Interfacing two ALMA softwares: TELCAL within CASA

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Context
The Atacama Large Millimeter Array (ALMA) is a radio interferometer of 66 antennas that is under construction and commissioning at the Chajnautir plateau at 5000 meters altitude in the Atacama desert in northern Chile. Telescope calibration consists in a series of operations (adjustment of antennas, atmospheric calibrations and early evaluation of the quality of observations) that are performed in order to ensure that the ALMA telescope is and remains in proper shape to successfully observe the projects that are scheduled. This key step in the observing process is done by TELCAL on-line software.

Aims
TELCAL main purpose is to execute calibrations at the telescope in quasi-realtime, i.e. on-line, with automatic feedback to the operators. In addition TELCAL has to be available to perform the same calibrations off-line, as a tool for data quality control and commissioning. For this purpose it was decided to interface TELCAL within CASA.

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CASA (Common Astronomy Software Applications) is the off-line data reduction software (final calibration, imaging and deconvolution) chosen for ALMA.

Create tasks: two interfacing steps

TELCAL is the on-line calibration software. TELCAL has been designed and is communally developed at IRAM since 2002. Around 70% of the 10^10 lines of code is written in C++. It is developed in the ACS environment (CORBA based middleware).

Both TELCAL input data and output results are formatted according the ASDM (ALMA Science Data Model).

CASA is the off-line data reduction software. CASA is developed at NRAO. It consists of a set of C++ tools that perform a TELCAL pointing calibration in CASA. It builds the TELCAL standalone package in two steps:

1. resolve all C++ and Python dependencies that belong to the tasks
2. link C++ library
3. install Python module

The StandAlone module

The StandAlone module is a part of the TELCAL subsystem responsible to create a packaging of TELCAL, the TELCAL standalone package, that works outside of the ACS environment.

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TELCAL-CASA interface at work

The TELCAL standalone package is now ready to be executed inside the CASA environment. This panel describes how the TELCAL tasks work through an example of a pointing task that performs a TELCAL pointing calibration in CASA.

The two first steps are:
- start CASA;
- load the TELCAL standalone package.

Then consider the tc_pointing task which processes a pointing calibration on an ASDM:
- get help on the task;
- list the parameter default values of the task.

Finally tune the parameters, execute the task and read the results of the calibration, then view the plot generated by the task:
- Jun the parameters;
- execute the task and read the calibration results;
- view the plot.