



Eidgenössische Technische Hochschule Zürich
Swiss Federal Institute of Technology Zurich

High-Performance Computing Lab for CSE

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Discussed with: FULL NAME

Solution for Project 1a

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1. Euler warm-up [10 points]

1.1. Module System

The module system allows Euler users to quickly and easily configure their environment to use centrally installed software package. A detailed description can be found in the Module System documentation.

There are two systems currently in use. The older system is called **Environment Modules** and the newer system is called **LMOD Modules**. All new software installations are done with LMOD Modules.

Listing 1: Euler module system

```
# List all available modules
module avail

# Load a module
module load <module_name>

# list all loaded modules
module list
```

1.2. SLURM

The Euler cluster uses SLURM to manage and schedule jobs. To run a job on the cluster, you need to submit a job script to the SLURM scheduler. A detailed description can be found in the SLURM documentation.

1.3. Hello Euler!

We start by compiling and running a simple C program on the Euler cluster. The program is called `hello_euler.cpp` and should print "Host name: <hostname>" to standard out.

To run the compiled program on the cluster, we need to submit a job script to the SLURM scheduler. The job script is called `hello_euler.slurm` and should look like this:

Listing 2: Hello Euler Job Script

```
#!/bin/bash
#SBATCH --job-name=hello_euler      # Job name      (default: sbatch)
#SBATCH --output=hello_euler.out    # Output file  (default: slurm-%j.out)
#SBATCH --error=hello_euler.err     # Error file   (default: slurm-%j.out)
```

```

#SBATCH --time=00:01:00           # Wall clock time limit
#SBATCH --nodes=1                 # Number of tasks
#SBATCH --ntasks=1               # Number of tasks
#SBATCH --cpus-per-task=1        # Number of CPUs per task
#SBATCH --mem-per-cpu=1024       # Memory per CPU
#SBATCH --constraint=EPYC_9654

```

```

srun hello_euler

```

The job can then be submitted to the SLURM scheduler with the following command:

```

sbatch hello_euler.sh

```

The code and output can be found in the `hello_euler` directory.

2. Performance characteristics [50 points]

2.1. Peak performance

2.2. Memory Hierarchies

2.2.1. Cache and main memory size

2.3. Bandwidth: STREAM benchmark

2.4. Performance model: A simple roofline model