



Laboratoire d'Annecy de Physique des Particules

LAPP IPMC Overview

IPMC Workshop @ CERN (9 Oct. 2018)

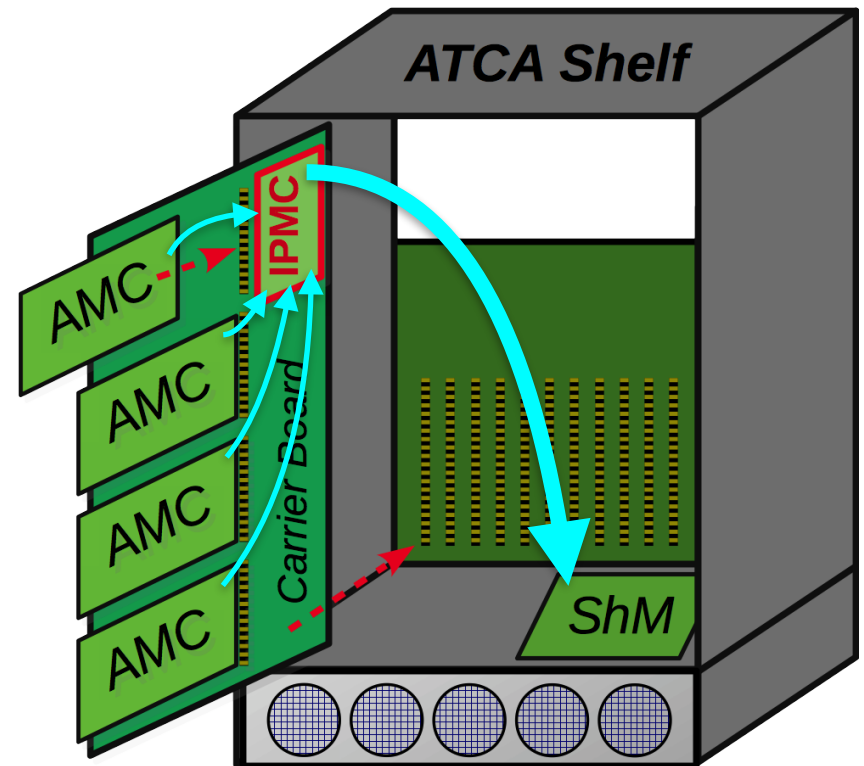
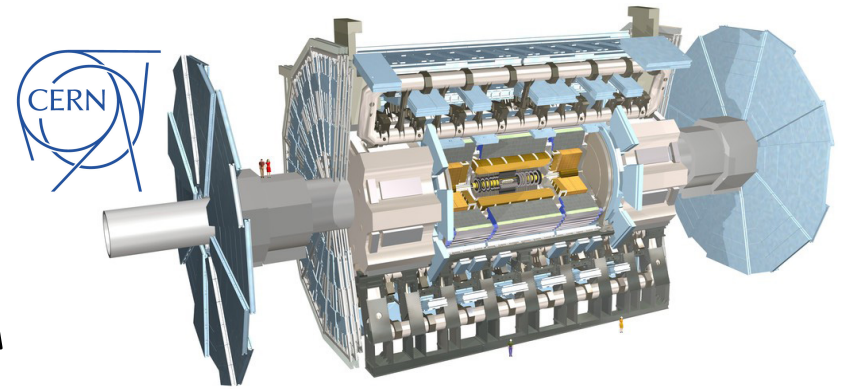
Sylvain LAFRASSE (LAPP)



1. Motivation
2. ATCA Overview
3. Hardware Overview
4. Software Overview



- **LAPP** is strongly involved in *CERN LHC*
- **ATLAS LAr** moves to *ATCA*
- **ATCA** requires *IPMC*
- **LAPP** portfolio includes *Carrier* and *AMC*
- “COTS” IPMCs require **expensive fees & NDA**
- *Designed beyond HEP !*

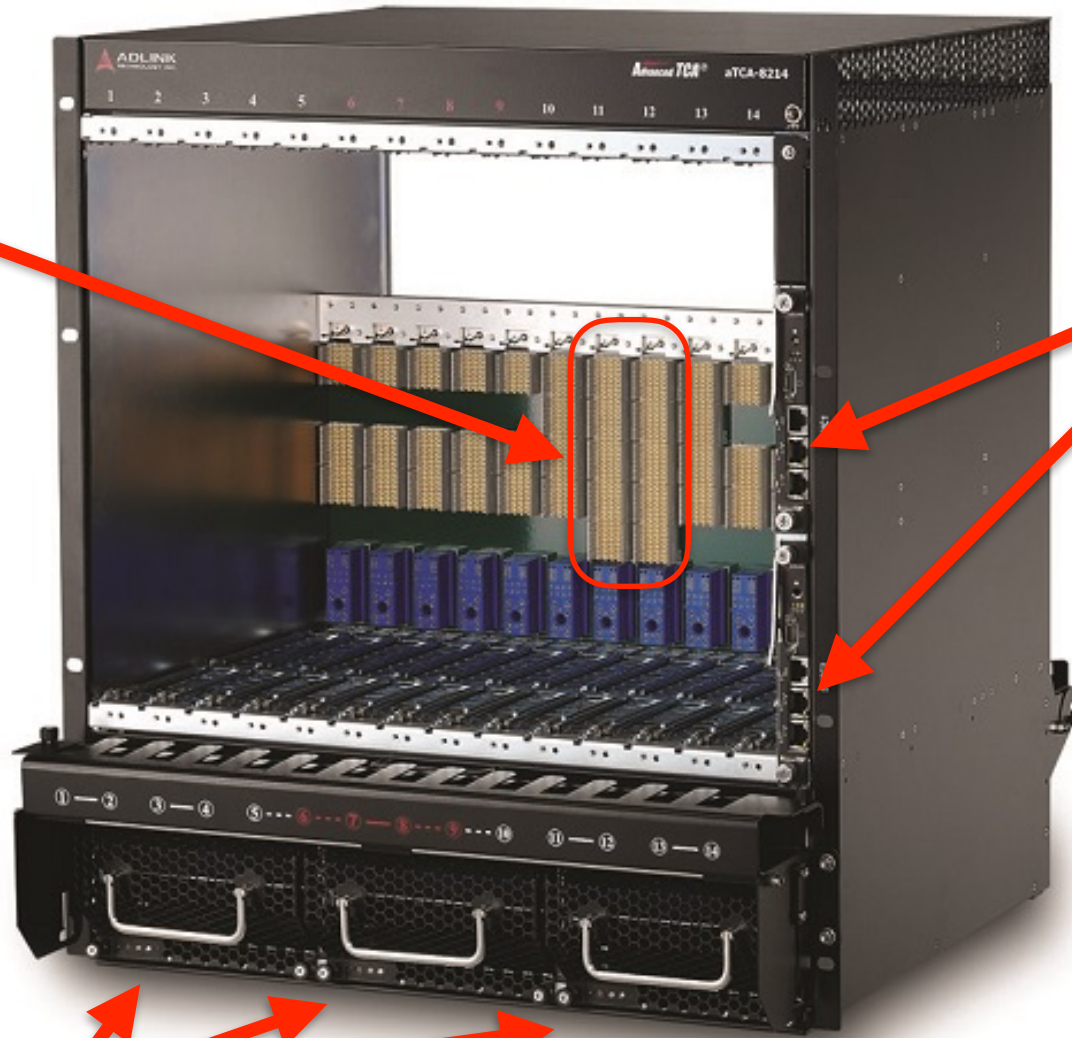


Advanced TCA[®] : **3.0 Standard** Open Modular Computing Specifications

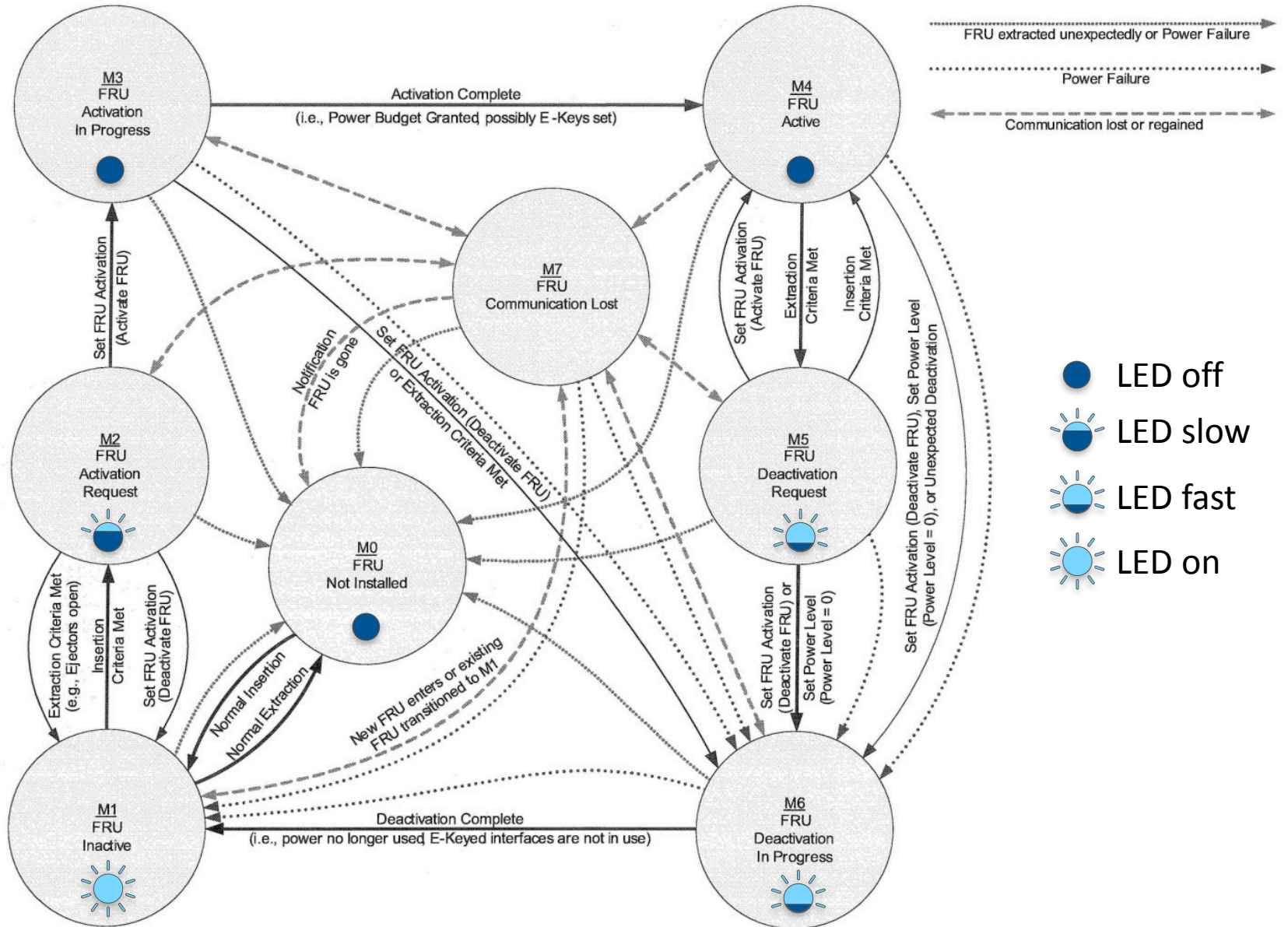
- ▶ **High Availability:** redundant cooling and power, management of temperatures and consumption, 99.999% uptime goal
- ▶ **Scalability:** up-to 400W * 14 slots in 12U/19” multi-protocol backplane up to 100 Gb/s large boards for large pools of DSP/FPGA/CPU
- ▶ **Serviceability:** robust power infrastructure, large cooling capacity, reliable mechanics, hot-plug swapping, hardware management interface

**Redundant
Network
Switch**

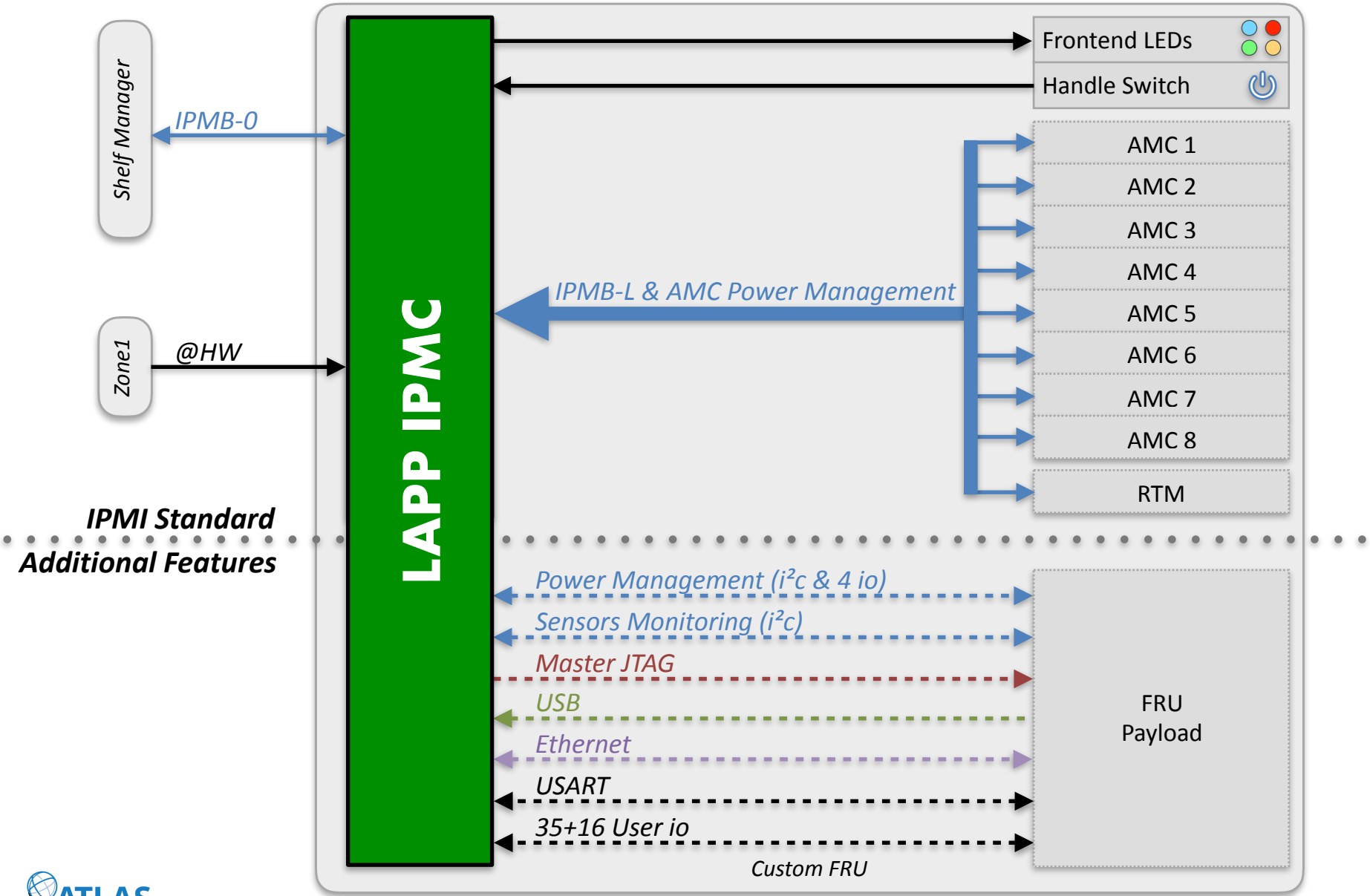
**Redundant
Shelf Managers**

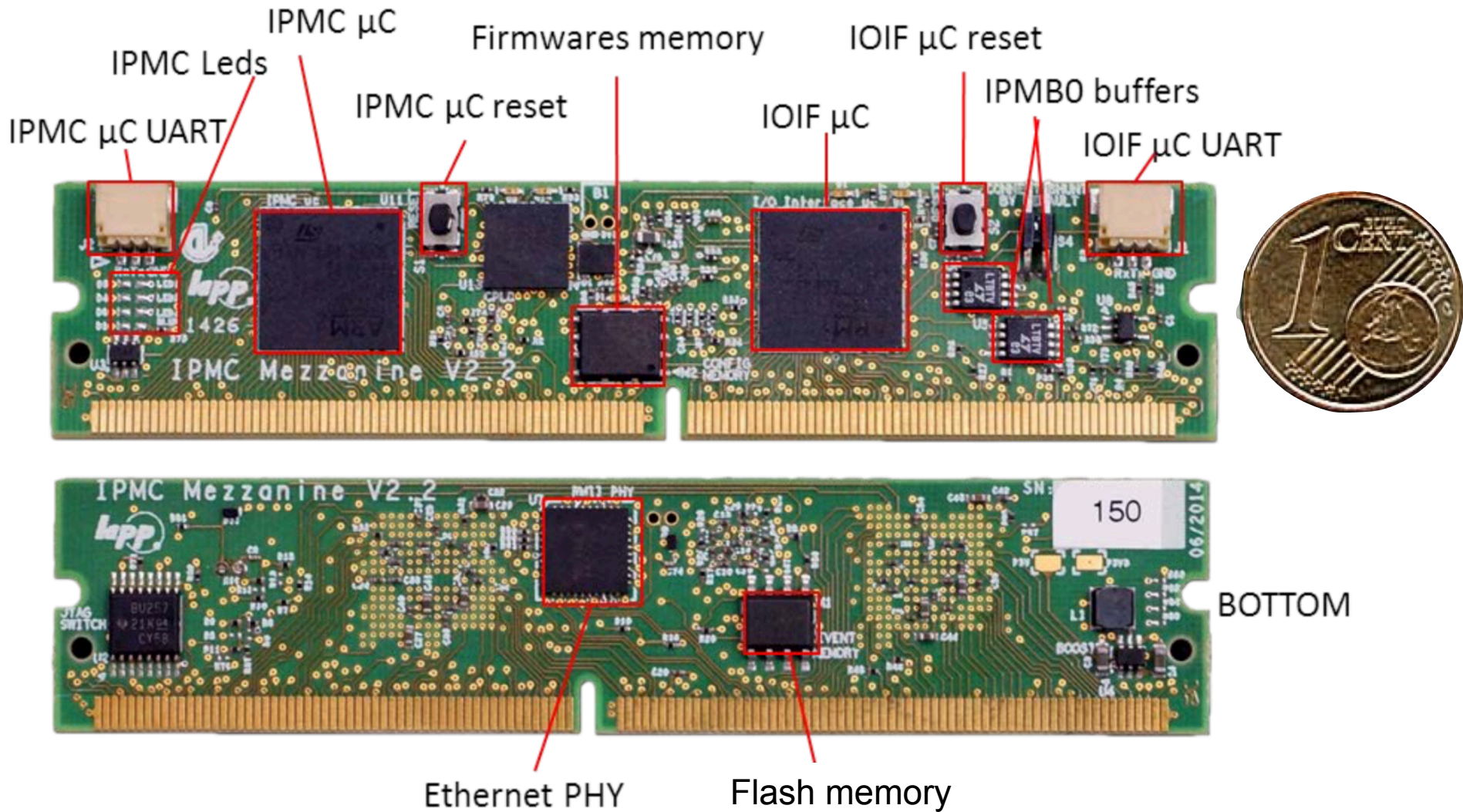


**Redundant
Fans & Power**

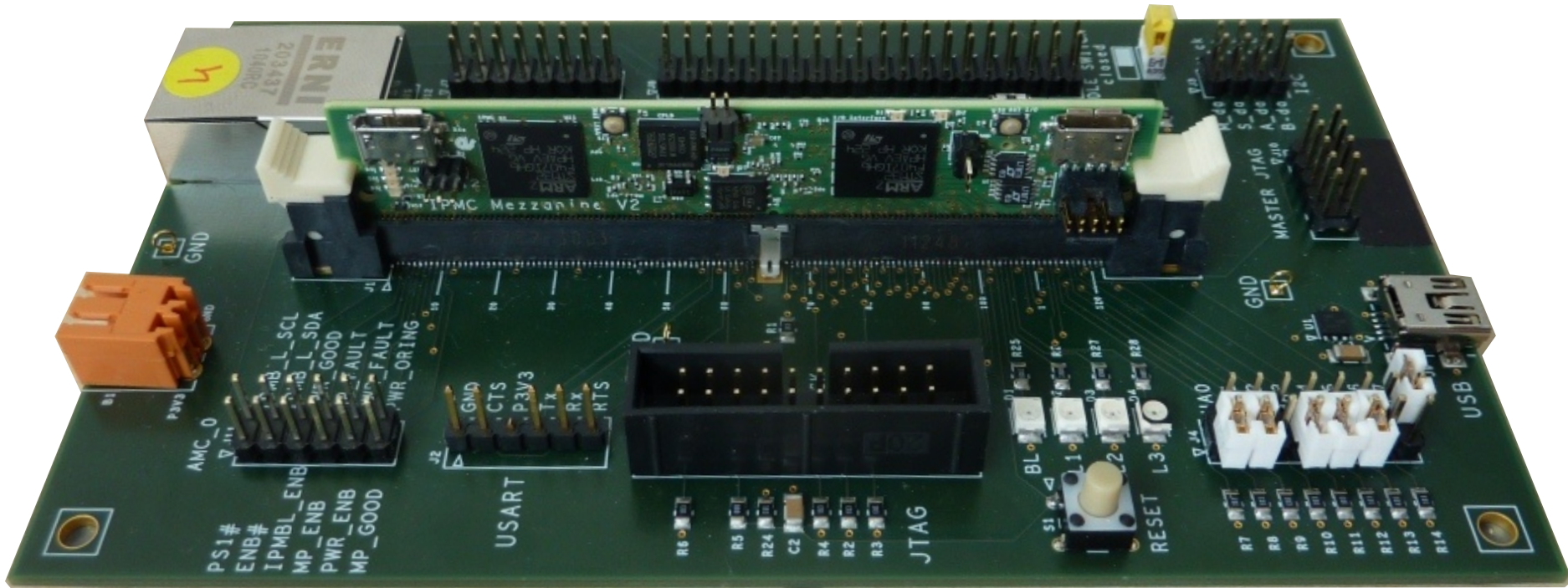


- **FRU information:** describe an ATCA board (board informations, product information)
- **SDR record:** describe board's sensors (type, channel, conversion coefficients, thresholds, ...)
- **E-Keying:** describe board's interfaces (port, protocol, clocks, ...)

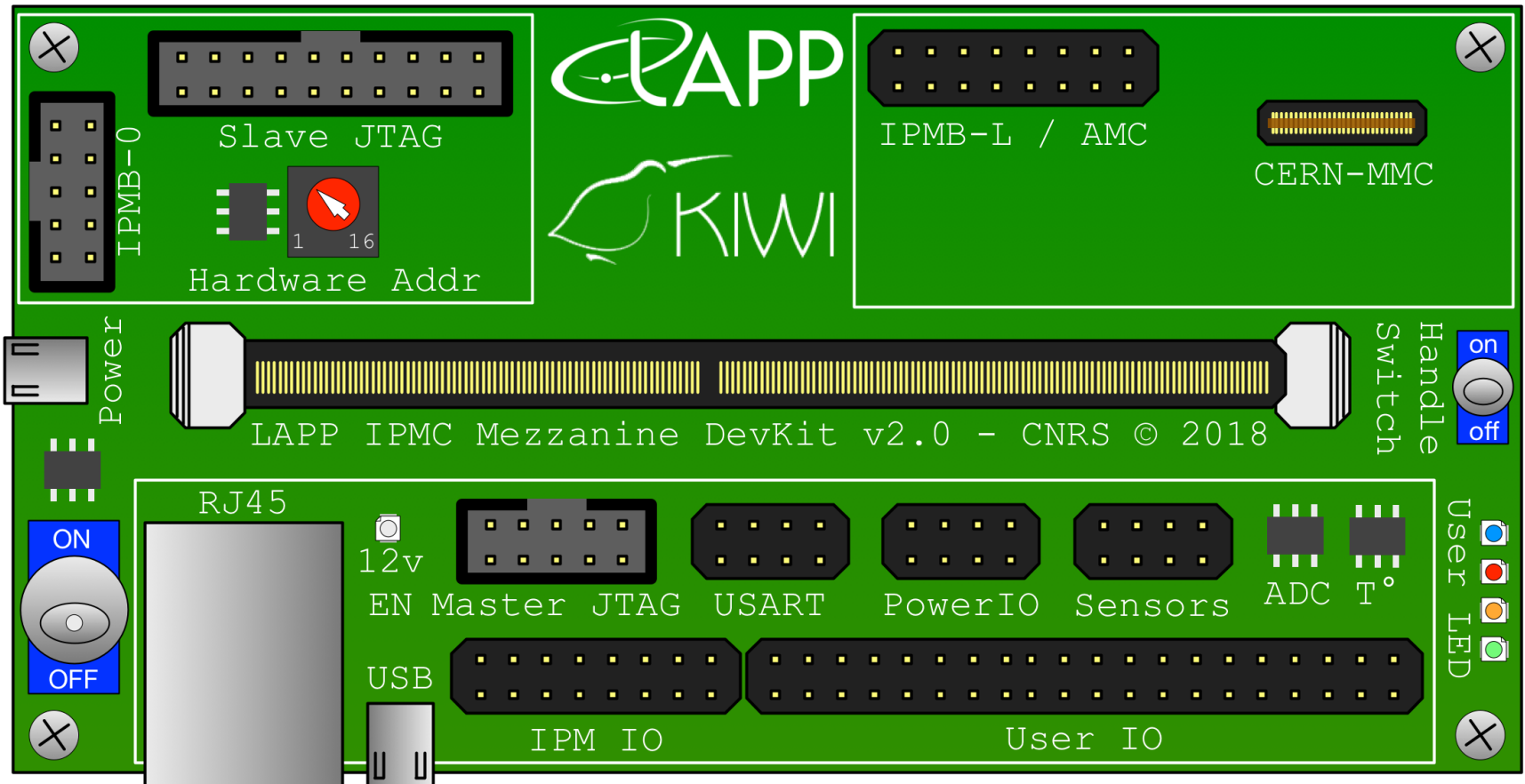




- **Small form-factor:** DDR3 SoDIMM mezzanine (horizontal or vertical mounting)
- **Hot Swap:** Redundant IPMB-0 with buffers, management of ATCA blue LED and front panel switch
- **FRU:** LED and hardware address management
- **Power Management:** dedicated I²C bus plus 4 GPIO for power supplies enabling and monitoring
- **Sensor Monitoring:** dedicated I²C bus
- **Carrier Support:** up-to 8 AMC plus one Intelligent RTM
- **Interfaces:** 1 Ethernet, 5 I²C, 35+16 GPIO, Master JTAG, USART



devKit for Ipmc Workshop Initiation

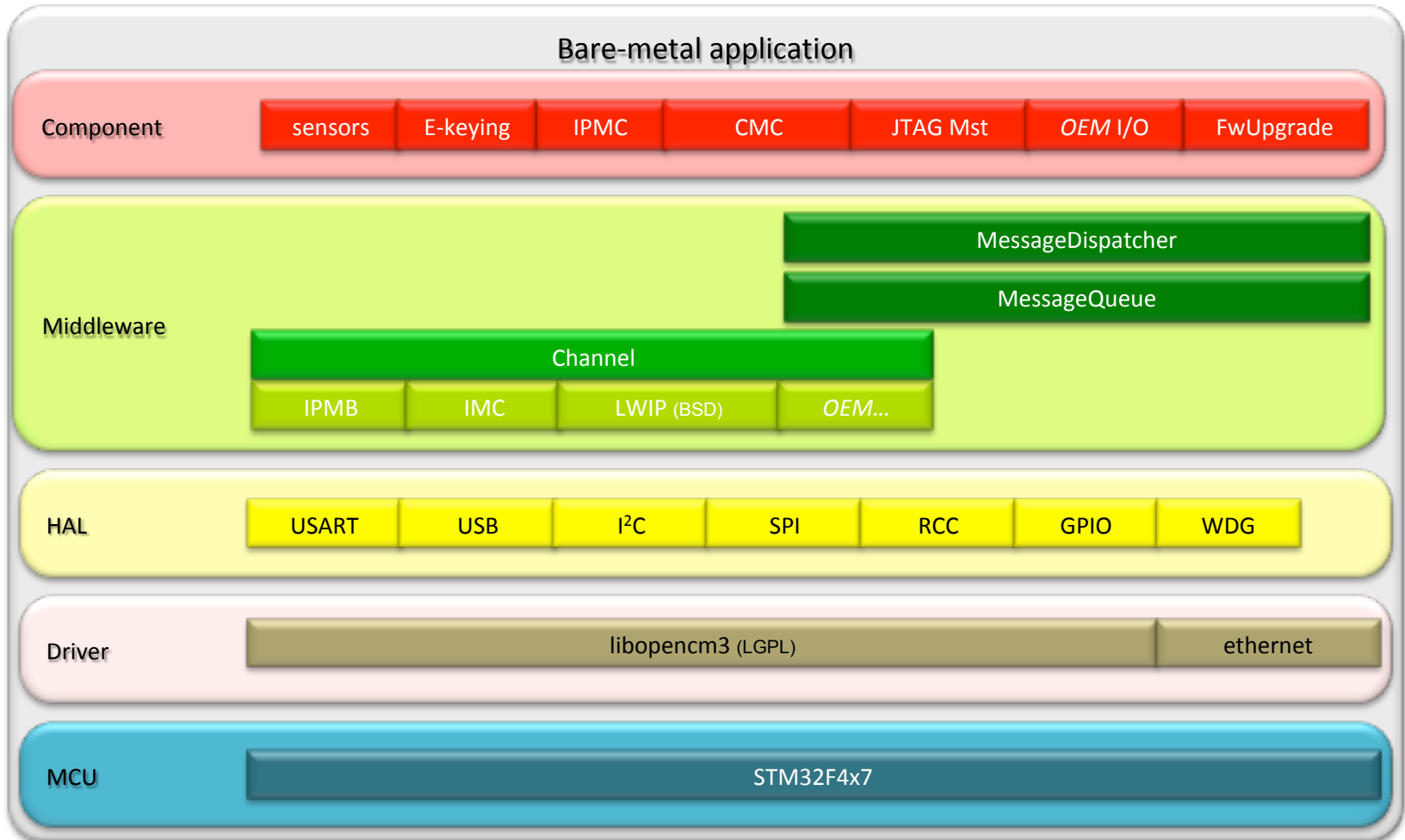


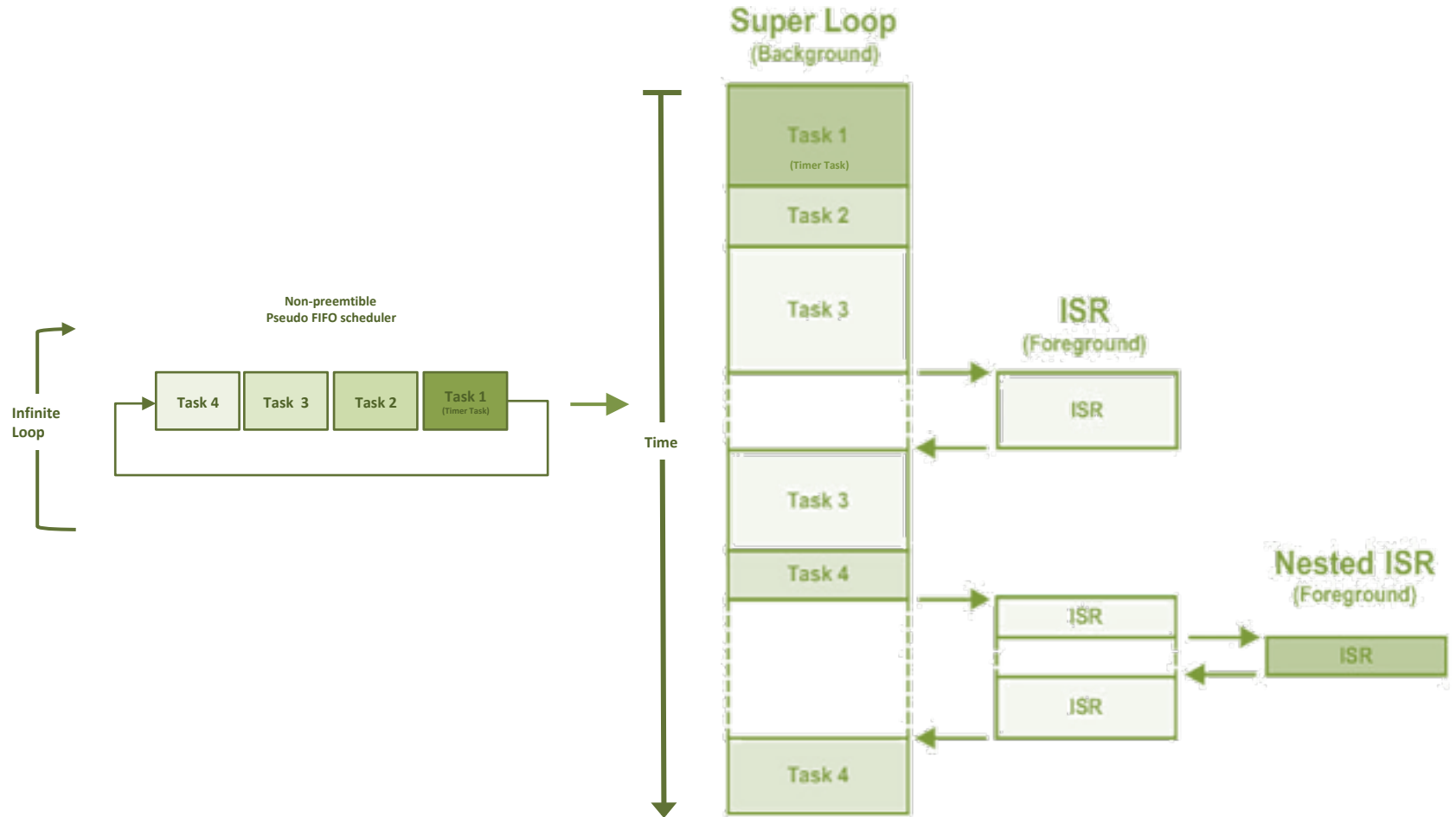
KIWI v2

devKit for Ipmc Workshop Initiation

- Compliant with PICMG 3.0 R3.0, IPMI v1.5 & v2.0 and AMC.0 R2.0
- OpenSource / Royalty-free
- Full ANSI C on bare metal
- Monolithic / Statically-linked
- Event Driven / Module-based
- Pseudo-FIFO Scheduling
- Comm. Channel Abstraction with Message Dispatching
- Firmware Upgrade over Network
- Master JTAG (XVC)





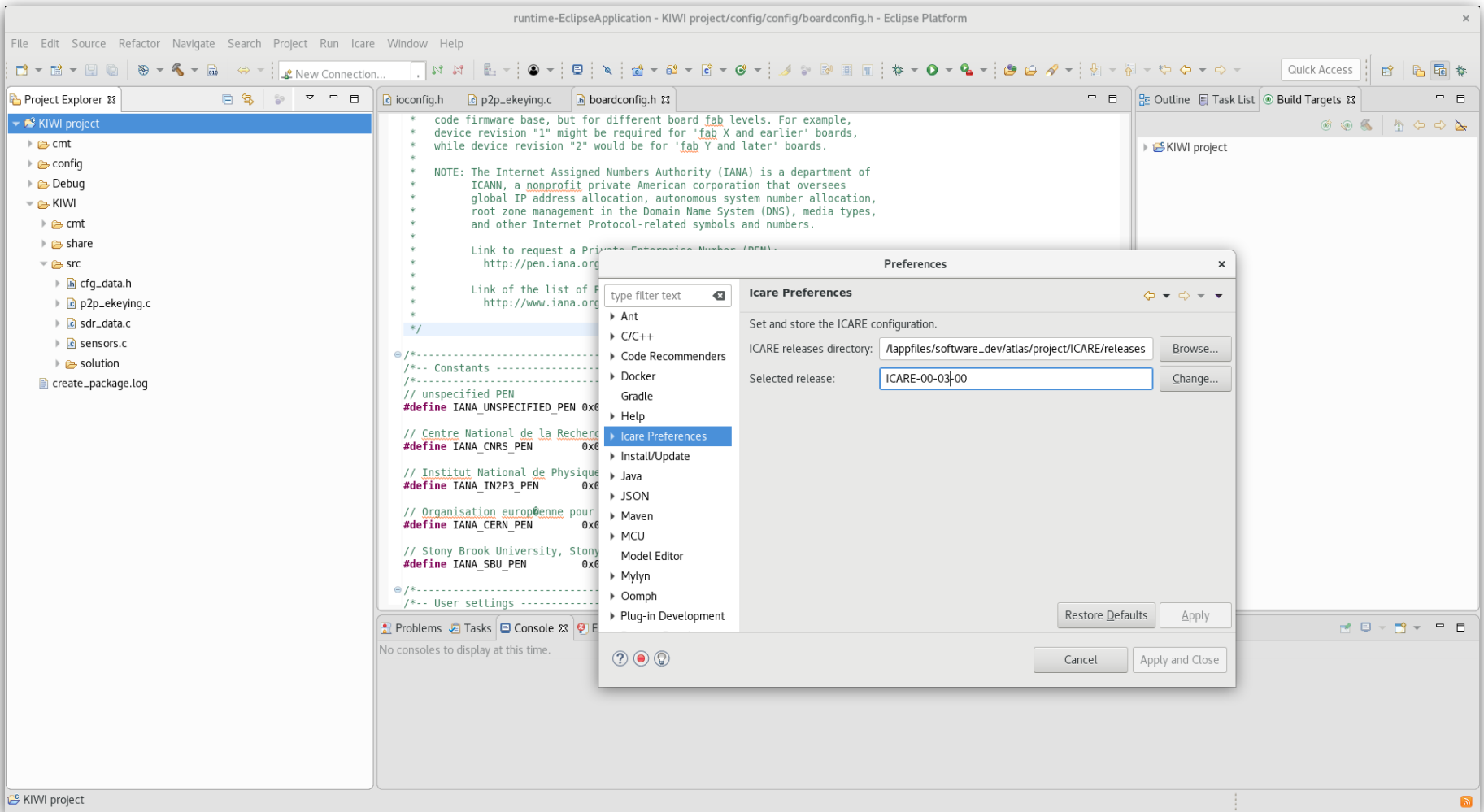


- **Toolchain:**
 - ▶ **OS:** CERN Scientific Linux 6.10
 - ▶ **Build:** CMT-based
 - ▶ **Compile:** gcc-4.7
 - ▶ **Deploy/Debug:** OpenOCD
 - ▶ **SCM:** CERN GitLab
- **All-in-One VirtualBox VM available *Today!***

► Eclipse plugin coming soon...

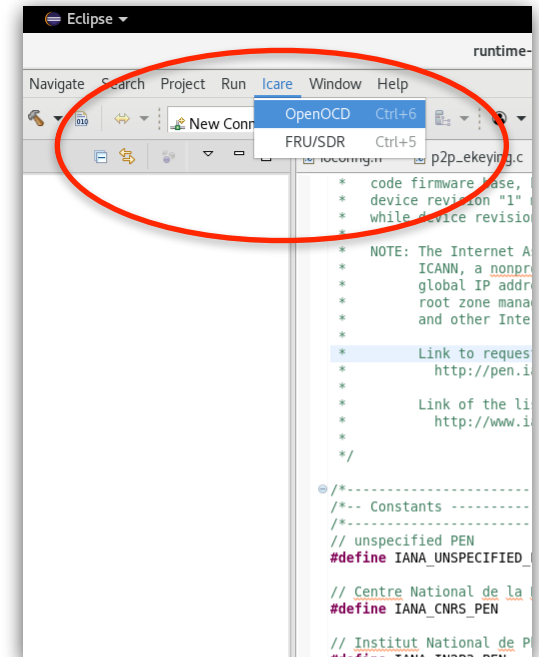
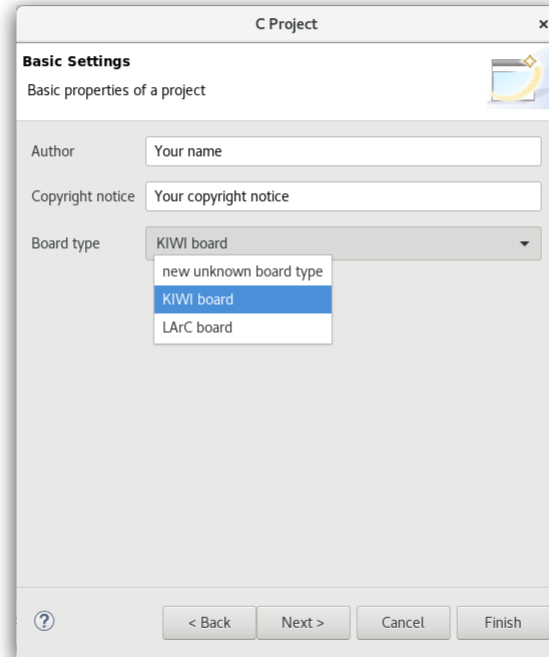
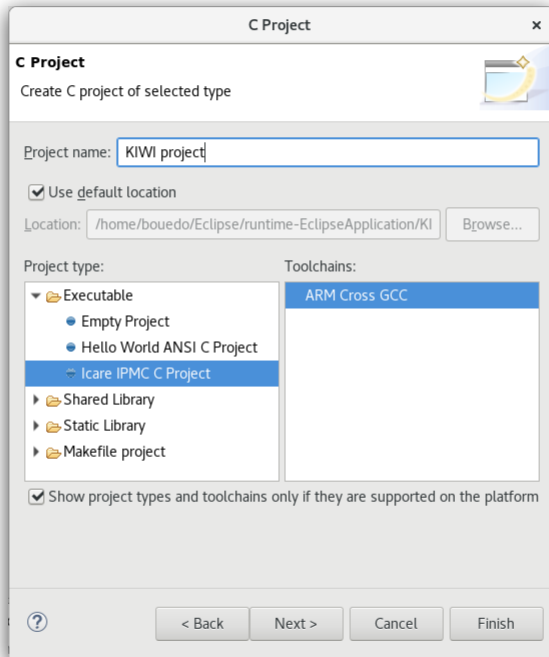


Integrated Development and Configuration Environment





integrated Development and Configuration Environment



The screenshot shows the Eclipse IDE interface with the following components:

- Project Explorer:** Shows a project named 'KIWI project' with sub-projects 'cmt' and 'config'. The 'config' sub-project contains files like 'appconfig.h', 'boardconfig.h', 'debounceconfig.h', and 'ioconfig.h'.
- Editor:** Displays the content of 'ioconfig.h'. It includes a comment about the 'IO_PIN_DEFINE()' macro, an include for 'iopin/iopin.h', and a series of #define statements for various GPIO signals under the 'IPMC' and 'AMC' sections.
- Outline:** Shows the structure of the 'iopin/iopin.h' file, listing multiple instances of the 'IO_PIN_DEFINE()' macro.
- Problems/Console/Errors:** The bottom panel shows 'No consoles to display at this time.'

```

*      Polarity:
*      - IO_PIN_ACTIVE_HIGH
*      - IO_PIN_ACTIVE_LOW
*      - IO_PIN_NORMALLY_OPENED
*      - IO_PIN_NORMALLY_CLOSED
*
*      The macro IO_PIN_DEFINE() allow to set polarity and define new
*      name of GPIO by adding prefix 'PIN_' (e.g. GPIO_AMC0_PS1 ->
*      PIN_GPIO_AMC0_PS1). This new name must used as parameter
*      for 'iopin' library functions.
*
*      ..
*/

/* Includes -----*/
#include <iopin/iopin.h>

#ifndef __IO_CONFIG_H__
#define __IO_CONFIG_H__

/* Exported constants -----*/
#ifdef IPMC
// Handle switch
IO_PIN_DEFINE(GPIO_HANDLE_SWITCH, IO_PIN_NORMALLY_CLOSED)
//IO_PIN_DEFINE(GPIO_HANDLE_SWITCH, IO_PIN_NORMALLY_OPENED)

// AMC #0 signals
IO_PIN_DEFINE(GPIO_AMC0_PS1, IO_PIN_ACTIVE_LOW)
IO_PIN_DEFINE(GPIO_AMC0_ENABLE, IO_PIN_ACTIVE_LOW)
IO_PIN_DEFINE(GPIO_AMC0_IPMB_ENABLE, IO_PIN_ACTIVE_HIGH)
IO_PIN_DEFINE(GPIO_AMC0_MP_ENABLE, IO_PIN_ACTIVE_HIGH)
IO_PIN_DEFINE(GPIO_AMC0_MP_GOOD, IO_PIN_ACTIVE_HIGH)
IO_PIN_DEFINE(GPIO_AMC0_MP_FAULT, IO_PIN_ACTIVE_HIGH)
IO_PIN_DEFINE(GPIO_AMC0_PWR_ENABLE, IO_PIN_ACTIVE_HIGH)
IO_PIN_DEFINE(GPIO_AMC0_PWR_GOOD, IO_PIN_ACTIVE_HIGH)
IO_PIN_DEFINE(GPIO_AMC0_PWR_FAULT, IO_PIN_ACTIVE_HIGH)
IO_PIN_DEFINE(GPIO_AMC0_PWR_ORING, IO_PIN_ACTIVE_HIGH)

// AMC #1 signals

```

FRU/SDR Generator

File Edit Tools Help

FRU

- FRU_record
 - Board_Info_Area
 - Language_Code
 - Mfg_Date_Time
 - Board_Manufacturer
 - Board_Product_Name
 - Board_Serial_Number
 - Board_Part_Number
 - FRU_File_ID
 - Product_Info_Area
 - Board_P2P_Connectivity_Record
 - Carrier_Activation_And_Current_Mgmy_Record
 - Carrier_Information_Record
 - PICMG_Record_ID
 - AMCO_Extension_Version
 - minor_version
 - major_version
 - Carrier_Site_Numbers_Count
 - Carrier_Site_Numbers
 - Internal_Use_Area
 - Chassis_Info_Area
 - Power_Supply_Information
 - Module_Current_Requirements_Record

Name	Type	Value	Encoding
Language_Code	language	25, English	
Mfg_Date_Time	dateTime	2000-01-01T00:00:00	
Board_Manufacturer	string	CNRS/LAPP	Latin1
Board_Product_Name	string	IPMC-TEST	Latin1
Board_Serial_Number	string	LAPP-ATCA-TEST-2013-0000	Latin1
Board_Part_Number	string	CARRIER-TEST	Latin1
FRU_File_ID	string	fru_data.bin	Latin1
PICMG_Record_ID	uint8_t	26	DEC
minor_version	4 bits	0x2	HEX
major_version	4 bits	0	DEC
Carrier_Site_Numbers_Count	uint8_t	4	DEC

Context menu for Carrier_Site_Numbers:

- Add child
 - Internal_Use_Area
 - Chassis_Info_Area
 - Power_Supply_Information
 - Module_Current_Requirements_Record
- Delete Del
- Undo Ctrl+Z
- Redo Ctrl+Y
- Move Upward
- Move Downward

Configuration

Plugin repository: F:\LAPP\Project\Files

Bit fields endianness: Big-endian Little-endian

Name	Version	Summary
<input checked="" type="checkbox"/> C Generator	0.0.0.1	C structure generator plugin
<input checked="" type="checkbox"/> PDF Genera...	0.0.0.1	This is a pdf generator plu...

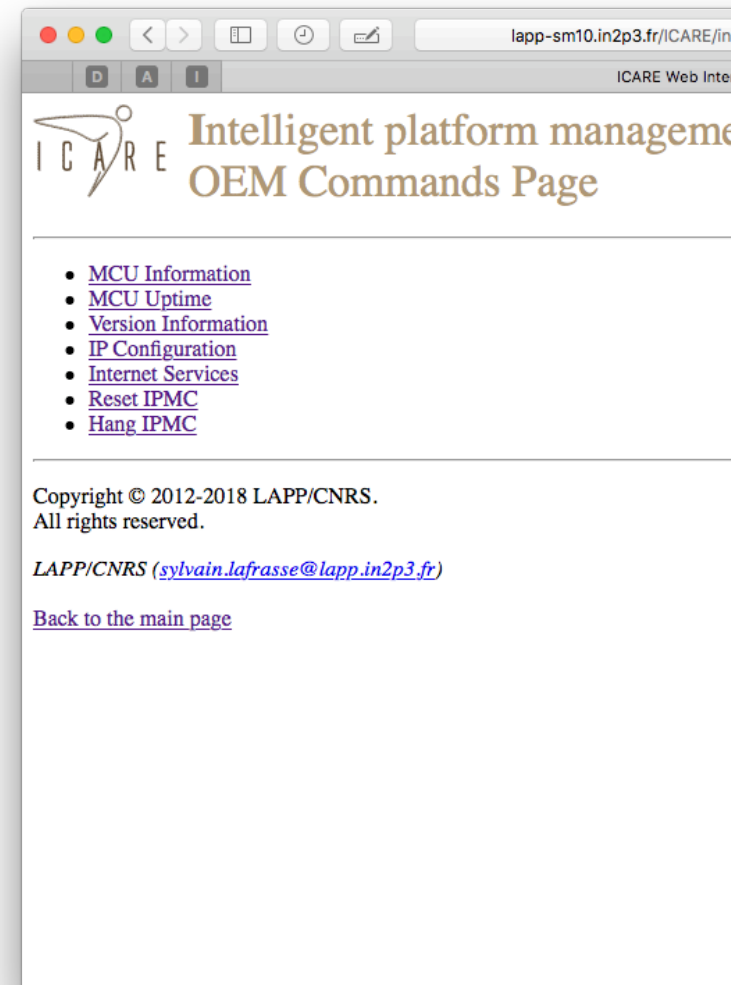
OK Cancel Apply



Graphical tOol for FRU SDR generaTion

Added OEM Commands in Pigeon Point Shelf-Manager:

- ▶ **MCU Information** (MCU ID, PCB Version, Serial Number, Die Revision)
- ▶ **MCU Uptime**
- ▶ **Version Information:**
 - Binary Name , Release Version
 - Compiler Details, Build date and time
 - List of Packages (names and versions)
- ▶ **IP Configuration:**
 - MAC address
 - IP address, Subnet Mask and Gateway
 - Link Status, Duplex Mode and Link Speed
- ▶ **Internet Services:**
 - List of services (name, protocol, port, [Client: IP address + port])
- ▶ **Reset IPMC**
- ▶ **Hang IPMC**



https://gitlab.cern.ch/atlas-lar-icare/shm500_addon_webpages

- Provided Drivers:

Temperature	ADC	Hot-Swap	EEPROM
TMP102	ADS1115	TPS2459	PROM24256
AD7414	LTC2499 LTC4151 LTC4222	IQ65033QMA10	
<i>Your contribution welcome !!!</i>			

Full-featured Platform:

- ▶ **Hardware** under **Creative Commons** licence
- ▶ **Software** under **GPL-like** licence
- ▶ **All-in-One VM** with all the **toolchain**
- ▶ **Eclipse** plugin **coming soon**
- ▶ **FRU/SDR** Graphical Generator
- ▶ Shelf-Manager **OEM commands** provided