RFC: Writing User Block for NPP files with nagg

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This document describes a new feature to write NPP metadata elements in a user block in nagg output files, according to the specification in the JPSS Common Data Format Control Book – External – Volume V, Section 3.2.

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# Introduction

**Nagg** (<http://www.hdfgroup.org/projects/npoess/nagg_index.html>) is a tool for aggregating JPSS data products from existing files into new files with a different number of granules per file or different combinations of compatible products. JPSS data files have a user block that contains XML elements which are a subset of the metadata elements in the file, but can be accessed without HDF5 tools or libraries. These elements are attributes of the root group, the /Data\_Products/<Collection Short Name> groups, or the /Data\_Products/<Collection Short Name>/<Collection Short Name>\_Aggr datasets in the file. The user block for the new file should contain these elements with the appropriate values for the products and aggregations in the new file. This RFC enumerates the currently required elements of this user block and the locations of the corresponding attributes for obtaining the element values.

While the user block element names match the names of the corresponding attributes, the location of those attributes is not given in the user block, and the values of the aggregation’s attributes are determined as the file is written. Although the current JPSS specification for the user block appears to be static, nagg should read the user blocks of the input files to check for unexpected new elements or user additions and issue a warning if any are found, as they will not be written in the output file.

# User block requirements

The XML schema for JPSS data product files of type SDR, TDR, EDR, ARP, GEO, and IP is specified in the JPSS Common Data Format Control Book – External Volume V – Metadata, section 3.2.1, and is included in Appendix 1.

The user block will contain exactly one of each of the first 4 elements and 1 or more of the Data\_Product elements to match the number of JPSS data products included in the file. While nagg does not currently support aggregation of RDR data products, note for future reference that the user block for RDRs differs only by the absence of the N\_GEO\_Ref element.

Each Data\_Product element will contain exactly one of the following elements:

N\_Collection\_Short\_Name

Instrument\_Short\_Name

N\_Dataset\_Type\_Tag

N\_Processing\_Domain

AggregateBeginningDate

AggregateBeginningOrbitNumber

AggregateBeginningTime

AggregateEndingDate

AggregateEndingOrbitNumber

AggregateEndingTime

AggregateBeginningGranuleID

AggregateEndingGranuleID

An example of a user block for a file with 2 products is included in Appendix 2.

# Implementation considerations

Nagg copies the values of the attributes corresponding to the user block elements from the input file to the output file in the course of processing the files. It should be most efficient to read and save the values for the user block at that time or to replace the copy by reading and writing them to the attribute and the user block string at the time they are copied from the input granule. The required size of the user block can be calculated before creating the file according to the element names and types and the number of products to be packaged in the output file. Element values can be saved for writing after the product granules are processed for an output file.

A list of expected elements will be useful for checking the input files’ user blocks. If more flexibility is required in the future, this list could be put in a configuration file to be read at runtime. Entries would need an HDF5 path for the corresponding attribute. This is not part of the work currently proposed.

## Top level elements

Mission\_Name and Platform\_Short\_Name are root group attributes as well as user block elements. Their values should be the same for all input and output files.

The N\_GEO\_Ref element for the output file user block will have the same value as the /N\_GEO\_Ref attribute. If the geolocation is packaged, the /N\_GEO\_Ref attribute will not be created. The user block element will be present, but empty (“<N\_GEO\_Ref></ N\_GEO\_Ref>”).

The value of the Number\_of\_Data\_Products element will be determined by the number of data products packaged in each output file (including the geolocation product).

## Data\_Product elements

The first four elements correspond to a subset of the attributes of the /Data\_Products/<Collection Short Name> group which use the same names:

N\_Collection\_Short\_Name

Instrument\_Short\_Name

N\_Dataset\_Type\_Tag

N\_Processing\_Domain

These values are copied by nagg from the first input file to the output file.

The remaining eight elements correspond to a subset of attributes of the /Data\_Products/<Collection Short Name>/<Collection Short Name>\_Aggr dataset:

AggregateBeginningDate

AggregateBeginningOrbitNumber

AggregateBeginningTime

AggregateEndingDate

AggregateEndingOrbitNumber

AggregateEndingTime

AggregateBeginningGranuleID

AggregateEndingGranuleID

The values for these attributes are copied by nagg from the first and last granules in the aggregation. They can also be read and written to the user block.

## Nagg structures for user block element values

The nagg structures to be added will be similar to these. Character arrays can be replaced by char \*s where information is obtained from persistent granules.

struct user\_block\_t {

char mission\_name[];

char platform\_name[];

char \*geofile\_name];

unsigned int number\_data\_products;

struct data\_product\_info\_t \*data\_products[];

}

struct data\_product\_info\_t {

char product\_name [];

char instrument\_name[];

char dataset\_type\_tag[];

char processing\_domain[];

char beginning\_date[];

uint64\_t beginning\_orbit;

char beginning\_time[];

char ending\_date[];

uint64\_t ending\_orbit;

char ending\_time[];

char beginning\_granule\_id[];

char ending\_granule\_id[];

}

# Unaddressed issue

The value of /N\_Processing\_Domain may not be the same for all input files to be aggregated. The value of the root group attribute for the output file is copied from the root group attribute in the input file for the first granule to be aggregated. If later granules in the same aggregation are from a file with a different value for /N\_Processing\_Domain, that value will be ignored for the current aggregation. There is no provision for this situation, which applies to several other attributes in the CDFCB specification.

# Testing for user block

A test program should be written to read the xml tags in the user block and compare the values to those found by reading the corresponding attributes of the root group, the product groups, and the <product>\_aggr datasets. A utility to output the user block with character returns and indentations as displayed in the appendix would also be useful.

# Summary and Recommendations

Nagg currently produces files without information expected in the user block. The values can be determined when nagg is creating new files, and for most nagg operations the majority of the values in the user block must be determined when creating the output file, as they will be different from the values in the input files. The user block should be added with the implementation suggested by the information in section 3.

# Revision History

|  |  |
| --- | --- |
| *September 20, 2013:* | Version 1 available for internal review.  Version 2 committed to subversion repository |

# Appendix 1 - HDF5 SDR, TDR, EDR, ARP, GEO, and IP HDF5 XML User Block Schema (JPSS CDFCB – External – Volume V, Section3.2.1)

<?xml version="1.0"?>

<xsd:schema xmlns:xsd=http://www.w3.org/2001/XMLSchema targetNamespace=http://

“NPOESS SDR, TDR, EDR, ARP, and IP XML User Block” xmlns="http://NPOESS

SDR, TDR, EDR, ARP, and IP XML User Block">

<!-- == NPP/NPOESS HDF5 XML User Block XML Schema == -->

<!-- == NPP/NPOESS HDF5 User Block – Primary Element== -->

<xsd:element name=”HDF\_UserBlock” type=”HDF\_UserBlockType” />

<!-- == Annotation for this schema == -->

<xsd:annotation>

<xsd:documentation xml:lang=”en”>

NPP/NPOESS HDF5 User Block XML Schema

</xsd:documentation>

</xsd:annotation>

<!-- == NPP/NPOESS HDF5 User Block == -->

<xsd:complexType name=”HDF\_UserBlockType”>

<xsd:sequence>

<xsd:element name=”Mission\_Name” type=”xsd:string” minOccurs=”1”

maxOccurs=”1” />

<xsd:element name=”Platform\_Short\_Name” type=”xsd:string”

minOccurs=”1” maxOccurs=”1” />

<xsd:element name=”N\_GEO\_Ref” type=”xsd:string”

minOccurs=”0” maxOccurs=”1” />

<xsd:element name="Number\_Of\_Data\_Products" type="xsd:integer"

minOccurs="1" maxOccurs="1" />

<xsd:element name=”Data\_Product” type=”Data\_ProductType”

minOccurs=”1” maxOccurs=”unbounded” />

</xsd:sequence>

</xsd:complexType>

<!-- == Data Product Type == -->

<xsd:complexType name=”Data\_ProductType”>

<xsd:sequence>

<xsd:element name=”N\_Collection\_Short\_Name” type=”xsd:string”

minOccurs=”1” maxOccurs=”1” />

<xsd:element name=”Instrument\_Short\_Name” type=”xsd:string”

minOccurs=”1” maxOccurs=”1” />

<xsd:element name=”N\_Dataset\_Type\_Tag” type=”xsd:string”

minOccurs=”1” maxOccurs=”1” />

<xsd:element name=”N\_Processing\_Domain” type=”xsd:string”

minOccurs=”1” maxOccurs=”1” />

<xsd:element name=”AggregateBeginningDate” type=”xsd:string” minOccurs=”1”

maxOccurs=”1” />

<xsd:element name=”AggregateBeginningOrbitNumber”

type=”xsd:integer” minOccurs=”1” maxOccurs=”1” />

<xsd:element name=”AggregateBeginningTime” type=”xsd:string”

minOccurs=”1” maxOccurs=”1” />

<xsd:element name=”AggregateEndingDate” type=”xsd:string”

minOccurs=”1” maxOccurs=”1” />

<xsd:element name=”AggregateEndingOrbitNumber” type=”xsd:integer”

minOccurs=”1” maxOccurs=”1” />

<xsd:element name=”AggregateEndingTime” type=”xsd:string”

minOccurs=”1” maxOccurs=”1” />

<xsd:element name=”AggregateBeginningGranuleID” type=”xsd:string”

minOccurs=”1” maxOccurs=”1” />

<xsd:element name=”AggregateEndingGranuleID” type=”xsd:string”

minOccurs=”1” maxOccurs=”1” />

</xsd:sequence>

</xsd:complexType>

</xsd:schema>

# Appendix 2 - User block example with packaged products

Here is a user block example for a packaged file with 4 GMODE granules and 4 SVM01 granules:

<HDF\_UserBlock><Mission\_Name>NPP</Mission\_Name><Platform\_Short\_Name>NPP</Platform\_Short\_Name><N\_GEO\_Ref></N\_GEO\_Ref><Number\_Of\_Data\_Products>2</Number\_Of\_Data\_Products><Data\_Product><N\_Collection\_Short\_Name>VIIRS-M1-SDR</N\_Collection\_Short\_Name><Instrument\_Short\_Name>VIIRS</Instrument\_Short\_Name><N\_Dataset\_Type\_Tag>SDR</N\_Dataset\_Type\_Tag><N\_Processing\_Domain>ops</N\_Processing\_Domain><AggregateBeginningDate>20120813</AggregateBeginningDate><AggregateBeginningOrbitNumber>4115</AggregateBeginningOrbitNumber><AggregateBeginningTime>094839.337354Z</AggregateBeginningTime><AggregateEndingDate>20120813</AggregateEndingDate><AggregateEndingOrbitNumber>4115</AggregateEndingOrbitNumber><AggregateEndingTime>095419.727577Z</AggregateEndingTime><AggregateBeginningGranuleID>NPP000255233200</AggregateBeginningGranuleID><AggregateEndingGranuleID>NPP000255235761</AggregateEndingGranuleID></Data\_Product><Data\_Product><N\_Collection\_Short\_Name>VIIRS-MOD-GEO</N\_Collection\_Short\_Name><Instrument\_Short\_Name>VIIRS</Instrument\_Short\_Name><N\_Dataset\_Type\_Tag>GEO</N\_Dataset\_Type\_Tag><N\_Processing\_Domain>ops</N\_Processing\_Domain><AggregateBeginningDate>20120813</AggregateBeginningDate><AggregateBeginningOrbitNumber>4115</AggregateBeginningOrbitNumber><AggregateBeginningTime>094839.337354Z</AggregateBeginningTime><AggregateEndingDate>20120813</AggregateEndingDate><AggregateEndingOrbitNumber>4115</AggregateEndingOrbitNumber><AggregateEndingTime>095419.727577Z</AggregateEndingTime><AggregateBeginningGranuleID>NPP000255233200</AggregateBeginningGranuleID><AggregateEndingGranuleID>NPP000255235761</AggregateEndingGranuleID></Data\_Product></HDF\_UserBlock>

The same string with carriage returns between fields, indented for nesting is repeated below, color coded yellow for top level elements that have no sub-elements, blue for data product 1 elements, and olive for data product 2 elements.

<HDF\_UserBlock>

<!—Root Group Attributes 🡪

<Mission\_Name>NPP</Mission\_Name>

<Platform\_Short\_Name>NPP</Platform\_Short\_Name>

<N\_GEO\_Ref></N\_GEO\_Ref>

<Number\_Of\_Data\_Products>2</Number\_Of\_Data\_Products> No matching attribute

<Data\_Product>

<N\_Collection\_Short\_Name>VIIRS-M1-SDR</N\_Collection\_Short\_Name> Product Group attributes

<Instrument\_Short\_Name>VIIRS</Instrument\_Short\_Name>

<N\_Dataset\_Type\_Tag>SDR</N\_Dataset\_Type\_Tag>

<N\_Processing\_Domain>ops</N\_Processing\_Domain>

<AggregateBeginningDate>20120813</AggregateBeginningDate> Aggregate Dataset Attributes

<AggregateBeginningOrbitNumber>4115</AggregateBeginningOrbitNumber>

<AggregateBeginningTime>094839.337354Z</AggregateBeginningTime>

<AggregateEndingDate>20120813</AggregateEndingDate>

<AggregateEndingOrbitNumber>4115</AggregateEndingOrbitNumber>

<AggregateEndingTime>095419.727577Z</AggregateEndingTime>

<AggregateBeginningGranuleID>NPP000255233200</AggregateBeginningGranuleID>

<AggregateEndingGranuleID>NPP000255235761</AggregateEndingGranuleID>

</Data\_Product>

<Data\_Product>

<N\_Collection\_Short\_Name>VIIRS-MOD-GEO</N\_Collection\_Short\_Name>

<Instrument\_Short\_Name>VIIRS</Instrument\_Short\_Name>

<N\_Dataset\_Type\_Tag>GEO</N\_Dataset\_Type\_Tag>

<N\_Processing\_Domain>ops</N\_Processing\_Domain>

<AggregateBeginningDate>20120813</AggregateBeginningDate>

<AggregateBeginningOrbitNumber>4115</AggregateBeginningOrbitNumber>

<AggregateBeginningTime>094839.337354Z</AggregateBeginningTime>

<AggregateEndingDate>20120813</AggregateEndingDate>

<AggregateEndingOrbitNumber>4115</AggregateEndingOrbitNumber>

<AggregateEndingTime>095419.727577Z</AggregateEndingTime>

<AggregateBeginningGranuleID>NPP000255233200</AggregateBeginningGranuleID>

<AggregateEndingGranuleID>NPP000255235761</AggregateEndingGranuleID>

</Data\_Product>

</HDF\_UserBlock>

## Section 1 (Yellow)

4 fields: Mission\_Name

Platform\_Short\_Name

N\_GEO\_Ref

Number of Data\_Products

The first 2 match attributes of the root group which are always present. The third matches a root group attribute that is present only for unpackaged files, but will be an empty field in the user block for files with packaged geolocation. The fourth is simply the number of data products packaged in the file.

## Section 2 (Blue, Olive)

Section 2, Data\_Product, is repeated once for each product in the file. It has 4 fields matching attributes of the Data\_Products child group named with the value of the N\_Collection\_Short\_Name field and 8 fields beginning with “Aggregate” matching attributes of the same group’s Aggregate dataset.