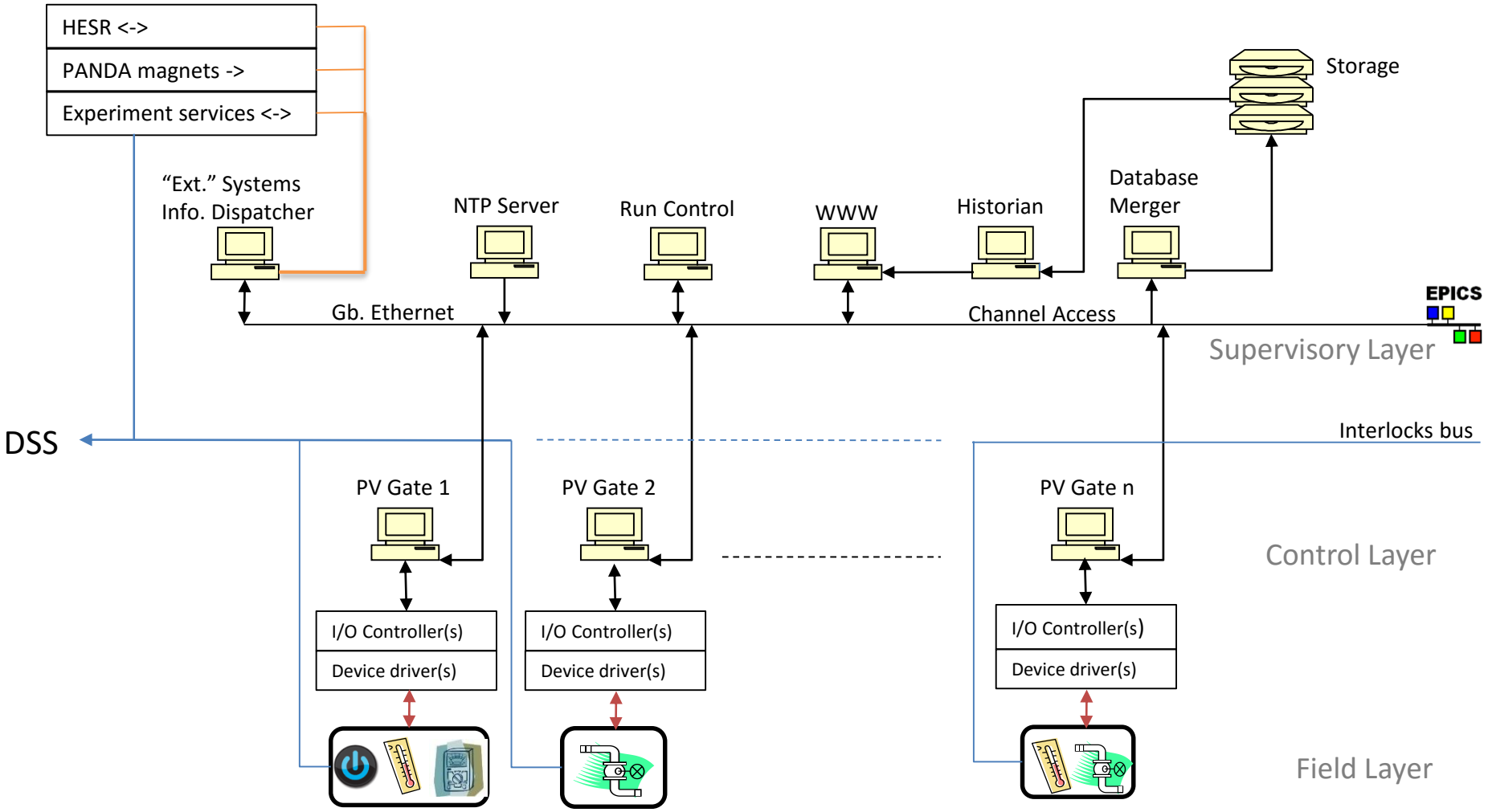
Update on Panda –HESR interface and new (candidate) device for PANDA DCS

Outline

1) Software interface EPICS – WinCC OA (Dec. 2015 DCS Session)
2) Update on the available tools for the EPICS – WinCC OA
3) New IFIN-HH developments: Multifunction Rack Control Unit

PANDA DCS Layers



PANDA DCS interface with HESR

HESR can be treated as **CLASS I system** >> **during injection and beam development** can turn into a **major safety issue** for some PANDA sub-systems (MVD, LUMI) <=> FAST Beam dump request (HW ?)

HESR < = > LUMI – luminosity & background; detector position control & firmware;

< = > PANDA MAGNETS !?

< = > PANDA TARGET(S) ? (we need a feedback loop ?)

< = background levels from other PANDA sub-detectors;

HESR status = > filling, ramping, tuning, stable beams available to **ALL PANDA** sub-systems;

HESR beam parameters => current, energy, etc available to **ALL PANDA** sub-systems.

We need to plan **a dedicated interface with HESR at the DCS Supervisory level acting** also as an i**nformation dispatcher for ALL PANDA sub-systems**.

PANDA DCS (software) interface with HESR

FAIR Control System:

- Frontend System Architecture (FESA) framework developed at CERN (LHC) to control part of accelerator equipment ;
- UNICOS CERN framework - WinCC OA (former PVSS) to control vacuum and cryogenic equipment.

No native software support for EPICS CA in WinCC OA or vice-versa

DIM - Distributed Information Management client/server communication system can be used as a bridge between the two SCADA

EPICS <-> WinCC OA via DIM

DIM - Distributed Information Management System

- Client/Server communication layer between online systems;
- Developed by DELPHI experiment (CERN) in the 90's;
- Maintained at CERN - Latest release 20r17 (24.03.2016).

PVSS-DIM toolkit

- Bridge between PVSS DataPoints and DIM services;
- Maintained at CERN - Latest release 20r13 (24.03.2016);
- Ready for WinCC OA 3.11 SP1 (Windows/Linux).

PyDIM

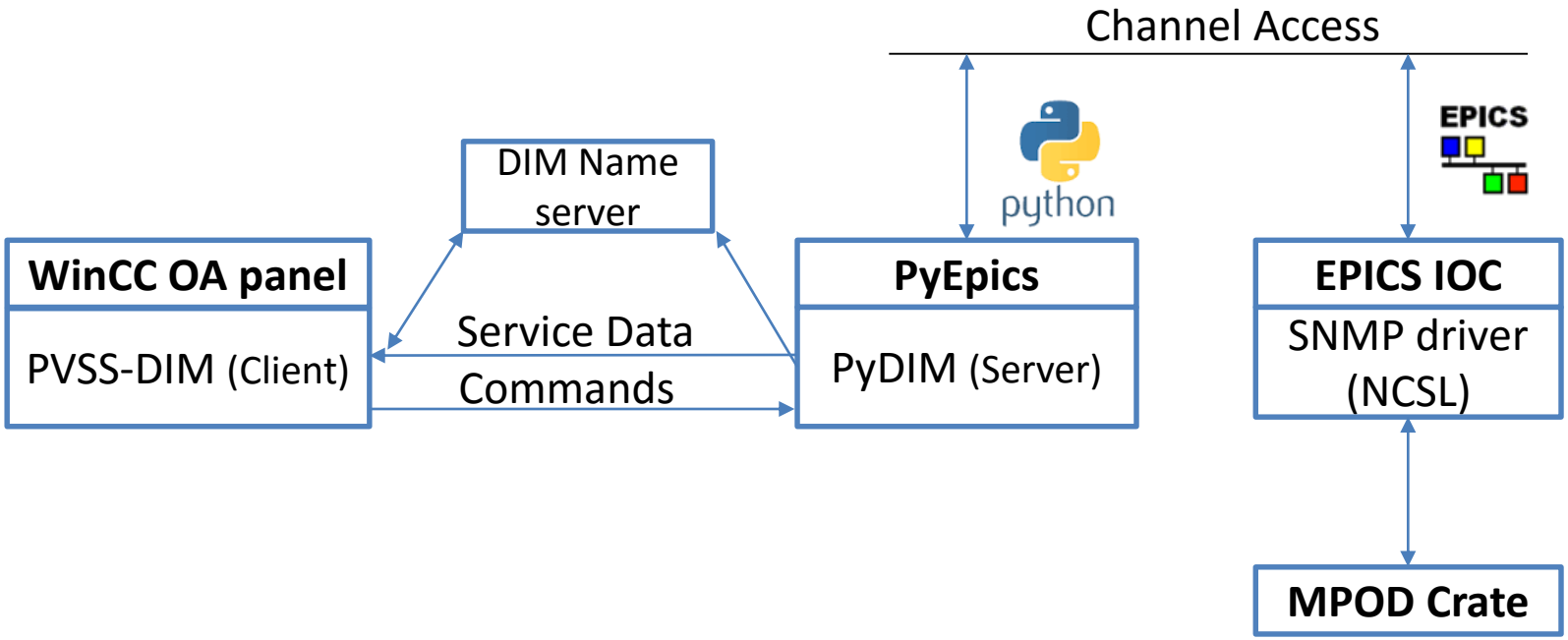
- Python interface to DIM;
- Maintained at CERN -Latest release 2.0.0 (18-05-2011).

PyEpics

- Python interface to EPICS CA;
- Maintained at CARS -Latest release 3.2.5 (21-05-2016).

Win CC OA – EPICS interface via DIM

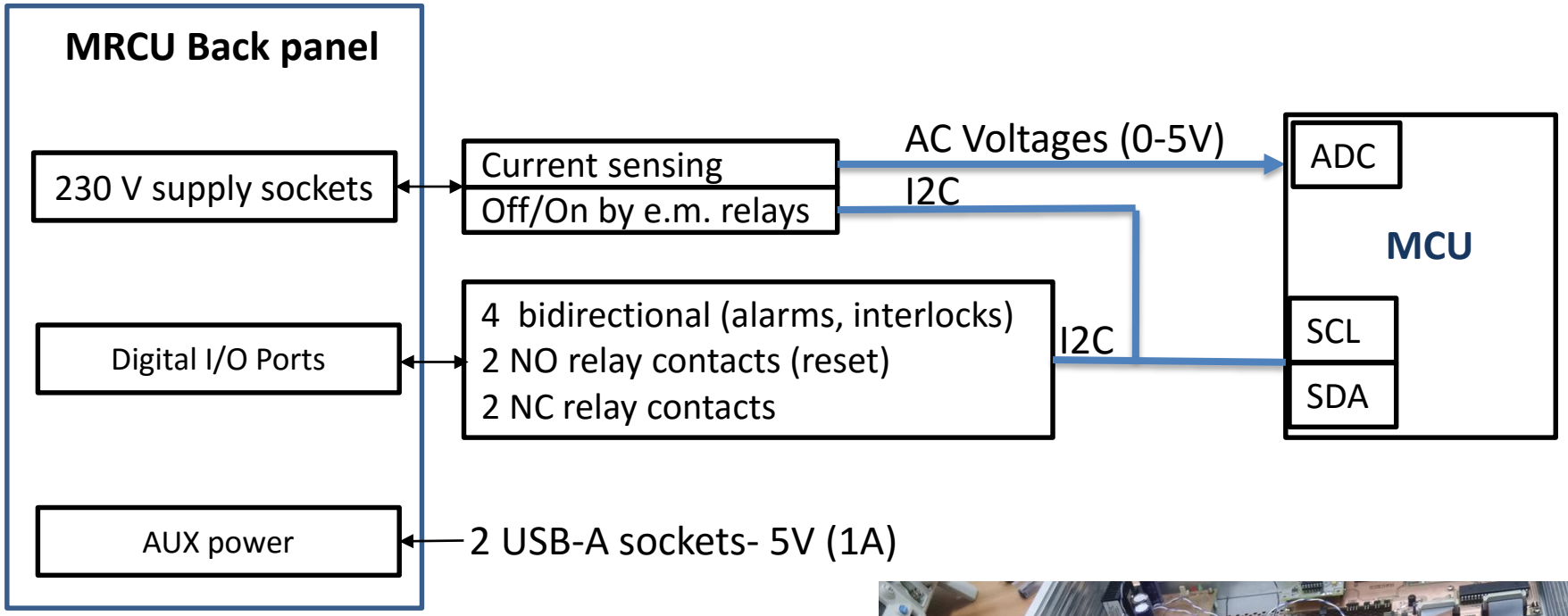
Working interface developed in IFIN-HH

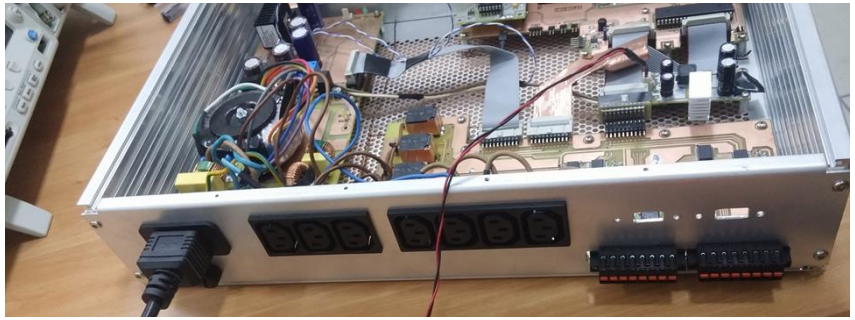


Service data: Ch. Voltage, Current, Status, …..
Commands: On/Off Switches

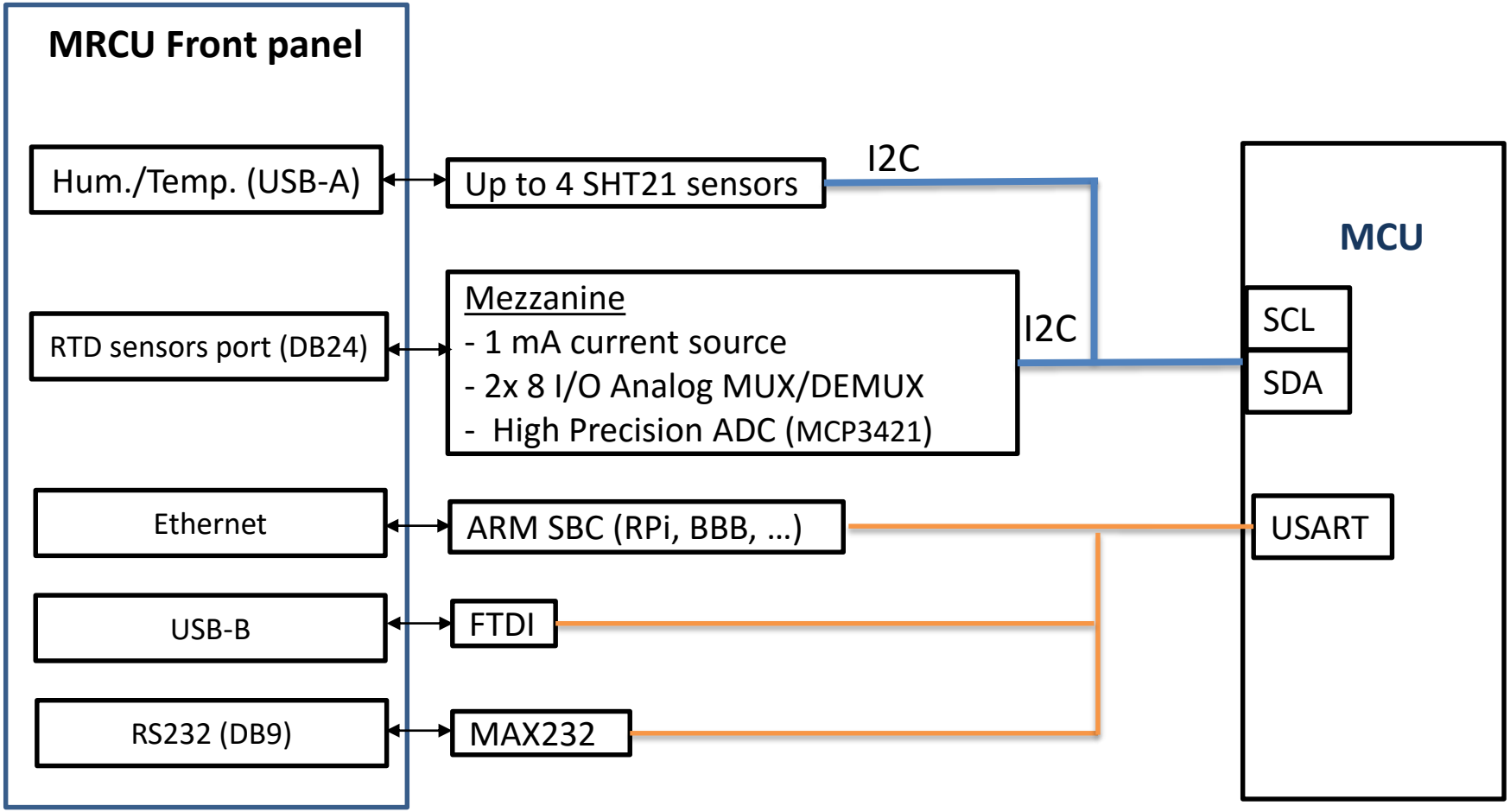
Multifunction Rack Control Unit (MRCU)

Under development in IFIN-HH for HASC Control System (NA62@CERN)

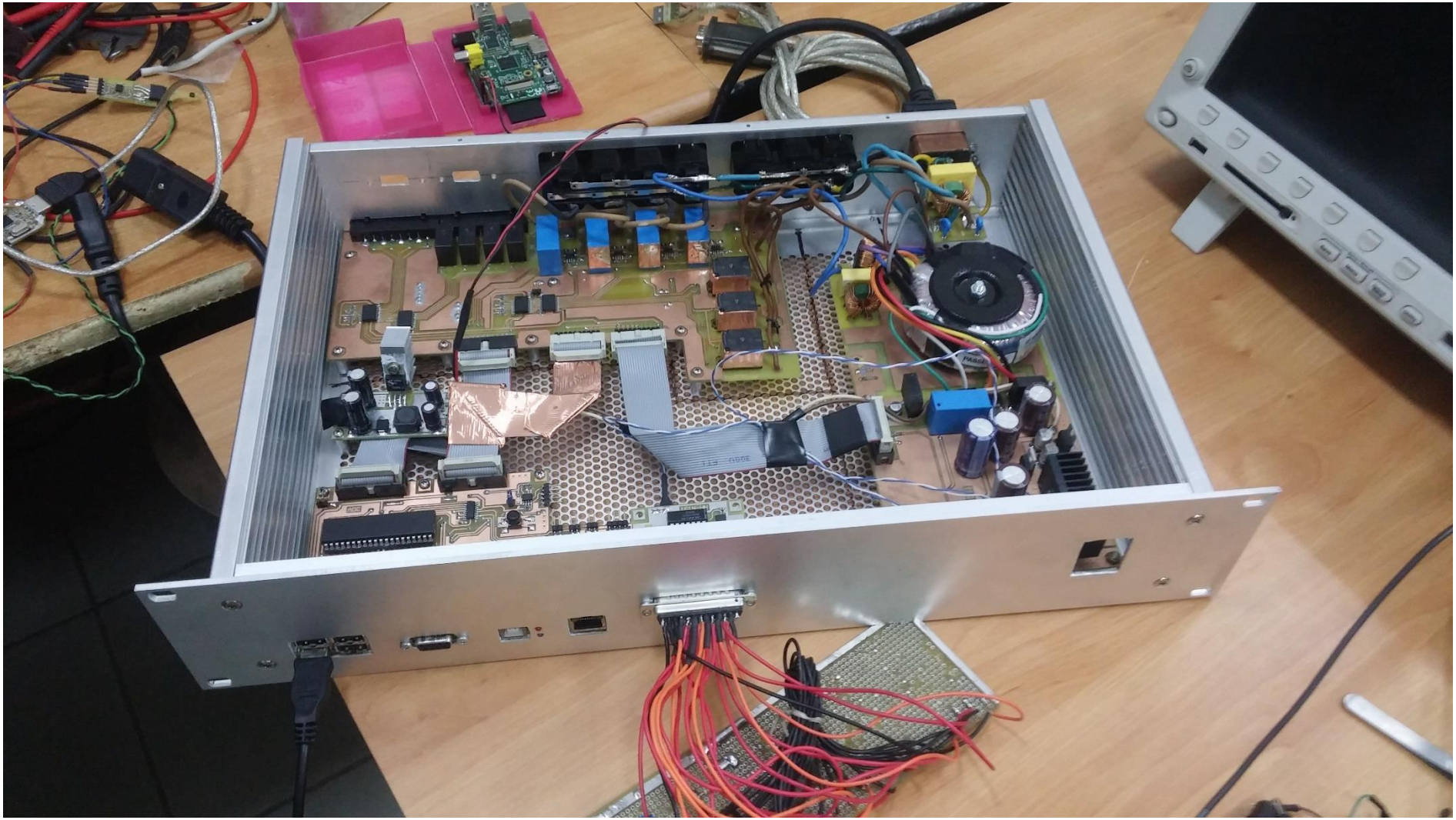




Multifunction Rack Control Unit (MRCU)



Multifunction Rack Control Unit



Multifunction Rack Control Unit (MRCU) software

Software **prototypes** are **ready** for:

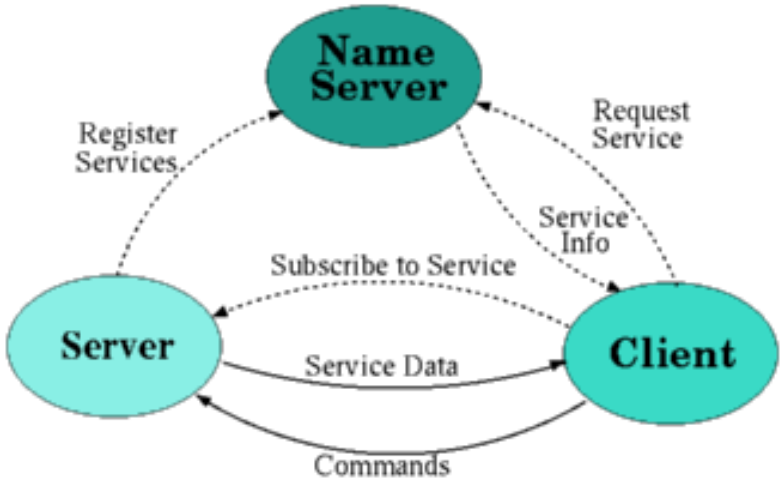
- **MCU firmware** ;
- **ARM-MCU communication** and **DIM server**

Integration and testing until **end of June**

EPICS Support planned for Q4-2016

Backup

DIM



The **Name server** keeps an up-to-date directory of all the servers and services available in the system

Clients "subscribe" to services by asking the name server which server provides the service and then contacting the server directly

Servers "publish" their services by registering them with the name server (normally once, at startup).

Easy recovery and migration of server application from one machine to another

Whenever one of the processes (a server or even the name server) in the system crashes or dies all processes connected to it will be notified and will reconnect as soon as it comes back to life.

Slide “prepared” by copy/paste from https://dim.web.cern.ch/dim/dim_intro.html

Allegro MicroSystems, LLC

ACS712

Fully Integrated, Hall Effect-Based Linear Current Sensor IC with 2.1 kVRMS Isolation and a Low-Resistance Current Conductor

Features and Benefits

- Low-noise analog signal path
- Device bandwidth is set via the new FILTER pin
- 5 µs output rise time in response to step input current
- 80 kHz bandwidth
- Total output error 1.5% at T_A = 25°C
- Small footprint, low-profile SOIC8 package
- 1.2 mΩ internal conductor resistance
- 2.1 kVRMS minimum isolation voltage from pins 1-4 to pins 5-8
- 5.0 V, single supply operation
- 66 to 185 mV/A output sensitivity
- Output voltage proportional to AC or DC currents
- Factory-trimmed for accuracy
- Extremely stable output offset voltage
- Nearly zero magnetic hysteresis
- Ratiometric output from supply voltage

TÜV America
Certificate Number:
U8V 06 05 54214 010

Package: 8 Lead SOIC (suffix LC)

Description

The Allegro™ ACS712 provides economical and precise solutions for AC or DC current sensing in industrial, commercial, and communications systems. The device package allows for easy implementation by the customer. Typical applications include motor control, load detection and management, switch-mode power supplies, and overcurrent fault protection. The device is not intended for automotive applications.

The device consists of a precise, low-offset, linear Hall circuit with a copper conduction path located near the surface of the die. Applied current flowing through this copper conduction path generates a magnetic field which the Hall IC converts into a proportional voltage. Device accuracy is optimized through the close proximity of the magnetic signal to the Hall transducer. A precise, proportional voltage is provided by the low-offset, chopper-stabilized BiCMOS Hall IC, which is programmed for accuracy after packaging.

The output of the device has a positive slope ($>V_{IOUT(Q)}$) when an increasing current flows through the primary copper conduction path (from pins 1 and 2, to pins 3 and 4), which is the path used for current sampling. The internal resistance of this conductive path is 1.2 mΩ typical, providing low power loss. The thickness of the copper conductor allows survival of

SENSIRION
THE SENSOR COMPANY

Datasheet SHT21

Humidity and Temperature Sensor IC

- Fully calibrated
- Digital output, I²C interface
- Low power consumption
- Excellent long-term stability
- DFN type package – reflow solderable

Product Summary

The SHT21 humidity and temperature sensor of Sensirion has become an industry standard in terms of form factor and intelligence: Embedded in a reflow solderable Dual Flat No leads (DFN) package of 3 x 3mm foot print and 1.1mm height it provides calibrated, linearized sensor signals in digital, I²C format.

The SHT2x sensors contain a capacitive type humidity sensor, a band gap temperature sensor and specialized analog and digital integrated circuit – all on a single CMOSens® chip. This yields in an unmatched sensor performance in terms of accuracy and stability as well as minimal power consumption.

Every sensor is individually calibrated and tested. Lot identification is printed on the sensor and an electronic identification code is stored on the chip – which can be read out by command. Furthermore, the resolution of SHT2x can be changed by command (8/12bit up to 12/14bit for RH/T) and a checksum helps to improve communication reliability.

With this set of features and the proven reliability and long-term stability, the SHT2x sensors offer an outstanding performance-to-price ratio. For testing SHT2x two evaluation kits EK-H4 and EK-H5 are available.

MICROCHIP

MCP3421

18-Bit Analog-to-Digital Converter with I²C Interface and On-Board Reference

Features

- 18-bit ΔΣ ADC in a SOT-23-6 package
- Differential Input Operation
- Self Calibration of Internal Offset and Gain Per Each Conversion
- On-Board Voltage Reference:
  - Accuracy: 2.048V ± 0.05%
  - Drift: 15 ppm/°C
- On-Board Programmable Gain Amplifier (PGA):
  - Gains of 1,2, 4 or 8
- On-Board Oscillator
- INL: 10 ppm of FSR (FSR = 4.096V/PGA)
- Programmable Data Rate Options:
  - 3.75 SPS (18 bits)
  - 15 SPS (16 bits)
  - 60 SPS (14 bits)
  - 240 SPS (12 bits)
- One-Shot or Continuous Conversion Options
- Low Current Consumption:
  - 145 µA typical (V_{DD}= 3V, Continuous Conversion)
  - 39 µA typical (V_{DD}= 3V, One-Shot Conversion with 1 SPS)
- Supports I²C Serial Interface:
  - Standard, Fast and High Speed Modes
- Single Supply Operation: 2.7V to 5.5V
- Extended Temperature Range: -40°C to +125°C

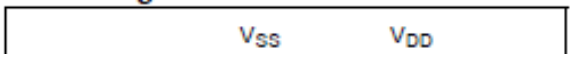
Description

The MCP3421 is a single channel low-noise, high accuracy ΔΣ A/D converter with differential inputs and up to 18 bits of resolution in a small SOT-23-6 package. The on-board precision 2.048V reference voltage enables an input range of ±2.048V differentially (Δ voltage = 4.096V). The device uses a two-wire I²C compatible serial interface and operates from a single 2.7V to 5.5V power supply.

The MCP3421 device performs conversion at rates of 3.75, 15, 60, or 240 samples per second (SPS) depending on the user controllable configuration bit settings using the two-wire I²C serial interface. This device has an on-board programmable gain amplifier (PGA). The user can select the PGA gain of x1, x2, x4, or x8 before the analog-to-digital conversion takes place. This allows the MCP3421 device to convert a smaller input signal with high resolution. The device has two conversion modes: (a) Continuous mode and (b) One-Shot mode. In One-Shot mode, the device enters a low current standby mode automatically after one conversion. This reduces current consumption greatly during idle periods.

The MCP3421 device can be used for various high accuracy analog-to-digital data conversion applications where design simplicity, low power, and small footprint are major considerations.

Block Diagram



Features

- High-performance, Low-power AVR® 8-bit Microcontroller
- Advanced RISC Architecture
  - 131 Powerful Instructions – Most Single-clock Cycle Execution
  - 32 x 8 General Purpose Working Registers
  - Fully Static Operation
  - Up to 20 MIPS Throughput at 20 MHz
  - On-chip 2-cycle Multiplier
- Nonvolatile Program and Data Memories
  - 128K Bytes of In-System Self-Programmable Flash
    Endurance: 10,000 Write/Erase Cycles
  - Optional Boot Code Section with Independent Lock Bits
    In-System Programming by On-chip Boot Program
    True Read-While-Write Operation
  - 4K Bytes EEPROM
    Endurance: 100,000 Write/Erase Cycles
  - 16K Bytes Internal SRAM
  - Programming Lock for Software Security
- JTAG (IEEE std. 1149.1 Compliant) Interface
  - Boundary-scan Capabilities According to the JTAG Standard
  - Extensive On-chip Debug Support
  - Programming of Flash, EEPROM, Fuses, and Lock Bits through the JTAG Interface
- Peripheral Features
  - Two 8-bit Timer/Counters with Separate Prescalers and Compare Modes
  - Two 16-bit Timer/Counter with Separate Prescaler, Compare Mode, and Capture Mode
  - Real Time Counter with Separate Oscillator
  - Six PWM Channels
  - 8-channel, 10-bit ADC
    Differential mode with selectable gain at 1x, 10x or 200x
  - Byte-oriented Two-wire Serial Interface
  - Two Programmable Serial USART
  - Master/Slave SPI Serial Interface
  - Programmable Watchdog Timer with Separate On-chip Oscillator
  - On-chip Analog Comparator
  - Interrupt and Wake-up on Pin Change
- Special Microcontroller Features
  - Power-on Reset and Programmable Brown-out Detection
  - Internal Calibrated RC Oscillator
  - External and Internal Interrupt Sources
  - Six Sleep Modes: Idle, ADC Noise Reduction, Power-save, Power-down, Standby and Extended Standby
- I/O and Packages
  - 32 Programmable I/O Lines
  - 40-pin PDIP, 44-lead TQFP, and 44-pad QFN/MLF
- Operating Voltages
  - 1.8 - 5.5V for ATmega1284P
- Speed Grades
  - 0 - 4 MHz @ 1.8 - 5.5V
  - 0 - 10 MHz @ 2.7 - 5.5V
  - 0 - 20 MHz @ 4.5 - 5.5V

ATMEL

8-bit AVR® Microcontroller with 128K Bytes In-System Programmable Flash

ATmega1284P

Preliminary