CRECBuilder User's Guide

Version 1.2

May 2017

This revision supersedes the March 2010 User's Guide contained within the CRECBUILDER_1.2.tar.gz file.

GODDARD SPACE FLIGHT CENTER
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General

The NASA Goddard Space Flight Center's (GSFC) Direct Readout Laboratory (DRL), Code 606.3 developed the CRECBuilder software for the National Polar-orbiting Operational Environmental Satellite System (NPOESS) Preparatory Project (NPP) In-Situ Ground System (NISGS) and the International Polar Orbiter Processing Package (IPOPP).

Users must agree to all terms and conditions in the Software Usage Agreement on the DRL Web Portal before downloading this software.

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http://www.directreadout.sci.gsfc.nasa.gov

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http://directreadout.sci.gsfc.nasa.gov/index.cfm?section=contact%20usAlgorithm

Software Description

The Construction Record Builder (CRECBuilder) Java application reads Production Data Set (PDS) packet files and recreates the corresponding Construction Records (CSRs) to comply with the mission-specified data format. The CRECBuilder program is particularly useful where packet files archived without CSRs need to be reprocessed.

The Construction Record Lister Program, also available from the DRL Web Portal, displays the contents of CSRs.

Software Version

This software package contains CRECBuilder Version 1.2.

Enhancements to Version 1.2 include:

- added checks to ensure that command-line arguments are valid;
- added checks to ensure validity of packet header fields.

This package has been tested on the following platforms: CentOS 5.3, Fedora 10, Kubuntu 8.10, and SUSE 11.1.

Prerequisites

To run this package, you must have the Java Development Kit (JDK) or Java Runtime Engine (JRE) (Java 1.5 or higher) installed on your computer. If you plan to rebuild the CRECBuilder distribution, you must install the JDK. Otherwise, only the Java Runtime Environment (JRE) must be installed. Ensure that Java applications can be executed.

CRECBuilder Installation

Download the CRECBUILDER_1.2.tar.gz software package file and optionally the CRECBUILDER_1.2_testdata.tar.gz file to a convenient subdirectory.

Decompress and extract the CRECBuilder subdirectory from the package file:

```
tar xzf  CRECBUILDER_1.2.tar.gz
```

Optionally decompress and extract the CRECBuilder-testdata subdirectory:

```
tar xzf  CRECBUILDER_1.2_testdata.tar.gz
```

Create a convenient environmental variable for running the program. Substitute "*user/path*" with the absolute username/pathname to the CRECBuilder subdirectory:

```
RUNCREC=\
'java -Xmx512m -classpath /home/user/path/CRECBuilder/classes/:. \
gov.nasa.gsfc.drl.crec.CRECBuilder'
```

NOTE: Please be aware that the backslashes (\) indicate line breaks only, and that there is a space before gov.nasa.gsfc.drl.crec.CRECBuilder'.

Verify correctness of the environmental variable by entering:

```
$RUNCREC
```

This should return a message including the text:

```
$RUNCREC
CRECBuilder Error: Check arguments
Usage Mode #1: CRECBuilder -file PDSPacketFile -vcid VCID# -pmin
PktLenMin# -pmax PktLenMax# [-date] [-force]
Usage Mode #2: CRECBuilder -file packetFile -scid SCID# -apid APID# -vcid
VCID# -pmin PktLenMin# -pmax PktLenMax# [-createPDSFileByMove | -
createPDSFileByCopy] [-date] [-force]
```

Program Inputs and Outputs

CRECBuilder reads a Consultative Committee for Space Data Systems (CCSDS) packet file containing time-ordered CCSDS packets with a single Application Process Identifier (APID) type.

If the input packet file follows Earth Observing System (EOS) Data and Operations System (EDOS) naming conventions, a corresponding CSR will be created.

If the input packet file does not follow EDOS naming conventions, the CSR filename will be assembled from command line arguments and the input packet file can be optionally copied or renamed to an EDOS name-conforming file.

For a more detailed description of input and output filenames, see Appendix A, "File Naming Convention."

Program Operation

CRECBuilder reads packet files and re-creates the corresponding CSRs sufficient to enable packet file processing using IPOPP.

IPOPP requires that both packet file names and CSR file names follow Earth Observing System (EOS) Data and Operations System (EDOS) file naming conventions.

CRECBuilder generates correctly named CSRs and optionally renames or copies input packet files with non-conforming filenames to properly named PDS packet files compatible with IPOPP. See Appendix A, "File Naming Convention."

The program operates in two distinct modes: the EDOS Mode and the Non-EDOS Mode.

EDOS Mode

The EDOS Mode creates CSRs from PDS packet files that follow EDOS naming conventions. Date and time for generating the CSR file name are extracted from the PDS file name or optionally set to the system time. The command line format is:

```
$RUNCREC  -file PDSPacketFile \
      -vcid VCID#  -pmin PktLenMin#  -pmax PktLenMax#  [-date] [-force]
```

-file -input packet file following EDOS naming convention, (See Appendix A, "File Naming Convention.")

-vcid -The CCSDS Virtual Channel ID associated with the Application ID. (See Appendix C, "Spacecraft Packet Parameters.")

-pmin -The minimum permissible packet length for this Application ID. (See Appendix C, "Spacecraft Packet Parameters.")

-pmax -The maximum permissible packet length for this Application ID. (See Appendix C, "Spacecraft Packet Parameters.")

-date -Flag to override date and time values in PDS with current system date and time.

-force -Flag to allow existing CSRs to be overwritten.

An example of an EDOS-Mode Execution follows:

```
$RUNCREC -file  P0420064AAAAAAAAAAAAAA08358162312001.PDS
-vcid 42  -pmin 276  -pmax 642 -date

Processing file:
/home/charlie/CREC5/crectest/P0420064AAAAAAAAAAAAAA0835816
2312001.PDS

Looking for packets: SCID[42], VCID[42], APID[64],
PktLenMin[276], PktLenMax[642]

Processing packets....

==> Found first packet: APID[64] Length[635]

.........................................

Created Construction Record:
/home/charlie/CREC5/crectest/P0420064AAAAAAAAAAAAAA0913915
0806000.PDS

Done.
```

Non-EDOS Mode

This mode creates Construction Records from a non-PDS named packet file and required command line arguments. Date and Time for generating the CSR file name are extracted from the first packet or optionally set to the system time. The command line format is:

```
$RUNCREC  -file packetFile  -scid SCID#  -apid APID#  -vcid VCID# \
      -pmin PktLenMin#  -pmax PktLenMax#  \
      [-createPDSFileByMove | -createPDSFileByCopy] [-date] [-force]
```

-file -input packet file name.

-scid -Spacecraft ID. (See Appendix C, "Spacecraft Packet Parameters.")

-apid -Application ID. (See Appendix C, "Spacecraft Packet Parameters.")

-vcid -The CCSDS Virtual Channel ID associated with the Application ID. (See Appendix C, "Spacecraft Packet Parameters.")

-pmin -The minimum permissible packet length for this Application ID. (See Appendix C, "Spacecraft Packet Parameters.")

-pmax -The maximum permissible packet length for this Application ID. (See Appendix C, "Spacecraft Packet Parameters.")

-createPDSFileByMove -Flag to optionally rename the existing input packet file to conform to EDOS naming conventions. If the file name is a symlink, then only the link will be renamed.

-createPDSFileByCopy -Flag to optionally copy the input packet file to a file conforming to EDOS naming conventions.

-date -Flag to override date and time values in first packet found with current system date and time.

-force -Flag to allow existing Construction Records or input packet files to be overwritten.

Examples of Non-EDOS Mode Executions follow:

```
$RUNCREC -file T2006093155500.L0_LAC -scid 42 -vcid 42 -
apid 64 -pmin 276 -pmax 642

Processing file:
/home/charlie/CREC5/crectest/T2006093155500.L0_LAC

Looking for packets: SCID[42], VCID[42], APID[64],
PktLenMin[276], PktLenMax[642]

Processing packets....

==> Found first packet: APID[64] Length[635]

..................

Created Construction Record:
/home/charlie/CREC5/crectest/P0420064AAAAAAAAAAAAAA060931
55500000.PDS

Done.


$RUNCREC -file T2006093155500.L0_LAC -scid 42 -vcid 42 -
apid 64 -pmin 276 -pmax 642 -createPDSFileByCopy

Processing file:
/home/charlie/CREC5/crectest/T2006093155500.L0_LAC

Looking for packets: SCID[42], VCID[42], APID[64],
PktLenMin[276], PktLenMax[642]

Processing packets....

==> Found first packet: APID[64] Length[635]

..................

Created Construction Record:
/home/charlie/CREC5/crectest/P0420064AAAAAAAAAAAAAA060931
55500000.PDS

Copying input file to PDSFile: T2006093155500.L0_LAC -->
P0420064AAAAAAAAAAAAAA06093155500001.PDS

.............................................
```

```
Done.
```

Running Test Files

The optional CRECBuilder-testdata subdirectory contains Aqua and Terra PDS files and their corresponding reference CSR files.

These reference CSR files were created using CRECBuilder and can be used to test its operation.

To run CRECBuilder against the PDS files, create a subdirectory, "crectest", in the subdirectory containing "CRECBuilder" and change to this subdirectory:

```
mkdir crectest
cd   crectest
```

Create logical links to the Terra MODIS PDS test file, and the Aqua MODIS and GBAD PDS files.

```
ln -s ../CRECBuilder-testdata/terra/\
P0420064AAAAAAAAAAAAAA08358162312001.PDS  \
P0420064AAAAAAAAAAAAAA08358162312001.PDS

ln -s ../CRECBuilder-testdata/aqua/\
P1540064AAAAAAAAAAAAAA08357172837001.PDS   \
P1540064AAAAAAAAAAAAAA08357172837001.PDS

ln -s ../CRECBuilder-testdata/aqua/\
P1540957AAAAAAAAAAAAAA08357172837001.PDS    \
P1540957AAAAAAAAAAAAAA08357172837001.PDS

ln -s ../CRECBuilder-testdata/terra/T2006093155500.L0_LAC    \
T2006093155500.L0_LAC
```

Run CRECBuilder to generate Construction Record files in the crectest subdirectory:

```
$RUNCREC -file  P0420064AAAAAAAAAAAAAA08358162312001.PDS \
 -vcid 42  -pmin 276  -pmax 642

$RUNCREC -file  P1540064AAAAAAAAAAAAAA08357172837001.PDS  \
-vcid 30  -pmin 276  -pmax 642

$RUNCREC -file  P1540957AAAAAAAAAAAAAA08357172837001.PDS  \
-vcid  3 -pmin 126 -pmax 126

$RUNCREC -file T2006093155500.L0_LAC  \
-scid 42 -vcid 42 -apid 64 -pmin 276 -pmax 642
```

Optionally, the resulting files can be copied and the tests re-run, invoking 'diff' against the results. The first set of derived CSRs should show no differences.

The contents of the derived Construction Records are similar, but not identical, to the original Construction Records as produced by RT-STPS. Certain items based on frame time and Reed-Solomon encoding are not present in the packet files, and those fields have been simulated as closely as possible when deriving the CSRs from them; this should be acceptable for processing purposes.

Program Compilation

To compile the program, change to the CRECBuilder Subdirectory and enter:

```
javac -d classes src/gov/nasa/gsfc/drl/crec/*.java
```

Appendix A
File Naming Convention

A summary of the output file naming convention follows. A more complete description may be found in Table 8.1.2.10-1, "File Name Convention for a PDS and an EDS," of the Interface Control Document Between the Earth Observing System (EOS) Data and Operations System (EDOS) and the EOS Ground System (EGS) Elements. CDRL B301. 510-ICD-EDOS/EGS. Revision 1. January 1998.

Item	Name	Size (bytes)	
1	File Id. Character	1	"P" = PDS
2	First APPID in Dataset	7	Spacecraft ID 3 Bytes, APPID 4 bytes.
3	2nd APPID in Dataset	7	Spacecraft ID 3 Bytes, APPID 4 bytes.
4	3rd APPID in Dataset	7	Spacecraft ID 3 Bytes, APPID 4 bytes. (fill with AAAAAAA if no APPID)
5	Time of PDS creation	11	GMT time (see NOTE)
6	Numeric Identification	1	generated by dataset counter
7	Unique File Number	2	generated by file counter 01 – Production Dataset (PDS) 00 – Construction Record (CSR)
8	File Name Extension	4	".PDS"

File names are 40 bytes in length. Name examples are:

P04202890420291AAAAAAA95030231459001.PDS	- Production Dataset (PDS) packet file name
P04202890420291AAAAAAA95030231459000.PDS	- Construction Record (CSR) file name

NOTE: See ICD **510**-ICD-EDOS/EGS, Table 8.1.2.6-1., "Greenwich Mean Time (GMT) in ASCII Format," which describes the format, size, and data characteristics for the year, Julian day, hour, minute and second.

Appendix B
Construction Record Format

A brief description of the Construction Record Format follows. A more detailed description may be found in Table 8.1.2.7-1, "PDS/EDS Construction Record," of the Interface Control Document Between the Earth Observing System (EOS) Data and Operations System (EDOS) and the EOS Ground System (EGS) Elements. CDRL B301. 510-ICD-EDOS/EGS. Revision 1. January 1998. Item numbers refer to Table 8.1.2.7-1.

Bytes	Type	Item	Description
2	Uint	1	EDOS Software Version Number first byte, EDOS Software Version Number second byte
1	Uint	2	Construction Record type. See ICD 8.1.2.7: 1=PDS, 2=EDS based on APPID, 3=EDS
1	Uint	3	spare
36	char	4	Id, not null-terminated. See ICD 8.1.2.8
1	bool	5-6	flag, 0=operational data, 1=test
1	Uint	7-1	spare
8	Uint	7-2	spare
2	Uint	8	number of scheduled SCS start/stop times.
1	Uint	8-1	spare
7	byte	8-2	SCS start time PB-5 code
1	Uint	8-3	spare
7	byte	8-4	SCS stop time PB-5 code
8	Uint	9	byte count of EDOS generated fill data, 8-bytes.
4	Uint	10	packet header vs. true length error count.
8	int	11	first pkt Spacecraft time format,
8	int	12	last pkt
1	Uint	13	spare
7	byte	14	First packet GMT time, PBS-5 format, see ICD table 8.1.2.4-1.
1	Uint	15	spare
7	byte	16	Last packet GMT time, PBS-5 format.
4	Uint	17	Packets corrected Reed-Solomon decoding
4	Uint	18	Number of packets in dataset.
4	Uint	19	Number of bytes in dataset
4	Uint	20	No. packets with Source Sequence Counter (SSC)discontinuities.
1	Uint	21	spare
7	byte	22	GMT time PBS-5 format (ICD table 8.1.2.4-1)Data set completed.
7	Uint	23	spare3
1	Uint	24	number of APPIDs in PDS. (1-3)

For each APPID, repeat items 24-1 to 24-19:

4	Uint	24-1 spare
3	Uint	24-2 SCID and APPID, see ICD Table 8.1.4.1.1-1.
8	Uint	24-3 index (byte offset) to first packet in PDS.
3	Uint	24-4 spare
1	Uint	24-5 number of VCIDs in PDS.

Repeat next two items for next VCID. See ICD Tables 8.1.2.5-1 and 8.1.4.1.1-2.:

2	Uint	24-5.1 spare
2	Uint	24-5.2 SCID and VCID.
4	Uint	24-6 pkts. with Source Seq. Ctr discontinuities

Repeat items 24-6.1 through 24-6.9 for each missing packet Source Sequence Counter Gap:

4	Uint	24-6.1 first Missing Packet Source Seq. Ctr.
8	Uint	24-6.2 index into data to missing packet
4	Uint	24-6.3 no. of packet Source Seq. Cnts missed in gap
8	int	24-6.4 time code from secondary hdr. just before gap.
8	int	24-6.5 time code from secondary hdr. just after gap.
1	Uint	24-6.6 spare
7	byte	24-6.7 ESH date & time just before gap.
1	Uint	24-6.8 spare
7	byte	24-6.9 ESH date & time just after gap.
4	Uint	24-7 Number of packets containing fill data.

Repeat for each fill packet identification, repeat items 24-7.1 through 24-7.3:

4	Uint	24-7.1 Source Sequence Cnt. of packet containing fill
8	Uint	24-7.2 index into dataset to fill packet
4	Uint	24-7.3 index to first fill byte
8	Uint	24-8 number of bytes of fill data
4	Uint	24-9 no. of packets with header length and actual length mismatches.

Repeat item 24-9.1 for each packet with length mismatch:

4	Uint	24-9.1 Source Sequence Cnt. of packet with mismatch

8	formatted int	24-10 Spacecraft format time code from first pkt.
8	formatted int	24-11 Spacecraft format time code from last pkt.
1	Uint	24-12 spare
7	byte	24-13 PB-5 time code of first packet in data set.
1	Uint	24-14 spare
7	byte	24-15 PB-5 time code of last packet in data set.
4	Uint	24-16 packets from RS-corrected VCDUs
4	Uint	24-17 count of pkts in dataset for this APPID
8	Uint	24-18 size for this APPID
8	Uint	24-19 spare
3	Uint	25 spare
1	Uint	25-1 no. of files for pds.

Repeat items 25-2 through 25-4.5 for each file

40	char	25-2 PDS 36-byte filename + ".PDS" or ".EDS"
3	Uint	25-3 spares

Repeat items 25-4.1 through 25-4.5 for each APPID:

1	Uint	25-4.1 spare
3	Uint	25-4.2 SCID and APPID
8 formatted	int	25-4.3 first pkt. time CCSDS binary time code
8 formatted	int	25-4.4 last pkt. time CCSDS binary time code
4	Uint	25-4.5 spare

Appendix C
Spacecraft Packet Parameters

A brief table of packet parameters for the Aqua and Terra MODIS Instrument follows.

spacecraftId	vcid	apid	Packet min	Packet max
Terra MODIS				
42	42	064	276	642
Aqua MODIS				
154	30	064	276	642
Aqua GBAD				
154	03	957	126	126