Progress Report for ACCESS Project
Software to Access HDF5 Datasets via OPeNDAP's Data Access Protocol
August 2007 – August 2008

Cooperative Agreement Number NNX06AG75A between NASA and The HDF Group
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August 23, 2008

1 Highlights

In this report we highlight four major accomplishments for the ACCESS project in this period:

- Development of fully functional HDF5-OPeNDAP data handler
- More OPeNDAP clients to read NASA HDF-EOS5 files
- Usage of the HDF5-OPeNDAP data handler
- Development of HDF5-friendly OPeNDAP client library prototype

Each of these accomplishments is covered in subsequent sections of the report. Outreach activities are listed in the final section.

2 Development of the HDF5-OPenDAP Data Handler

2.1 Features Added to the HDF5-OPeNDAP Data Handler

2.1.1 Mapping an HDF5 group to a DAP attribute

Defining an appropriate mapping from the HDF5 hierarchical group structure to DAP is not trivial since DAP does not have a concept that corresponds to the group in HDF5. After in-depth investigations and discussions, we decided to map all HDF5 datasets to DAP variables, with information about the HDF5 group structure mapped as a DAP attribute. This will be natural for most DAP applications, as clients that do not need to use the group information can simply ignore it.

2.1.2 Mapping an HDF5 object/regional reference to a DAP URL

Since future NPP/NPOESS HDF5 data relies heavily on object and region references to organize data aggregations and granules, we also implemented the feature that maps an HDF5 object/regional reference to a DAP URL.

2.2 Integrating with DAP Server 4 framework (Hyrax)

We have fully integrated the HDF5-OPeNDAP data handler with the DAP server 4 framework (Hyrax). We also helped the OPeNDAP team fix a few bugs related to the Server 4 framework.

2.3 Testing with NASA HDF-EOS5 Files

We have tested with more HDF-EOS5 files during this period. HDF-EOS5 swath and grid files generated by Aura HIRDLES, TES, MLS and OMI instruments have been tested.

2.4 Documentation

We finished up the following technical notes during this period.

- Mapping HDF5 group to DAP[1]
- Mapping HDF5 Reference to DAP[2]
- Using DAP clients to visualize EOS5 Grid data[3]

We are also in the process of writing HDF5 to DAP2 mapping technique note and other documents.

3 Using OPeNDAP Clients to Read NASA HDF-EOS5 Files

During this period, we have tested Aura HDF-EOS5 data with eight OPeNDAP clients.

Eight OPeNDAP clients are:

- Ferret[4]
- ncBrowse[5]
- IDV[6]
- ODC[7]
- GrADS[8]
- NCL[9]
- IDL[10]
- MATLAB[11]

Aura Level 3 HDF-EOS5 grid data can be successfully visualized and accessed via these OPeNDAP clients. A demo can be viewed to see how ozone hole is generated over the South Pole by using the IDV OPeNDAP client to access the OMI Level 3 grid data. The URL of the demo is http://hdfgroup.org/projects/opendap/index.html.

Various problems accessing the data using other clients have been discovered and are documented [3].

4 Usage of the HDF5-OPeNDAP data handler

NASA GES DISC started using the HDF5-OPeNDAP data handler to serve Aura OMI Level 3 grid product.

5 Development of HDF5-friendly OPeNDAP client library prototype

One important task in this period is to develop an HDF5-friendly OPeNDAP client library prototype. We have almost finished the development of the library prototype. We have also tested the prototype with GrADS OPeNDAP client. We can successfully visualize the vertical profile of HDF-EOS5 swath data with GrADS through the prototype. A report of using Aura MLS swath data to show the air pollution level of a major city can be found at the following URL http://hdfdap.hdfgroup.uiuc.edu:8080/HDF5-OPenDAP_Impact_2008.pdf. This client library

prototype can be used by OPeNDAP clients to visualize the HDF-EOS5 swath data. It can also retrieve the HDF5 group information, which is ignored by the NetCDF OPeNDAP client library.

6 Outreach

We have communicated actively with NASA Aura developers in the process of implementing the handler. Presentations reporting the progress of this project were given at the 11th HDF and HDF-EOS workshop [12] and at the 2008 NASA HDF annual briefing. Posters on the work were also presented at the 2007 ESDSWG conference, the 88th American Meteorological Annual meeting and the 2008 ESIP Federation summer meeting.

References

1. Mapping HDF5 group to DAP:

http://hdfdap.hdfgroup.uiuc.edu:8080/mapping_hdf5_groups_to_dap_final.pdf

2. Mapping HDF5 object/regional Reference to DAP:

http://hdfdap.hdfgroup.uiuc.edu:8080/mapping_hdf5_reference_to_dap.pdf

3. Using DAP clients to visualize EOS5 Grid data:

http://hdfdap.hdfgroup.uiuc.edu:8080/cf.html

4. Ferret /OPeNDAP: http://ferret.wrc.noaa.gov/Ferret/DODS/ferret_dods.html

5. ncBrowse – A Graphical netCDF File Browser: http://www.epic.noaa.gov/java/ncBrowse/

6. IDV – Integrated Data Viewer: http://www.unidata.ucar.edu/software/IDV/index.html

7. ODC – OPeNDAP Data Connector: http://www.opendap.org/ODC/

8. GrADS – Grid Analysis and Display System: http://grads.iges.org/grads/grads.html

9. NCL – NCAR Command Language: http://www.ncl.ucar.edu/

10. IDL – Interactive Data Language: http://www.ittvis.com/idl/

11. MATLAB – Matrix Laboratory: http://www.mathworks.com/products/matlab/

12. HDF5-OPeNDAP Project Update and Demo – A presentation at 11th HDF workshop: http://hdfeos.org/workshops/ws11/presentations/day3/HDF5-OPeNDAP-Final.ppt