A Measurement Set Data Model.

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Abstract

With the evolution of the instrumentation the importance of data management is becoming more and more important. It is in direct relation with the continuously growing volume of data generated by the radio-telescopes which push to more and more automated data processing.

Indeed the computing power and memory and storage capacities have tremendously increased for many years but this in contrast to the bandwidth IO which remains relatively limited when transporting data. In radio interferometry the volume of the data is entirely dominated by the visibility data. The associated meta-data, although essential for the data processing, are comparatively negligible. A likely trend will be that the telescopes will produce partially reduced data. A typical example illustrating this is the atmospheric phase corrections performed in the correlator software of mm/submm radio interferometers. With such trends the role of the meta-data is becoming even more important.

For more than a decade the radio-astronomers have measured the importance of having a well defined data model. Their model is closely related to their measurement equation. A significant step was achieved with the elaboration of the version 2 of MeasurementSet (MSv2). The MSv2 was primarily thought to be used off-line for data reduction (calibration and imaging). In the mean time this model has been adapted and augmented to be used on-line i.e. during the data acquisition (ASDM for ALMA, also used for the EVLA). With evolutions already anticipated inside the ALMA project and in conjunction with the advent of new instrumental concepts currently under developments for the SKA project further developments for the data model became necessary.

The presentation will describe a highly generic data model. It was shaped for what we need in radio interferometry but should be useful in a much broader context. For convenience I'll name this model the Measurement Set Data Model (MSDM). I'll describe its main properties and give some hints about its mathematical foundation. Then I'll describe the main characteristics of a MSDM-based profile which was tuned for radio instrumentation, especially phased arrays and interferometers.

Although mathematics give a universal language that can be shared across the different communities to describe the MSDM, we lack that at the level of domain specific profiles. Radio-astronomy makes no exception in that respect. I suggest that the two communities gathered at this workshop make the exercise of identifying their common concepts to reveal synonyms given their different terminologies such that we can better understand each other with the prospect to ease collaborative initiatives.