Contribution ID: **61** Type: **Talk**

Performance Analysis of an HPC Implementation for Large-Scale Propagation Prediction

Wednesday, 6 December 2017 11:30 (20 minutes)

The concept of Dynamic Spectrum Access (DSA), allows under-utilised radio frequency (RF) spectrum to be made available for Secondary Users (SUs) when not utilised by the Primary User (PU). A geolocation database is currently the preferred approach by regulators to deploy DSA in the TV-bands, i.e. TV white space networks. Central to the geolocation database is the computation node, responsible for performing RF propagation predictions over a large area. RF field strengths are computed for all PU transmitters to determine the geographic location of spectrum available to SUs. RF propagation prediction is computationally intensive and time-consuming, effectively becoming the limiting factor in extending the geolocation based approach for DSA to other parts of the spectrum. We present a High-Performance Cluster Computer (HPCC) implementation for the computation node. Four propagation models are implemented and adapted for parallelisation. Our performance analysis indicates computational speed-up for all propagation models on the HPCC and factors affecting linear scalability are identified. The HPCC implementation is used to study the impact that the choice of propagation model has on spectrum availability to SU's.

HPC content

The problem under investigation is treated as a SIMD (Single Instruction Multiple Data) problem with all the processors running the same program with different input data. The programs used were all written by the author in the C environment and parallelized using MPI. The first processor, would read the input data file, divide the input data into the amount of processors available, and distribute the input data to them. The large memory of the cluster was also utilised to store the DEM (Digital Elevation Model) and thus reduced the time needed for file IO.

Primary author: Mr HAVENGA, Johan (North-West University)

Co-author: Dr FERREIRA, Melvin (North-West University)

Presenter: Mr HAVENGA, Johan (North-West University)

Session Classification: Computational Mechanics

Track Classification: Computational Mechanics