Contribution ID: **8** Type: **Sessions contributions**

Computing Requirements for a several cubic kilometer sized Underwater Neutrino Telescope

Wednesday, 21 May 2014 14:20 (20 minutes)

We present the computing requirements of KM3NeT, a future European deep-sea research infrastructure, which will host a distributed network of neutrino telescopes with a volume of several cubic kilometers at the bottom of the Mediterranean Sea. KM3NeT is part of the ESFRI roadmap and will open a new window on the Universe. The telescope will search for neutrinos from distant astrophysical sources like gamma-ray bursts, supernovae or colliding stars and will be a powerful tool in the search for dark matter in the Universe. The KM3NeT computing model is similar to the one of the CERN experiments with different levels of tiers. For the different steps of data processing (simulation, filtering, calibration, reconstruction and analysis) several software packages are utilized. The computing requirements of the KM3NeT spans from serial to mulit-parallel or GPU-optimized jobs. The collaborative nature of the infrastructure demands very frequent WAN data transfers and data sharing among individuals, groups and the public.

Wider impact and conclusions

The networked KM3NeT facility will become part of the EMSO/ESONET seafloor observatory network for long-term real-time measurements in the extreme environment of the deep Mediterranean Sea in the Ligurian sea near Toulon, the Ionian sea near Sicily and Pylos. The installation of specialized instrumentation will make the KM3NeT infrastructure an abyssal multidisciplinary observatory for deep-sea science that will offer a unique opportunity to explore the properties of a deep Mediterranean Sea site over a period of many years.

URL(s) for further info

http://km3net.org/

Description of work

KM3NeT is an array of thousands of optical sensors built to detect the faint light in the deep sea from charged particles originating from interactions of cosmic neutrinos and the Earth. The facility will also house instrumentation from Earth and Sea sciences (see below) for long-term on-line monitoring of the deep-sea environment. As the KM3NeT project currently starts the construction phase, the computing requirements increase in view of the finalization of several key issues of the design. As data taking will start in 2014 the need for real-time data processing in several steps arises. Moreover, recent results from ICECUBE encourage us to investigate in more detail several physics phenomena which appear to be extremely promising and interesting. Currently, we have developed several software frameworks for simulation, calibration and reconstruction that run at local data centers. We have setup a new VO which will be initially active at CNAF T1 and at the HellasGrid sites and we plan to request more resources from EGI.

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Session Classification: New services for Astronomy and Astrophysics

Track Classification: Success stories in using e-Infrastructures for research (Track Leaders: E. Katragkou, P. Castejon)