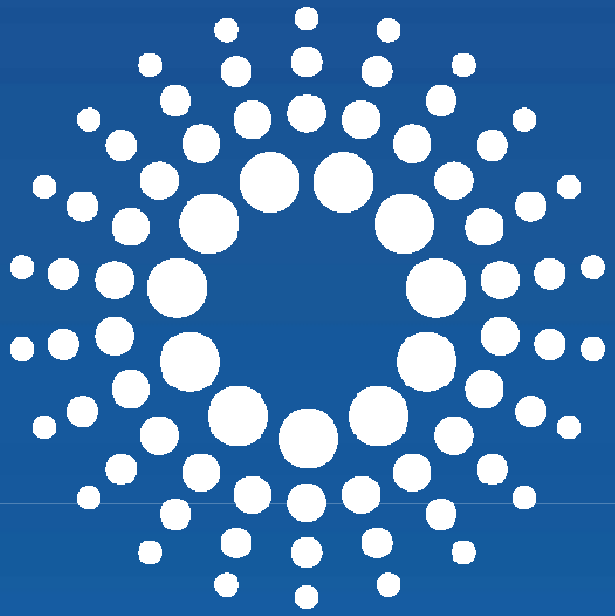
ESRF

European Synchrotron Radiation Facility



DAnCE

Presented by Jose Maria CLEMENT
Electronics Support Lab

What is DAnCE?

(Data Acquisition and Control Electronics)

New control platform for in-house developments as well as the design of several general interest control electronics modules

Generic hardware and software components
(DCore, embedded Linux, basic libraries, ...)

Applications Applications Applications

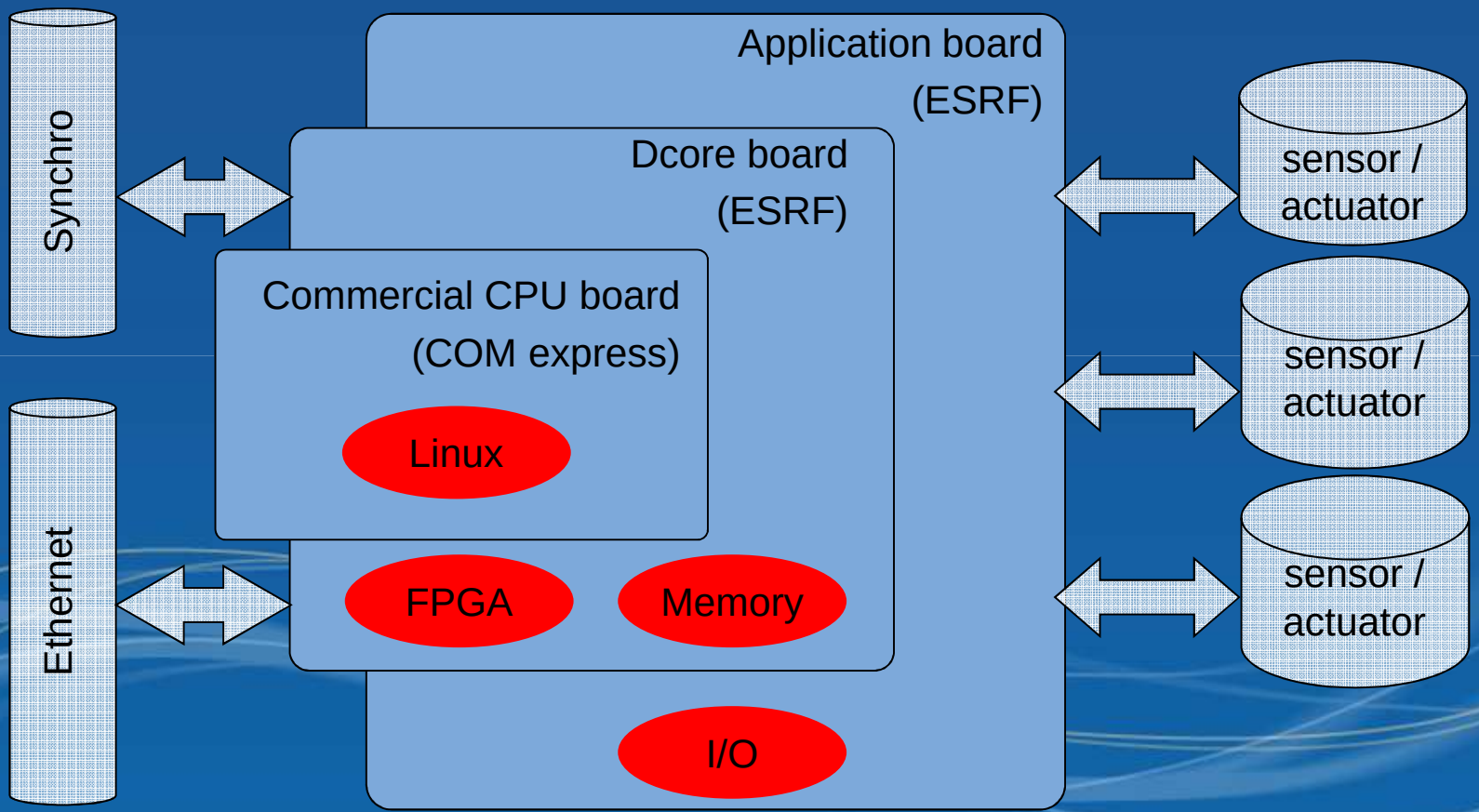
First Applications

- Encoder readout/mux module
- Analog to Digital/Frequency converter
- Single channel electrometer

Why an internal development?

- VME boards not supported in new beamlines
- Keep the modules close to the sensor/actuator
- Have a common interface with the applications

DAnCE internals



DAnCE internals (cont.)

- CPU board:
  - COM Express NANO standard compliant (55x84mm)
  - Standard footprint and connector
  - Several commercial products
  - Resizable resources (calculation, low power, memory, etc)
  - 1 Gb Ethernet link
  - Evaluating KONTRON boards
    (Intel Atom E6xx 600MHz/1.6GHz, 512MB/2GB ram, 1/8GB flash)

- Dcore:
  - FPGA XILINX SPARTAN6 (SLX100T)
  - Large data memory directly connected to FPGA (64M x 16b)
  - FPGA internal design based on ESRF E-bone specifications
  - Communication between CPU and FPGA through PCI Express

DAnCE software issues

- Embedded:
  - Linux kernel 2.6 (built and customized by ESRF)
  - Three kernels under evaluation (standard, RT patched, XENOMAI)
  - PCI Express Linux driver (ESRF)
  - Communication/configuration program (ESRF)
  - Socket based (ASCII and binary) protocol (ESRF)
- Remote:
  - Unique Python communication library
  - TANGO Device Server on client host
  - Standalone clients
  - Etc

DAnCE: Synchronization aspects

- Synchronization outputs:
  - For each application board some internal events can be defined:
    - Reaching a certain position in an encoder
    - An event generated at regular encoder step intervals
    - Getting out of a position range
  - 2 events can be configured to be output through 2 generic Synchro OUT signals

- Synchronization inputs:
  - 2 generic Synchro IN signals allow for external events
  - For each application board, some actions can be defined and linked to the external events
    - Store all the input channels values in a buffer
    - Start an ADC conversion and store the result in a buffer

DAnCE: Synchronization aspects (cont.)

- For applications with more than one channel (4 channel ADC, others), more synchronization signals can be added
- Buffers
  - Each application board has a large memory buffer (1Gb)
  - Storage into the buffer can be done entirely by hardware events
  - Time stamping methods under discussion, but for the most common applications (continuous scans) it is not mandatory

Hardware Synchronization summary

- With the 3 first applications described (encoders, ADC, electrometer) and the use of P201, OPIOM and MUSST we meet the needs in terms of hardware synchronization expected at ESRF

- The next step towards simplification in the experiment configuration would be to have a timer board and a programmable hardware sequencer as application modules within the DAnCE platform

Acknowledgments

Joel Clement
Jose Maria Clement
Jacques Cerrai
Christian Herve
Thierry LeCaer
Ricardo Hino
Pablo Fajardo
Gilles Berruyer
Bernard Regad
Manuel Perez