2001-12-10

The Abdus Salam
International Centre for Theoretical Physics

ICTP activities in Trieste

JOINT ICTP-INFM SCHOOL IN "HIGH PERFORMANCE COMPUTING ON LINUX CLUSTERS"

ICTP - 31 January 2002 - 15 February 2002

application form   more information

The availability of high-speed networks and increasingly powerful commodity microprocessors are making the usage of clusters, or networks, of computers an appealing vehicle for cost effective parallel computing. Clusters, built using commodity-of-the-shelf COTS) hardware components as well as free, or commonly used, software, are playing a major role in redefining the concept of high performance computing.nThe School aims to provide the skills needed to benefit from this generation of HPC solutions, giving a basic knowledge of programming, administering and tuning, as well purchasing or building Linux-based clusters.nnAs a provisional program there will be lectures on :nn Interconnections solutions(characteristics and performances)n Parallel programming techniquesn Optimization and profiling techniques for clustersn Operating system issues: parallel file systems and IOn System Administration of a Linux clusternnThese lectures will be complemented by hands-on lab sessions where participants, grouped in small teams, will build their own cluster from scratch; during the first week of the school these clusters will be assembled, configured and tested. nIn the second part of the course, some representative parallel codes in the areas of computational condensed matter, engineering and weather forecast will be distributed to the participants. These codes will be presented in a series of tutorials illustrating their usage and the parallelisation strategies they adopt. During Lab sessions, the participiants will be asked to install, analyse and profile some of these codes on the previously built clusters.

PLEASE CONSIDER THE FOLLOWING PROGRAM AS PRELIMINARY (IT COULD CHANGE SIGNIFICANTLY)

Chair: Stefano Cozzini

Session 1: Day 1

more information

31 January 2002

09:00   **Registration**

10:30   **Introduction**   **S.Cozzini** / *INFM udr.*
              A brief presentation of school and an overview of   *Sissa, Trieste, Italy*
              HPC and the impact of linux cluster approach   web page

| 11:30 | **The Linux O.S. : an overview** | **to be defined** |

An overview of the Linux .O.S. will be presented.
Pros and Cons of this OS with respect to other
operating systems will be adressed and discusses

| 12:30 | | --- Lunch --- |

| 14:30 | **Lab Session: presentation** | **Director, Lab people** |

Introduction: how to use the lab sessions

| 14:45 | **Tutorial: installing Linux** | **Carlo Fonda** / *ICTP* |

How to install Linux on a PC-box

| 15:45 | **Practical: Install your own linux box** |

Every student is supposed to install a Linux Box

Session 2: Day 2 (Room: Adriatico Guest House Small Lecture Room)

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01 February 2002

| 09:00 | **Cluster Hardware: PC and networks** | **R. Innocente** / *SISSA* |

The basic hardware to build a linux cluster

| 11:00 | **Tutorial: Oscar for linux cluster** | **J. Enos** / *NCSA* |

OSCAR is a fully integrated easy to install bundle of
software designed to make it easy to build and use a
cluster for high performance computing. Everything
you need to build, maintain, and use a modest sized
Linux cluster is included in OSCAR.

| 13:00 | | --- Lunch --- |

| 14:30 | **Tutorial: Oscar (II)** | **J. Enos** / *NCSA* |

| 16:30 | **Practical I** |

Assembly the parts of your Linux Cluster

Session 3: Day 3 (Room: Computer Lab. (M))

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02 February 2002

| 09:00 | **Practical: Install Oscar** |

| 11:30 | **Student Presentation** | **Students' presentations** |

How we build our first linux cluster...

Session 4: Day 4: Parallel programming techniques

Learn how to program parallel machines

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04 February 2002

| 09:00 | **Parallel Programming in MPI (I)** | **Carlo Cavazzoni** / *Cineca* |

11:00	**practical:MPI examples** Run your first MPI programs	**Lab people**
13:00	--- Lunch ---	
14:30	**OpenMp programming**	**TIm Mattson** / *Intel*
16:30	**Practical: OpenMP at work**	**Tim Mattson** / *INTEL*

Session 5: Day 5 (Room: Adriatico Guest House Small Lecture Room)

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05 February 2002

09:00	**Linux Cluster Management I** To be defined	**S. Martinelli** / *Cineca*
11:00	**Intel tools for Linux clusters:** Intel compilers + Intel Libraries	**Tim Mattson** / *Intel*
13:00	--- Lunch ---	
14:30	**Practical: play with INTEL tools**	
16:00	**MPI programming II** Adanced Topic in MPI	**C. Cavazzoni** / *Cineca*
17:00	**Practical: Free Exercises on MPI/Open MP**	

Session 6: Day 6 (Room: Adriatico Guest House Small Lecture Room)

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06 February 2002

09:00	**Linux Tools for HPC: compilers and libraries** topics: which compilers are available for HPC on Linux: free compilers gnu compilers/ intel compilers commercial compilers: absoft/pgi/NAG free libraries: FFTW// / ATLAS LAPACK / SCALAPACK	**S. Cozzini** / *INFM udr* *SISSA*
11:00	**Linux Cluster Management II**	**S. Martinelli** / *Cineca*
13:00	--- Lunch ---	
14:30	**Practical: configuring PBS and run PBS**	
15:30	**Practical: Install free libraries for HPC**	
16:30	**Practical: Use compilers and compare performances**	

Session 7: Day 7 (Room: Adriatico Guest House Small Lecture Room)

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07 February 2002

09:00	**Again on Hardware: High -end Processors and High Speed Network**	**R. Innocente** / *Sissa*
	A survey of the high-end processors available and high speed networks	
11:00	**Profiling and Optimization Techinque (I)**	**Luiz De Rose** / *ACTC -IBM*
12:00	**Itanium IA64 architecture**	**Tim Mattson** / *Intel*
13:00	--- Lunch ---	
14:30	**Practical: Install and test free libraries**	
16:30	**Practical: MPI Parallel programming using libraries**	

Session 8: Day 8 (Room: Adriatico Guest House Small Lecture Room)

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08 February 2002

09:00	**Profiling and Optimization technique (II)**	**Luiz De Rose** / *ACTC IBM*
11:00	**Portable MPI Tools at Work - Cracking Performance Problems**	**Werner Krotz-Vogel** / *Pallas*
	Abstract	

Vampir, the leading MPI performance analysis tools, is now available in a new and improved version. Vampir features a streamlined user-interface, additional displays and source-code display, while keeping all the unique features of previous Vampir releases.
This presentation will cover
- brief introduction to Pallas, a leading european vendor of software tools for parallel computing.
- Vampir, visualization and analysis of MPI programs, focus on 'news'
- Vampirtrace, low overhead MPI profiling library, news on Linux
- TotalView 5, multi-process debugger

13:00	--- Lunch ---	
14:30	**Practical: Optimize these codes !**	
	hands-on session on code optimization	
16:30	**Practical: Vampir at work**	

Session 9: day 9 (Room: Computer Lab. (M))

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09 February 2002

09:00 **Lab Session**
A free lab session in order to
1. Complete/repeat previous day work
2. Install and run your own code
3. Test different Solution

12:00 **Group Presentation**
A 10 minutes presentation for each group where
results obtained, problem encountered are presented
and discussed

Session 10: Day 10:Monday

11 February 2002

09:00 **Advanced Topic: Parallel Filesytems GPFS**   **Luiz De Rose** / *ACTC -IBM*
<u>minutes</u>

11:00 **Case study A: Engineering application**   **Carmen Borges** /
Universidade Federal do Rio de Janeiro Escola de Engenharia - Departamento de Eletrotécnica

12:00   --- Lunch ---

13:30 **case A tutorial**   **Carmen Borges** /
Universidade Federal do Rio de Janeiro Escola de Engenharia - Departamento de Eletrotécnica

14:30 **Case A Practical**

Session 11: Day 11 (Room: Adriatico Guest House Small Lecture Room)

12 February 2002

09:00 **Advanced Topic: Mosix cluster approach**   **Moshe Bar** / *Mosix's Group*

11:00 **Case study B : Metereological Application**   **Andy Heaps** / *Centre for Global Atmospheric Modelling Reading, UK.*
The Met Office climate model is a world class model
used for the study of climate change. The model will
be briefly described and examples of it's use for the
understanding of the climate system will be shown.
Experience and results of using the model on various
64 bit and 32 bit platforms and interconnects will be
discussed.

13:00		--- Lunch ---	
14:30	**Case B Tutorial**		**Andy Heaps**
15:30	**Case B Practical**		

Session 12: Day 12

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13 February 2002

09:00	**Performances of Parallel chemistry codes on Linux Cluster**		**Guest (To be confirmed)** / *Daresbury*
10:00	**Advanced Topic: the high performance QsNet network**		**Milton Romero** / *QSW*
11:00	**Case Study C: Condensed matter application**		**S. Cozzini** / *INFM udr Sissa*
13:00		--- Lunch ---	
14:30	**Case C tutorial**		**S. Cozzini**
15:30	**Case C practical**		

Session 13: Day 13: Experiences in building Linux Cluster

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14 February 2002

09:00	**How to build and run a 128 Processor Cluster.**		**S. Martinelli** / *Cineca*
10:00	**How to build a cluster for Monte Carlo Simulation**		**D. Galli** / *Dip. Fisica Milano*
11:00	**The VRANA project**		**Lubiana Guy (to be confirmed)** / *Ljubjiana*
12:00	**Daresbury Experience**		**Guest (To be confirmed)**
13:00		--- Lunch ---	
14:30	**Practical: free exercises**		
16:30	**Group Presentation** Each Group will present results on the three different test cases		

Session 14: Day 14

This session is still to be completed

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15 February 2002

09:00	**Future Trend: GRID COMPUTING**	**Guest (? To be confirmed)** / *Daresbury l*
10:00	**Future Trends: Java for HPC**	**M. Ronchetti** / *Universita' di Trento*
11:00	**Student's talks** Students who want to present their work related to cluster are welcome (20 minutes each talk)	
12:30	**Conclusions**	**S.Cozzini, A. Nobile**

XML creation in 0 seconds
XSLt processing in 2 seconds