

Prototype for raw voltage recording in the backend system of the upgraded GMRT

Abstract for META2019

Poster Title : Prototype for raw voltage recording in the backend system of the upgraded GMRT

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The GMRT Wideband Backend (GWB) combines the Baseband signals of all antennas and gives out the visibility

continuous samples into frequency domain. In the frequency domain, the fine delays are compensated by proportionate phase rotation and the signals in each baseline are multiplied and then accumulated. The resulting visibility spectrum is stored for offline processing. The hardware of the GWB consists of FPGAs, CPUs and GPUs. This hardware has been frozen as per the observatory requirements. Due to hardware limitations the digitized data needs to be accumulated before storing them on the Hard Disk Drives and cannot be processed directly in real time. The raw voltages if recorded will give astronomers the flexibility to analyze the data using their own algorithm/software. This will also lead to the development of new observatory modes which require raw voltages for data analysis.

The final aim of this project is to record the raw voltages from the antenna which is sampled at Nyquist rate on the Hard drives installed on a computer. The writing speed of the disks is the major bottleneck in the data recording. Hence as a precursor to the raw voltage recording project it is essential to find the maximum speed at which the data can be written on the Hard drives of a computer and enhance the data recording speed if needed. In addition to the writing speed of the Hard drives a huge volume of the data has to be recorded on the drives.

As a prototype of the raw voltage system a RAID0 of the hard drives is done on a server to overcome the problems of speed and volume limitations of Hard Disk Drives. RAID0 is a technology that is used to increase the performance and/or quantity of data storage. The abbreviation stands for Redundant Array of Inexpensive Disks. A RAID system consists of two or more drives working in parallel.

Upcoming technologies such as the NVMe SSDs are also being explored which increase the writing speed upto 35 times as that of the standard Hard drives.

The poster presentation explains the setup of the prototype system and shows the test results of the system. It explains the methodology used to show that all the packets coming from the network to the node is written on the hard disk drive without any data loss. Upcoming technologies in the field of data storage are also discussed in the poster.