Recommended Software System Changes

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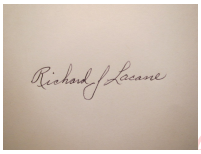
Rich Lacasse  Digitally signed by Richard Lacasse Date: 2017.03.02 11:29:04 -05'00'	National Radio Astronomy Observatory

Abstract

The ALMA2 Upgrade requires software changes to packages outside of the correlator itself. This report summarizes these changes and considers effects on the deployment schedule

Correlator Upgrade Study Project

Other ICT Related Efforts

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1 Presentation

Correlator and bandwidth upgrades will extend ALMA science capabilities. To be fully exploited, a number of adjustments to the infrastructure must happen. There are some adjustments that go beyond the correlator hardware and software themselves. In the present document, a list is provided hinting at some other ICT related efforts, beyond correlator software itself. All those items will need to be coordinated outside, and perhaps in parallel, to the correlator upgrade project itself.

Integrating the correlator upgrade project to ALMA will require some effort from different sub-systems. It is out of the project's scope to consider every possible detail, but there are very distingushable aspects that it is convenient to mention from the outset. It is expected that during

the proposal evaluation process, JAO will help characterize some or all aspects listed below with more detail.

Doubling the IF bandwidth from 2 to 4 GHz, and increasing the number of spectral channels eightfold, it will have an effect on a number of hardware and software sub-systems. The list below shows necessary changes to the computing infrastructure and some ICT sub-systems. All these changes are necessary to enable all the science possible after the upgrade. Some aspects have a direct impact to the upgrade project itself (e.g. testing capabilities before deployment).

1.1 Deployment schedule

February's maintenance shutdown period seems to be a proper time to deploy the new correlator. At least such approach minimizes the total shutdown time. However, the month of February is in the middle of a science cycle, which could be inconvenient to disrupt with a major infrastructure change.

1.2 Testing and deployment.

A 5th quadrant hardware will be of great help to debug and partially integrate the system before actual deployment at the AOS. It is indispensable to confirm that a test environment will be available before deployment. Testing a lot in advance is indispensable to minimize the shutdown period.

1.3 Delay tracking

The smallest instrumental delay update requirement will remain 1/16th of the Nyquist sample interval; which implies that delays will need to be updated two times faster than today. That is, in average two times more CAN-bus commands to update delay steps in hardware (sampler and correlator). CONTROL and CORR sub-systems will need to accommodate to that. Alternatively, an algorithm which places some of the delay computations in hardware and reduses CAN traffic could be considered.

1.4 Telescope calibration sub-system (TELCAL)

TELCAL has recently seen some improvements to boost up its performance (see ICT-8009 for atmospheric calibration in FDM). An eightfold increase in the number of channels will have an important impact to this sub-system and its ability to deliver results on time.

1.5 ALMA observing tool (OT)

It will need to accomodate a whole new correlator modes table. From past ICT CPM#6 meeting (December 2016, Santiago) we also know that only the bandwidth extension implies an important effort.

1.6 Networking infrastructure and bulk-data

Higher data rates, due to a larger number of spectral channels, has consequences to data transmission from CDP master to CONTROL, TELCAL, and ARCHIVE. Switching all links to a 10 GbE environment will be necessary if all correlator modes are to be enabled for science observations. Spectral averaging and longer integration times might be used to limit data rates, and volume, until network and archiving infrastructures are ready.