

Time Accounting in the Green Bank Telescope Proposal Handling Tool

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Abstract

This memo describes the way in which time accounting is handled within the Proposal Handling Tool for the Robert C. Byrd Green Bank Telescope.

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History

1.1 First revision (O'Neil)

1.0 Original Draft (Marganian)

1 Introduction

The Robert C. Byrd Green Bank Telescope (GBT) has implemented a new Proposal Handling Tool (PHT) to replace the previous tools for handling GBT proposals and preparing those proposals for scheduling. In addition to replacing the previous proposal handling tools, the new tool is also integrated into both the GBT Dynamic Scheduling System (DSS) and the NRAO-wide proposal submission and handling tools.

This document describes the time accounting within the GBT PHT.

2 Time Fields

Here we list the various fields used for time accounting in the GBT PHT. For each field, we define it's source (calculated, derived from PST, or provided by user), and provide a brief description.

2.1 Proposal Time Fields

The time fields for proposals are simply summations of the corresponding values of the proposal's sessions.

- **Requested Time:** Equation 1 shows how a Proposal's *Requested Time*, R_p , is the summation of it's Sessions' *Total Requested Time*, R_s .

$$R_p = \sum_i R_s \quad (1)$$

- **Allocated Time:** Equation 2 shows how a Proposal's *Allocated Time*, A_p , is the summation of it's Sessions' *Total Allocated Time*, A_s .

$$A_p = \sum_i A_s \quad (2)$$

2.2 Session Time Fields

Unlike Proposals, there are many time fields associated with Sessions. In this section we describe these fields: their values' origins, and how they are used. We also split them up into the requested and allocated fields, and everything else. Unless otherwise noted, all fields are in *hours*.

2.2.1 Main Session Time Fields

- **Total Requested Time:** Equation 3 shows how a Session's *Total Requested Time*, R_s is the product of it's *Requested Time*, q , and it's *Requested Repeats*, r_r . q and r_r are derived from the PST, but also editable by the user.

$$R_s = qr_r \quad (3)$$

- **Total Allocated Time** Equation 4 shows how a Session's *Total Allocated Time*, A_s , is the product of it's *Allocated Time*, a , it's *Allocated Repeats*, r_a , and it's *Outer Repeats*, r_o . These fields are all editable by user, and can also be set via the 'Allocated' functionality. Outer repeats, r_o , defaults to 1, and is used for Period Generation (see below)

$$A_s = ar_ar_o \quad (4)$$

2.2.2 Other Session Time Fields

There are a number of other Session time fields, none of which, however, affect the Session's allocated or requested time. These time fields do affect, however, such things as LST Pressure and Period Generation. None of these fields are derived from the PST, and are all editable by the user.

These fields affect **LST Pressures**:

- **Semester Time** - Set by user in cases where the session may need to be scheduled over more than one semester, but the time it's scheduled in one semester is maxed out at this value. When calculating LST Pressure, this value is used when the session's semester is a future semester [Marganian(2012)].
- **Next Semester Time** - Set by user for carryover sessions, using the results of a lookahead simulation [Marganian(2012)].
- **Time Remaining** - derived from PHT session's DSS session's Time Remaining [O'Neil & Marganian(2010)].

These fields are used for **PHT Period Generation** and/or exporting the session to DSS (see below). Periods can be generated for Fixed Sessions, and, for Windowed Sessions, the periods represent the windows' Default Periods.

- **Start Date** - Date on which the first period should occur ("Start Date" in the DSS).
- **Interval** - The time, in units of *Separation*, between each period ("Time between sessions" in DSS).
- **Separation** - The units of *Interval*, in either days, or weeks.
- **Period** - The duration of each period, in hours ("Required Minimum Duration" and "Required Maximum duration" in DSS; values are equal).
- **Outer Interval** - The time, in units of *Outer Separation*, between each inner loop (no DSS equivalent).
- **Outer Separation** - The units of *Outer Interval*, in either days, or weeks.
- **Window Size** - The time surrounding each period, in days (used only when exporting windowed sessions to DSS; equivalent to the DSS "Start Date" - "Default Period" date).

3 'Allocate' function

The GBT PHT provides a way to allocate time to all the sessions in a proposal via the 'Allocate' function. This can be done either by specifying an absolute, or scaled time. In both methods, the **Requested Repeats** value is assigned to the **Allocated Repeats value**:

$$r_a \leftarrow r_r$$

The following equations apply to each Session of the Proposal.

3.1 'Allocate' Absolute Time

In Equation 5, the *time* variable is an absolute time, in hours, and r_a is the allocated number of repeats.

$$a = \text{time}/r_a \quad (5)$$

3.2 'Allocate' Scaled Time

In Equation 6, the *time_fraction* variable is a scaling factor, between 0 and 100, and r_a is again the allocated number of repeats.

$$a = (\text{time_fraction}/100)r_a \quad (6)$$

4 Period Generation

As stated above, PHT Periods can be generated for a PHT Session if the proper fields are specified. But this has no effect on the Session's allocated time.

5 LST Pressures

Generically speaking, the Allocated Total field is used for pressures of incoming (the next semester) sessions. For other categories of pressure (Carryover, Requested, etc.), different time fields are used. For more details, see [Marganian(2012)]

- **Total Allocated Time** - A_s is used for sessions that are being considered by the TAC, and have been allocated time.
- **Total Requested Time** - R_s is used for sessions that are being considered by the TAC, but have not been allocated time.
- **Semester Time** - is used for sessions that are being considered by the TAC, have been allocated time, but have been assigned Semester Time.
- **Time Remaining** - is used for sessions that are considered carryover, and the user has explicitly chosen this field for the LST Pressure calculations.
- **Next Semester** - is used for sessions that are considered carryover, and the user has explicitly chosen this field for the LST Pressure calculations.

6 Examples

6.1 Example 1

Here, we describe the time accounting fields of a new proposal and its sessions. The new proposal gets allocated 100% of it's time, though changes are made to accomodate monitoring and period generation.

- Start off with a proposal imported from PHT
 - Proposal has two sessions
 - Session 1 (monitoring):
 - * **Requested Repeats** (r_r) = 8
 - * **Requested Time** (q) = 10 hours
 - * Following Equation 3, **Total Requested Time** (R_s) = 80 hours
 - Session 2 (not monitoring):
 - * **Requested Repeats** (r_r) = 1
 - * **Requested Time** (q) = 20 hours
 - * Following Equation 3, **Total Requested Time** (R_s) = 20 hours
 - All other fields default (mostly None, or affectively zero)
 - Proposal's Requested Time, following Equation 1, $(1*8*10) + (1*1*20) = 100$.
- User edits time fields - Sessions allocated 100% of their time via the 'Allocate' functionality, with *time_fraction* being scaled and set to 100.

- Session 1:
 - * **Outer Repeats** (r_o) = 1 (by default)
 - * **Allocated Repeats** (r_a) = 8 (from **Requested Repeats**, r_r)
 - * Following Equation 6, **Allocated Time** (a) = $(100/100) \times 10 = 10$ hours
 - * Following Equation 4, , **Total Allocated Time** (A_s) = $10 \times 8 \times 1 = 80$ hours
- Session 2:
 - * **Outer Repeats** (r_o) = 1 (by default)
 - * **Allocated Repeats** (r_a) = 1 (from **Requested Repeats**, r_r)
 - * Following Equation 6, **Allocated Time** (a) = $(100/100) \times 20 = 20$ hours
 - * Following Equation 4, , **Total Allocated Time** (A_s) = $20 \times 1 \times 1 = 20$ hours
- Session 1's repeat field is then changed to reflect monitoring needs: use of an inner *and* outer loop. Note that this does *not* change the session's **Total Allocated Time**, A_s .
 - **Allocated Repeats**, r_a , from 8 to 4.
 - **Outer Repeats**, r_o from 1 to 2.
 - Following Equation 4, **Total Allocated Time** = $10 \times 4 \times 2 = 80$.
- Session 1 set up to generate periods. Again, this does not affect allocated time, and periods only add up to match allocated time because these fields were set up correctly. Fields set:
 - **Start Date** = 2012-02-01
 - **Interval** = 7
 - **Period** = 10
 - **Separation** = 'day'
 - **Outer Separation** = 'day'
 - **Outer Interval** = 90

6.2 Example 2

Here, we use the same information as in Example 1, except the new proposal is scaled to receive only 75% of its requested time. Changes are again made to accomodate monitoring and period generation.

- Start off with a proposal imported from PHT
 - Proposal has two sessions
 - Session 1 (monitoring):
 - * **Requested Repeats** (r_r) = 8
 - * **Requested Time** (q) = 10 hours
 - * Following Equation 3, **Total Requested Time** (R_s) = 80 hours
 - Session 2 (not monitoring):
 - * **Requested Repeats** (r_r) = 1
 - * **Requested Time** (q) = 20 hours
 - * Following Equation 3, **Total Requested Time** (R_s) = 20 hours
 - All other fields default (mostly None, or affectively zero)
 - Proposal's Requested Time, following Equation 1, $(1 \times 8 \times 10) + (1 \times 1 \times 20) = 100$.
- User edits time fields - Sessions allocated 75% of their time via the 'Allocate' functionality, with *time_fraction* being scaled and set to 75.

- Session 1:
 - * **Outer Repeats** (r_o) = 1 (by default)
 - * **Allocated Repeats** (r_a) = 8 (from **Requested Repeats**, r_r)
 - * Following Equation 6, **Allocated Time** (a) = $(75/100) \times 10 = 7.5$ hours
 - * Following Equation 4, , **Total Allocated Time** (A_s) = $7.5 \times 8 \times 1 = 60$ hours
- Session 2:
 - * **Outer Repeats** (r_o) = 1 (by default)
 - * **Allocated Repeats** (r_a) = 1 (from **Requested Repeats**, r_r)
 - * Following Equation 6, **Allocated Time** (a) = $(75/100) \times 20 = 15$ hours
 - * Following Equation 4, , **Total Allocated Time** (A_s) = $15 \times 1 \times 1 = 15$ hours
- Session 1's repeat field is then changed to reflect monitoring needs: use of an inner *and* outer loop. Note that this does *not* change the session's **Total Allocated Time**, A_s .
 - **Allocated Repeats**, r_a , from 8 to 4.
 - **Outer Repeats**, r_o from 1 to 2.
 - Following Equation 4, **Total Allocated Time** = $7.5 \times 4 \times 2 = 60$.
- Session 1 set up to generate periods. Again, this does not affect allocated time, and periods only add up to match allocated time because these fields were set up correctly. Fields set:
 - **Start Date** = 2012-02-01
 - **Interval** = 7
 - **Period** = 10
 - **Separation** = 'day'
 - **Outer Separation** = 'day'
 - **Outer Interval** = 90

References

- [Marganian(2012)] Marganian, Paul, 2012, *PHT LST Pressures* NRAO PH/PN002.0
- [O'Neil & Marganian(2010)] O'Neil, K. & Marganian, P, 2010, *Time Accounting for the GBT DSS* NRAO DSS/PN011.0