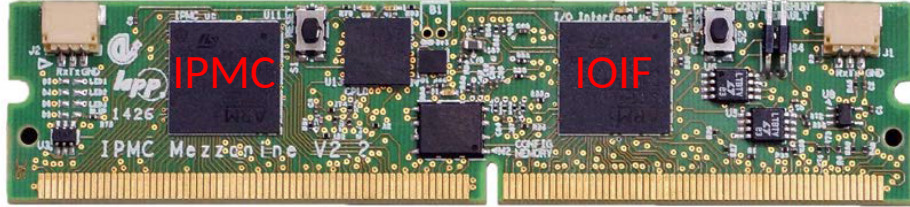
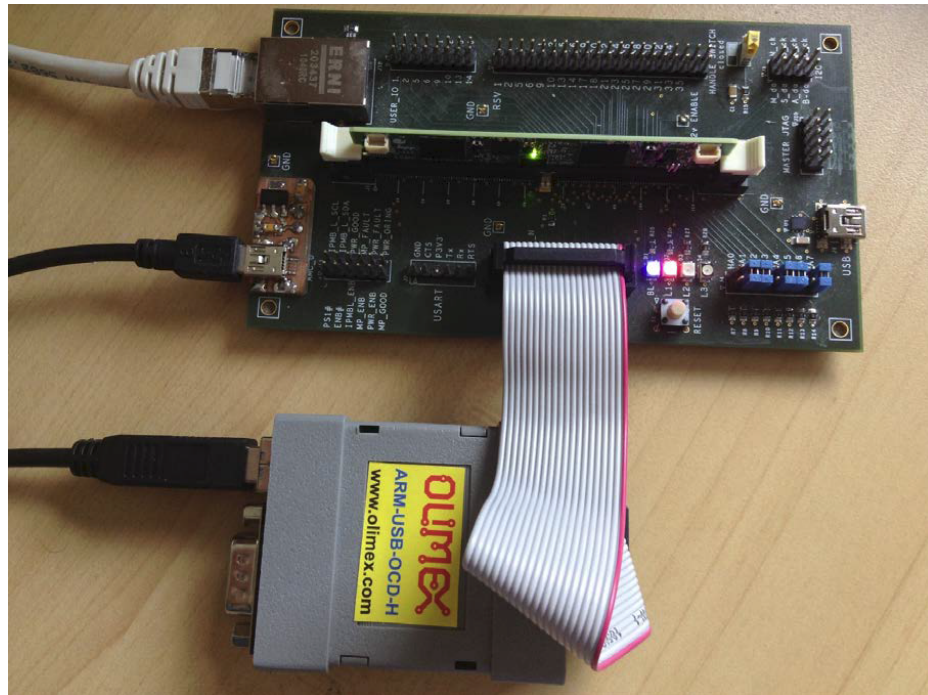


LAPP IPMC Hardware

IPMC Serial Port



IOIF Serial Port



IPMC Test Board Setup

The IPMC has 2 micro-controllers called IOIF and IPMC
Each micro-controller has an internal flash memory for storing the firmware and One Time Programming memory for storing permanent information

There is also an external flash memory which is accessible by the two micro-controllers through a CPLD

PC communicates with the IPMC through the IPMC JTAG chain and through the serial port of each micro-controller on the IPMC

New firmware (version 5.2) allows Ethernet access to JTAG chain

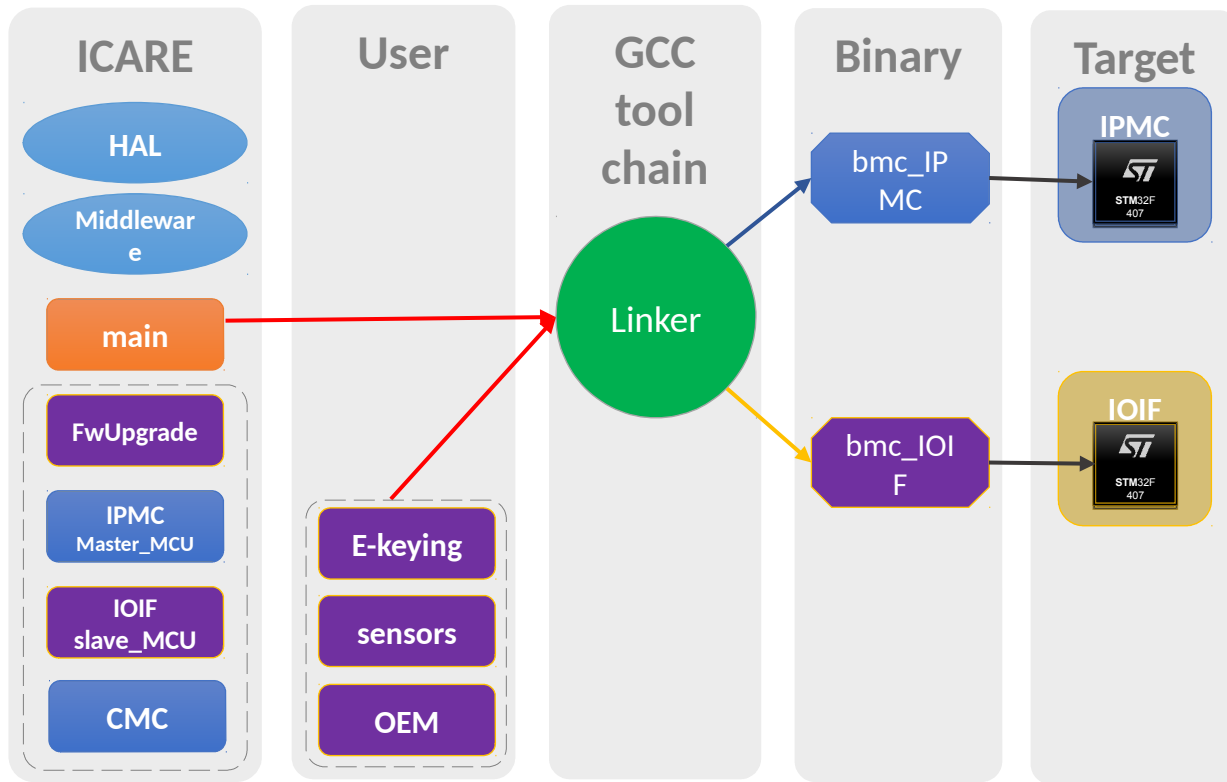
Two PC required to program IPMC using Test Board

Software Environment

```
hayra@hepdaq002:~  
login as: hayra  
=====  
Particle Physics Research Centre, Queen Mary, University of London  
THIS SYSTEM IS AVAILABLE TO AUTHORIZED USERS ONLY  
=====  
Access denied  
hayra@hep.ph.qmul.ac.uk's password:  
Last login: Mon Nov 28 23:39:21 2016 from 90.198.69.189  
to get the SGE environment do:  
source /opt/sge/default/common/settings.sh  
hayra@heppc100:~$ ssh hepdag002.ph.qmul.ac.uk  
=====  
Particle Physics Research Centre, Queen Mary, University of London  
THIS SYSTEM IS AVAILABLE TO AUTHORIZED USERS ONLY  
=====  
hayra@hepdag002.ph.qmul.ac.uk's password:  
Last login: Wed Dec 7 14:10:40 2016 from hepwin30.ph.qmul.ac.uk  
[hayra@hepdag002 ~]$ source Desktop/icare/releases/ICARE-00-01-00/admin/v0r5/cmt/setup.s  
=====  
ICARE  
=====  
Intelligent platform management Controller software  
Copyright © 2014, LAPP/CNRS  
=====  
Setting up ICARE S/W release ICARE-00-01-00  
ICARECONFIG set to arm-gcc47-dbg  
[hayra@hepdag002 ~]$
```

- Scientific Linux host development
- 32-bit ARM Cortex-M4 microcontroller
- Written in standard ANSI C
- GCC (4.7.0) tool chain
- Open Source Configuration Management Environment: CMT
- FRU generation utility (using M4 preprocessor)
- OpenOCD (0.9.0) utility (Linux/Windows)
 - Requires USB to JTAG interface Debug-Adapter-Hardware
 - Olimex ARM-USB-OCD-H
 - NGX technology
- Successfully running ICARE framework at QMUL

Software



- ICARE framework 00-01-00 release project structure
- Template projects available
- User modifications needed for specific hardware
 - I/O pin polarity ioconfig.h
 - Extra board information boardconfig.h
 - E-Keying cannels p2p_ekeying.c
 - Sensors sensors.c
 - Configuration cfg_data.h

FRU management

Activation/De-activation state machine

M0 (not installed)

M1 (installed)

- CM read the FRU information
 - Current
 - E-keying
 - Clock

M2 (activation requested)

M3 (activation in progress)

- Enable power
- E-keying control
- Clock configuration

M4 (active)

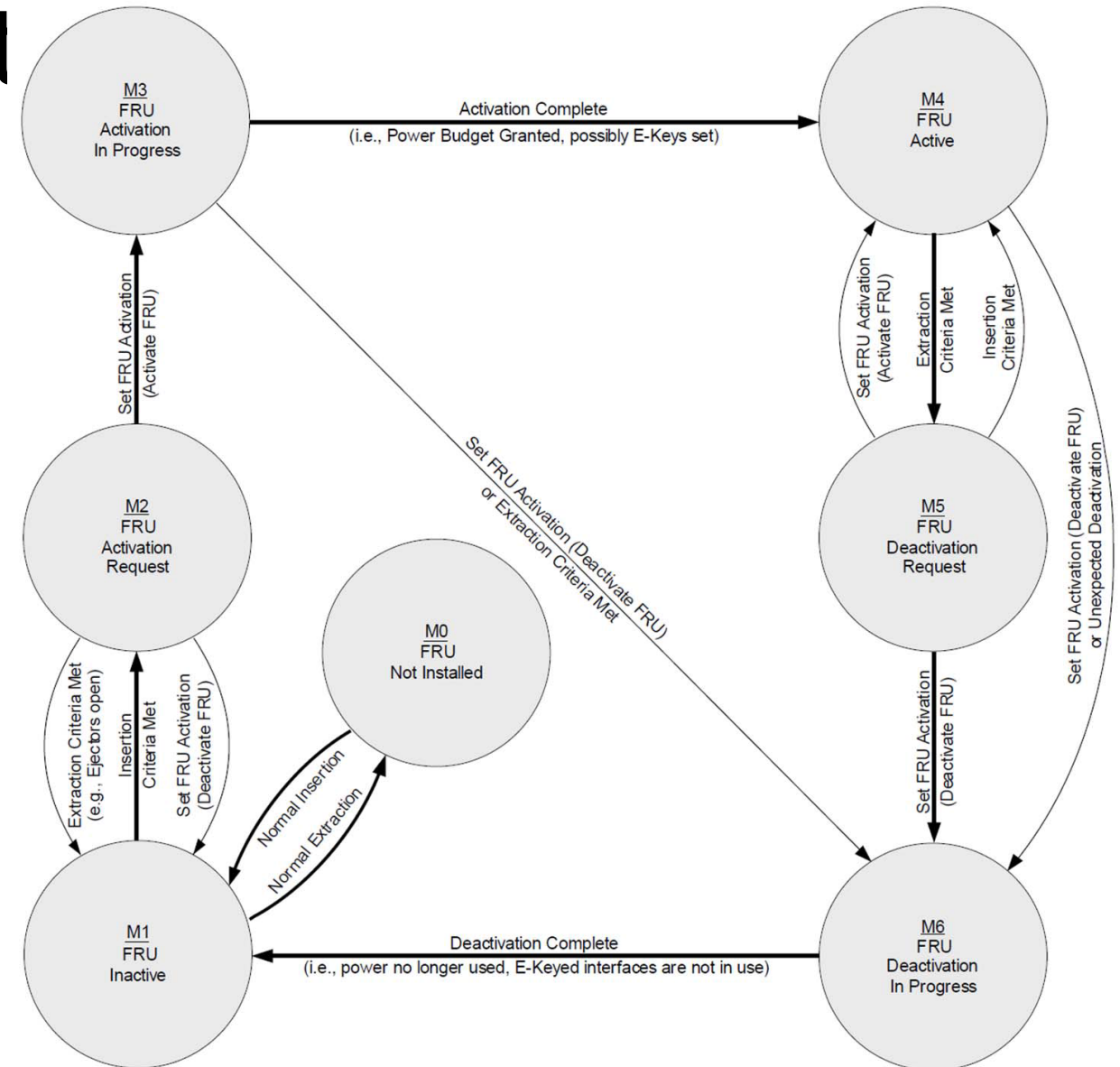
- Sensor, Power, Handle switch monitoring

M5 (Deactivation requested)

- E-keying de-activation
- Clock de-activation

M6 (Deactivation in progress)

- Disable power



EEPROM

- Used to store FRU/SDR information
- The Framework support EEPROM M24256 or 24xx256
- For an unsupported EEPROM the user must overwriting the following functions:
 - `bool prom_init(void)`
 - `bool prom_reset(void)`
 - `int prom_erase(unsigned addr, int len)`
 - `bool prom_busy(void)`
 - `int prom_read(void *dst, unsigned src_addr, int len)`
 - `int prom_write(unsigned dst_addr, void *src, int len)`
- By default FRU/SDR data are stored in 'IOIF' MCU memory.

Sensor

- The Framework support the following sensors
 - AD7414
 - LTC4151
 - LTC2499
 - IQ65033QMA10
- Registering sensor with the ResourceBroker library e.g.:

```
/*-----  
*/  
bool SensorsInit()  
/*-----  
*/  
{  
    RBResource_t stResource;  
  
    // AD7414 Temperature  
    stResource.ucChannelId = CHANNEL_I2C_SENSOR;  
    stResource.ucAddress   = SDR_AD7414_I2C_ADDR;  
    stResource.ucIdentifier = SDR_NUM_AD7414_TEMP;  
    stResource.fnInit      = InitSensorAD7414;  
    stResource.fnRead      = ReadSensorAD7414;  
    stResource.fnWrite     = WriteSensorAD7414;  
  
    if (ResourceBrokerAddResource("AD7414 Temp", &stResource) == false)  
        return false;  
  
    ...  
  
    return true;  
}
```

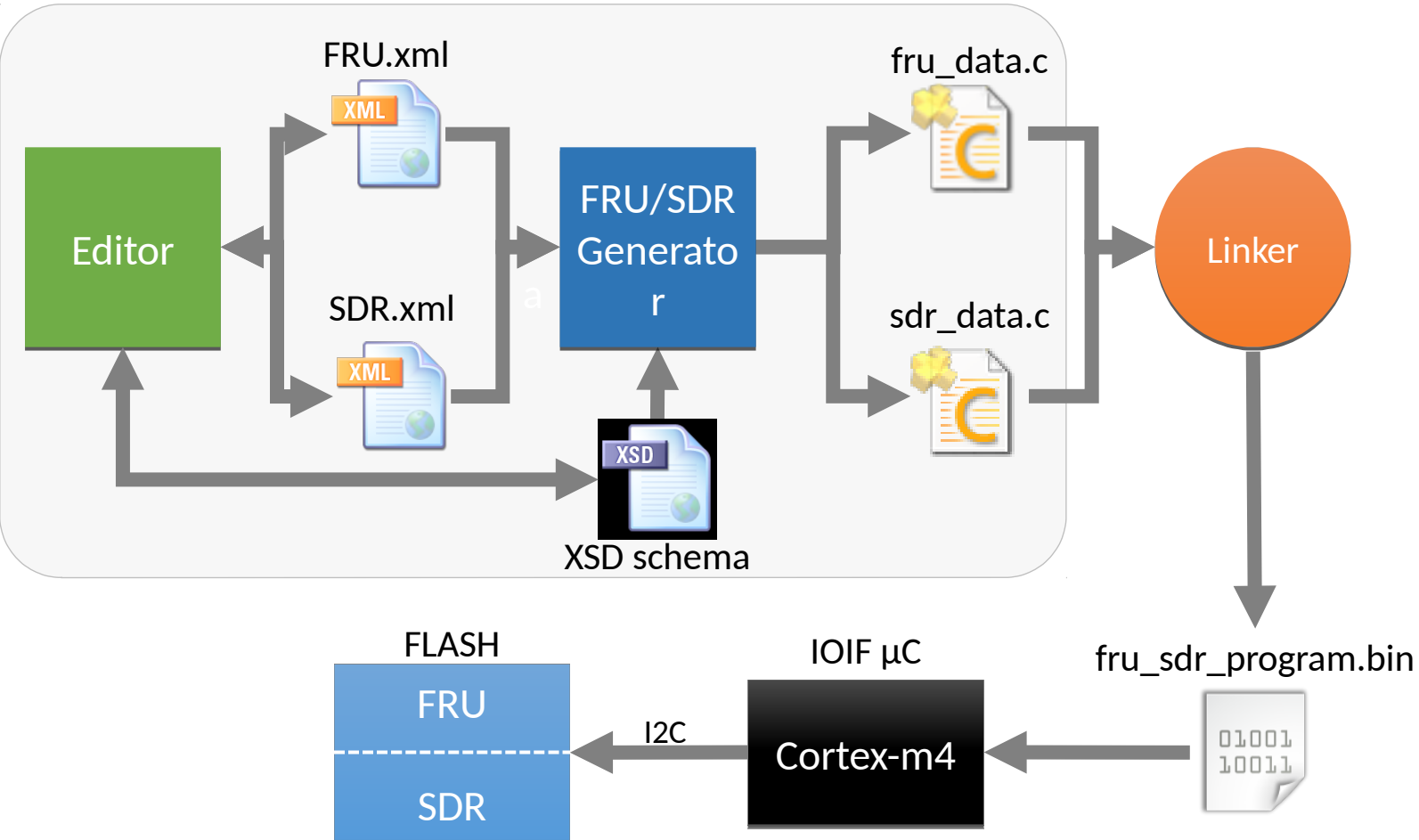
Channel #

I2C address

Unique sensor ID

User's functions

FRU/SDR



- FRU and SDR generation utility
- M4 file templates available
 - using M4 preprocessor
 - GUI interface
- User modifications needed for specific hardware
- Generates fru_data.c and sdr_data.c

FRU/SDR GUI setup

The screenshot displays the FRU/SDR Generator application interface. The main window is titled "FRU/SDR Generator" and contains a menu bar (File, Edit, Tools, Help) and a tree view on the left. The tree view shows a hierarchy starting with "FRU", followed by "FRU_record", and then several sub-areas: "Board_Info_Area", "Product_Info_Area", and "Board_P2P_Connectivi...".

The central pane shows a table of data for the selected "Carrier_Site_Numbers" record. The table has columns for Name, Type, Value, and Encoding.

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_Num...	string	LAPP-ATCA-TEST-2013-0000	Latin1
Board_Part_Number	string	CARRIER-TEST	Latin1
FRU_File_ID	string	fru_data.bin	Latin1
Product_Info_Area			
Board_P2P_Connectivity_Record			
Carrier_Activation_And_Current_Mgmy_Record			
Carrier_Information_Record			
PICMG_Record_ID	uint8_t	26	DEC
AMCO_Extension_Version			
minor_version	4 bits	0x2	HEX
major_version	4 bits	0	DEC
Carrier_Site_Numbers_Count	uint8_t	4	DEC
Carrier_Site_Numbers			

A context menu is open over the "Carrier_Site_Numbers" record, showing options: "Add child", "Delete", "Undo", "Redo", "Move Upward", and "Move Downward". The "Add child" option is expanded, showing a list of potential child records: "Internal_Use_Area", "Chassis_Info_Area", "Power_Supply_Information", and "Module_Current_Requirements_Record".

On the right side of the main window, there are buttons for "C Generator" and "PDF Generator".

Overlaid on the right is a "Configuration" dialog box. It has tabs for "Plugins" and "Files". The "Plugins" tab is active, showing a table of installed plugins:

Name	Version	Summary
1 C Generator	0.0.0.1	C structure generator plugin
2 PDF Genera...	0.0.0.1	This is a pdf generator plu...

The dialog also includes a "Plugin repository" field with a "Browse..." button, and radio buttons for "Bit fields endianness" (Big-endian and Little-endian, with Little-endian selected). At the bottom are "OK", "Cancel", and "Apply" buttons.

Things to do

- Get Test Board for the access to IPMC
- Setup USB to JTAG interface adapter-hardware
- Upgrade current firmware (to version 5.2)
- Get FRU/SDR generator utility and GUI
- Understand eeprom programming procedures
- Setup eFEX to use JTAG chain