



SDH

Introduction and „hands on“ training

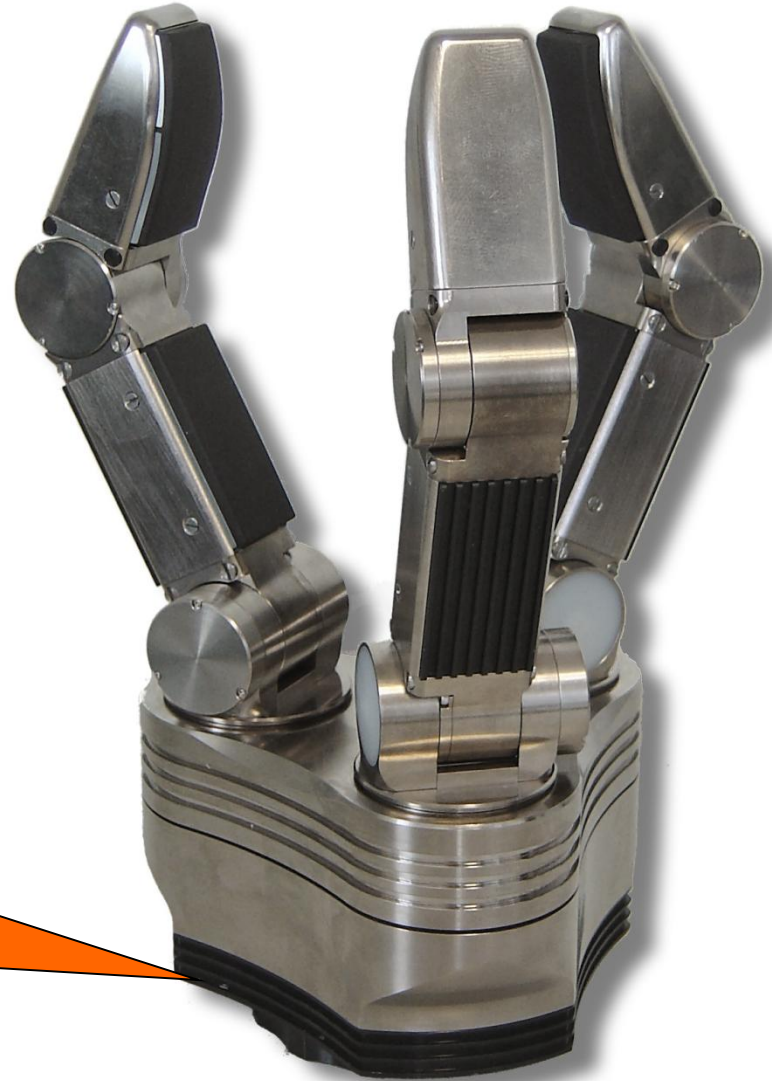
2011-12-20

Outline

Or: What can you expect today?

- Brief demonstration of the SDH
 - Watch the hand "in action"
- Presentation of technical features
 - Mechanical structure
 - Electronical structure
- Presentation of software
 - Overall Structure
 - Practical training
 - Integration into the customers system
- Outlook - what's next
 - Future features

**If you have questions:
feel free to ask - any time!**



Technical features

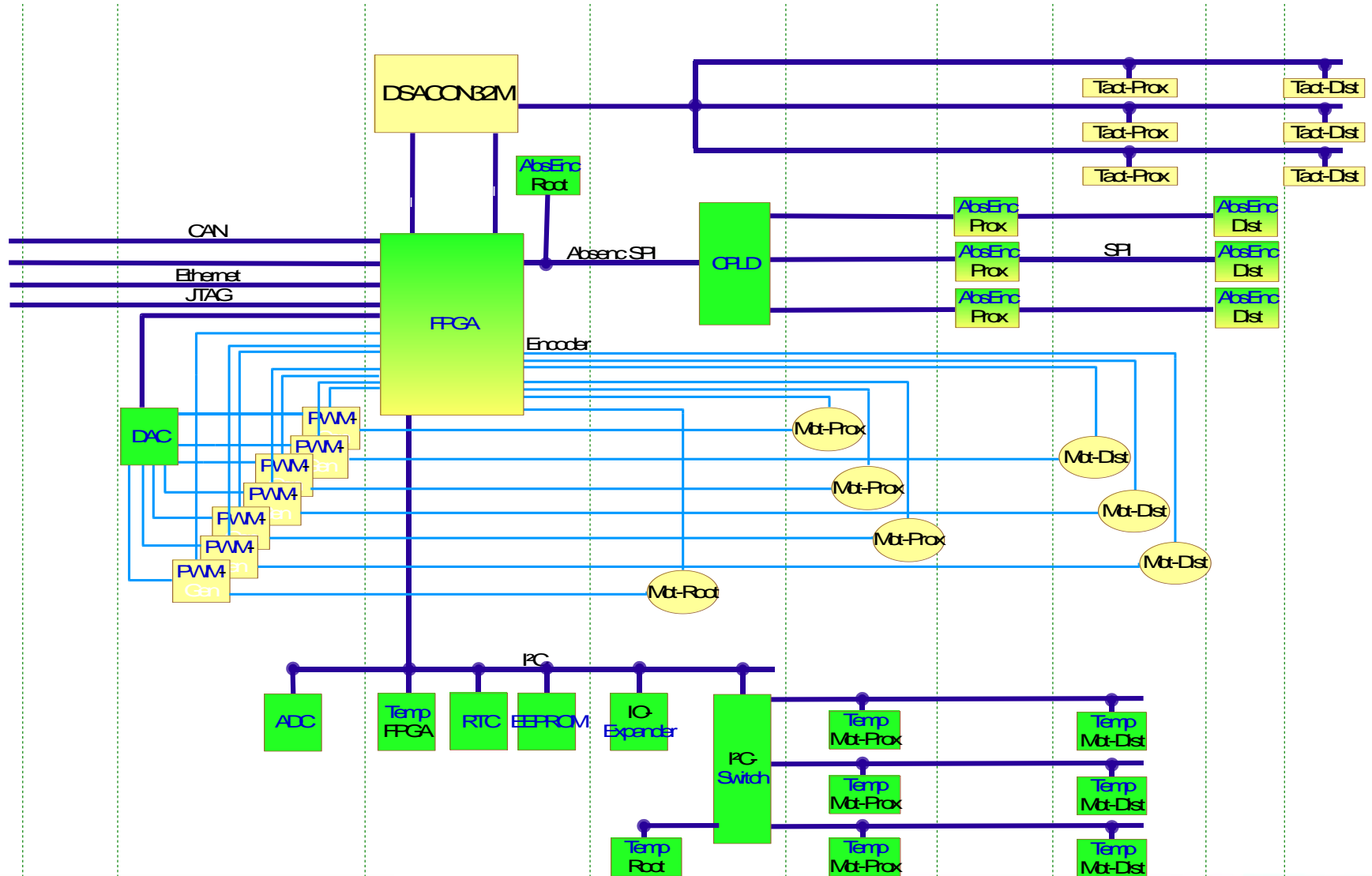
Or: Where to get more detailed information?

- Mechanical features
 - [Data sheet](#)
 - Tactile sensor system: [Sensor](#), [Controller](#)
- Electrical features
 - [Common wiring](#) & wiring of the wooden [test board](#)
 - Components: see next slides
- Software features
 - [Controller structure](#)
 - [Communication structure](#)
 - [SDHLibrary CD](#)



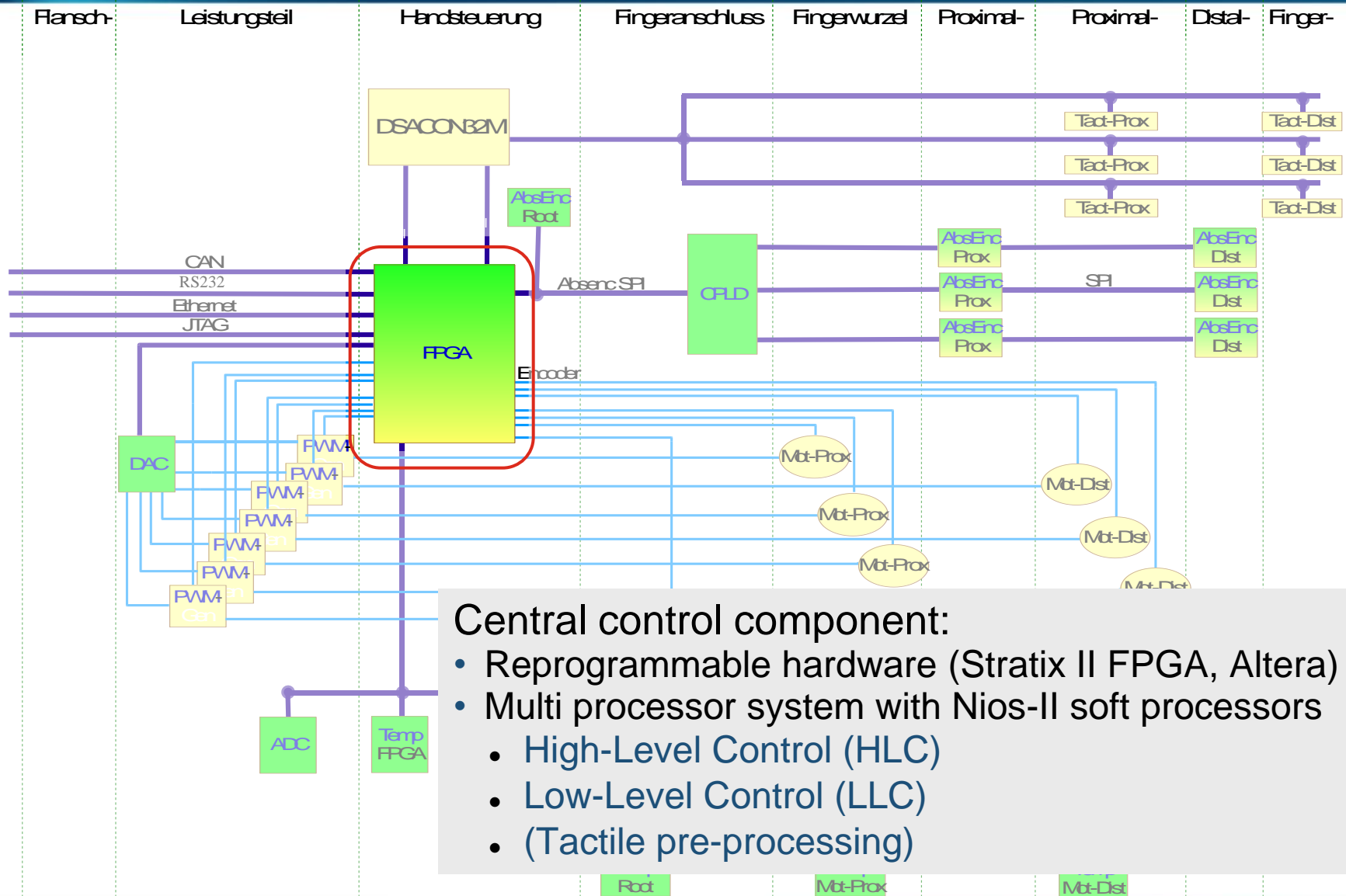
SDH components

Or: What's inside that thing?



SDH 2 Components:

Control

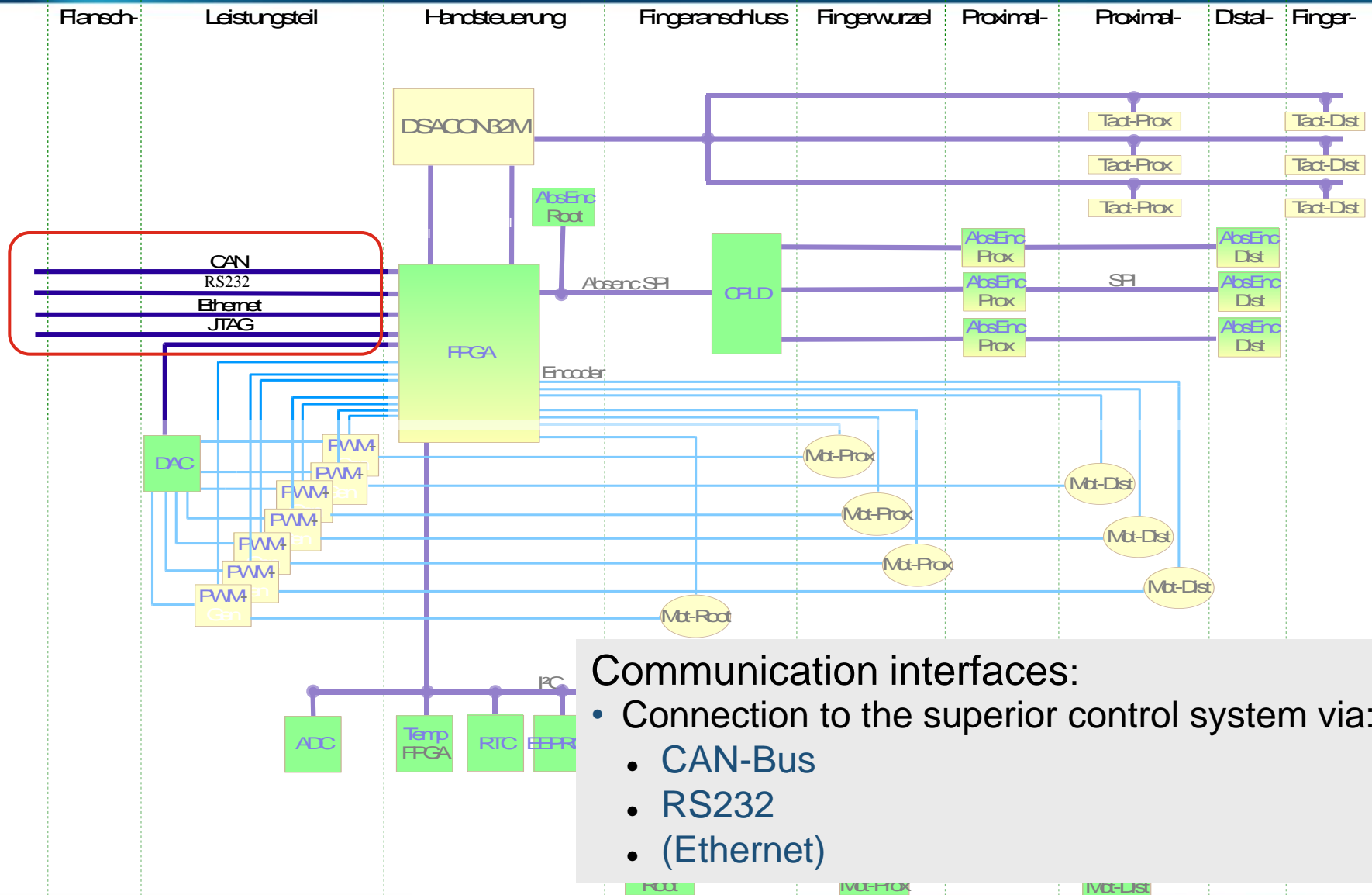


Central control component:

- Reprogrammable hardware (Stratix II FPGA, Altera)
- Multi processor system with Nios-II soft processors
 - High-Level Control (HLC)
 - Low-Level Control (LLC)
 - (Tactile pre-processing)

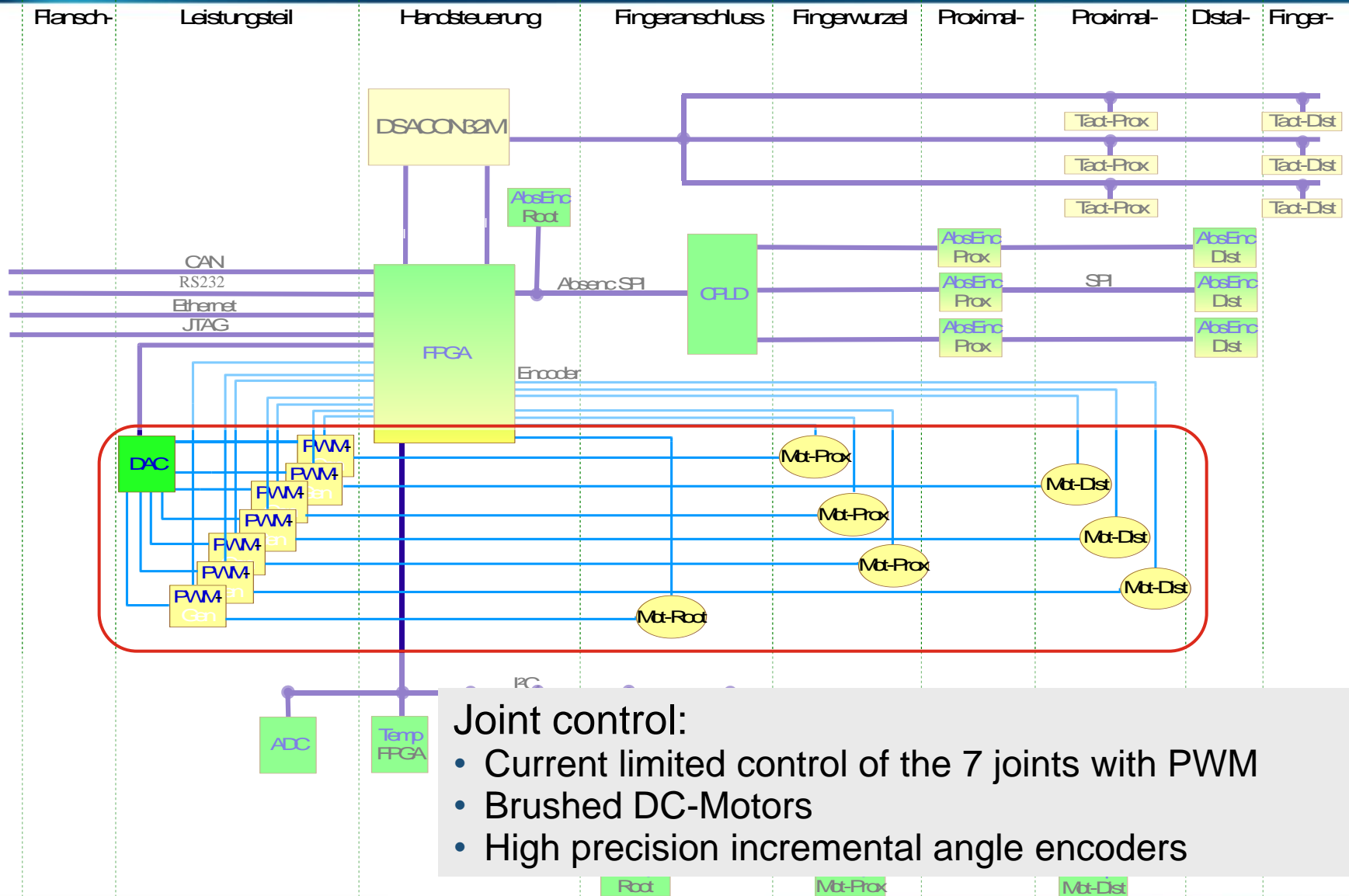
SDH 2 Components:

External communication

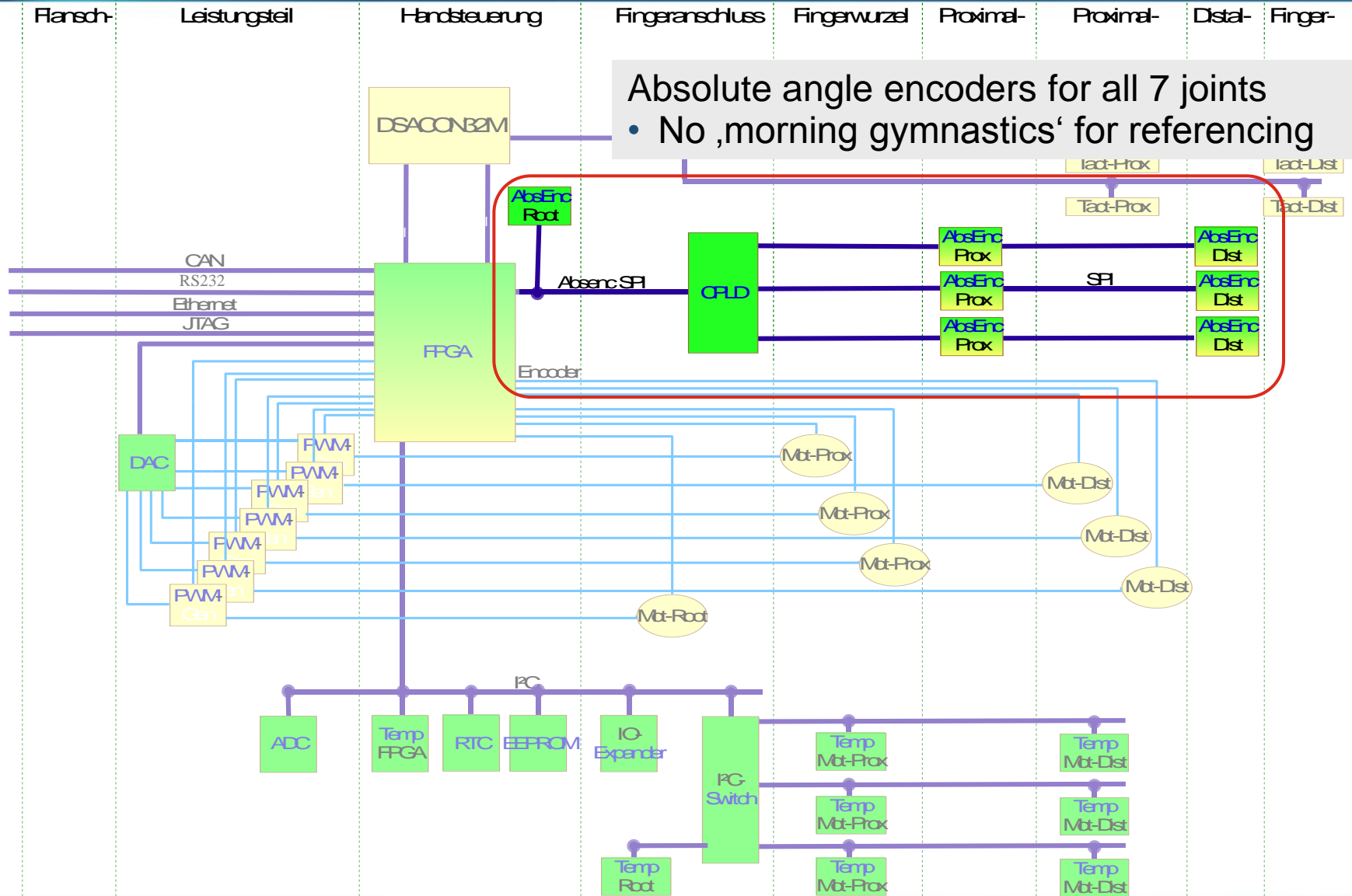


SDH 2 Components:

Joint control

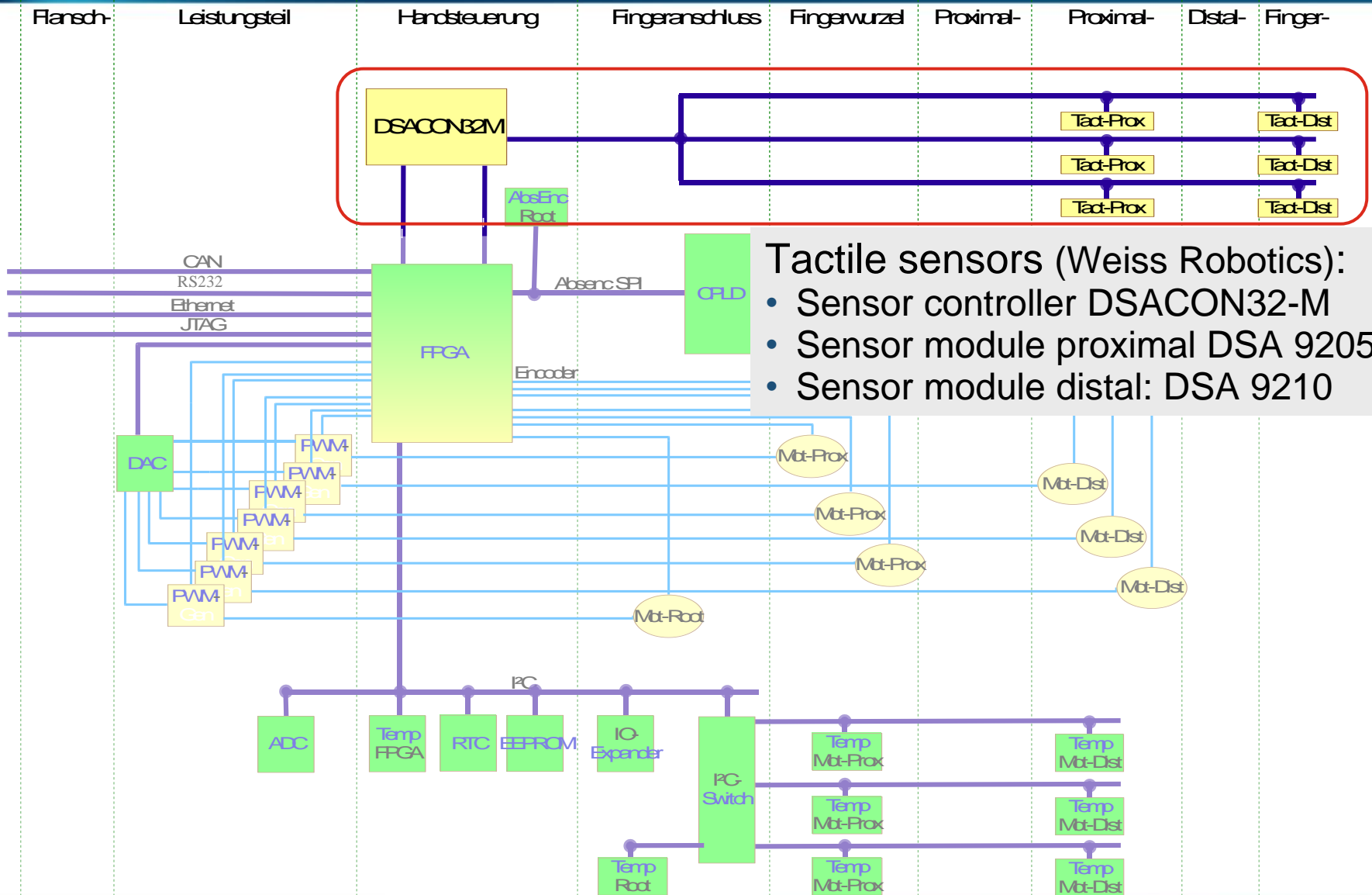


Absolute angle encoders



SDH 2 Components:

Tactile sensor system



Tactile sensors (Weiss Robotics):

- Sensor controller DSACON32-M
- Sensor module proximal DSA 9205
- Sensor module distal: DSA 9210

SDH 2 Components:

Tactile sensor system

Each finger has 2 tactile sensor arrays

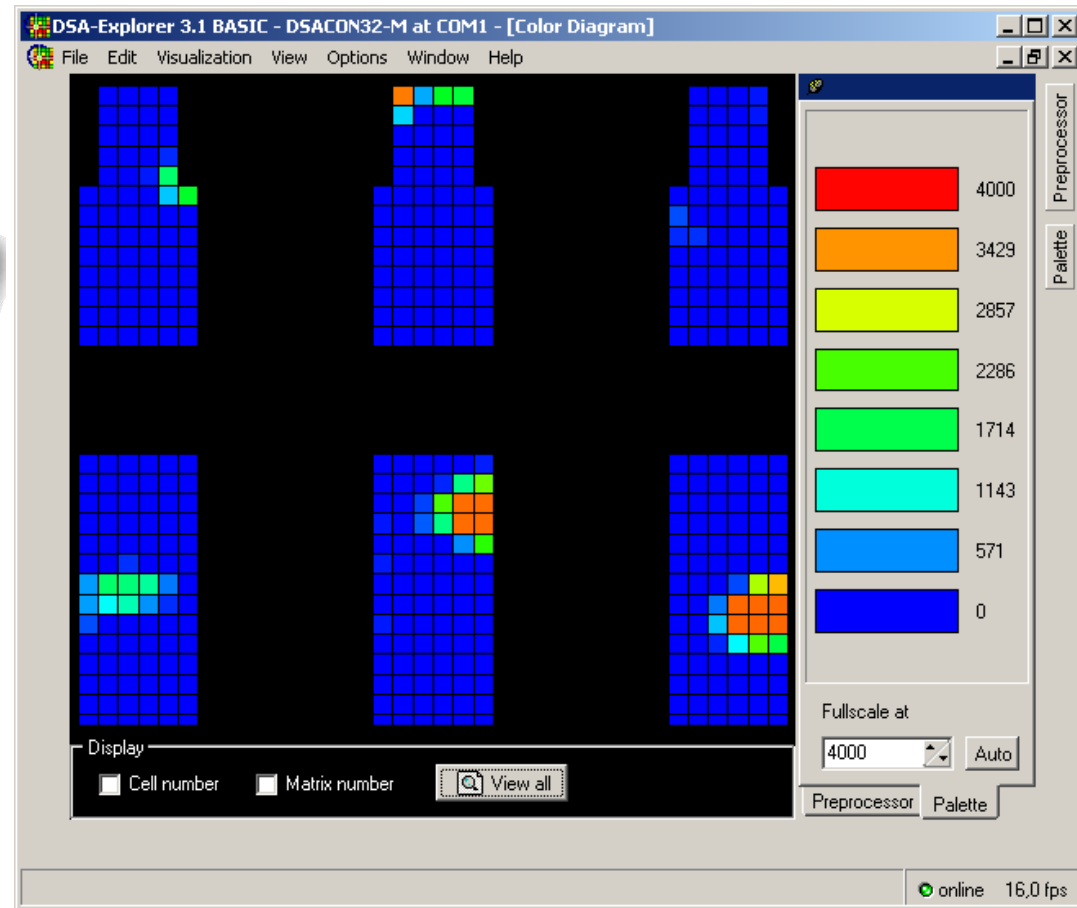
- Force (pressure-) and position resolving, modular measuring system
- 6x13 respectively 6x14 Texel
- 3.4 mm spatial resolution
- 250 kPa pressure measuring range
- Easily exchangeable

proximal sensor pads
DSA 9205



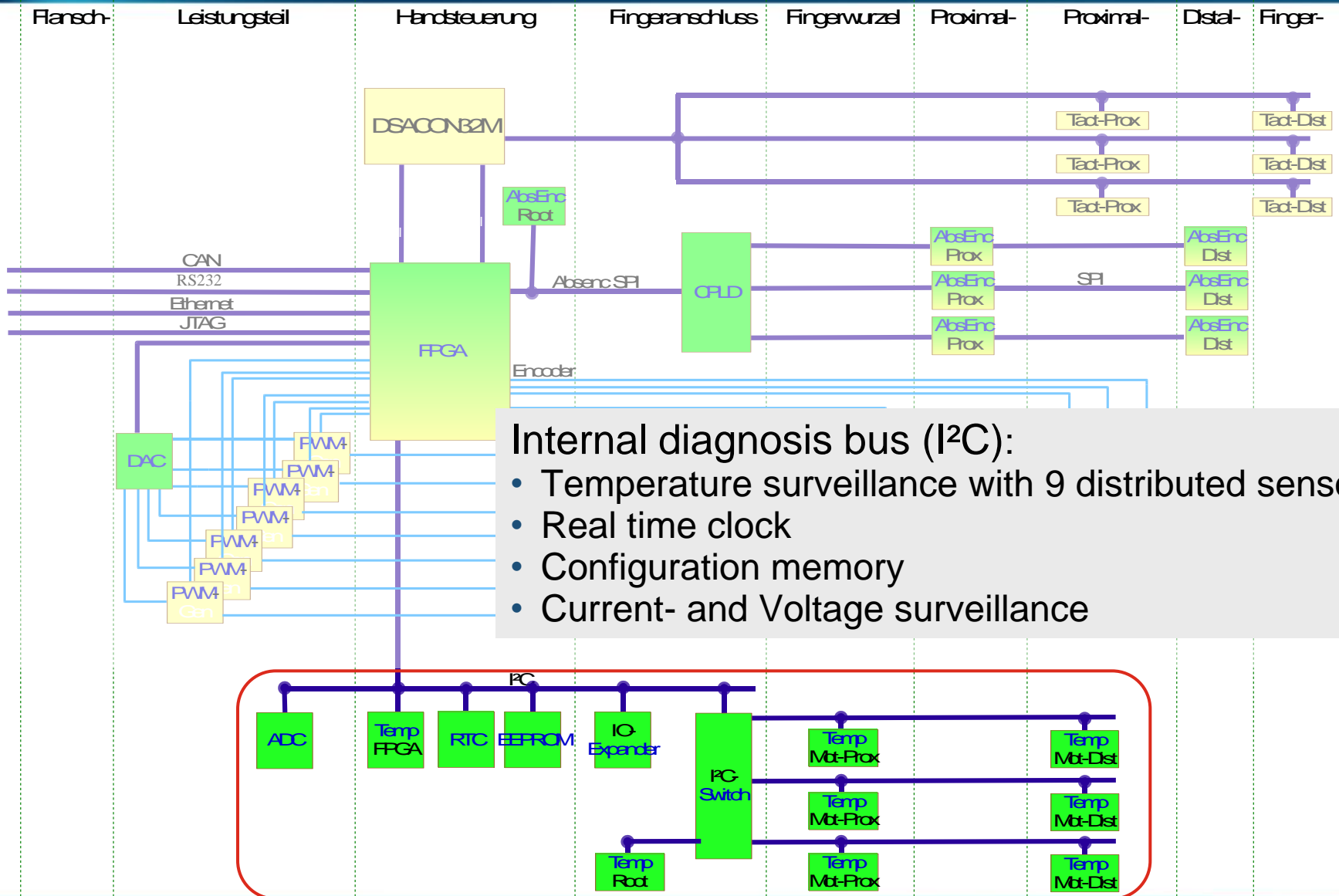
integrated tactile sensor
controller DSACON32m

Sensor system: [Weiss Robotics](http://www.weissrobotics.com)



SDH 2 Components:

Internal diagnosis bus

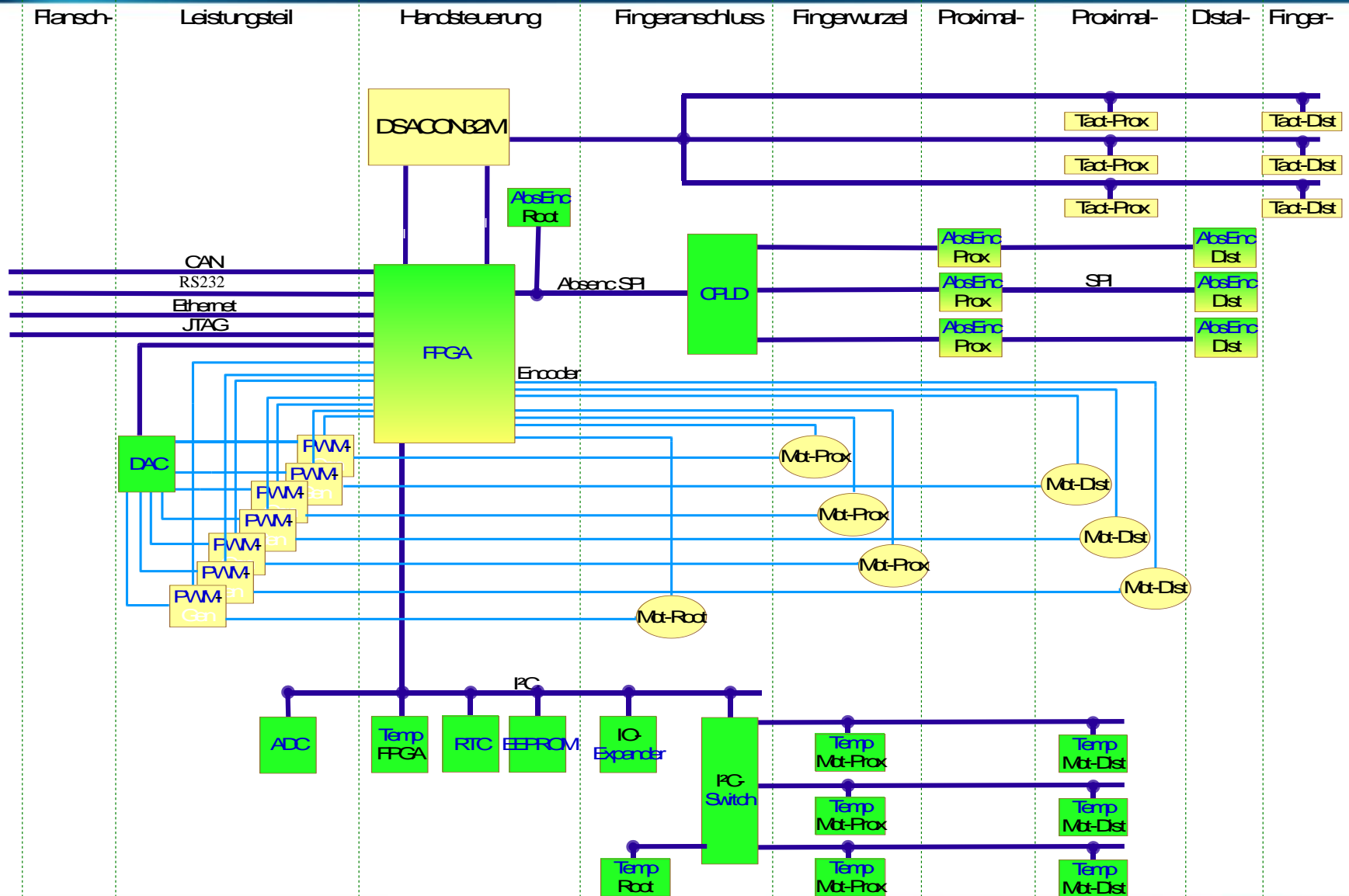


Internal diagnosis bus (I²C):

- Temperature surveillance with 9 distributed sensors
- Real time clock
- Configuration memory
- Current- and Voltage surveillance

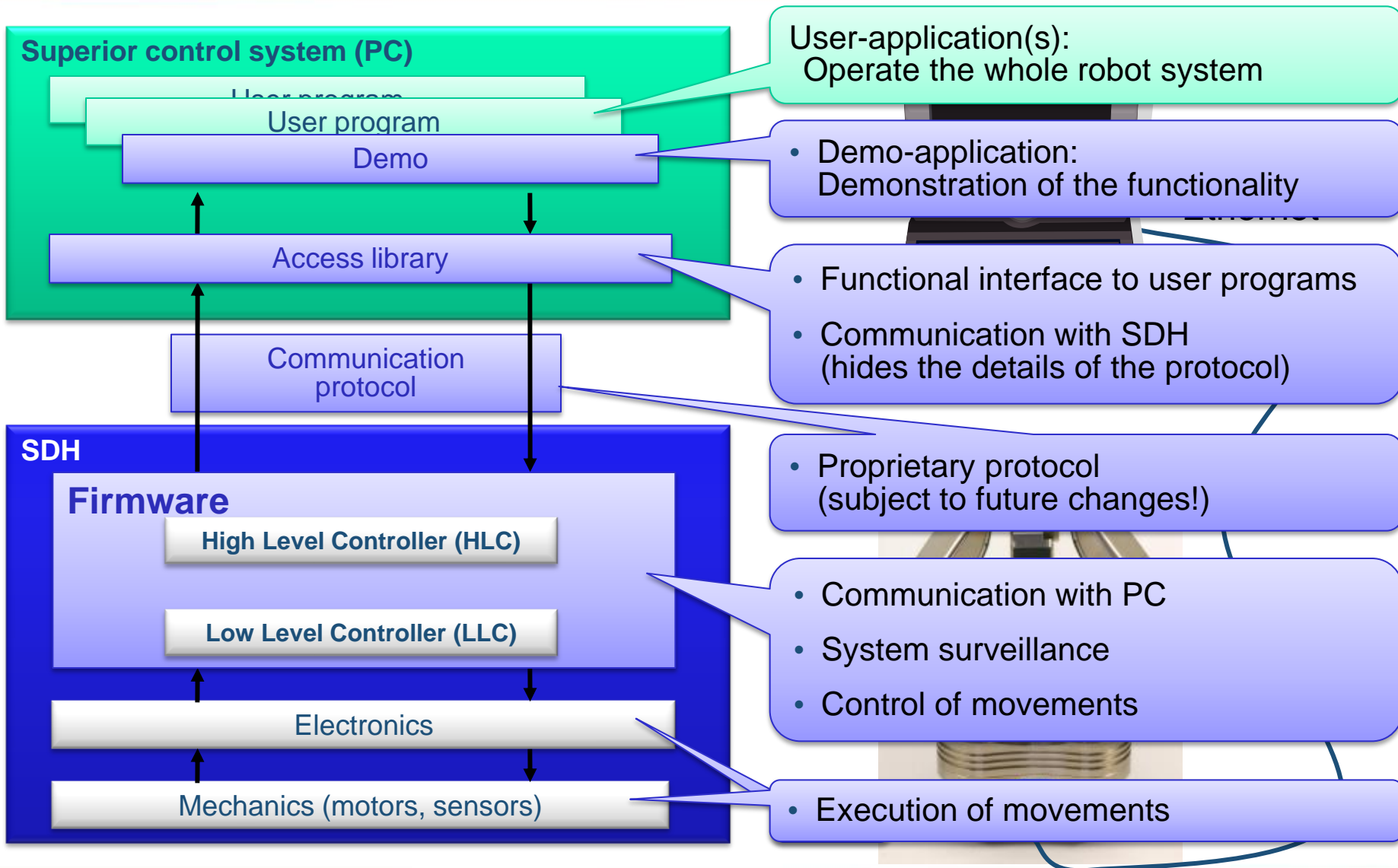
SDH 2 Components:

Overview



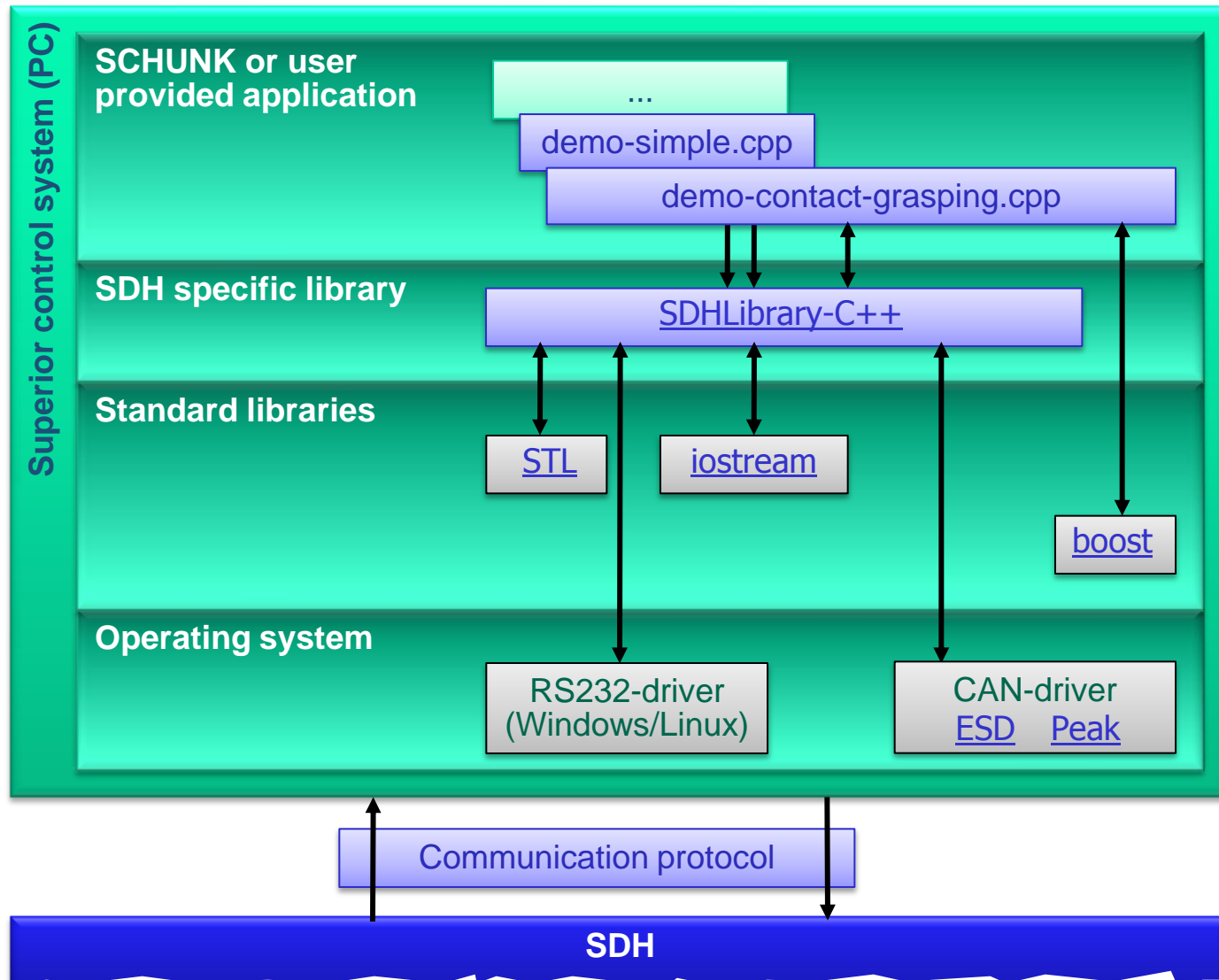
SDH 2 Components:

Integrated control system. Or: How can you operate that thing?



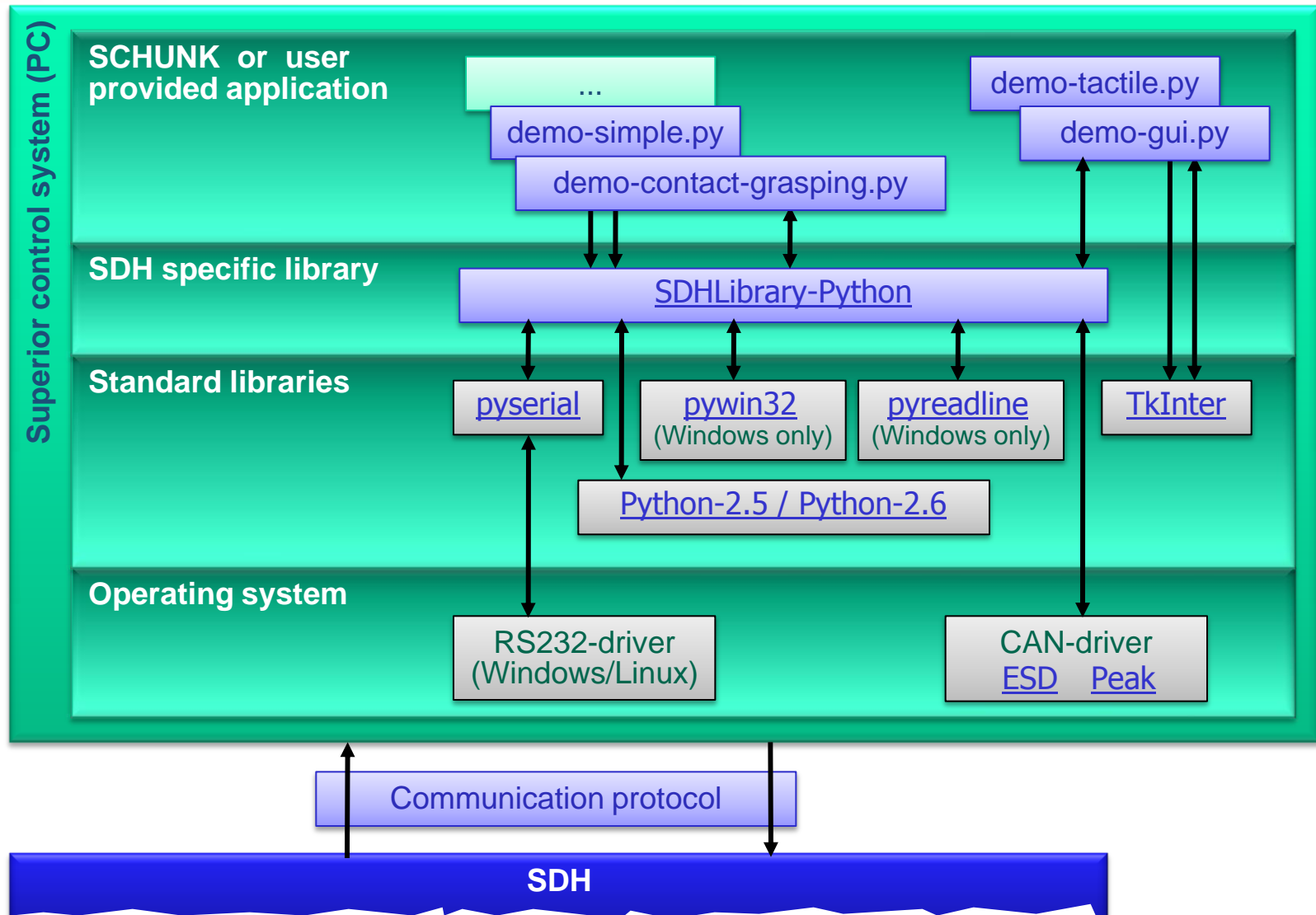
Software

Or: What do you need to operate that thing via C++?



Software

Or: What do you need to operate that thing via Python?



Communication

Or: How to talk to that thing – now and in the future

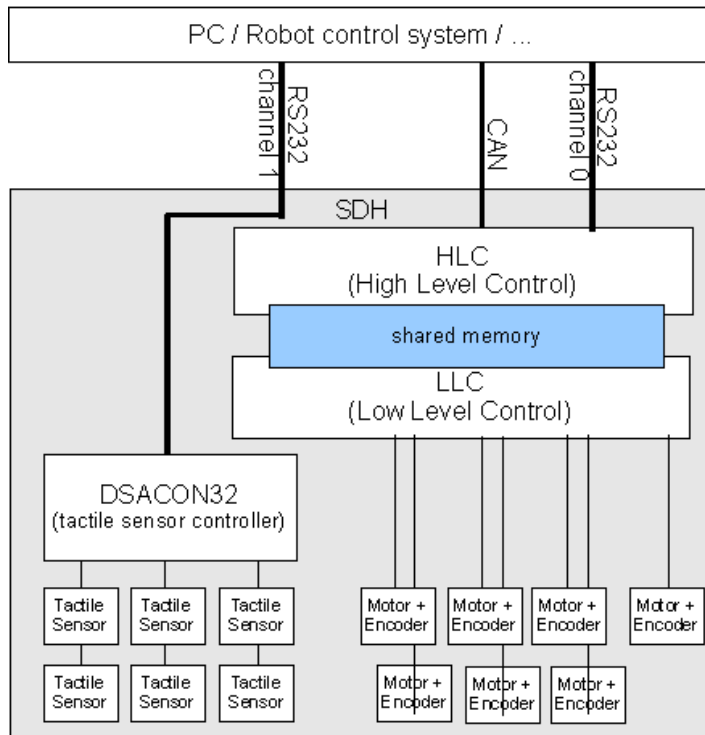


SDH configurable communication structure



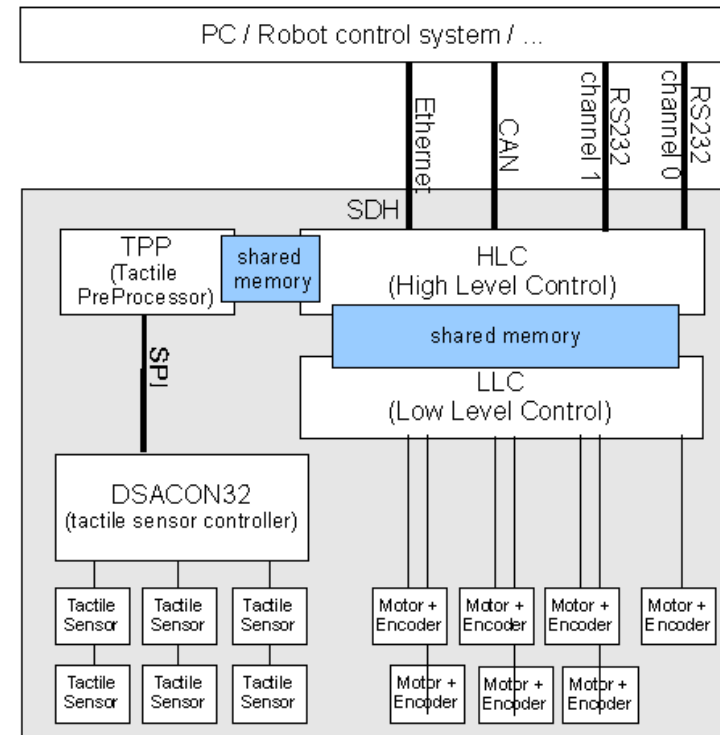
Current configuration options:

configuration	movement commands and feedback	tactile sensor commands and feedback
A	RS232 channel 0	RS232 channel 1
B	CAN	RS232 channel 0
C	CAN	RS232 channel 1



Possible future configuration options:

configuration	movement commands and feedback	tactile sensor commands and feedback
A	RS232 channel 0	RS232 channel 1
B	CAN	RS232 channel 0
C	CAN	RS232 channel 1
D	RS232 channel 0	RS232 channel 0
E	RS232 channel 1	RS232 channel 1
F	CAN	CAN
G	Ethernet	Ethernet



- Basic tasks:
 - Mechanical and electrical connection
 - Predefined demo programs
 - Compile your own programs
- Advanced features:
 - Recalibration of the joints ([PDF](#))
 - Firmware update procedure ([PDF](#))
 - **Want to take a look inside?**
 - Easy exchange of expendable parts
 - Fuse
 - Battery
 - Tactile sensors ([PDF](#))
 - Assembly/disassembly instructions (available on request) ([PDF](#))



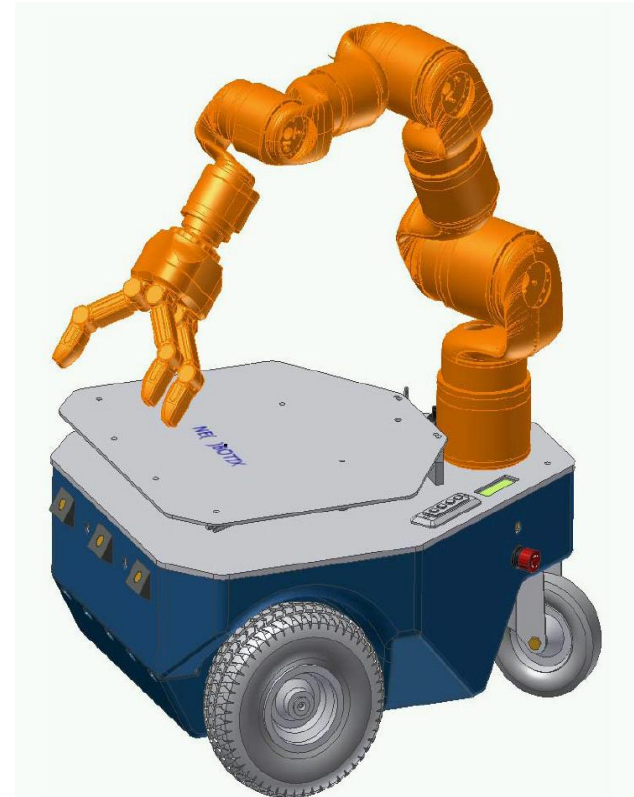
Applications and customers

Or: Who else needs something like this?



Until now the SDH2 has been used mainly in **research**, e.g. in the area of **service robotics**. Among the customers are:

- University of Wales, Aberystwyth (GB)
- IPA Fraunhofer Institut, Stuttgart (D)
- IBMT Fraunhofer Institut, Potsdam (D)
- RWTH Aachen (D)
- RoboCluster Forschungsinitiative (Dk)
- KTH University of Stockholm (S)
- SIR Soluzioni Industriali Robotizzate, Modena (I)
- Honda Research (D)
- FANUC Robotics (Jp)
- University of Edinburgh (GB)
- Google (USA)
- University of Georgia, Georgia Tech (USA)
- Karlsruher Institut für Technologie, KIT (D)
- Astrium, ESA-European Space Agency (NL)
- Universitat Politècnica de Catalunya UPC, Barcelona (E)
- Baumann Universität, Dimitrov (RU)



Mobile Plattform: **Neobotix**
Arm: **SCHUNK LWA**
Hand: **SCHUNK SDH**

- The potential of the SDH is not fully exploited yet!
 - Space is left for further tasks in the reprogrammable hardware (FPGA)!
 - There is still memory space and computing time available in the firmware for further duties!
- Possible future features:
 - Common communication for movement and sensor data
 - Use of the advanced communication protocol common to other SCHUNK products (SMP)
 - Extending the joint controllers
 - Direct usage of tactile sensor data for joint control
 - Execution of “grasp-skills” within the hand
- The development is going on
 - Feedback from customers is welcome (and is respected and taken into account!)
 - Support for customers is as a matter of course

- What was the training like from **your** point of view?
 - Was it like what you expected?
 - Was it all too detailed / giving too much information?
 - Has it been incomplete / insufficient in some area?
 - Is something still missing?
- Any further suggestions?
- Finally: Thank you for your attention!

