GBT Data Sender

Background: DSS

Observations on the GBT are scheduled using the Dynamic Scheduling System (DSS). GBT observations are heavily affected by weather, among other factors. So, in order to maximize efficiency, GBT observations are scheduled only 24-48 hours in advance. The schedule consists of a series of Periods: contiguous blocks of time that a given set of Receivers are being used to observe a portion of a given Proposal. The public schedule can be viewed here.

The DSS is *currently* the sole source of information for the GBT Data Sender.

Note that while each scheduled Period DSS is linked to an explicit set of Receivers, observers are not technically constrained to that set: they can observe using any available Receiver.

To learn more about the DSS, see the wiki

The GBO ODS Exporter

The relevant component of the DSS is a web application named nell, which is written in Python using the Django web framework. The Exporter is implemented as a Django management command, `ods_export.py` . It runs via a cron job, once every 5 minutes. The flow is quite simple:

1. Check NRAO ODS to see if there is already data for the next-scheduled Period. If so, bail out
2. Inspect the next-scheduled Period for the relevant values
3. Send values to ODS API via HTTP POST

DSS Information

For a given looktime defined as now + 30 minutes, we first identify the observing period (look_period) and receiver (period_rx) which correspond to that time.

```
look_period = Period.objects.filter(start__gte=self.looktime).order_by("start").first()
period_rx = Period_Receiver.objects.filter(period=self.look_period.id).first()
```

Site Data

The following information is sent as a JSON object to be a site_data entry in the OSS database.

Key	Type	Value
obs_id	string	look_period.session.name
site_id	string	"gbt"
site_lat_deg	float	38.433129
site_lon_deg	float	-79.839839
site_el_m	float	824.0
src_id	string	look_period.session.target.source
src_ra_j2000_deg	float	look_period.session.target.vertical
src_dec_j2000_deg	float	look_period.session.target.horizontal
src_radius_deg	float	0.0
trk_rate_ra_deg_per_sec	float	0.0
trk_rate_dec_deg_per_sec	float	0.0
freq_lower_hz	float	period_rx.receiver.freq_low * 1E9
freq_upper_hz	float	period_rx.receiver.freq_hi * 1E9

src_start_utc	timestamp	look_period.start
src_end_utc	timestamp	look_period.start + look_period.duration
status	string	look_period.state.name
notes	string	look_period.session.observing_type.type

Limitations

The current version of the GBO Data Sender has a few severe limitations.

The primary limitation is inherent to the current design: the DSS lacks the level of granularity needed to accurately reflect GBT position at a given time. There is only one location provided for a Period, but Periods can be many hours long, and the GBT is not actually restricted to any positional offset from this location value.

There are a few other limitations that could be resolved with slight modifications to the current script:

1. The Period derivation has the potential to skip over a Period in the case where the next-scheduled Period is less than 30 minutes away when the Exporter runs
2. The Exporter selects an arbitrary Receiver for the next-scheduled Period; it does not consider all Receivers