CERN School of Computing 2017

Sunday 27 August 2017 - Saturday 9 September 2017

Universidad Politécnica de Madrid

Programme

The complete program will offer about 50 hours of lectures and hands-on exercises.

The syllabus described below may be subject to some very minor changes. We are currently finalising it in conjunction with UPM, and aim to be able to offer you 6 ECTS credits when the process is complete.

Data Technologies

This series of lectures addresses the broad domain of data storage and management technologies. It starts by setting the scene and surveying the various data storage media. Then, the series describes possible data storage architectures and the associated software solutions. Focusing on Large Data Centres, it addresses the issues of heating and power consumption. This is followed by a description of storage models and addresses data management issues and their supporting techniques and tools.

Finally, the series focuses on reliability and performance of modern Data storage systems.

In the course of the series, elements of computer security an authentication that are relevant to data management are also presented. The series of lectures is complemented by 5 hours of practical exercises on aspects such as Performance Tuning and Peer-to-Peer storage.
Lecture series in this track
Storage technologies, data workflows, reliability, security and Cloud - *Alberto Pace and Andreas J. Peters*

Physics Computing

The track will first introduce the fundamental concepts of Physics Computing and will then address two specific aspects of scientific computing: tools and techniques for scientific software and Data Analysis.

The first series of lectures gives an overview of the software and hardware components required for the processing of the experimental data, from the source - the detector - to the physics analysis. The emphasis is on the concepts, but some implementation details are discussed as well. The key concept is data reduction, both in terms of rate and in terms of information density. The various algorithms used for data reduction, both online and offline, are described. The flow of the real data is the main topic, but the need for and the production of simulated data is discussed as well.

The second series of lectures presents modern techniques for software design and modern tools and technologies for understanding and improving existing software, which are relevant for Physics Computing. The emphasis is placed on the large software projects and large executable that are common in HEP. The series consist of lectures and exercises. These lectures include topics such software engineering, design, methodology and testing.

The third lecture series concentrates on Data Analysis aspects. Data analysis lectures will contain many examples of data visualisation and analysis code. Exercises are done with ROOT data analysis toolkit.
Lecture series in this track

General Introduction to Physics Computing - *Arnulf Quadt*
Tools and Techniques for Physics Computing - *Bob Jacobsen*
Data Analysis - *Ivica Puljak*
Multivariate Analysis and Visualisation - *Thomas Keck*

Base Technologies

This theme presents a selection of advanced underlying computing technologies which are particularly relevant in the context of scientific computing, and serve as a basis to construct higher level services such as those offered by Data Technologies and Physics Computing. They include software engineering, computer architecture, computing security and networking topics.

The first topic addresses computer security with a particular focus on the creation of secure software. The second and third series of lectures describes the evolution and the state of the art of computer architectures, discusses the bottlenecks and the consequences of this evolution on software design and optimization. It presents principles for writing software that scales with the hardware, techniques for hardware and software performance monitoring and issues related to the impact of compilers on performances.

The theme is complemented by a series of lectures on networking, which presents principles, methods and techniques for improving quality of service and network performance.
Lecture series in this track
Computer Architecture and Performance Tuning - *Andrzej Nowak*
Software Design in the Many-Cores Era - *Danilo Piparo and Enric Tejedor*
Creating Secure Software - *Sebastian Lopienski*
Networking - *Francois Fluckiger*