The CARMA Data Viewer

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The CARMA Data Viewer (CDV) is a CORBA and Java based real-time data viewer for radio interferometric arrays. CDV was designed to solve the problem of a common data viewer for interferometric observatories (the Berkeley-Illinois-Maryland Association array and the Owens Valley Radio Observatory array) with differing visibility data (amplitude and phase) formats and differing hardware and technical specifications. In the coming years, the BIMA and OVRO arrays are to be merged into a common array called CARMA.

We chose CORBA because it is available on many platforms with bindings for many programming languages, enabling remote object support in a heterogeneous computing environment. We chose Java for its cross-platform support and its rich set of lightweight graphical data viewer for radio interferometeric arrays. CDV was designed to observatories (the Berkeley-Illinois-Maryland Association array and the Owens Valley Radio Observatory array) with differing visibility data scales to one third the size of the BIMA data. Directly accessing the remote ObsRecord with standard accessor calls to update the Data Viewer would require hundreds of remote method invocations.

The latency, overhead, and data transport time can all make significant contributions to performance and must be examined. Latency for calls over the general Internet is typically 100 to 200 msec. There is negligible latency over a 100 Mbps LAN. The overhead in a CORBA call that transfers no information is very small—approximately 1 msec. For transferring data (large CORBA objects) over the Internet, measured transfer speeds were at least 60% of the nominal T1 connecting a CORBA call. The structure can then be used to form a local cloned copy that could encompass the different visibility formats, independent of the peculiarities of either telescope array. An ObsRecord contains an array of visibilities records, one for each unique antenna pair, measured at a given time from an astronomical source. The visibility data may be multi-channel or single channel and are tagged with frequency, position, velocity, and time information. The channel data are represented in individual spectral windows, which are not necessarily contiguous in frequency. Each observer produced software to create ObsRecords from its own visibility format and place them on a server using standard CORBA methods. The client-side data viewer can then connect to a server at either observatory (or both at once).

CONCLUSION

The CARMA Data Viewer (CDV) is a CORBA and Java based real-time data viewer for radio interferometric arrays. CDV was designed to solve the problem of a common data viewer for interferometric observatories (the Berkeley-Illinois-Maryland Association array and the Owens Valley Radio Observatory array) with differing visibility data (amplitude and phase) formats and differing hardware and technical specifications. In the coming years, the BIMA and OVRO arrays are to be merged into a common array called CARMA.

Figure 1. View of the CDV workspace showing different data representations for sideband averages (LSB & USB), which are selected using the Options Menu. Upper window shows baseline-based amplitudes (red trace) and phases (blue dots) vs. time from BIMA. Lower window contains antenna-based plots of amplitude and phase vs. time from OVRO.

Figure 2. View of the CDV workspace showing antenna-based amplitude (red trace) and phase (blue dots) vs. channel from OVRO. Note the iconified BIMA window and the lower corner and the different Look & Feel from Figure 1 (changed with L&F Menu).

Figure 3. A diagram representing the data flow. ObsRecords are created from the correlated data on each array and registered with a CORBA Name Service. Client viewers can fetch ObsRecords from either observatory by first querying the Name Service for the ObsRecord location, then using the ObsRecord public CORBA interface to obtain its member data.