NetCDF

NetCDF (Network Common Data Form) is an interface for array-oriented data access and a freely-distributed collection of software libraries for C, Fortran, C++, Perl and Java that provide implementations of the interface. The netCDF software was developed by Glenn Davis, Russ Rew, Steve Emmerson and Harvey Davies at the Unidata Program Center in Boulder, Colorado, and augmented by contributions from other netCDF users. The netCDF libraries define a machine-independent format for representing scientific data. Together, the interface, libraries, and format support the creation, access, and sharing of scientific data. The following packages are discussed in this document:

- NetCDF libraries and utilities
- parallel invocation of NetCDF: By integration of the NetCDF API with HDF5 as well as pNetCDF, a simple interface for parallel I/O processing is provided.
- NCO: the NetCDF Operators comprise a dozen standalone, command-line programs that take netCDF files as input, then operate (e.g., derive new data, average, print, hyperslab, manipulate metadata) and output the results to screen or files in text, binary, or netCDF formats.

Installation and use of NetCDF on LRZ platforms

Linux based HPC Systems

Available versions of netCDF are given in the following table. Parallel version is configured with pnetcdf and hdf5.

<table>
<thead>
<tr>
<th>Version</th>
<th>SuperMUC</th>
<th>Linux Clusters</th>
</tr>
</thead>
<tbody>
<tr>
<td>netcdf/serial/4.4</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>netcdf/mpi/4.4</td>
<td>yes (IBM MPI and Intel MPI)</td>
<td>yes (Intel MPI)</td>
</tr>
<tr>
<td>netcdf/serial/4.6</td>
<td>no</td>
<td>yes</td>
</tr>
<tr>
<td>netcdf/mpi/4.6</td>
<td>no</td>
<td>yes (Intel MPI)</td>
</tr>
</tbody>
</table>

Serial NetCDF Library

NetCDF is available on all HPC systems at LRZ; it has been built for usage with the Intel C, C++ and Fortran compilers. To make use of NetCDF, please load the appropriate environment module.

module load netcdf/serial

compile your code with

```bash
[icc|icpc|ifort] -c $NETCDF_INC foo.[c|cc|f90]
```

and then link it with

```bash
icc -o myprog.exe main.o foo.o $NETCDF_LIB
icpc -o myprog.exe mainC.o foo.o $NETCDF_CXX_LIB
ifort -o myprog.exe mainF.o foo.o $NETCDF_F90_LIB
```

using a suitable library environment variable which depends on the base language. Note that in Fortran 90 codes you will need to pull the required functionality into your source code via a use statement:

```fortran
use netcdf
```

NetCDF in parallel mode

To use NetCDF in parallel mode, please load the environment module.

```bash
use netcdf
```

The actual version of the loaded library will depend on the MPI module loaded prior to the above command. To compile and link your code, please use the MPI compiler wrappers mpicc, mpif90 etc., and take care to keep the compile and link step separate as illustrated above for the serial case. If this module is used, the parallel extensions (e.g. the additional optional arguments for nf90_open) will work properly instead of returning an error message; and of course MPI_Init() and MPI_Finalize() must be invoked at the beginning and end of your program, respectively.
Run time settings for parallel execution

For running pnetcdf or netcdf/mpi programs there exist system-dependent settings which are discussed here:

- For **IBM MPI** (module `mpi.ibm`), please keep the setting "**MP_SINGLE_THREAD=no**", otherwise your program will probably crash with an error in the MPI_IO subsystem.

NetCDF Operators (NCO)

To make use of the NetCDF operators (NCO), please load the appropriate environment module. Version 4.6.2 is available in SuperMUC and Linux clusters; and version 4.6.7 in Linux Clusters.

```bash
module load nco
```

Documentation

- Please refer to the NetCDF Web Site for documentation of the interface. The manuals include a description of the integrated parallel facilities.
- Please refer to the PNetCDF Web Site for documentation of the pnetcdf interface.
- Documentation on the NetCDF operators may be found on the NCO Web Site.