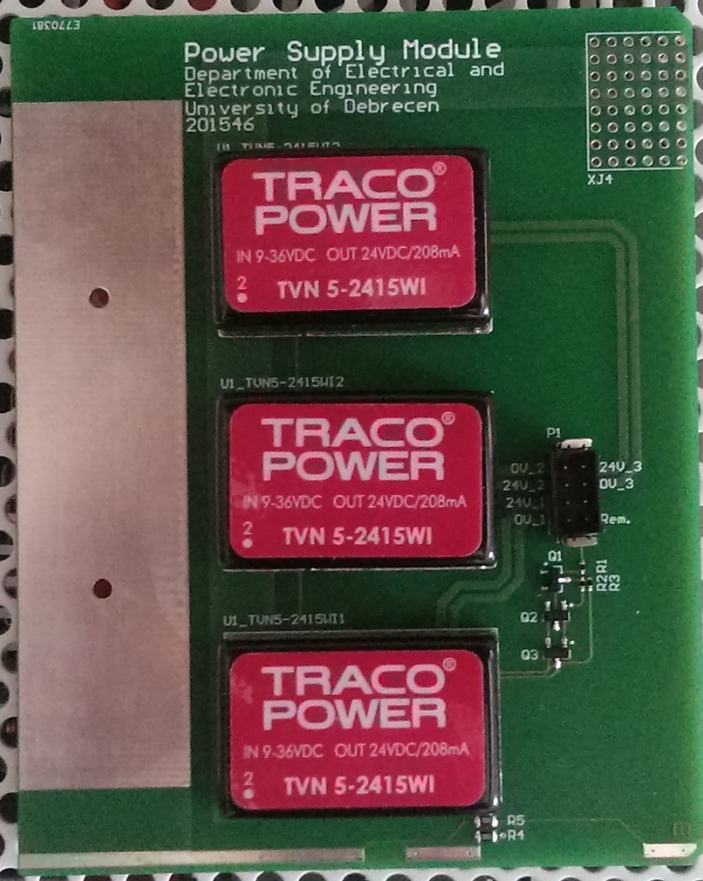
Providing direct measurement for verification

Not exceeding 0.2% relative measurement error

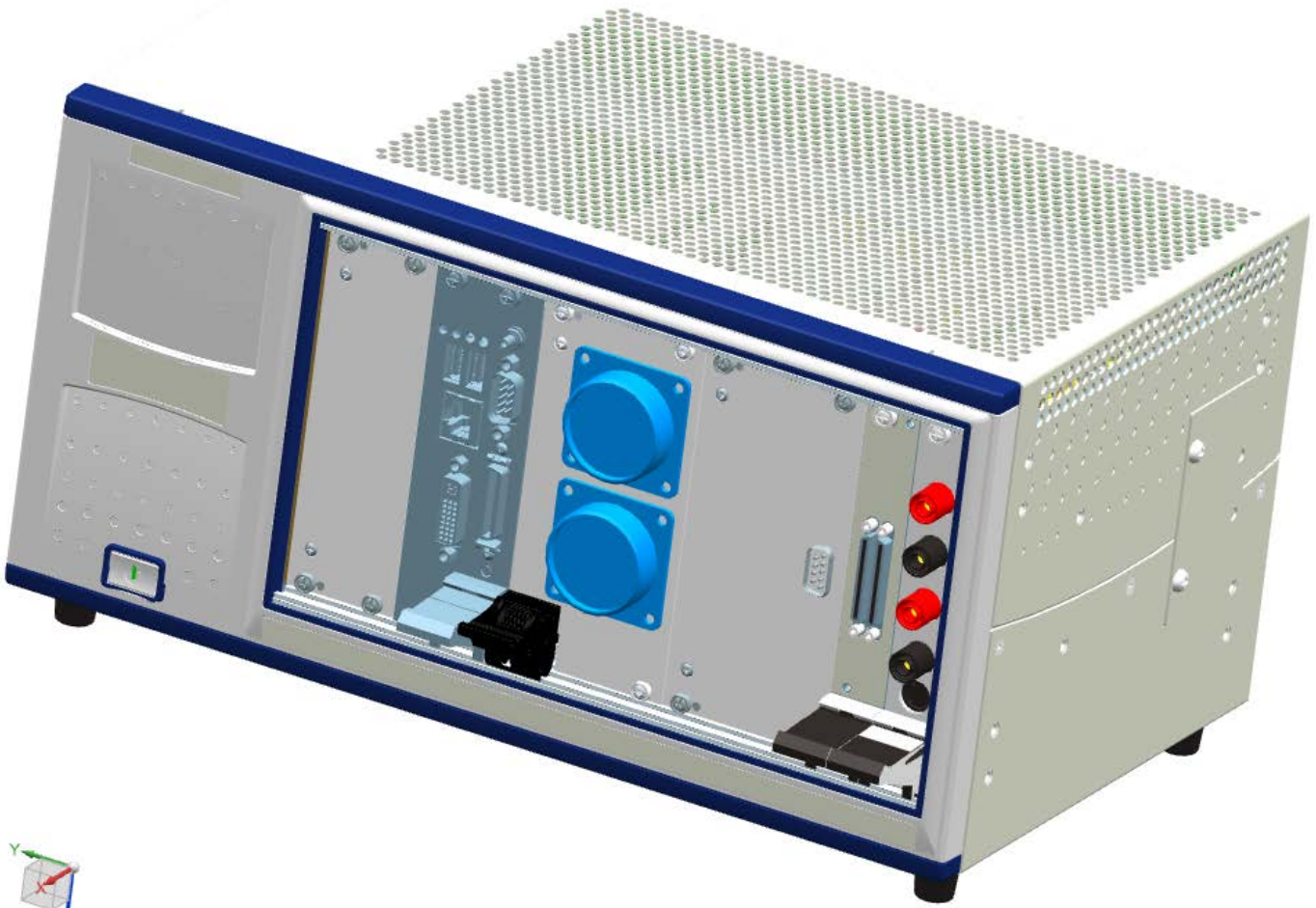
Switching Level - Specifications



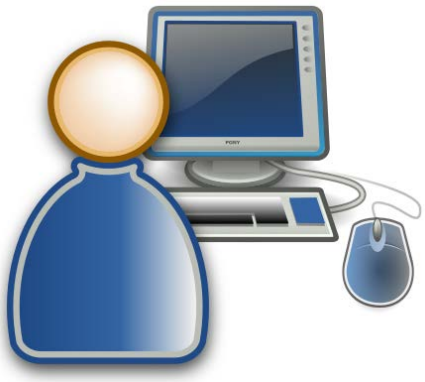
Switching Level - Realisation

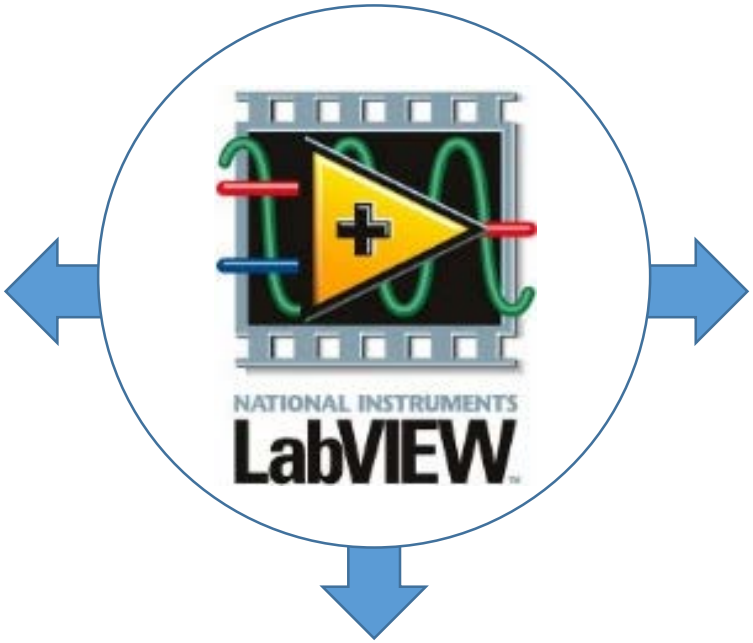


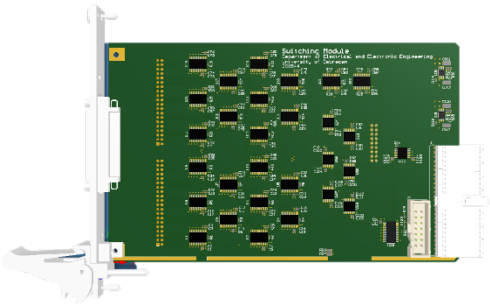
Instrument Integration



Software

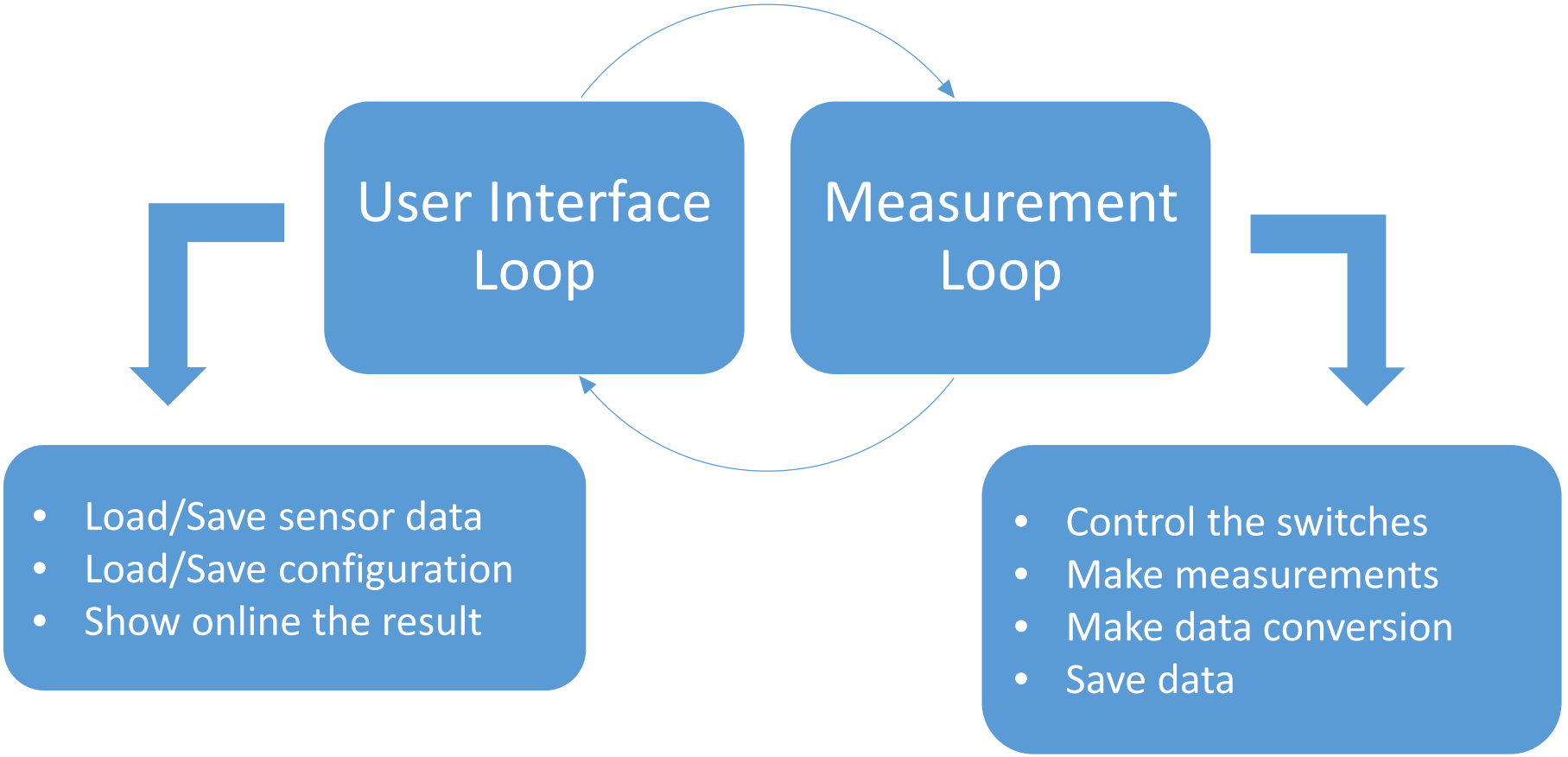






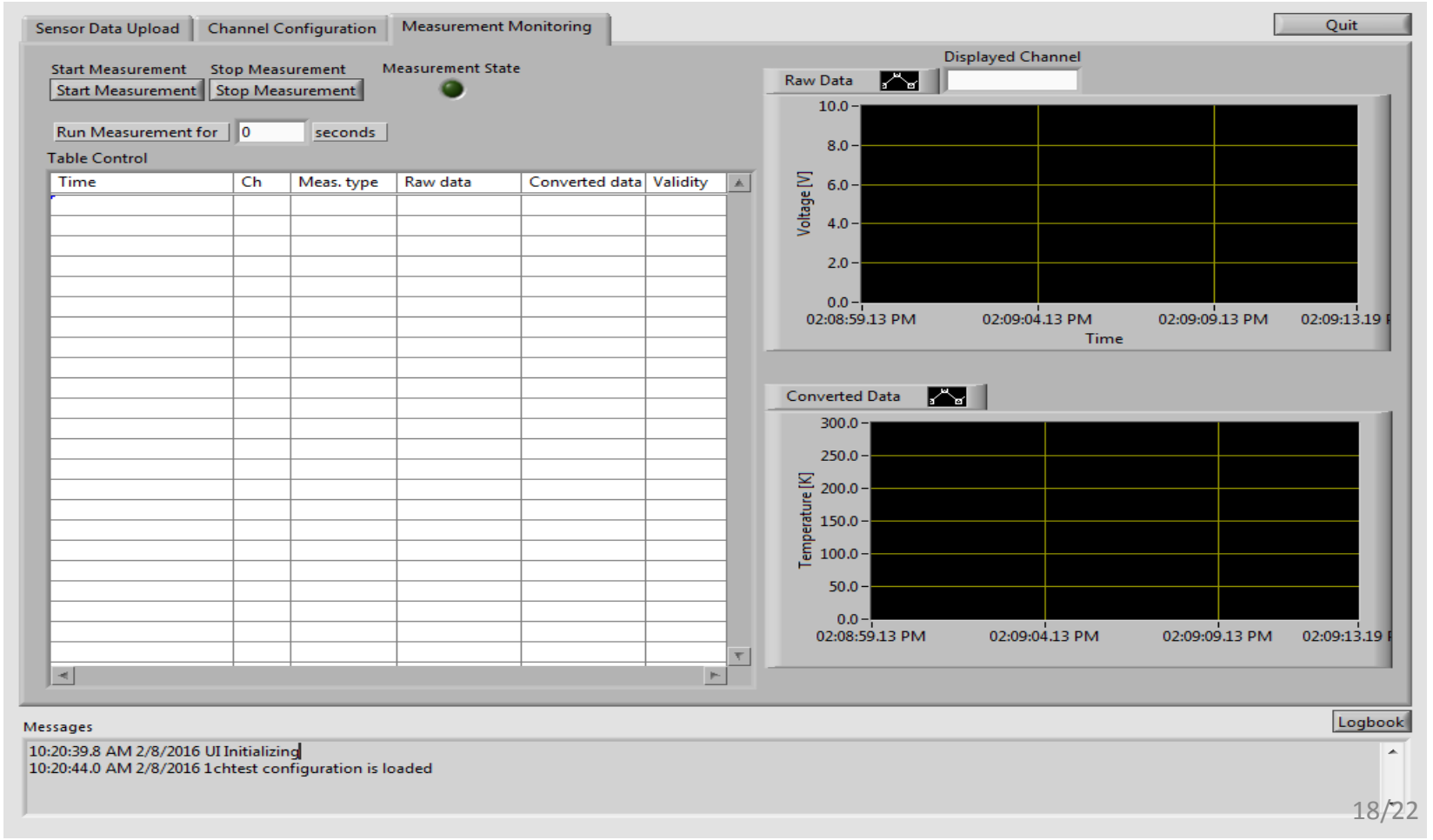
Software

Producer/Consumer Design Pattern

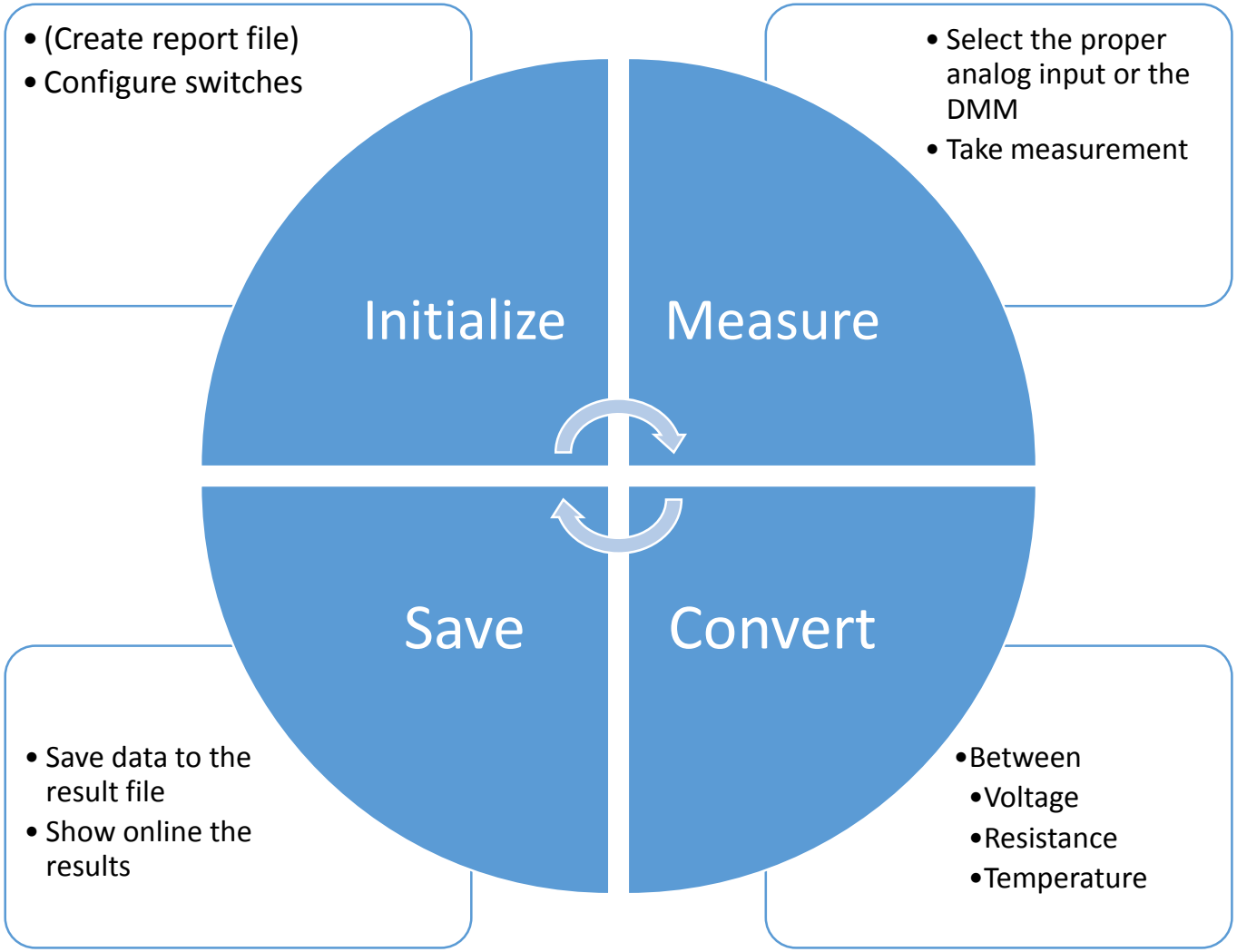


Software – User Interface

Measurement Monitoring



Software - Measurement



Summary


NI PXIe-1078
NATIONAL INSTRUMENTS
NATIONAL INSTRUMENTS
USER2
USER1
PWR OK / FAULT
DRIVE
TRIG
ACT/ LINK
10/100 /1000
RESET
NI PXIe-8820
Embedded Controller
NI PXI-4065
6½ Digit DMM
NI PXIe-6341
X Series
300V MAX
INPUT
AUX I/O
PXI LOW POWER
1
2
3
4
5H
6H
7H
8H
9H

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Thank you for your attention