"Memory coherency" is changing IT.
Why ? How?

Fabrice MOYEN – Alexandre CASTELLANE – Bruno MESNET

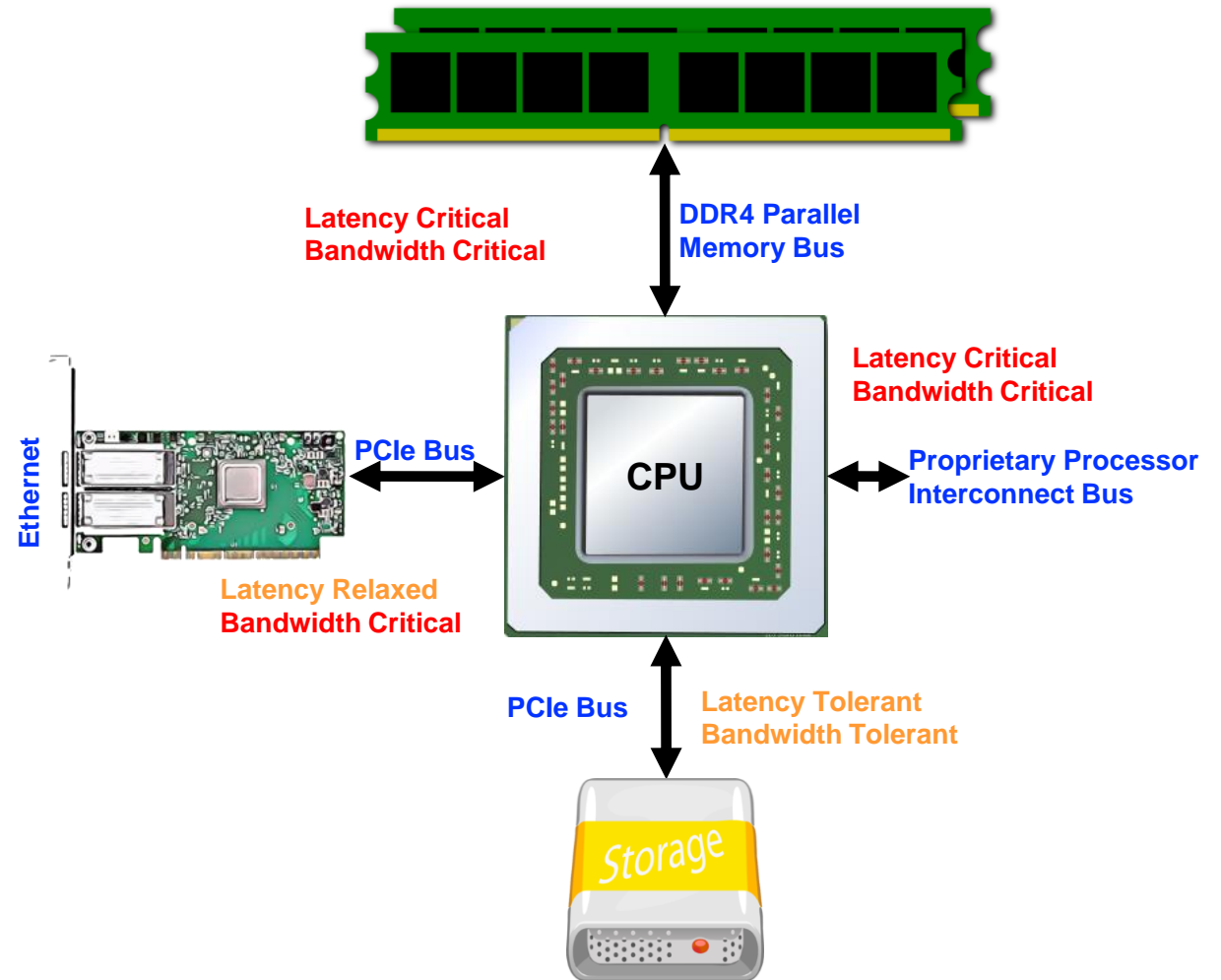*IBM Systems – Hardware Acceleration enablement*

Dr Filip LEONARSKI *– Paul Scherrer Institute - Beamline data scientist*

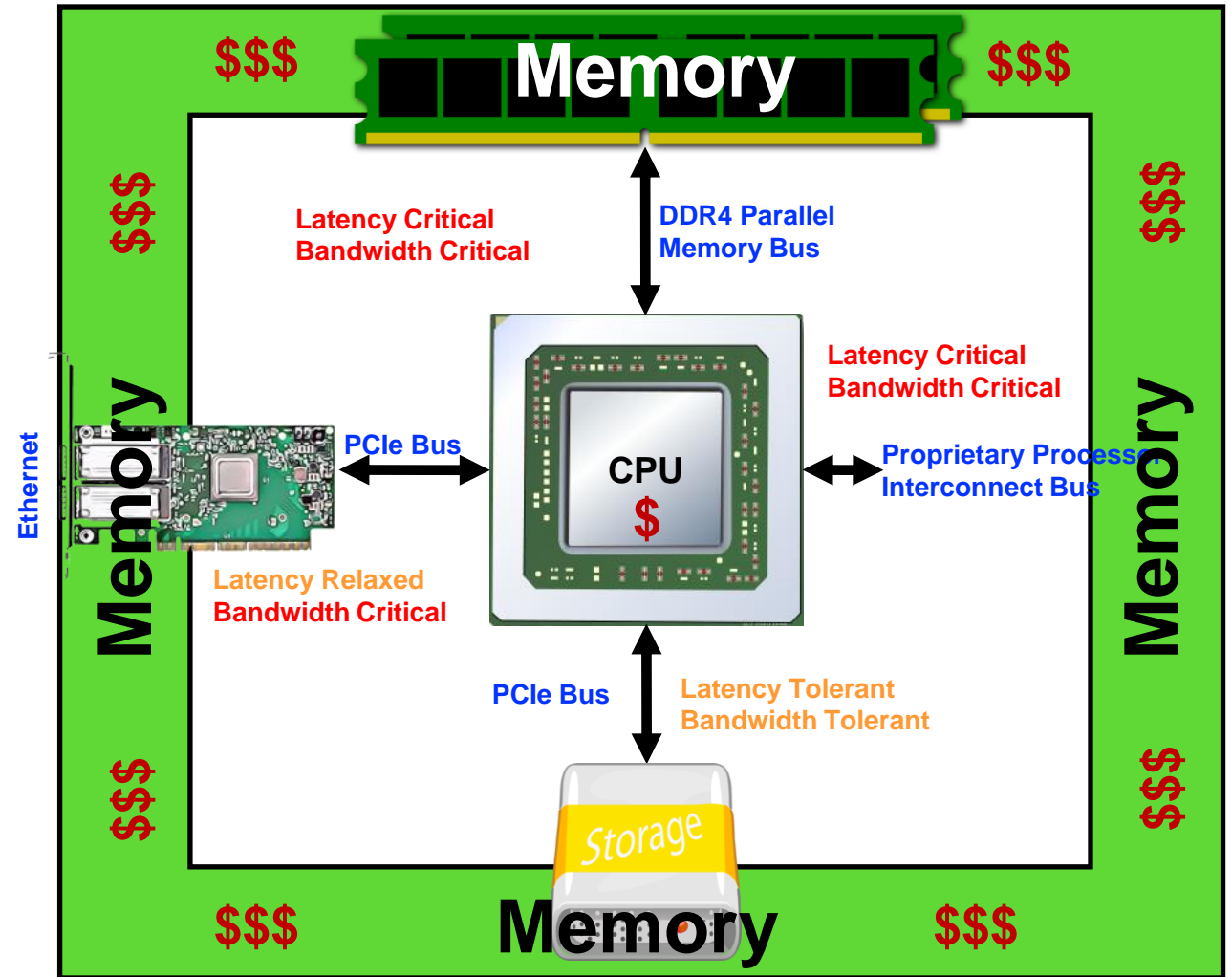**Dr Lionel CLAVIEN –** *Innoboost – CTO & Co-founder*

Today's Basics

CPU Centric
A Generational Religion

Latency Critical
Bandwidth Critical

DDR4 Parallel
Memory Bus

Latency Critical
Bandwidth Critical

Ethernet

PCIe Bus

CPU

Proprietary Processor
Interconnect Bus

Latency Relaxed
Bandwidth Critical

PCIe Bus

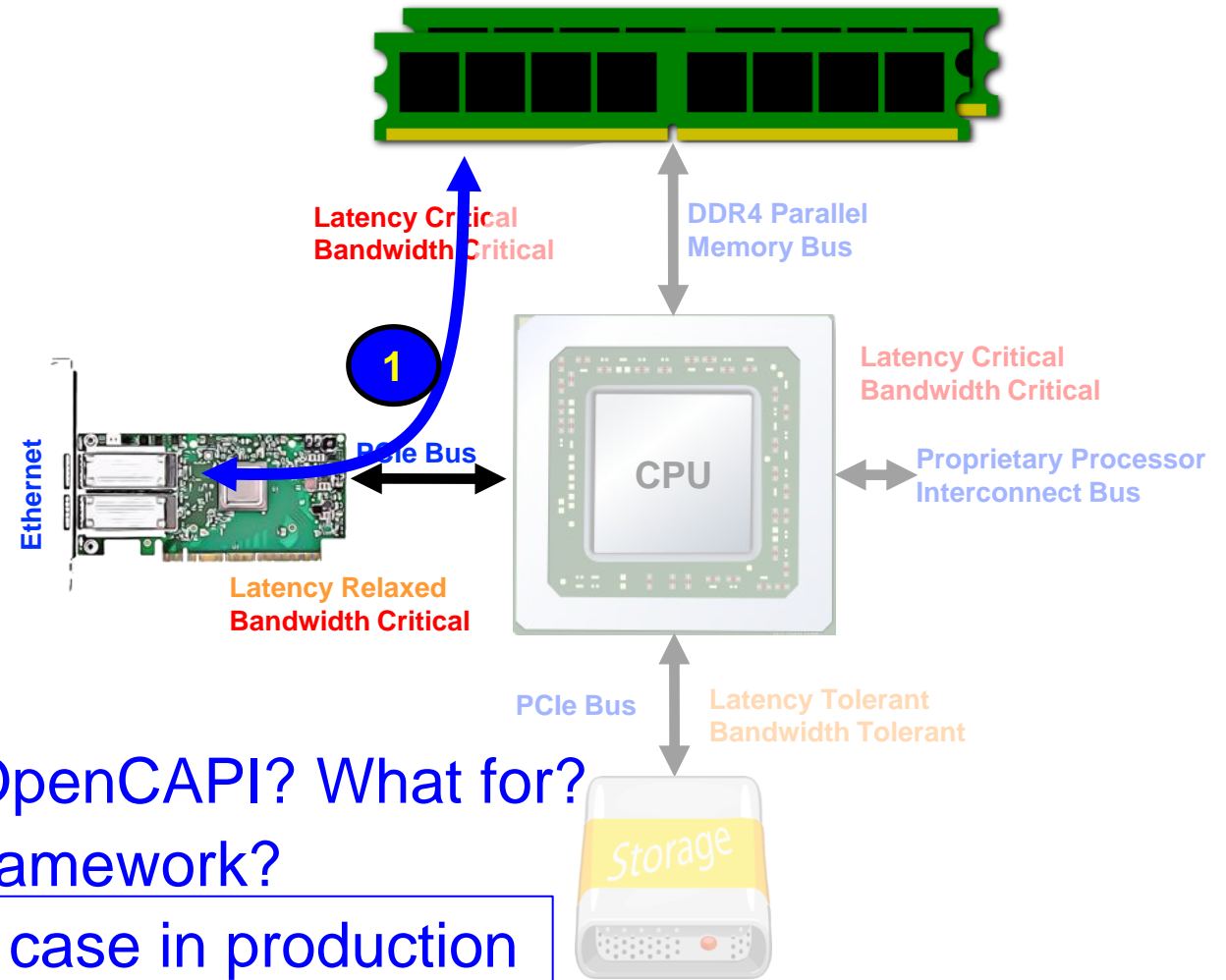Latency Tolerant
Bandwidth Tolerant

Storage

Data Centric Shift

Memory, Memory, Memory In a CPU Centric World

Memory Cost >> Processor Cost

The new architecture
Memory Centric

Latency Critical
Bandwidth Critical

DDR4 Parallel
Memory Bus

Latency Critical
Bandwidth Critical

1

PCIe Bus

Ethernet

CPU

Proprietary Processor
Interconnect Bus

Latency Relaxed
Bandwidth Critical

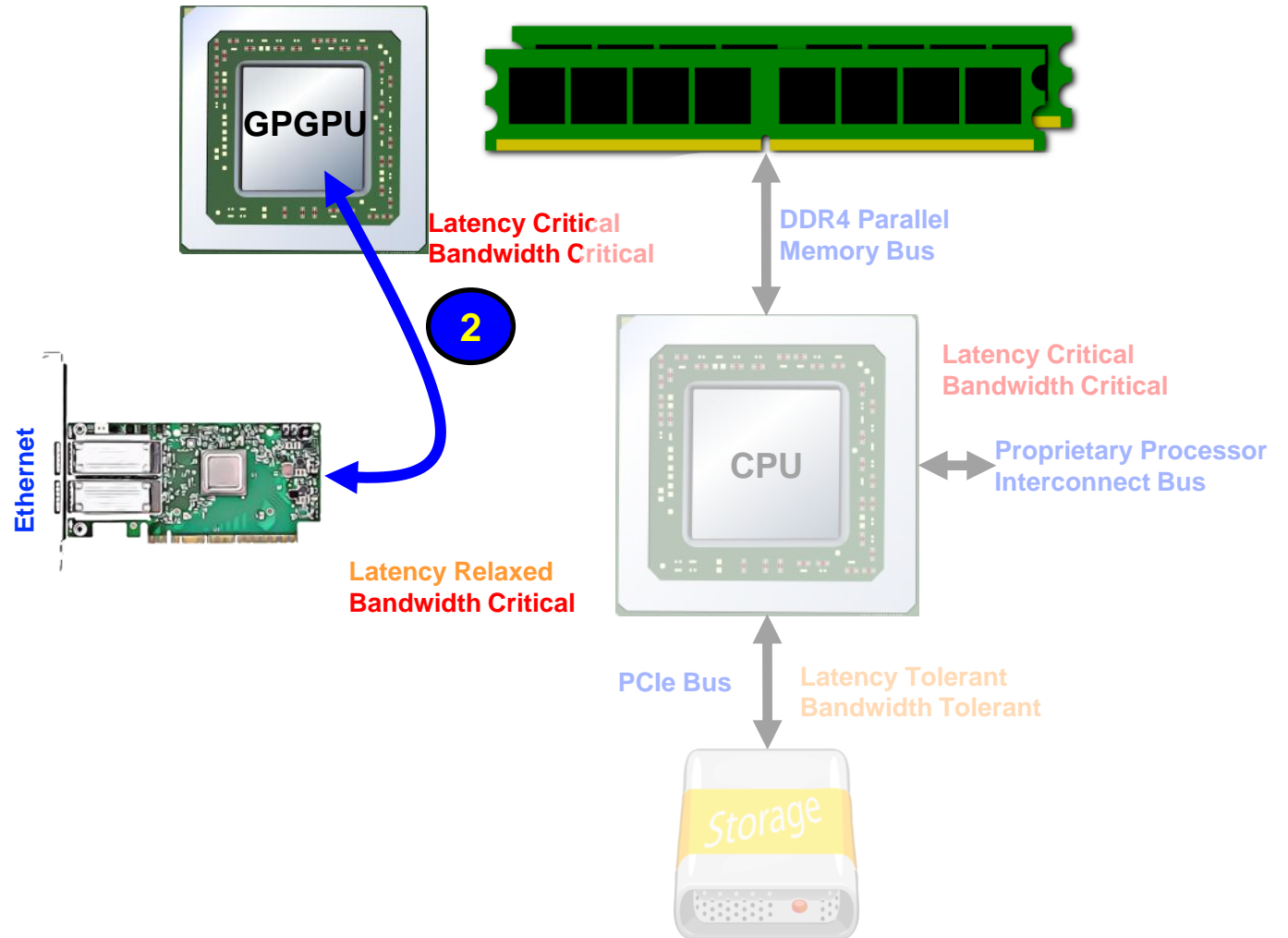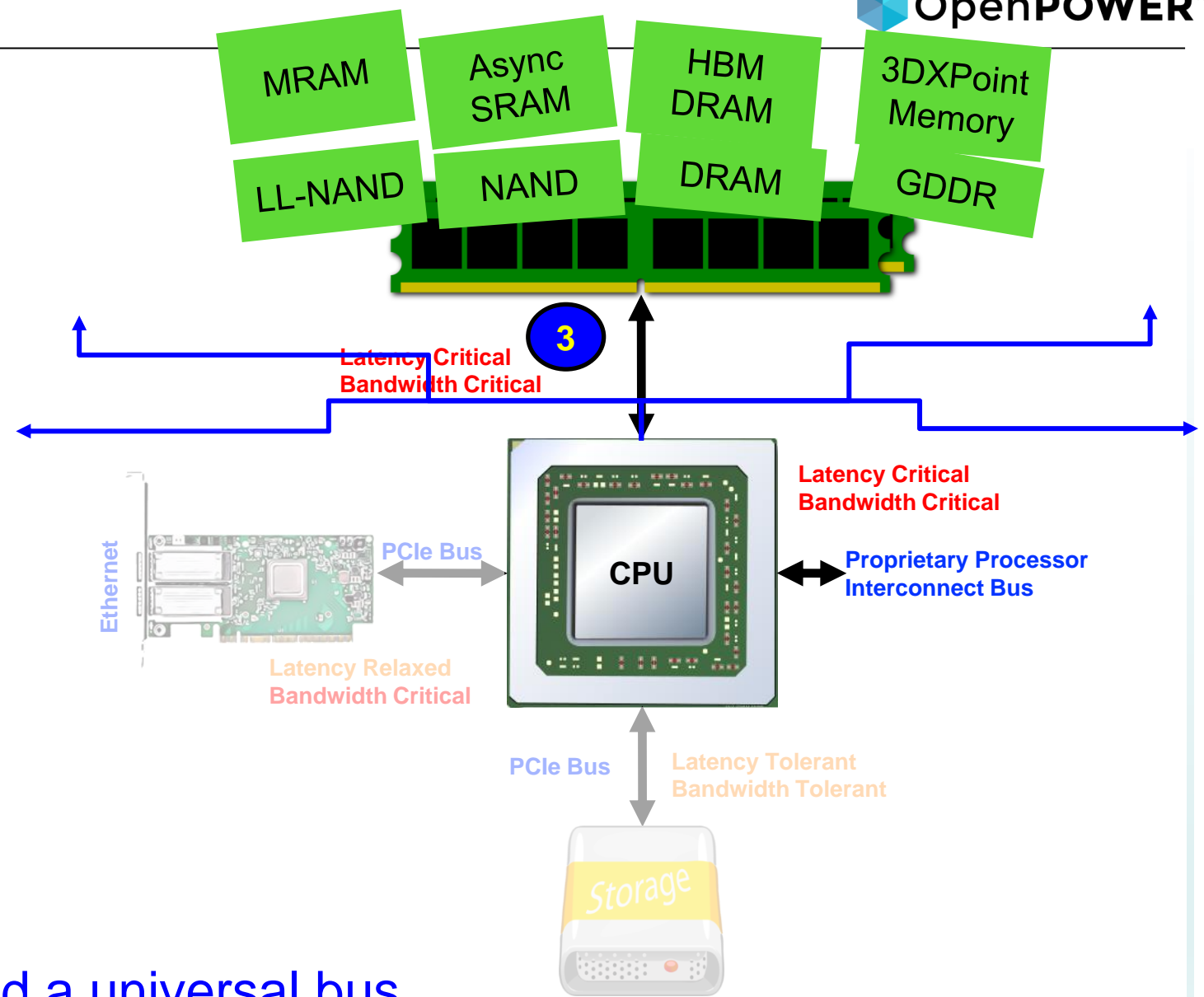**1** Adapters
➔ Memory coherency? CAPI? OpenCAPI? What for?
➔ FPGA programming? Open framework?
➔ Paul Scherrer Institute: a real case in production

PCIe Bus

Latency Tolerant
Bandwidth Tolerant

Storage

The new architecture

Memory Centric

GPGPU

Latency Critical
Bandwidth Critical

2

Ethernet

DDR4 Parallel
Memory Bus

CPU

Latency Critical
Bandwidth Critical

Proprietary Processor
Interconnect Bus

Latency Relaxed
Bandwidth Critical

PCIe Bus

Latency Tolerant
Bandwidth Tolerant

Storage

1 Adapters

2 Hardware Accelerators

➔ FPGA-GPU combination

MRAM **Async SRAM** **HBM DRAM** **3DXPoint Memory**

LL-NAND **NAND** **DRAM** **GDDR**

③

Latency Critical
Bandwidth Critical

Latency Critical
Bandwidth Critical

CPU

Proprietary Processor
Interconnect Bus

Ethernet

PCIe Bus

Latency Relaxed
Bandwidth Critical

PCIe Bus

Latency Tolerant
Bandwidth Tolerant

Storage

The new architecture
Memory Centric

1 Adapters

2 Hardware Accelerators

3 Host memory

➔ OMI: New memories around a universal bus

➔ Work with pools of memories

Agenda

1 Adapters

➔ Memory coherency? CAPI? OpenCAPI? What for?

➔ FPGA programming? Open framework?

➔ Paul Scherrer Institute: a real case in production

2 Hardware Accelerators

3 Host memory