SPD detector control system (DCS)

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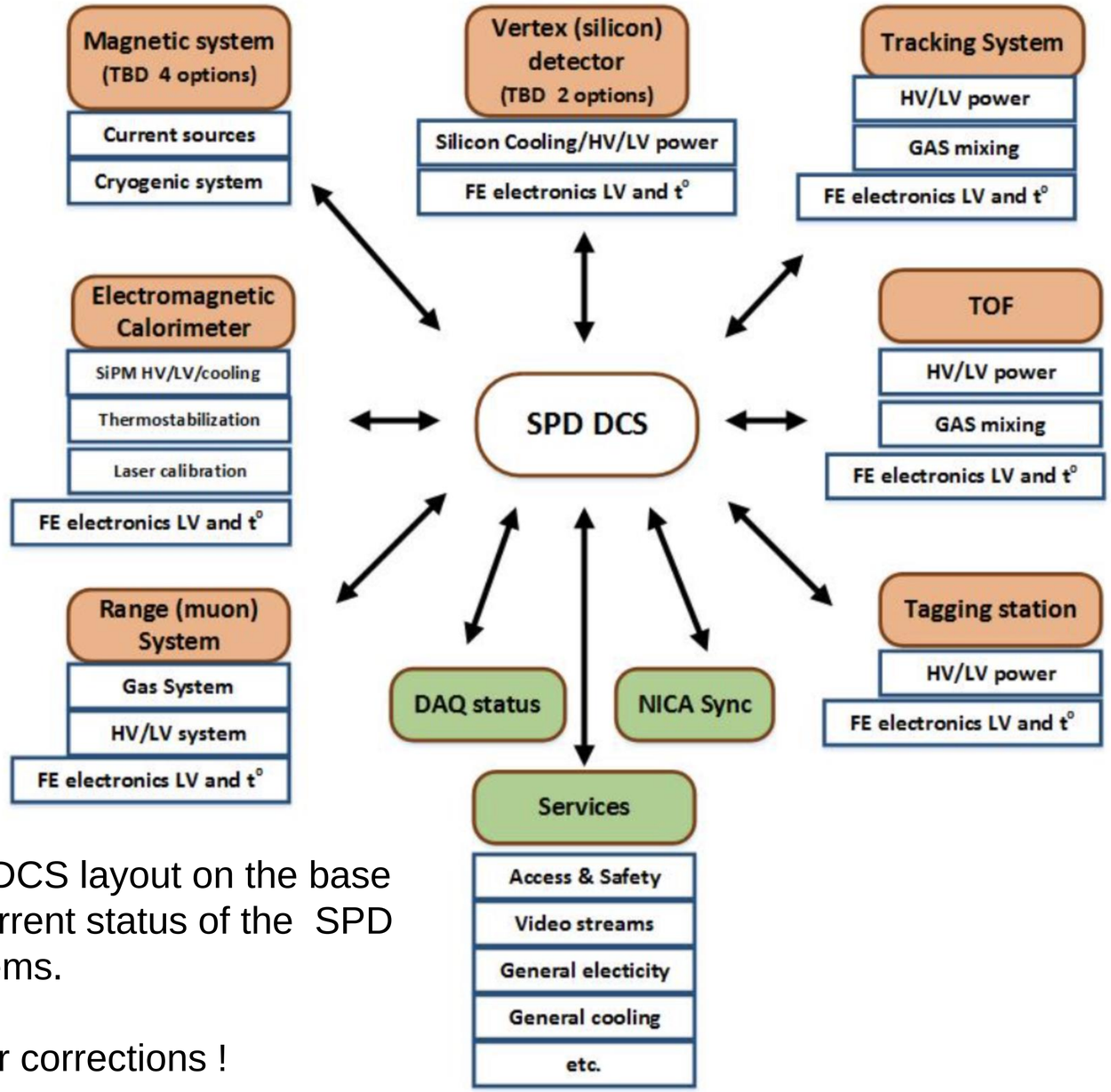


Current DCS layout on the base of the current status of the SPD subsystems.

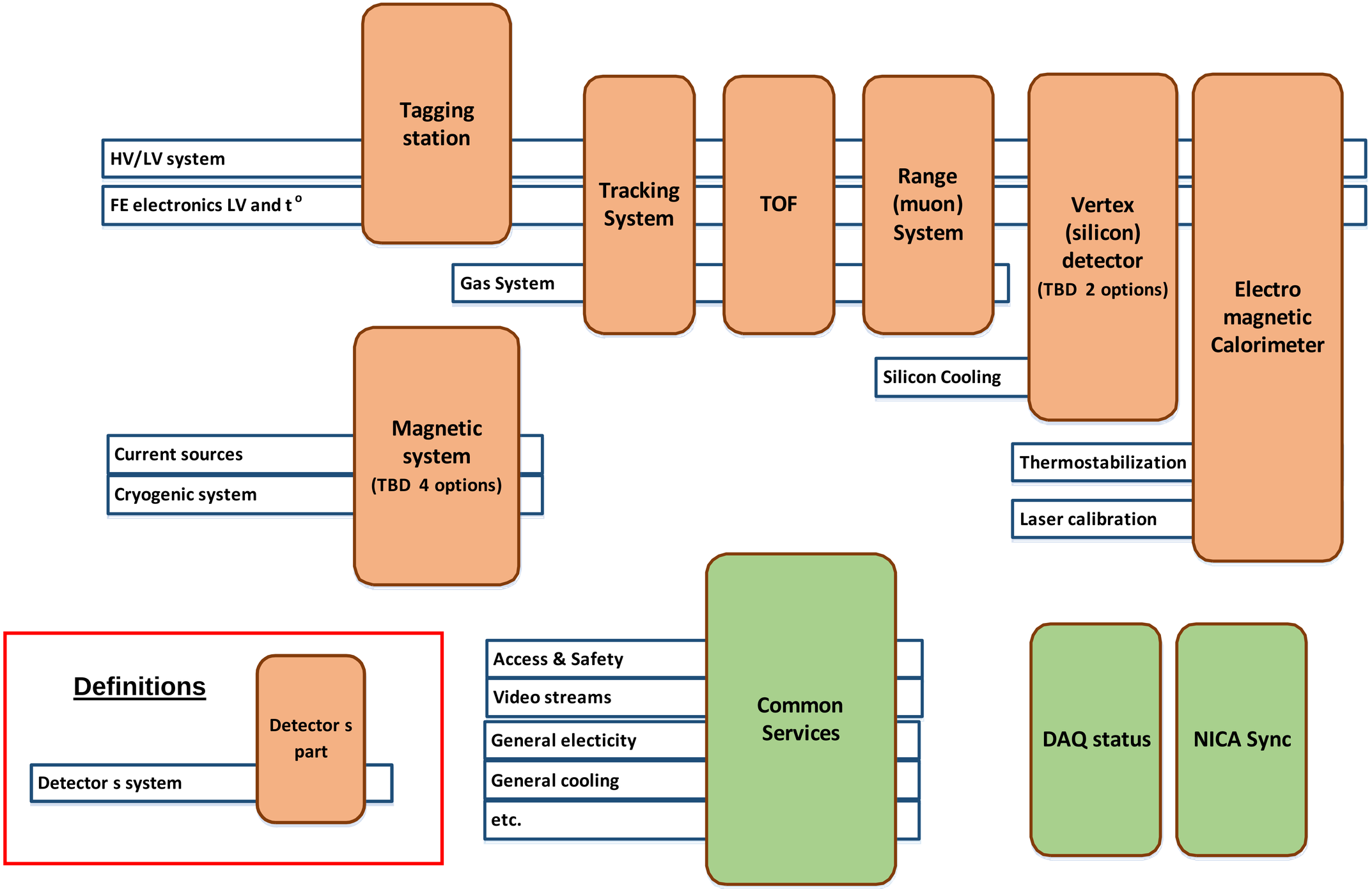
Open for corrections !

<u>SPD DCS basic principles and rules</u>

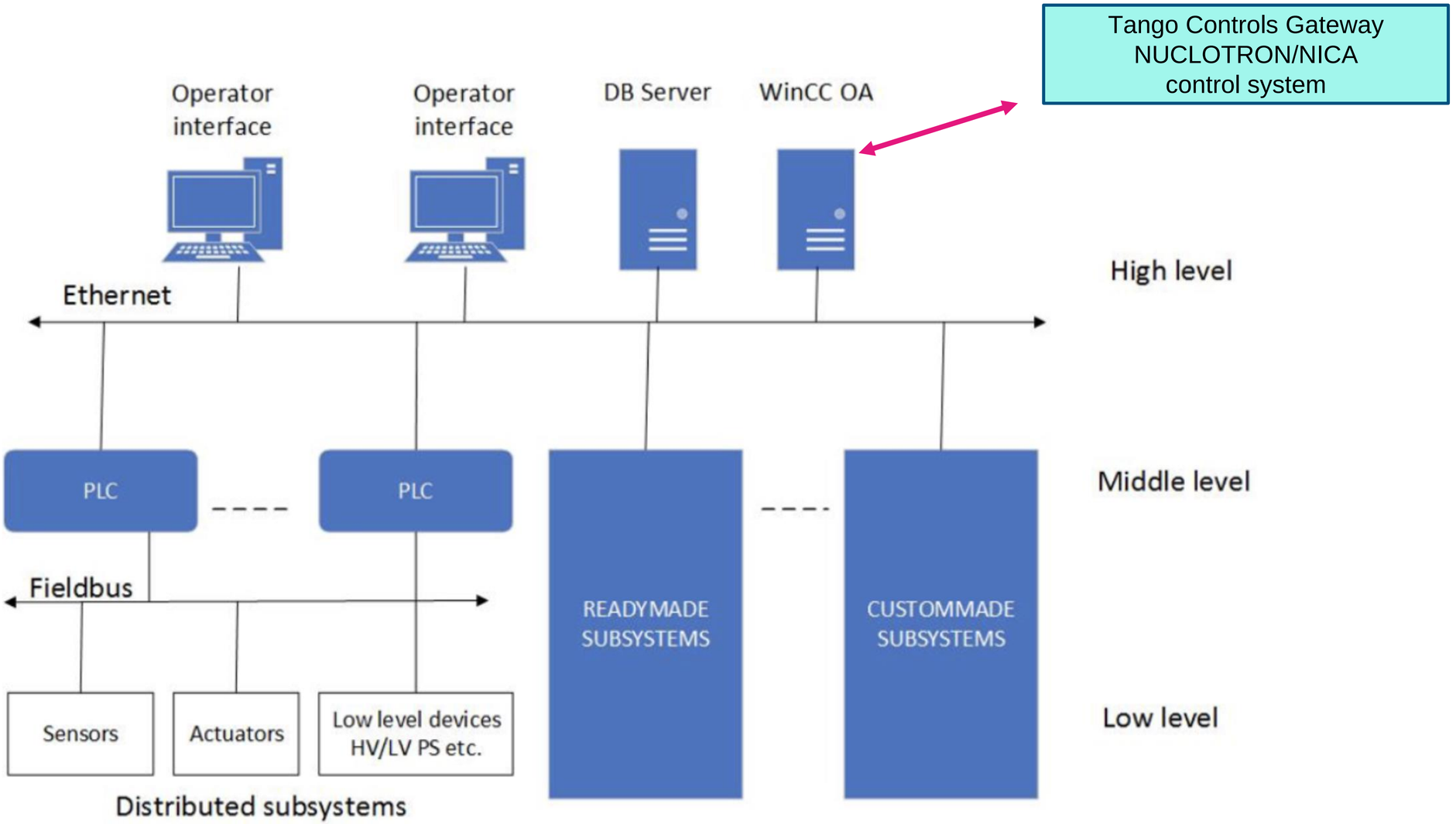
Control system of each SPD system should be developed according to the predefined rules and principals described in SPD CDR

Used (or planned to use) technologies, software and hardware components should fullfilled predefined rules and agree with the SPD DCS responsible persons.

These rules could be modified and changed till the SPD TDR stage

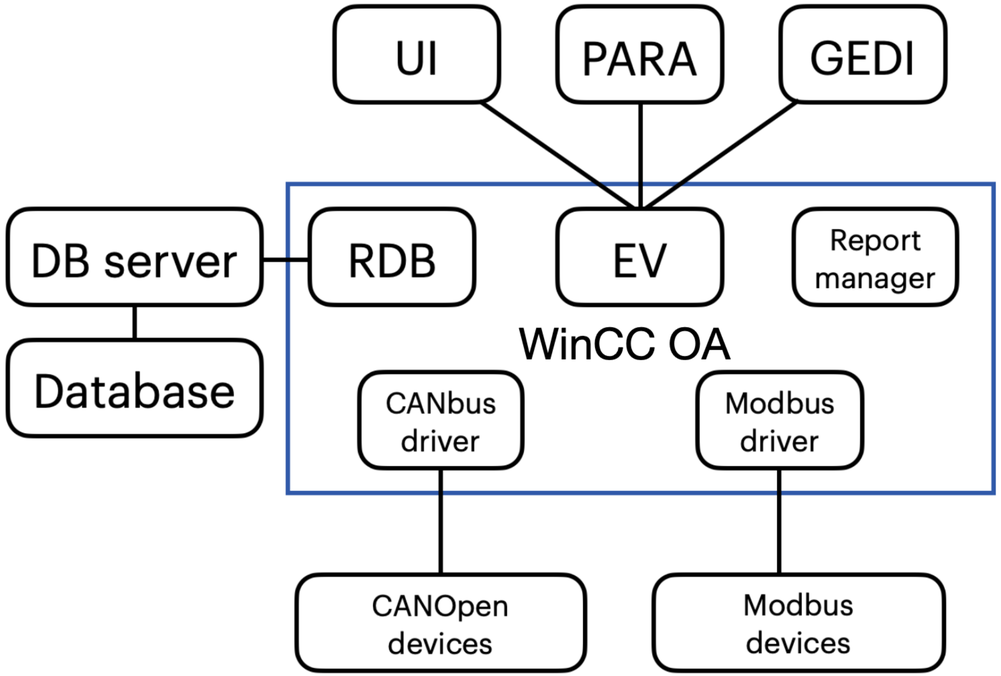

Tagging station
HV/LV system
FE electronics LV and t°
Tracking System
Gas System
TOF
Range (muon) System
Vertex (silicon) detector
(TBD 2 options)
Silicon Cooling
Electro magnetic Calorimeter
Thermostabilization
Laser calibration
Magnetic system
(TBD 4 options)
Current sources
Cryogenic system
Definitions
Detector s part
Detector s system
Common Services
Access & Safety
Video streams
General electicity
General cooling
etc.
DAQ status
NICA Sync

SPD DCS architecture



SIMATIC WinCC Open Architecture

- Widely used at CERN
- Event driven system
- Platform independent (Linux & Windows)
- Include main traditional SCADA functionalities:
  » Engineering (device creation, device settings, etc.)
  » Acquisition (OPC, Ethernet, etc.)
  » Alarm handling, display, filtering
  » Archiving, trending, logging
  » User Interface
  » Access Control
- Wide range of drivers and options for communication
  OPC, OPC UA, S7, Modbus, IEC 60870-5-2564 101/104,DNP3, XML, JSON, SOAP…..
- The ability to create a native connection with other SCADA systems (f.e. Tango Controls)



Beam Test Zone control system (Open architecture)

Beam Test Zone control system is intened for the following purposes:

1. To test prototypes of control systems for different SPD systems

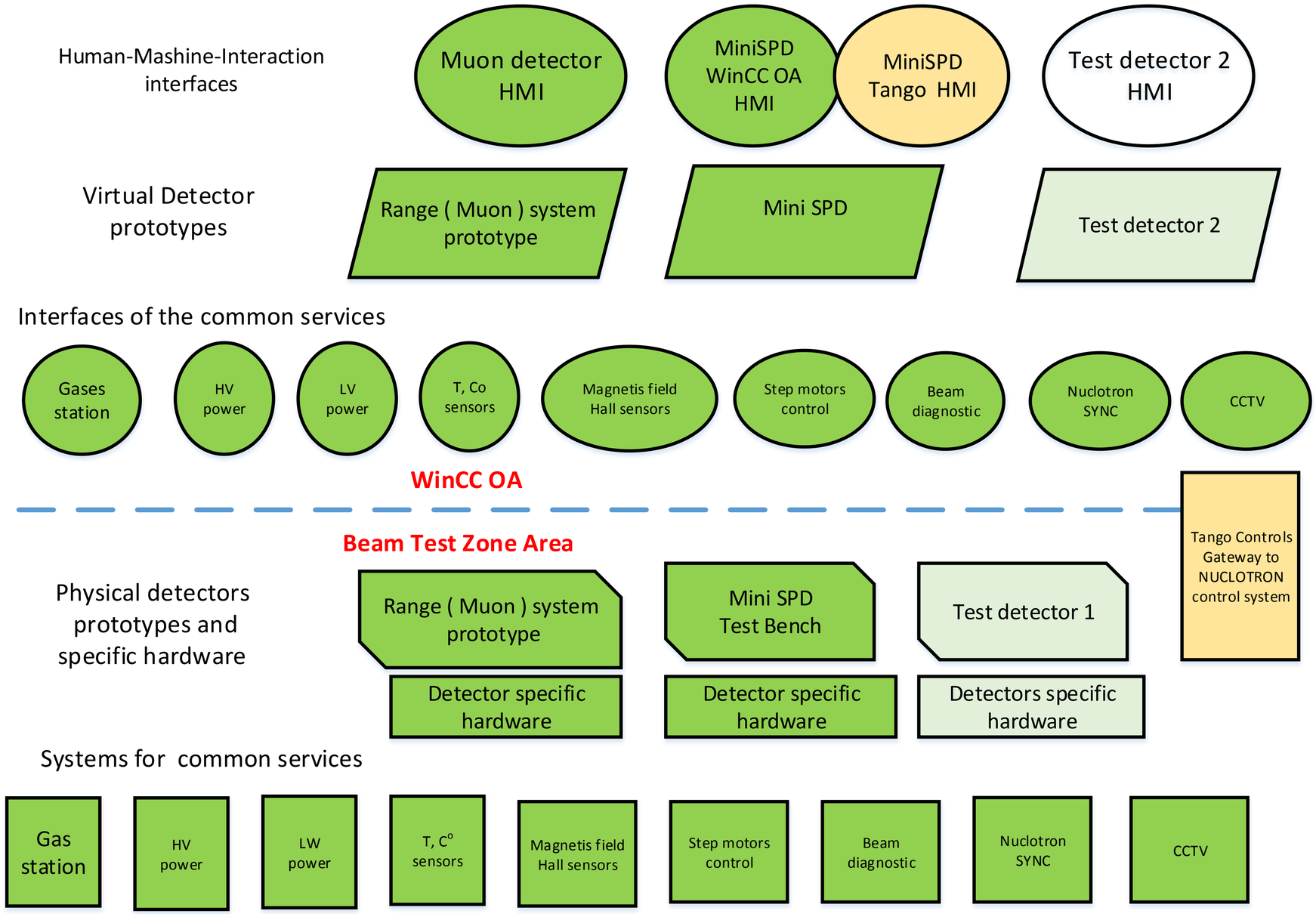
2. To test separate components of SPD DCS with WinCC OA

3.To develop and test software prototypes for common SPD DCS services such as HMI, DB etc.

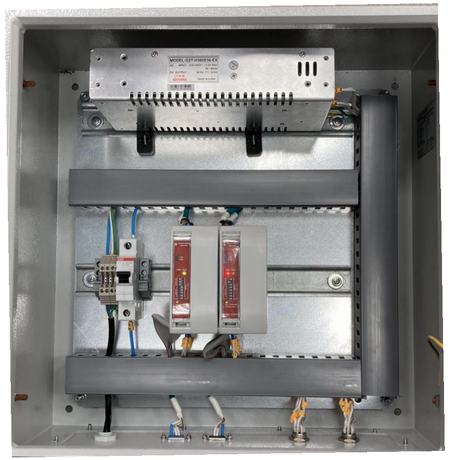
4. To test interoperability between SPD DCS of different systems

5. To test interoperability between SPD DCS of different systems and NICA accelerator

6. Anything else …. ???



BTZ control system - examples of hardware for common systems control



Stepper motor control

Gas station control

T, C^{o} measurement

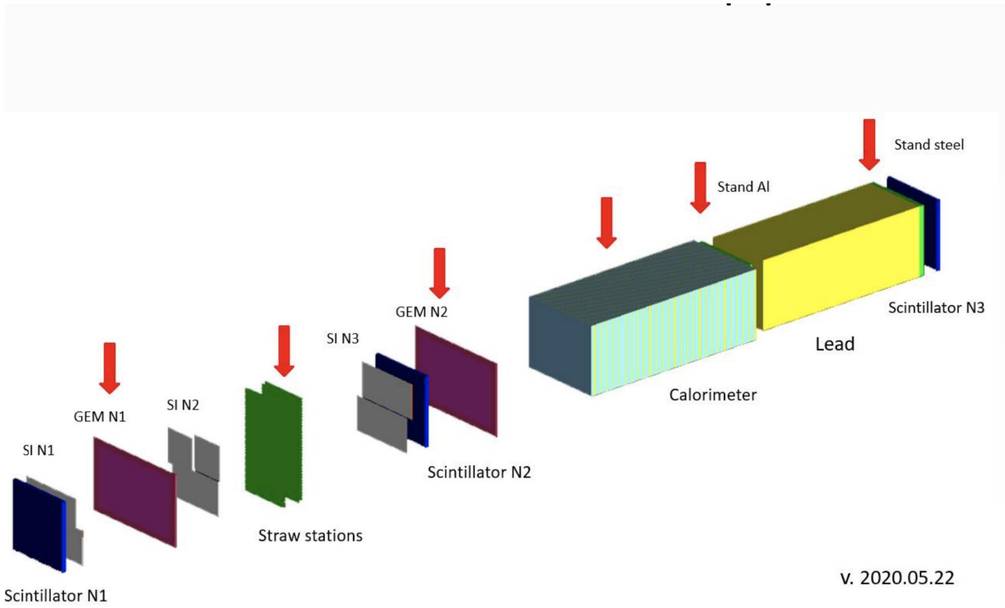
More
Systems are coming

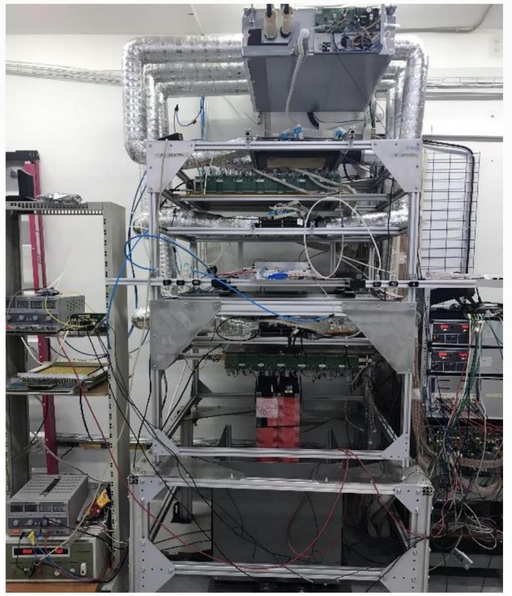
miniSPD Test stand

At the moment, a prototype of the SPD cross section has been implemented. To operate the prototype control system based on Tango Controls was developed.

The following subsystems were implemented and worked out in practice:
-Gas system;
-Environment control system;
-HV & LV control system.

Moving of miniSPD to BTZ will be an important exercise in bringing together the work of different groups from the point of view of the control systems





Name	Completeness	Name	Completeness
APC UPS	++	Gas Gain	+++
WIENER MPOD Crates	++++	Gas reserve (scales)	+++
CAEN Power Supply	++	Gas flow regulators	+
iseg Power Supply	+++	Network state	++++
FuG Power Supply	++++	Subsystem states	
AIM TTi Power Supply	++	Hall	++
THP (temp., press., hum.)	++++	Air Conditioners	+
High sense THP	++++	Seismic and geometry	

(Based on Kirill Salamatin's presentation)

DCS dashboard based on Tango Control for the miniSPD

(Based on Kirill Salamatin’s presentation)

Conclusion

DCS development often encounters typical difficulties and mistakes:

- Weak “connections” between different groups developing different parts of the detector including the corresponding control (hardware/software);
- Extremely heterogeneous set of equipment to be monitored/controlled which could be usually avoided;
- DCS typically being developed later than major parts of all subsystems,
  (we have got a chance to do parallel development)
- DCS typically is considered as less important part of the controlled system so less attention and limited funding is the usual practice

We have a chance to minimize these difficulties if will follow agreed rules concerning SPD DCS development

DCS working group should be established within the SPD collaboration with representatives of each groups developing different parts of the SPD detector