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MEMORANDUM

To: Proposers

From: Barry Clark and Daniel Lyons

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Subject: A Brief Description of the VLA Prioritizer

For the VLA, an important component of the Proposal Handling Tool (PHT) is called the prioritizer. It assigns scheduling priorities to the sessions of the proposals under consideration according to the time requested and the linear-rank scores flowing from the relevant Science Review Panels (SRPs). This process had to be automated because otherwise assigning scheduling priorities to several hundred sessions per semester - in the environment where a large fraction of daytime Local Sidereal Times (LSTs) are reserved for maintenance, software work, and commissioning new capabilities - is a nearly impossible load.

The prioritizer is given the range of dates for each configuration it is to schedule. From this is subtracted the time reserved for maintenance, software work, and commissioning new capabilities. A few other prior commitments are also subtracted, namely, fixed-date commitments for coordinated observations with other observatories; known fixed-date phased array VLBI observations; and time allocated in the current configurations by a previous Time Allocation Committee (TAC). This gives the prioritizer the time available for scheduling as a function of LST.

Because, in practice, observations are scheduled dynamically, often in scheduling blocks not closely related to the sessions described in the proposal, the impact of a given session on the time available is not as clear as it might be. As a simplification, the time requested for a given session is considered as spread uniformly between the session's minimum and maximum LSTs. Although rather simplistic, this prevents proposals that request overlapping LST ranges from interfering with each other. Note that this means that the process is insensitive to some session parameters specified via the Proposal Submission Tool, such as whether observations at two bands are described as two sessions or one, and is terribly sensitive to other parameters, particularly the minimum and maximum LSTs of the sessions.

The sessions requesting a given configuration are ordered by the linear-rank scores of their proposals. Each session is then considered in turn, in three passes. In the first pass, the prioritizer considers whether the session can fit in the schedule under the criteria for scheduling priority A. (See below for the criteria for the various priorities.) If so, its scheduling priority is marked 'A', it is marked to be skipped in subsequent passes, and its time, as defined in the paragraph above, is added to the time allocated. The prioritizer then proceeds through the list a second time, skipping those sessions already marked as priority A, and sees whether the session can fit in the schedule under the criteria for scheduling priority B. If so, its scheduling priority is marked 'B', it is marked to be skipped in the subsequent pass, and its time is added to the time allocated. The prioritizer then makes a third pass, assigning scheduling priority 'C'. Sessions that are not picked in any of these passes are marked as 'Not Scheduled'.

The rules for assigning the various scheduling priorities are entirely heuristic, and are chosen to provide a set of assigned priorities that fit well with the NRAO's defined meaning of the priority codes. It is fairly easy to tinker with the criteria to provide priorities that fit better, if need be. Values below are the current ones used for Semester 2014B.

- For scheduling priority A: Adding the session to the time allocated results in the time allocated being less than 0.48 of the time available over the session's entire range from its minimum LST to maximum LST.
- For scheduling priority B: Adding the session to the time allocated results in (1) the time allocated being less than 0.96 of the time available over the session's entire LST range, AND (2) the average of the time-allocated to time-available ratio over the session's LST range being less than 0.84.
- For scheduling priority C: Adding the session to the time allocated results in (1) the average of the time-allocated to time-available ratio over the session's LST range being less than 1.04, OR (2) that ratio being less than 0.8 at some LST in the session's LST range, OR (3) the time allocated at some LST in the session's LST range being less than a third of the time available averaged over the day.

The prioritizer does occasionally need help from a human scheduler, for instance by breaking up sessions that request too much time to be fully scheduled but which the TAC thinks could profitably be partially scheduled; or by assigning scheduling priorities by hand under TAC instruction, which the prioritizer will not change thereafter.

A small fraction of proposals involve 'Any' configuration. The prioritizer assigns their sessions to the configuration which can most readily accommodate them, adding their time to the time allocated to that configuration. Such allocations are not displayed in the configuration's pressure plot but are quantified in the TAC report.

Proposals of type Triggered are not handled by the prioritizer. Instead, the human scheduler assigns scheduling priorities to their sessions by hand under TAC instruction.

/jmw