Eighth INFN International School on: ”Architectures, tools and methodologies for developing efficient large scale scientific computing applications” ESC16 - Bertinoro (Forlì-Cesena) Italy 23-29 October 2016

Report of Contributions

https://agenda.infn.it/e/11680

Contribution ID: **0** Type: **not specified**

Programming GPUs with OpenCL: Kernel programs

Friday, 28 October 2016 08:30 (45 minutes)

Presenter: Dr MATTSON, Tim (Intel)

Session Classification: Sessione di venerdi'

Contribution ID: **1** Type: **not specified**

Programming GPUs with OpenCL: Performance issues

Friday, 28 October 2016 09:15 (45 minutes)

Presenter: Dr MATTSON, Tim (Intel)

Session Classification: Sessione di venerdi'

Contribution ID: **2** Type: **not specified**

Lecture

Friday, 28 October 2016 10:30 (45 minutes)

Session Classification: Sessione di venerdi'

Contribution ID: **3** Type: **not specified**

Cluster Computing with MPI

Friday, 28 October 2016 11:15 (45 minutes)

Presenter: Dr MATTSON, Tim (Intel)

Session Classification: Sessione di venerdi'

Contribution ID: **4** Type: **not specified**

Consolidation

Friday, 28 October 2016 12:00 (1 hour)

Session Classification: Sessione di venerdi'

Contribution ID: **5** Type: **not specified**

The 10 core constructs every MPI programmer should know

Friday, 28 October 2016 14:30 (1h 15m)

Presenter: Dr MATTSON, Tim (Intel)

Session Classification: Sessione di venerdi'

Contribution ID: **6** Type: **not specified**

Geometric decomposition and MPI

Friday, 28 October 2016 15:45 (45 minutes)

Presenter: Dr MATTSON, Tim (Intel)

Session Classification: Sessione di venerdi'

Contribution ID: **7** Type: **not specified**

Information

Friday, 28 October 2016 17:00 (5 minutes)

Presenter: MORANDIN, Mauro (PD)

Session Classification: Sessione di venerdi'

Contribution ID: **8** Type: **not specified**

Consolidation

Friday, 28 October 2016 17:05 (1h 25m)

Session Classification: Sessione di venerdi'

Contribution ID: **9** Type: **not specified**

Evening lecture: The future of Big Data: Polystore, specialized storage engines, and embedded analytics.

Friday, 28 October 2016 18:30 (1 hour)

Theory is nice when trying to understand Big Data systems, but nothing beats experience with real data. Working with the MIMIC II data set (data from an intensive care unit) we've concluded that:

1. Data must match the storage engine if you care about performance
2. Data in flat files is almost equivalent to deleting it.

Or, turning these conclusions into slogans, "one size does not fit all" and "we need to bring the power of a database to all data". In this talk we describe our ongoing work to create a system that responds to these slogans. We call this the BigDAWG Polystore system. A Polystore system contains multiple storage engines integrated behind a common API but exposing features of individual storage engines as needed.

We are also working on a new storage engine tuned to the needs of sparse array data called TileDB. TileDB has entered production usage at the Broad Genomics institute. Our continuing work with TileDB is to extend it to dense arrays (thereby competing with HDF5).

Finally, we believe that key analytics functions need to be integrated into the storage engines. We'll describe our early efforts to create GraphBLAS routines and other machine learning primitives integrated into our Polystore system.

Presenter: Dr MATTSON, Tim (Intel)

Session Classification: Sessione di venerdi'

Contribution ID: **10** Type: **not specified**

Welcome and introduction

Monday, 24 October 2016 09:00 (30 minutes)

Presenter: MORANDIN, Mauro (INFN - Padova)

Session Classification: Session 1

Contribution ID: **11** Type: **not specified**

Computer Architecture evolution and the performance challenge

Monday, 24 October 2016 09:30 (1 hour)

Presenter: INNOCENTE, Vincenzo (CERN)

Session Classification: Session 1

Contribution ID: **12** Type: **not specified**

Computer Architecture evolution and the performance challenge

Monday, 24 October 2016 11:00 (45 minutes)

Presenter: INNOCENTE, Vincenzo (CERN)

Session Classification: Session 1

Contribution ID: **13** Type: **not specified**

Hands-on environment checkout

Monday, 24 October 2016 11:45 (45 minutes)

Presenter: Dr GIACOMINI, Francesco (CNAF)

Session Classification: Session 1

Contribution ID: **14** Type: **not specified**

Efficient C++ programming and memory management

Monday, 24 October 2016 14:10 (45 minutes)

Presenter: Dr GIACOMINI, Francesco (CNAF)

Session Classification: Session 1

Contribution ID: **15** Type: **not specified**

Efficient C++ programming and memory management

Monday, 24 October 2016 14:55 (45 minutes)

Presenter: Dr GIACOMINI, Francesco (CNAF)

Session Classification: Session 1

Contribution ID: **16** Type: **not specified**

Efficient C++ programming and memory management

Monday, 24 October 2016 16:10 (45 minutes)

Presenter: Dr GIACOMINI, Francesco (CNAF)

Session Classification: Session 1

Contribution ID: **17** Type: **not specified**

Consolidation

Monday, 24 October 2016 16:55 (30 minutes)

Session Classification: Session 1

Contribution ID: **18** Type: **not specified**

Students lightning presentations

Monday, 24 October 2016 17:25 (45 minutes)

Session Classification: Session 1

Contribution ID: **19** Type: **not specified**

Efficient C++ programming and memory management

Tuesday, 25 October 2016 08:30 (45 minutes)

Presenter: Dr GIACOMINI, Francesco (CNAF)

Session Classification: Session 2

Contribution ID: **20** Type: **not specified**

Efficient C++ programming and memory management

Tuesday, 25 October 2016 09:15 (45 minutes)

Presenter: Dr GIACOMINI, Francesco (CNAF)

Session Classification: Session 2

Contribution ID: **21** Type: **not specified**

Efficient C++ programming and memory management

Tuesday, 25 October 2016 10:30 (45 minutes)

Presenter: GIACOMINI, Francesco (CNAF)

Session Classification: Session 2

Contribution ID: **22** Type: **not specified**

Efficient C++ programming and memory management

Tuesday, 25 October 2016 11:15 (45 minutes)

Presenter: GIACOMINI, Francesco (CNAF)

Session Classification: Session 2

Contribution ID: **23** Type: **not specified**

Consolidation

Tuesday, 25 October 2016 12:00 (1h 30m)

Session Classification: Session 2

Contribution ID: **24** Type: **not specified**

Introduction to parallel computing (basic concepts)

Tuesday, 25 October 2016 15:00 (45 minutes)

Presenter: Dr MATTSON, Tim (Intel)

Session Classification: Session 2

Contribution ID: **25** Type: **not specified**

Introduction to parallel computing with OpenMP

Tuesday, 25 October 2016 15:45 (45 minutes)

Presenter: Dr MATTSON, Tim (Intel)

Session Classification: Session 2

Contribution ID: **26** Type: **not specified**

Parallel Performance concepts using OpenMP

Tuesday, 25 October 2016 17:00 (45 minutes)

Presenter: Dr MATTSON, Tim (Intel)

Session Classification: Session 2

Contribution ID: **27** Type: **not specified**

Students lightning presentations

Tuesday, 25 October 2016 17:45 (45 minutes)

Session Classification: Session 2

Contribution ID: **28** Type: **not specified**

Efficient C++ programming and memory management

Wednesday, 26 October 2016 08:30 (45 minutes)

Presenter: GIACOMINI, Francesco (CNAF)

Session Classification: Session 3

Contribution ID: **29** Type: **not specified**

Efficient C++ programming and memory management

Wednesday, 26 October 2016 09:15 (45 minutes)

Presenter: GIACOMINI, Francesco (CNAF)

Session Classification: Session 3

Contribution ID: **30** Type: **not specified**

A ”Hands-on” introduction to OpenMP

Wednesday, 26 October 2016 10:30 (45 minutes)

Presenter: Dr MATTSON, Tim (Intel)

Session Classification: Session 3

Contribution ID: **31** Type: **not specified**

A ”Hands-on” introduction to OpenMP

Wednesday, 26 October 2016 11:15 (45 minutes)

Presenter: Dr MATTSON, Tim (Intel)

Session Classification: Session 3

Contribution ID: **32** Type: **not specified**

Consolidation

Wednesday, 26 October 2016 12:00 (1 hour)

Session Classification: Session 3

Contribution ID: **33** Type: **not specified**

Working with OpenMP: Performance Optimization

Wednesday, 26 October 2016 14:30 (1h 15m)

Presenter: Dr MATTSON, Tim (Intel)

Session Classification: Session 3

Contribution ID: **34** Type: **not specified**

Working with OpenMP: Debugging Applications

Wednesday, 26 October 2016 15:45 (45 minutes)

Presenter: Dr MATTSON, Tim (Intel)

Session Classification: Session 3

Contribution ID: **35** Type: **not specified**

Consolidation

Wednesday, 26 October 2016 17:00 (1h 30m)

Session Classification: Session 3

Contribution ID: **36** Type: **not specified**

Evening Lecture ”Go: a different tack at building concurrent programs that grow with grace”

Wednesday, 26 October 2016 18:30 (1 hour)

In this talk, we’ll introduce the basic concepts of Go, focusing on its concurrency primitives and its interface model.
We’ll see how these concepts, together with a great tooling and quick edit-compile-run cycle allow for a great development environment.
Finally, we’ll touch on how these assets apply to science software: from control frameworks to soft real-time data acquisition systems.

Presenter: Dr BINET, Sebastien (LPC/IN2P3)

Session Classification: Session 3

Contribution ID: **37** Type: **not specified**

Students feedback

Saturday, 29 October 2016 08:30 (30 minutes)

Session Classification: Session 9

Contribution ID: **38** Type: **not specified**

Final examination

Saturday, 29 October 2016 09:00 (2 hours)

Session Classification: Session 9

Contribution ID: **39** Type: **not specified**

Delivery of certificates of attendance

Saturday, 29 October 2016 11:30 (30 minutes)

Session Classification: Session 9

Contribution ID: **40** Type: **not specified**

Shuttle departure (to Forli' railway station)

Saturday, 29 October 2016 13:30 (20 minutes)

Session Classification: Session 9

Contribution ID: **41** Type: **not specified**

Floating point computing efficiency

Presenter: INNOCENTE, Vincenzo (CERN)

Contribution ID: **42** Type: **not specified**

Efficient floating-point computation and vectorization

Thursday, 27 October 2016 09:15 (45 minutes)

Presenter: INNOCENTE, Vincenzo (CERN)

Session Classification: Session 4

Contribution ID: **43** Type: **not specified**

Vectorization

Presenter: INNOCENTE, Vincenzo (CERN)

Contribution ID: **44** Type: **not specified**

GPUs and the Heterogeneous programming problem

Presenter: Dr MATTSON, Tim (Intel)

Contribution ID: **45** Type: **not specified**

Consolidation

Contribution ID: **46** Type: **not specified**

GPU programming with OpenCL: Core Ideas and the host program

Presenter: Dr MATTSON, Tim (Intel)

Contribution ID: **47** Type: **not specified**

Consolidation

Contribution ID: **48** Type: **not specified**

Consolidation

Contribution ID: **49** Type: **not specified**

Evening lecture: ”Low-power computing with System-on-Chips”

The embedded and high-performance computing sectors have in the past been very isolated and unaware of each other’s needs and technologies. Similar isolations have occurred between HPC and the mobile/tablets commodity markets. We are now experiencing a very important convergence between markets, both in constraints and needs as well as in technologies. High computational demands, power consumption limitation, parallelism, heterogeneous computing and cost effectiveness are now driving constraints of both the HPC and embedded sectors. This convergence opens the way to the possibility of performing scientific computation on low power architecture originally developed for the embedded or mobile world. In this talk, we present the panorama of the low power architectures suitable for scientific computation. The INFN experience in building a low power cluster based on System-on-Chips (SoCs) is discussed together with the performance results in terms of power ratio and energy consumption obtained on that cluster. The applications used in the tests range from synthetic benchmarks to real life use cases. Results are compared to those obtained on traditional HPC architectures. An overview of the current European projects on low power computing for exascale HPC machine is finally presented.

Presenter: CESINI, Daniele (CNAF)

Contribution ID: **50** Type: **not specified**

Efficient floating-point computation and vectorization

Thursday, 27 October 2016 08:30 (45 minutes)

Presenter: INNOCENTE, Vincenzo (CERN)

Session Classification: Session 4

Contribution ID: **51** Type: **not specified**

Efficient floating-point computation and vectorization

Thursday, 27 October 2016 10:30 (45 minutes)

Presenter: INNOCENTE, Vincenzo (CERN)

Session Classification: Session 4

Contribution ID: **52** Type: **not specified**

GPUs and the Heterogeneous programming problem

Thursday, 27 October 2016 12:15 (45 minutes)

Presenter: Dr MATTSON, Tim (Intel)

Session Classification: Session 4

Contribution ID: **53** Type: **not specified**

Consolidation

Thursday, 27 October 2016 11:15 (1 hour)

Session Classification: Session 4

Contribution ID: **54** Type: **not specified**

GPU programming with OpenCL: Ideas and the host program

Thursday, 27 October 2016 15:30 (45 minutes)

Presenter: Dr MATTSON, Tim (Intel)

Session Classification: Session 4

Contribution ID: **55** Type: **not specified**

Consolidation

Thursday, 27 October 2016 16:15 (1 hour)

Session Classification: Session 4

Contribution ID: **56** Type: **not specified**

Consolidation

Contribution ID: **57** Type: **not specified**

Welcome by the Director of the INFN Padova site

Monday, 24 October 2016 14:00 (10 minutes)

Presenter: MEZZETTO, Mauro (PD)

Session Classification: Session 1

Contribution ID: **58** Type: **not specified**

Consolidation

Thursday, 27 October 2016 17:45 (1h 15m)

Session Classification: Session 4