Current and Projected Needs for High Energy Physics Experiments (With a Particular Eye on CERN LHC)

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Abstract

The High Energy Physics (HEP) Experiments at Particle Colliders need complex computing infrastructures in order to extract knowledge from the large datasets collected, with over 1 Exabyte of data stored by the experiments by now. The computing needs from the top world machine, the Large Hadron Collider (LHC) at CERN/Geneva, have seeded the realisation of the large scale GRID R&D and deployment efforts during the first decade of 2000, a posteriori proven to be adequate for the LHC data processing. The upcoming upgrade of the LHC collider, called High Luminosity LHC (HL-LHC) is foreseen to require an increase in computing resources by a factor between 10x and 100x, currently expected to be beyond the scalability of the existing distributed infrastructure. Current lines of R&D are presented and discussed. With the start of big scientific endeavours with a computing complexity similar to HL-LHC (SKA, CTA, Dune, ...) they are expected to be valid for science fields outside HEP.

Bio

Dr. Tommaso Boccali (m) has a Degree in Physics "cum laude" in 1997, at Florence University, and a PhD in Physics in 2001, at Scuola Normale Superiore. He has been active in experimental particle physics since then, previously in the ALEPH (CERN-LEP) and then in CMS Collaboration (CERN-LHC). He is now a Senior Researcher at INFN, Italy. His research interests are mostly about software and computing, where he has been coordinator of major activities (Simulation, Reconstruction, Distributed Computing, Operations). He has been coordinator of GRID activities at INFN-Pisa, and responsible for the WLCG Tier-2 center there since its start. He is member of the Collaboration Board of INDIGO-DataCloud, representing INFN, and of the Management and Collaboration Boards of WLCG. Since 2012, he has been coordinator of Software and Computing for CMS-Italy, supervising the budget, operations, developments of one Tier-1 site and 4 Tier-2 sites. He was deputy coordinator for INFN for the proposal EU EOSC-Hub and Italian PI for the project ES-CAPE. He is currently CMS Deputy Upgrade Coordinator, charged to design and implement the Computing and Software infrastructure for the High Luminosity LHC runs; until recently, he was CMS Offline and Computing Coordinator. He is author of some 1000 papers, including the Discovery of the Higgs Boson by CMS. Recently, he has been involved in R&D computing activities, studying the feasibility of new computing architectures for High Energy Physics experiments in collaboration with HPC centers.