Remote Data Access with OPeNDAP

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Overview

- What are OPeNDAP and DAP?
- What is a Client-Server Architecture
- Why is Remote Data Access Useful?
- Specifying a DAP Data Source
- The netCDF-DAP Integration
- Selected Public DAP Data Sources
- Questions

- Debugging
- Build and Install NETCDF+DAP
What are OPeNAP and DAP?

- **DAP** (version 2) is a widely supported protocol and standard data format for accessing remote data.
- The standard is maintained by the OPeNDAP organization ([http://www.opendap.org/](http://www.opendap.org/)).
- DAP was expressly designed to serve as intermediate format for accessing a wide variety of data sources.
- The terms “DAP” and “OPeNDAP” will be used interchangeably in this talk.
What is a Client-Server Architecture

- DAP data access is similar to accessing a web page through a web browser.

Diagram:
- Web Browser
  - Internet Explorer
  - URL Request
  - HTML (Web Page) Response

- Web Server

- DAP Client
  - Application Code (e.g., ncdump)
  - netCDF Library
  - DAP Library
  - DAP Request (URL)
  - DAP Formatted Data Response

- Web Server
  - DAP Server (e.g., Hyrax or Thredds)
Why is Remote Data Access Useful?

- Remote access allows the netCDF library to retrieve data that is stored on other machines in the internet.
- Remote => not local => saves local disk space
- The DAP2 protocol supports finer grain transfers than e.g. FTP.
  - Only the necessary minimum amount of data needs be transferred from the server
  - E.g. “ncdump –v” retrieves only a specific variable
- DAP is integrated into netCDF => remote access to DAP Data Servers through the netCDF API
Specifying a DAP Data Source

- A DAP data source is specified using a URL that refers to the DAP server containing that data
  - Much like specifying a web page
- Used in place of a file name in e.g. ncdump
- **Beware**: Shell may require quotes around URL
- Example:
  - ncdump "http://motherlode.ucar.edu:8081/dts/Drifters"
The netCDF-DAP Integration

- DAP support is enabled in netCDF by default
  - Use --disable-dap to turn it off
- DAP requires the curl library (libcurl)
- If your ./configure fails because it cannot find libcurl, then you must specify it like you do other libraries (e.g HDF5).
  - Use curl-config to get the appropriate flags
Selected Public DAP Data Sources

- **http://motherlode.ucar.edu:8081/dts**
  - When you install netcdf from the source, the “make check” command uses this site to test the correct operation of DAP within netcdf.
  - Note: sometimes this server is down, in which case “make check” will fail. You can disable DAP from testing against this test servers by setting the ./configure flag
    --disable-dap-remote-tests

- **http://motherlode.ucar.edu:8080/thredds/catalog.html**
  - This is the primary Unidata data server. If you look into it, you will see that many of the datasets can be accessed using DAP.
Questions?
Debugging

- When things go wrong it is usually a problem with the server
  - E.g. bad url, the server is down, or access rights

- First symptoms:
  - “NetCDF: I/O failure”
    => Server probably is down or otherwise unreachable
  - “Malformed or inaccessible DAP DDS”
    => Server sent back non-dap response
Debugging (cont.)

- Step 1: Try again with the “-h” flag
  - `ncdump -h http://motherlode.ucar.edu:8081/dts/Drifters`
  - Ok => problem is the data, not the meta-data

- Step 2: Get more information
  - [log] causes extra information to be printed

- Step 3: Access the url in your web browser
  - Requires changing the url a bit.
    - `http://motherlode.ucar.edu:8081/dts/Drifters`
Debugging (cont.)

- Step 4: Contact the site you are trying to access and send them the output from, especially, step 3.
- Step 5: If the problem is not obvious at that point, then collect the information from the previous steps and send it to Unidata support.
- BTW: the problem in this case is actually an access rights problem.
- Other typical problems:
  - Asking for too much data
  - Asking for a variable that does not exist (usually a typo)
Questions?
Demos Sites

- http://test.opendap.org
- http://test.opendap.org/dap/data/ff
- http://www.usgodae.org/dods/GDS/coamps_cent_am
- http://motherlode.ucar.edu:8080/thredds/catalog.html