CSPP Geo GRB Software Version 1 Interface Control Document

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DRAFT - 20141114

The purpose of this document is to describe the external interface to the CSPP Geo GRB Software, which is responsible for processing the GOES Rebroadcast (GRB) data stream and recovering data products. Version 1 will support recovery of Level 1 ABI and Level 2 GLM products.

This information is provided for the use of direct broadcast users and vendors of GRB receiving systems who plan to integrate the CSPP Geo GRB Software into their processing chains. Note that this is a working document and there are likely to be changes before the Version 1 software release.

Note that ABI Level 2 products will be produced by the CSPP Geo Geocat Software, which is packaged separately. The interface to that software is not described in this document.

1. References
[Product Definition and Users' Guide (PUG), Vol. 4, Rev C](#)

2. System overview

A GRB receiving system will consist of an antenna, receiver and demodulator, connected to a Linux box for data processing. The CSPP Geo GRB software will run on the Linux box and perform the primary functions of ingesting the raw CCSDS packets from the GRB data stream, decompressing and recovering the payloads, reconstructing datasets, and writing output to files.

The GRB software can be configured to run in either of two processing modes: 1) receiving packets on a socket (streaming mode), or 2) reading packets from files (user-callable mode). Each of these two modes is described below.

Figure 1: CSPP Geo GRB data flow (Version 1)
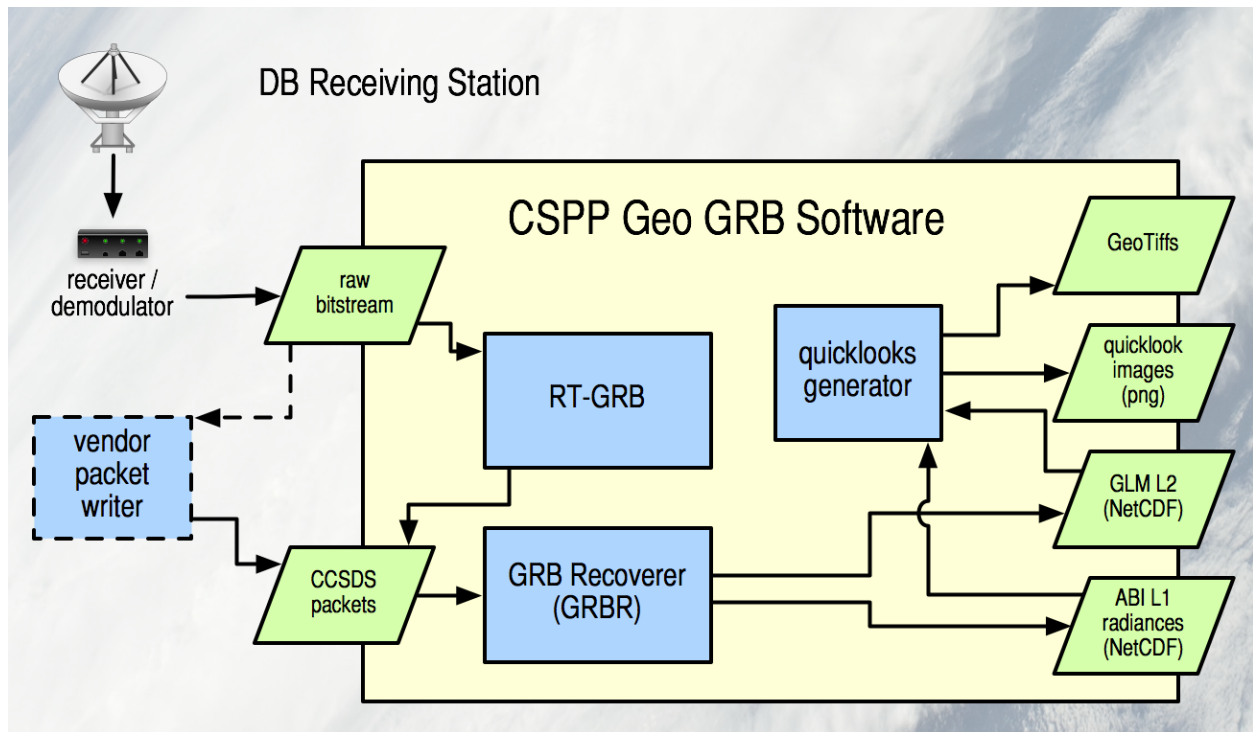
3. Streaming mode

In streaming mode, the software will run as a daemon, retrieving packets from a socket and writing out reconstructed L1 and L2 data files automatically. Multi-processing will be handled transparently; in other words the GRB software will spawn jobs which will run on multiple cores if it is configured to do so and if cores are available.

The GRB Software will be capable of processing two simultaneous data streams, i.e. left and right polarization.

3.1. Streaming mode input interface

The GRB Software will connect to a network socket and read UDP datagrams. Each datagram must contain CCSDS space packets encapsulated in an AOS transfer frame and a Channel Access Data Unit (CADU), as shown in the PUG, Vol. 4, Figure 4.4.1. There can be no other network communication artifacts in the input data stream, such as DVB-S2 frames or IPDU headers. The CCSDS packets must be provided in the order received from the spacecraft.

4. User-callable mode

In user-callable mode, the GRB software is called at the command line, and reads in a single data file containing CCSDS packets. This mode is intended for users who want to run their own software to parse the raw data stream, or who want a greater degree of control over program invocation and job scheduling.

In this mode, the user is responsible for multi-processing. Multiple simultaneous instances of the GRB software can be run on different files if desired.

4.1. User-callable mode input interface

Each file must contain only unframed CCSDS space packets with no CADU metadata, UDP headers, or other transport artifacts. The file must not contain duplicate packets, and each packet must appear in only one file.

A file must contain only unsegmented packets or complete sequences of packets. Incomplete packet sequences should be dropped by upstream software.

As described in the PUG, a sequence of packets has the following characteristics:
- begins with a packet containing primary header sequence flag 0b01
- ends with a packet containing primary header sequence flag 0b10
- incrementing sequence count (mod 16384)
- no missing sequence counts

As described in the PUG, an unsegmented packet has a primary header sequence flag value of 0b11.

Each packet must be complete and intact.

While there is no requirement regarding the size of an input file or the number of packets that should be included in a file, it is recommended that this be made a tunable parameter in upstream software. The size of input files may affect overall performance due to file completion latency, disk I/O overhead and the number of simultaneous jobs that can be run. Therefore it may be useful to have a setting controlling file size of number of packets per file that can be tuned for a given hardware setup.

4.2 User-callable mode return value

When called from the command line, the GRB software will return a value of 0 to indicate that no problems were encountered, or a non-zero value to indicate that problems occurred when processing data.

5. Ancillary data

Currently there is no plan to require dynamic ancillary data for GRB processing. If dynamic ancillary data is required in the future, it will be staged by SSEC and distributed via the internet.

6. Output interface

Version 1 of the GRB software will write Level 1 ABI data and Level 2 GLM data to NetCDF4 files. The format of the output files is described in the PUG, Vol 4.

ABI output will contain one image per file. GLM output will be aggregated at the 20 second interval described in the PUG, Vol 4.

Missing data in output files will be represented by a fill value.

7. Quicklooks

Quicklooks are low-resolution images that can optionally be generated after processing to give the user a rough idea of what is going on in a scene, and to indicate whether there were any obvious processing or data problems. The CSPP Geo GRB Package will include software to generate quicklook images from L1 ABI and L2 GLM data. The software will be capable of producing static .png files or GeoTIFFs.

When running in streaming mode, quicklooks can be generated automatically after a NetCDF file is written. Quicklooks can also be generated by running the software at the command-line on a NetCDF file.

8. Future enhancements

Future versions of the GRB software will add support for the remaining GOES-R instruments (SUVI, MAG, SEISS, EXIS). SUVI output will be written to FITS files, and for each of the other instruments output will be written to NetCDF4 files.