Data transfer on manycore processors for high throughput applications

› 14/09/2016

ICE-DIP WP4a - ESR4
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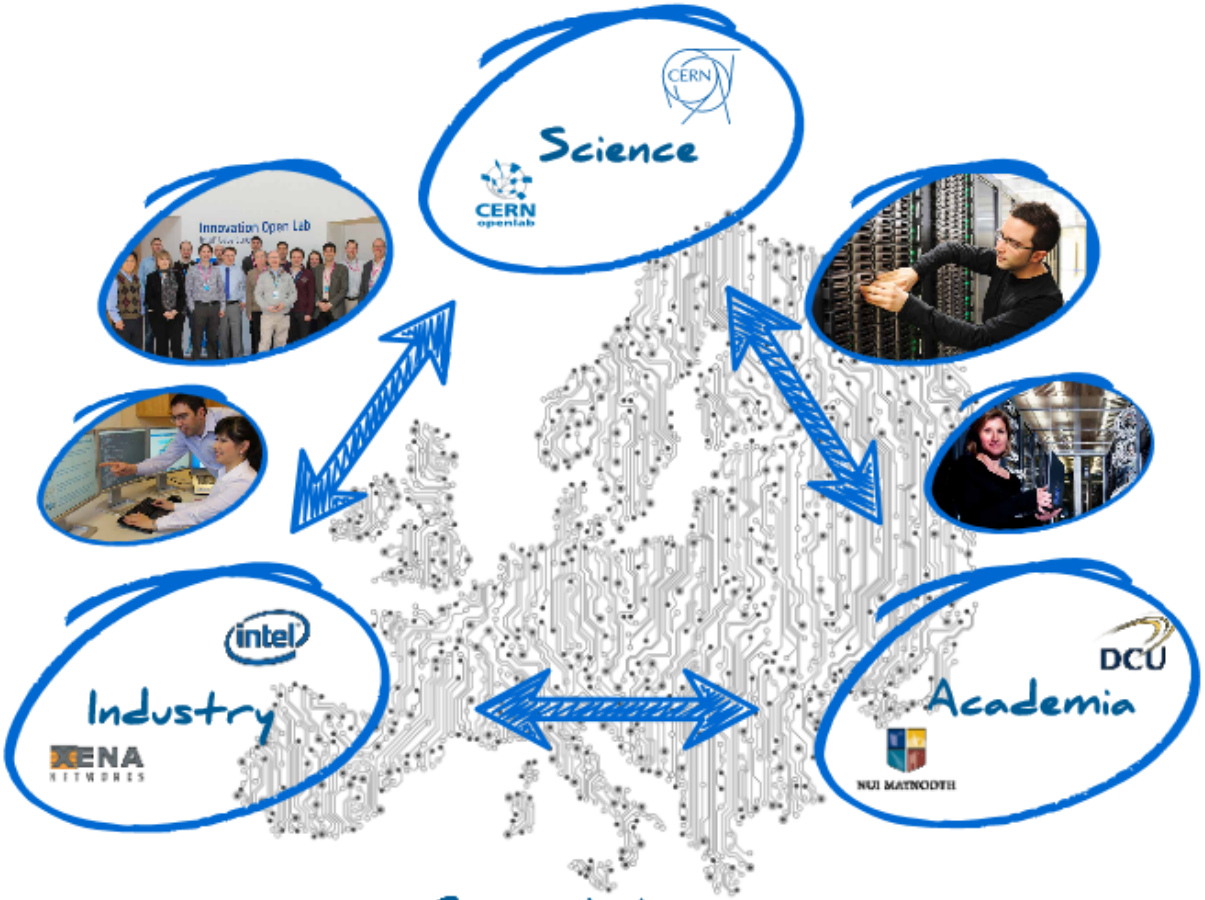
ICE-DIP is a European Industrial Doctorate project funded by the European Community's 7th Frameworkprogramme Marie Curie Actions under grant PITN-GA-2012-316596

ICE-DIP 2013-2017:
The Intel-CERN European Doctorate Industrial Program

A public-private partnership to research solutions for next generation data acquisition networks, offering research training to five Early Stage Researchers in ICT



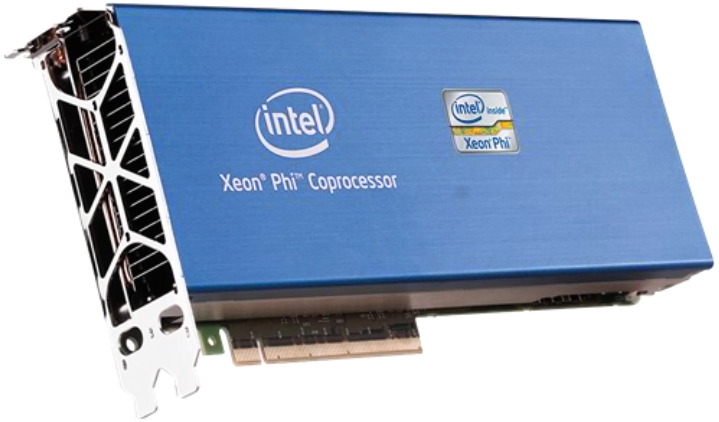
Research topics:

- Silicon photonics systems
- Next generation data acquisition networks
- High speed configurable logic
- Computing solutions for high performance data filtering

Background image: Shutterstock

Intel Xeon Phi Coprocessor

- Up to 61 Cores
- PCIe gen2 Peripheral
- Different computation modes
  - Offloading
  - Symmetric



Online processing overview and my focus

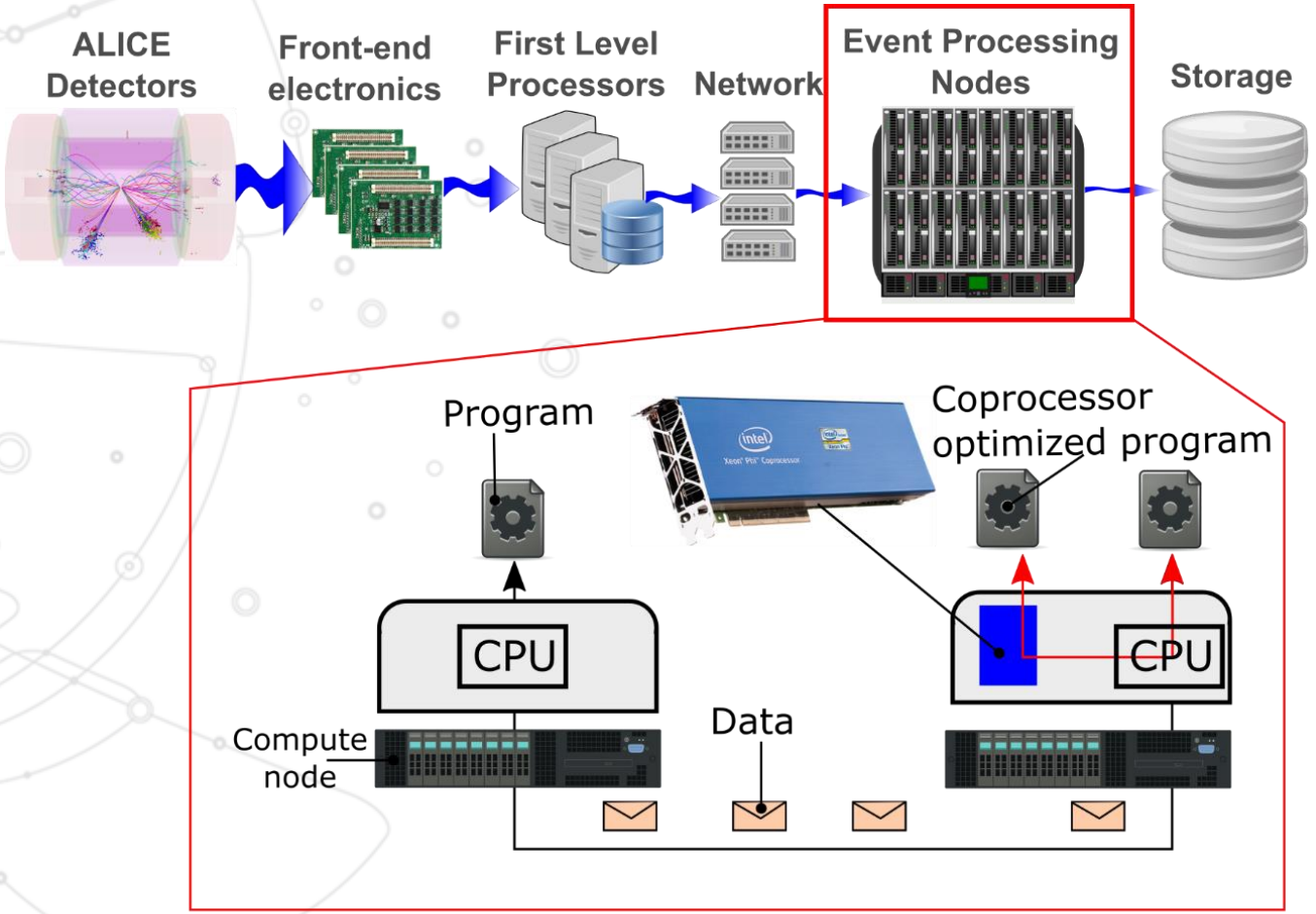
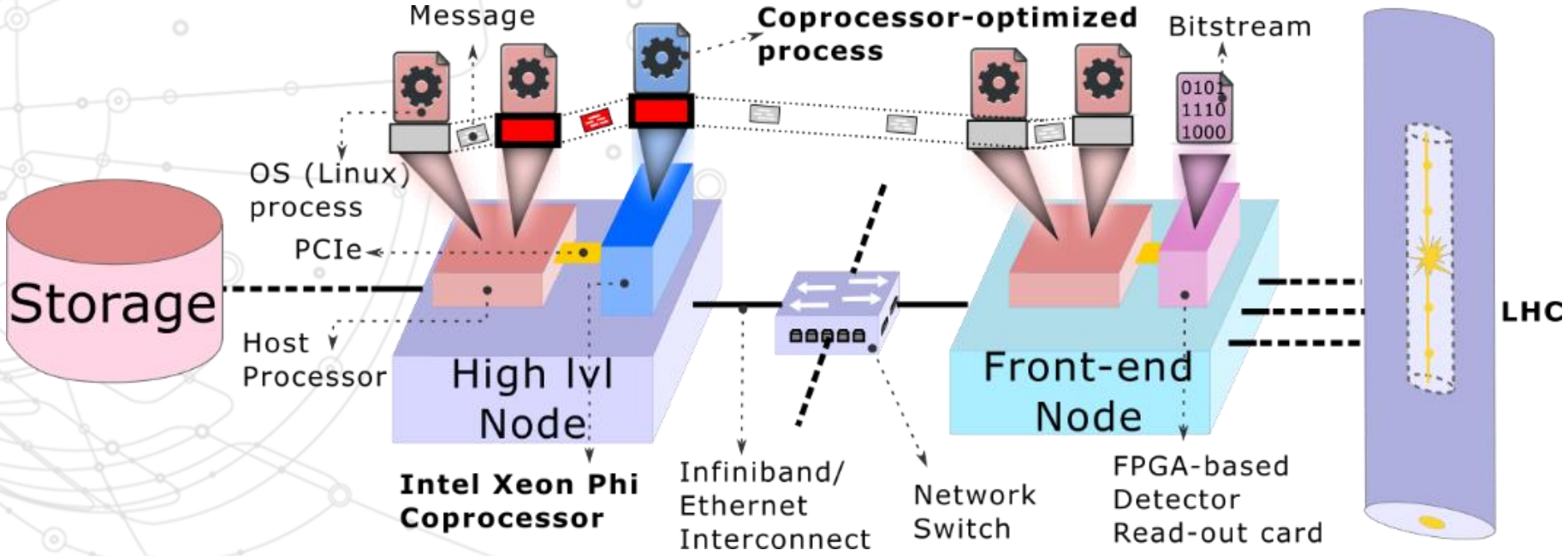


Figure 1. *An overview of the ALICE data acquisition process with emphasis on the Event Processing Nodes*.

Coprocessor-Host communication in the online processing system



Data transfer libraries for the data acquisition system of the ALICE experiment

nanomsg

- Instant messaging for computers
- Helps to create distributed systems
- Provides good performance
- Easy to program from non-expert programmers

An opportunity for improvement

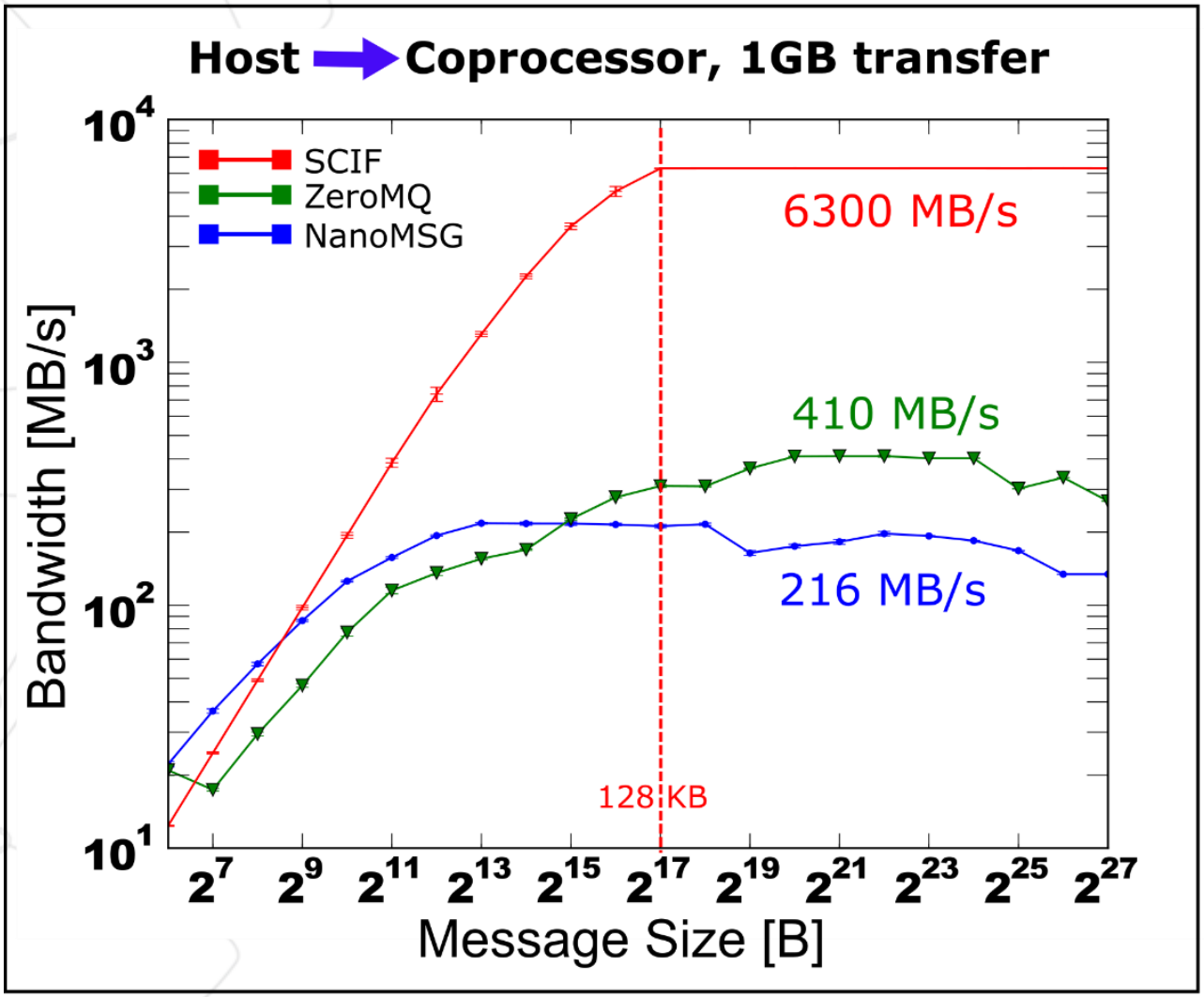
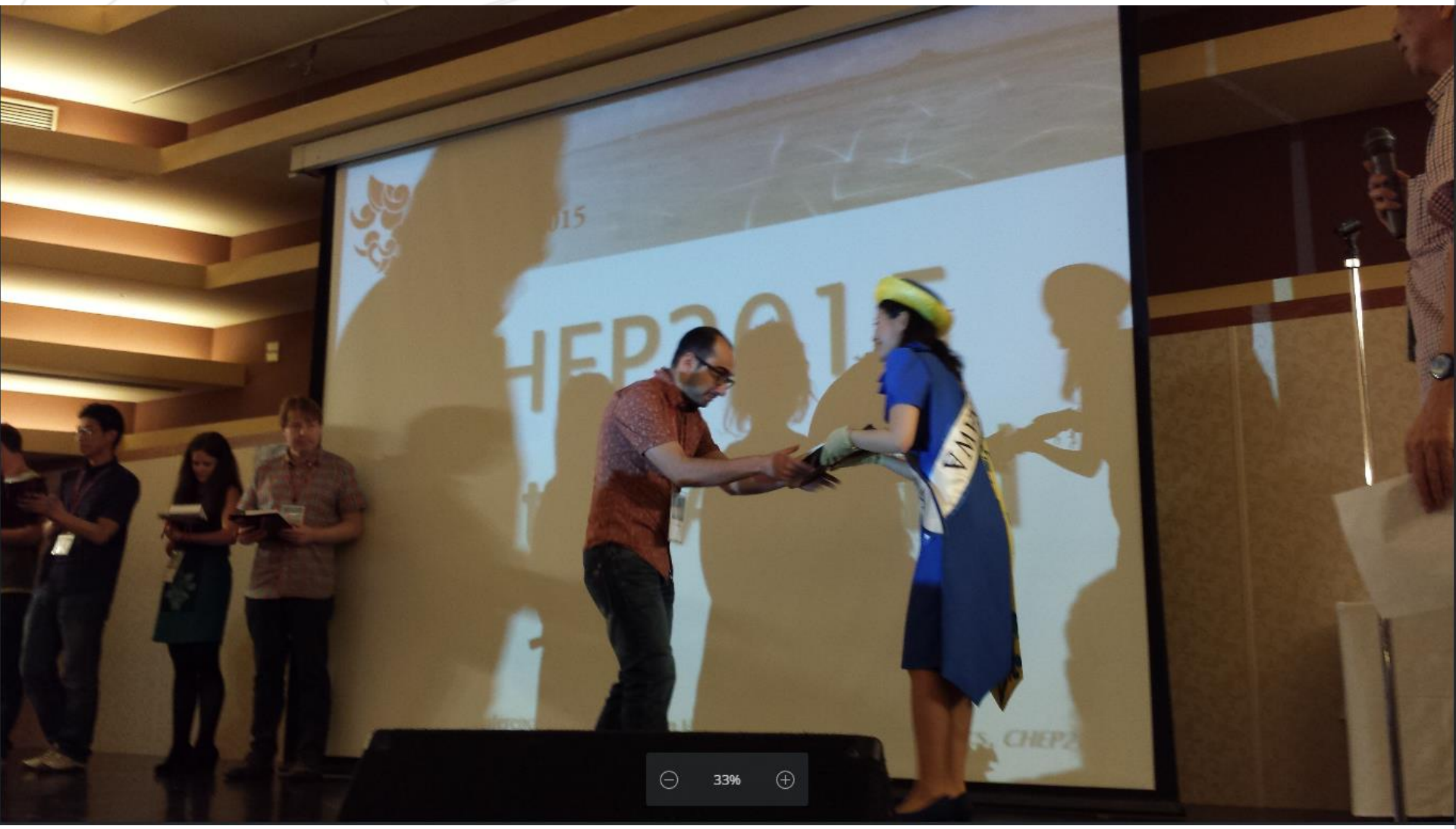


***Figure 2** . This plot corresponds toa performance test of transfer-ring1GB payload in chunks from 4KB to 128MB[1].*

CHEP'15 poster contest award



The Trans4SCIF library the Intel Xeon Phi Coprocessor

- **Easy-to-use socket-like interface**
  - Send/Recv
- **E.g. up to 3 GB/s data throughput (4x imporovementwith the cost of 32 MB of memory space**
- **Exploits cache-aligned RDMA transfers over PCIe**
- **ZeroMQ extension for SCIF**
- **In principle can be re-used by other RDMA based transports (e.g OmniPath)**

Outreach and dissemination

- **Publication**
  - A. Santogidis, A. Hirstius, and S. Lalis. “Optimizing the transport layer of the ALFA framework for the Intel Xeon PhiCoprocessor” Proceedings of the 21st International Conference on Computing in High Energy and Nuclear Physics, April 2015, Okinawa, Japan, 2015.
- **Many talks were given to diverse audiences and places**
  - CHEP’15, Okinawa, Japan
  - Augmented reality lab, Hong Kong
  - inverted CERN School of Computing, Geneva
  - thematic CERN School of Computing, Split
- **Some more are planned for the immediate future**
  - Huawei Labs, Paris
  - Undergraduate students of University of Thessaly, Volos, Greece

Acknowledgements

Many thanks to ICE-DIP and openlab colleagues for their support. Also thanks and regard to my 6! supervisors. Andrzej Nowak, Andreas Hirstius, Olof Barring, Fons Rademakers, Spyros Lalis, Bryan Hennelly.

This research project has been supported by a Marie Curie Early European Industrial Doctorates Fellowship of the European Community's Seventh Framework Programme under contract number (PITN-GA-2012-316596-ICE-DIP).