Parmetis on HPC

What is Parmetis?

Parmetis is a parallel graph partitioning software library for unstructured graphs. It is designed to partition large graphs into smaller subgraphs that can be processed efficiently on parallel computers. Parmetis uses a combination of graph partitioning algorithms and heuristics to achieve a balance between load balance and communication volume. It can be used in a wide range of applications, such as scientific simulations, network analysis, and data mining. The software is open-source and available for download on the website of the Technical University of Munich.

Links:

Official Website

Manual

Versions Available:

The following versions are available on the cluster:

- parmetis/gcc/shared/4.0.3
- parmetis/gcc/static/4.0.3
- parmetis/intel/shared/4.0.3
- parmetis/intel/static/4.0.3

How to load Parmetis?

To load Parmetis, use the following commands:

```
#Load the Parmetis module
module load parmetis/intel/shared/4.0.3
```

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 intel compiler and parmetis module loaded.

How to use Parmetis?

This parallel software has both command line tool and API which user can access by C or C++ programming language. Here is a basic format of how-to use parmetis using its API,

```
#include <stdio.h>
#include <stdlib.h>
#include <mpi.h>
#include <parmetis.h>

int main(int argc, char **argv) {
    int nvtxs, nparts, edgecut;
    idx_t *xadj, *adjncy, *part;

    MPI_Init(&argc, &argv);
    /* Read graph data from a file */
    /* ... */
    /* Call ParMETIS function to partition the graph */
    ParMETIS_V3_PartKway(xadj, adjncy, NULL, NULL, &nparts, NULL,
NULL, &edgecut, part, &MPI_COMM_WORLD);
    /* Print the partition information */
    /* ... */
    MPI_Finalize();
    return 0;
}
```

Users must link the parmetis library and MPI while compiling. Here is a basic format of slurm script users can use,

```
#!/bin/bash

#SBATCH --job-name=parmetis-run
#SBATCH --nodes=1
#SBATCH --ntasks-per-node=1
#SBATCH --cpus-per-task=24
#SBATCH --time=00:30:00
#SBATCH --partition=your-partition
 #SBATH --qos= your-qos

# Load the module
module load parmetis/intel/shared/4.0.3
 # Compile
srun -n 1 -c $SLURM_CPUS_PER_TASK g++ -I/path/to/mpi/headers -o sample
sample.cpp -lmetis -lparmetis -lm -lpthread

#Execute
srun -n 1 -c $SLURM_CPUS_PER_TASK  mpiexec -np
$SLURM_CPUS_PER_TASK sample
```

Refer to the parmetis manual for more information about API and applications.

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