Readout System On Chip

A highly integrated system using FPGA COTS

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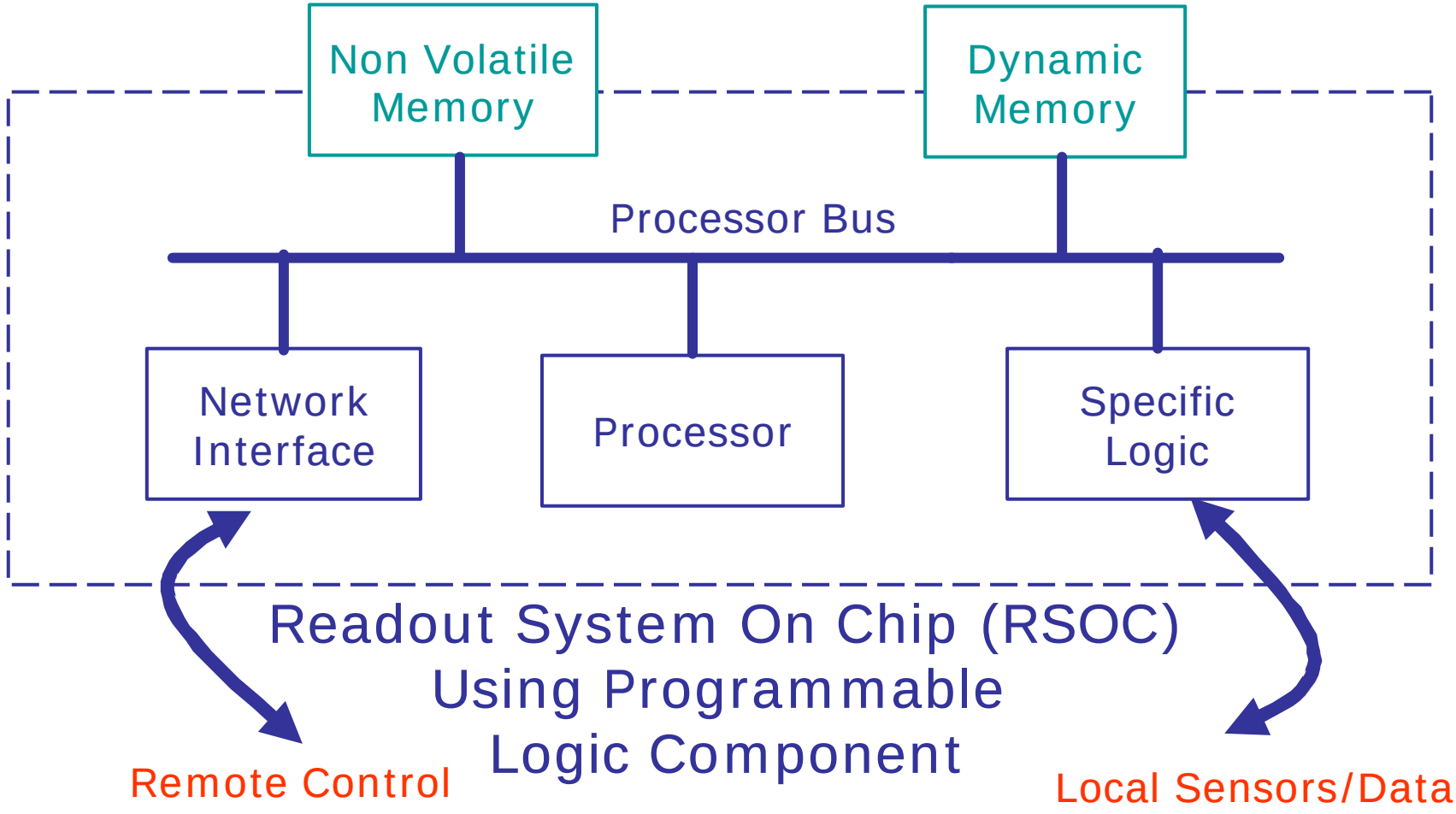
– CEA Saclay DAPNIA –

VLVnT, NIKHEF, 2003 October 6

DAPNIA

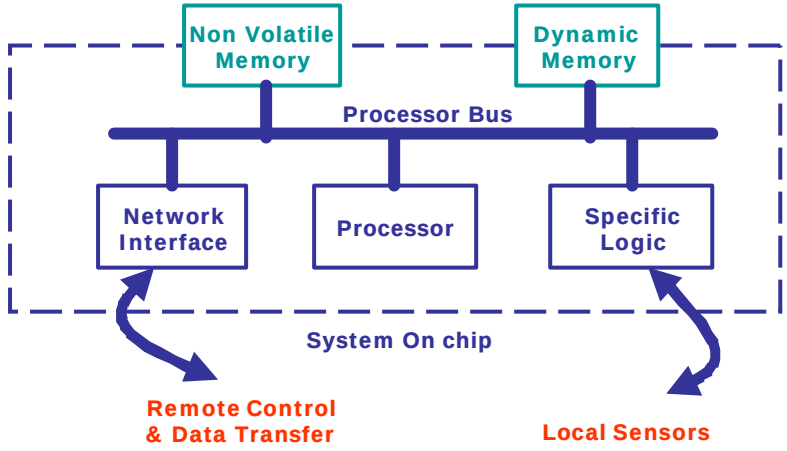
A Generic Acquisition System



RSOC : The embedded Blocks

Processor
- Firmware, Synthesized with logical gates
  32 bit RISC@150 MHz, 125 D-MIPS
- Hardware, Pre-Implemented in silicon
  32 bit RISC@400 MHz, 600 D-MIPS

Network Interface
- Hardware
  High speed serial links, Gbit Ethernet
- IP (Intellectual Property) Cores
  Ethernet MAC layer



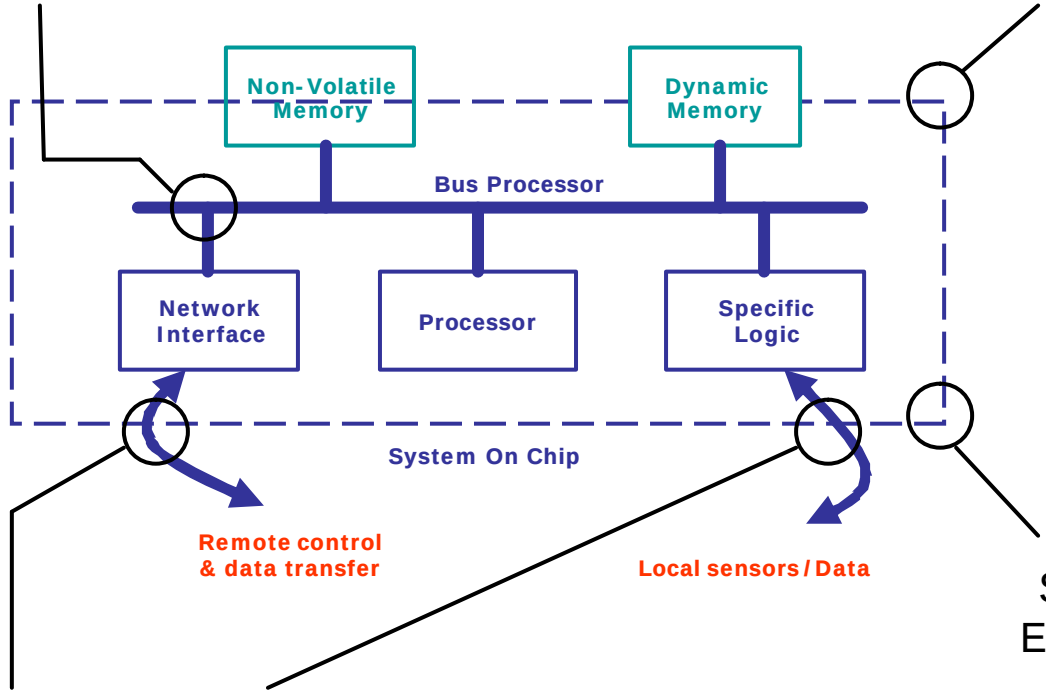
Specific logic
- Described by the user in VHDL or Verilog language

Memories
- Non-volatile: processor boot
- Volatile: programmes & Operating System execution, data buffers

RSOC : Technical Advantages

Faster Internal Buses

Room saving

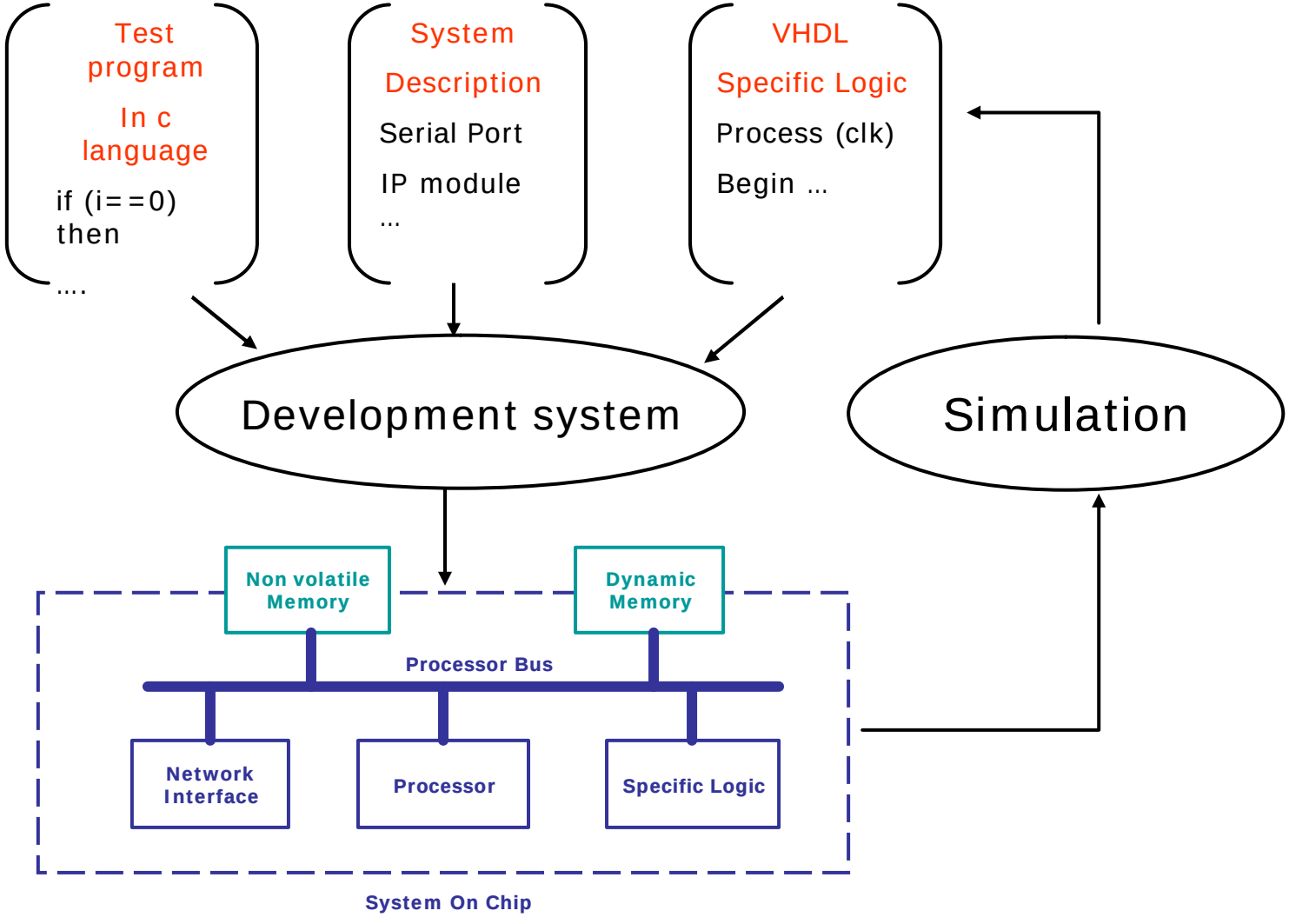


System Evolution & Reconfiguration

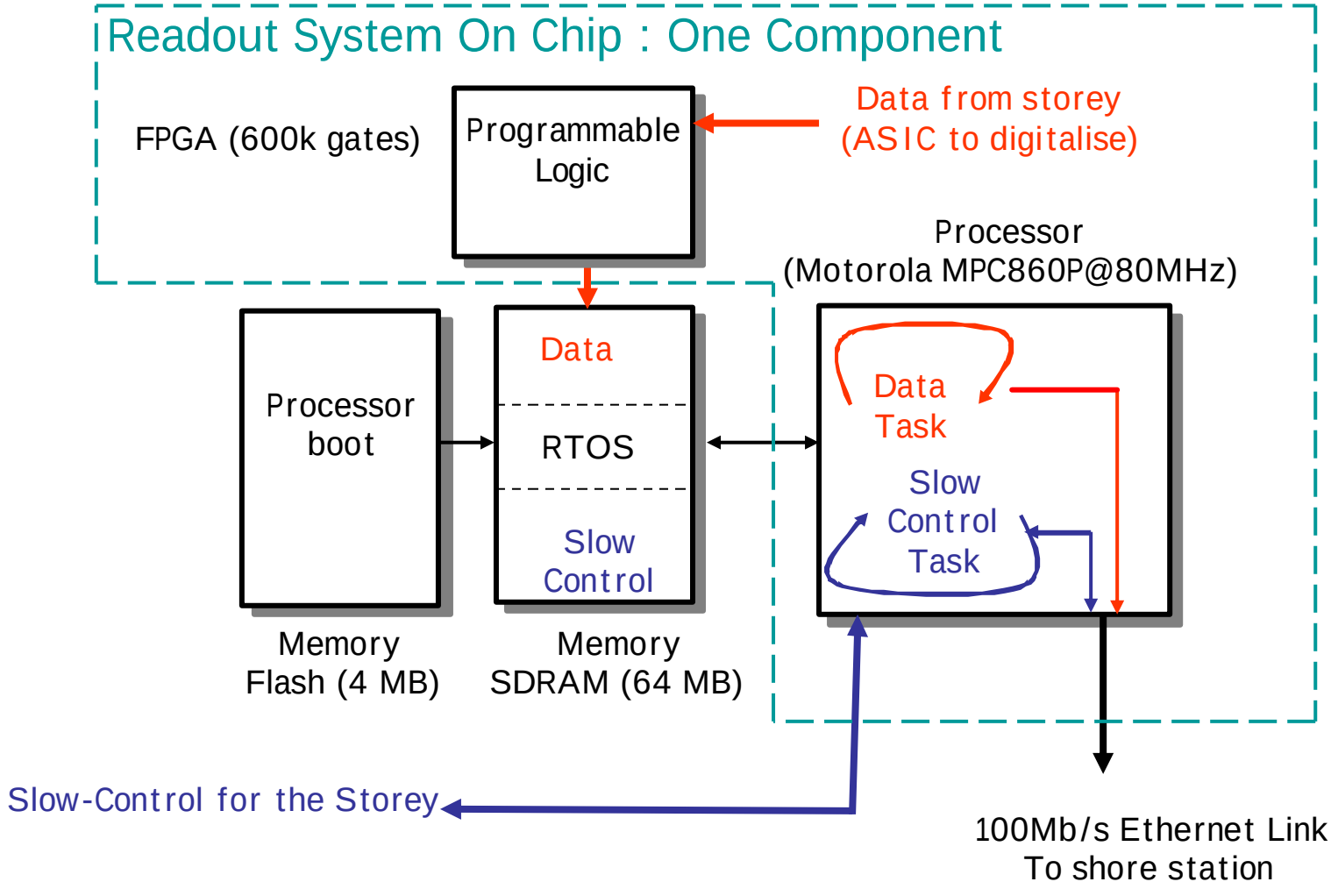
Limited I/O number : higher reliability

- Reduced power consumption
- Less Solder faults
- Simplified PCB

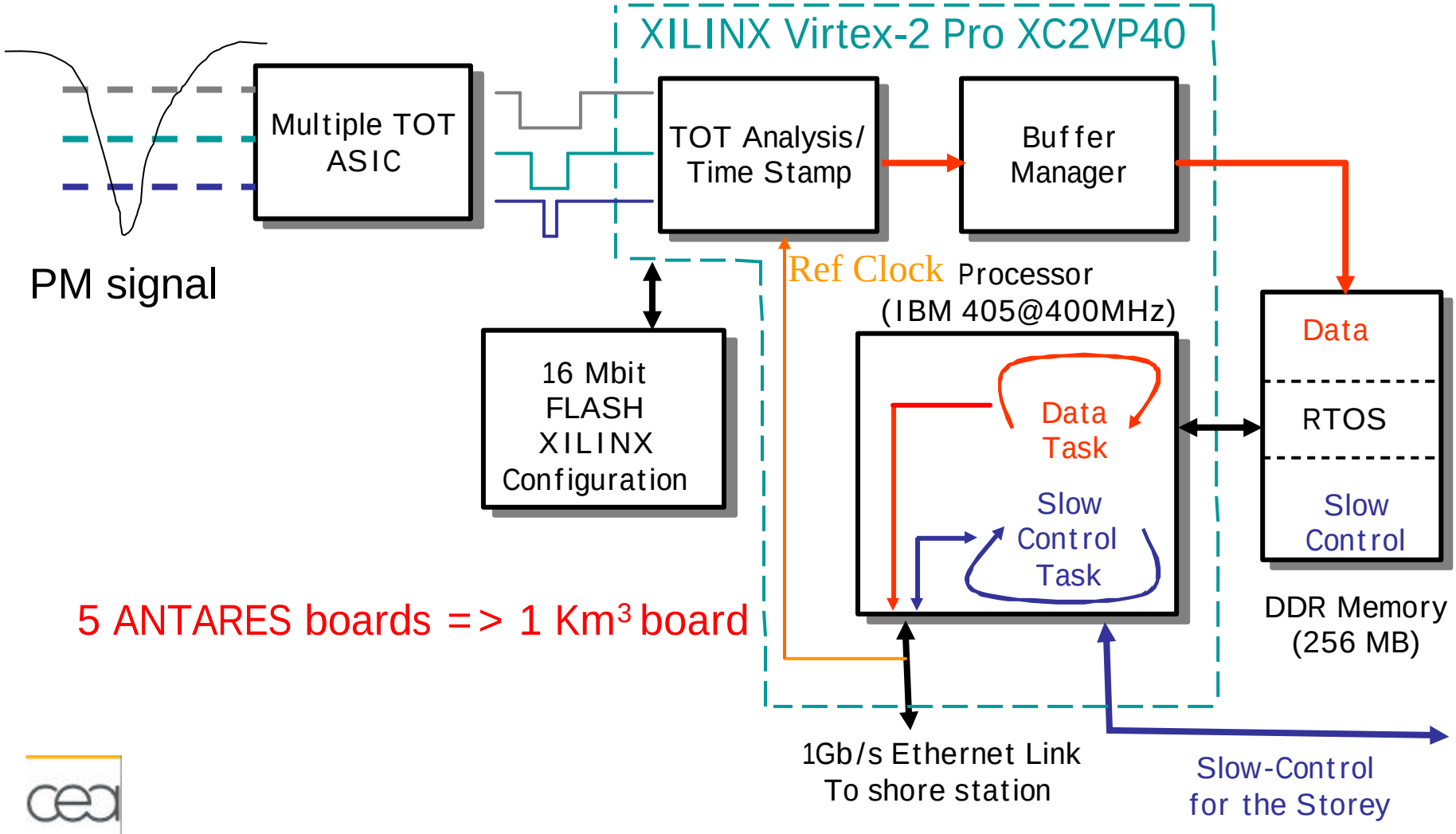
RSOC Development



The ANTARES Off-Shore Processor Board



The km³ Off-Shore Processor Board ?



- **Generic Acquisition system**
  - Credit Card Format
  - XILINX Virtex-2 Pro
  - Memories : DDR RAM, FLASH
  - I/O connector
  - Ethernet ports 100 Mbit/s, 1 GBbit/s
  - Operating system : vxWorks, Linux

- **ANTARES Off-Shore processor board upgrade**
  - Hardware compatible : 100 Mbit/s port, +5V powered
  - Firmware : processor interface to modify
  - Software compatible : vxWorks RTOS
  - Cooling system to redesign, should be simpler
  - A prototype could be tested on the first deployed ANTARES String

- **A Km^3 prototype**
  - Clock extraction and frame synchronisation (over Ethernet) to study
  - Evaluate the network and CPU performances versus the power consumption
  - Emulate the front end multiple TOT ASIC
  - Check if a TOT ASIC is suitable for track reconstruction

Conclusion

- **ANTARES like design but with a much higher integration level**
- **Digital solutions, hardware and software, off-the-shelf**
- **Design may migrate toward a mixed Analog/Digital ASIC**
- **First Step for a Km3 prototype : 1 man, 1 year. Budget to buy IP, components, build a prototype**