AbstractID: 7554 Title: Beowful Cluster parallelisation of Monte Carlo code for dose calculation in radiotherapy

Monte Carlo methods proven to be very promising in terms of accuracy in dose calculation in radiotherapy but intrinsically require hours or even day to provide statistically significant results. So, to be applied in clinical practice, the time needed for calculations is critical points. Since MC are intrinsically parallel their natural implementation is on parallel machines, generally very efficient but extremely expensive. High performance networks of PCs (namely Beowulf cluster (BC)) are now realistic alternative since offer the possibility of parallel processing of MC at a lower cost showing competitive performances.

Through Italian Association for Cancer Research Grant a prototype of a 4-nodes BC has been build. It consists of 4 PC Athlon xp 1500+ with 512 MB RAM and fast-ethernet card connected with fast-ethernet switch. The cluster has been configured on a private LAN using ssh and every node uses Linux RedHat 7.2 with xfs journaled file-system.

We then installed Geant4 Toolkit, a MC code born to describe high energy physics experiments, but that, with its recent low energy electromagnetic package, is well fitted even for medical application.

We simulated the linear accelerator's head of our Varian 600C/D equipped with a 120-leaves MLC and we verified the dosimetry in water phantom.

The MC code was hence parallelised using Lam MPI; particular care has been used in the use of pseudo random number generator. The results of benchmarking onto the BC showed a very good scalability trend.