

PROJ on HPC

What is PROJ?

PROJ (previously known as "PROJ.4") is a widely used open-source library for performing coordinate transformations and projections of geospatial data. It supports a wide range of projections and transformations, including those used in cartography, surveying, and geographic information systems (GIS). The library provides a robust and efficient way to transform between different coordinate reference systems, allowing for accurate representation and comparison of geospatial data from various sources. PROJ is used in a variety of software applications, such as GIS systems, mapping libraries, GPS navigation software, and more.

Links:

[Documentation](#)

[Quickstart](#)

Versions Available:

The following versions are available on the cluster:

- PROJ 6.2.0

How to load PROJ?

To load PROJ, use the following commands:

```
#Load the PROJ module  
module load physical/proj/6.2.0
```

To verify if the module is loaded correctly, use the following command,

```
# List all the module loaded in the environment
module list
```

In a fresh environment, this should show only PROJ as loaded module.

How to use PROJ?

Here are general steps of how to use PROJ in HPC environments,

1. Link the PROJ library in your application: To use the PROJ library in your HPC application, you will need to link the library to your code. This can be done by specifying the library path and name in your compiler options or by using a package manager to install the library and header files.
2. Call the PROJ functions: Once the PROJ library is linked to your code, you can call the PROJ functions to perform coordinate transformations and projections. The PROJ library provides a variety of functions for tasks such as transforming between coordinate reference systems, converting coordinates, and transforming geometries.
3. Optimize performance: To optimize the performance of your application when using the PROJ library in an HPC environment, you can consider using parallel processing techniques, such as multithreading or MPI. Additionally, you can use performance profiling tools to identify and optimize bottlenecks in your code.

There are command line tools that supplement the PROJ library. See the docs for more information about command line tools. For example,

```
# Convert geodetic coordinates to GRS80 cartesian coordinates
echo 17.7562015132 45.3935192042 133.12 2017.8 | cct +proj=cart
+ellps=GRS80
```

Here are all the command line tools,

- [cct](#)
- [cs2cs](#)

- [geod](#)
- [invgeod](#)
- [gie](#)
- [proj](#)
- [invproj](#)
- [projinfo](#)
- [projsync](#)

Here is a sample API usage,

```
#include <proj.h>
#include <stdio.h>

int main(void)
{
    PJ *src, *dst;
    PJ_COORD coord;
    char *srcdef = "+proj=latlong +datum=WGS84";
    char *dstdef = "+proj=utm +zone=32 +datum=WGS84";

    src = proj_create(PJ_DEFAULT_CTX, srcdef);
    if (!src) {
        fprintf(stderr, "Failed to create source projection\n");
        return 1;
    }

    dst = proj_create(PJ_DEFAULT_CTX, dstdef);
    if (!dst) {
        fprintf(stderr, "Failed to create destination projection\n");
        proj_destroy(src);
        return 1;
    }

    coord = proj_coord(0.0, 45.0, 0.0, 0.0);
    coord = proj_trans(dst, PJ_FWD, coord);
    printf("UTM 32N: %.2f %.2f\n", coord.xyz.x, coord.xyz.y);

    coord = proj_trans(src, PJ_INV, coord);
    printf("Lat/Lon: %.8f %.8f\n", coord.lp.phi, coord.lp.lam);

    proj_destroy(src);
    proj_destroy(dst);
    return 0;
}
```

Here is a sample script to submit a job to cluster,

```
#!/bin/bash
#SBATCH --job-name=proj_job
#SBATCH --output=proj_job.out
#SBATCH --error=proj_job.err
#SBATCH --partition=main
#SBATCH --qos main
#SBATCH --nodes=1
#SBATCH --ntasks-per-node=1
#SBATCH --cpus-per-task=1
#SBATCH --time=00:05:00

# Load PROJ library
module load physical/proj/6.2.0

# Compile PROJ program
gcc -o proj_program proj_program.c -lproj

# Run PROJ program
./proj_program
```

Where to find help?

If you are confused or need help at any point, please contact OIT at the following address.

<https://ua-app01.ua.edu/researchComputingPortal/public/oitHelp>