PARADE

Parallel Development Environment for HPC

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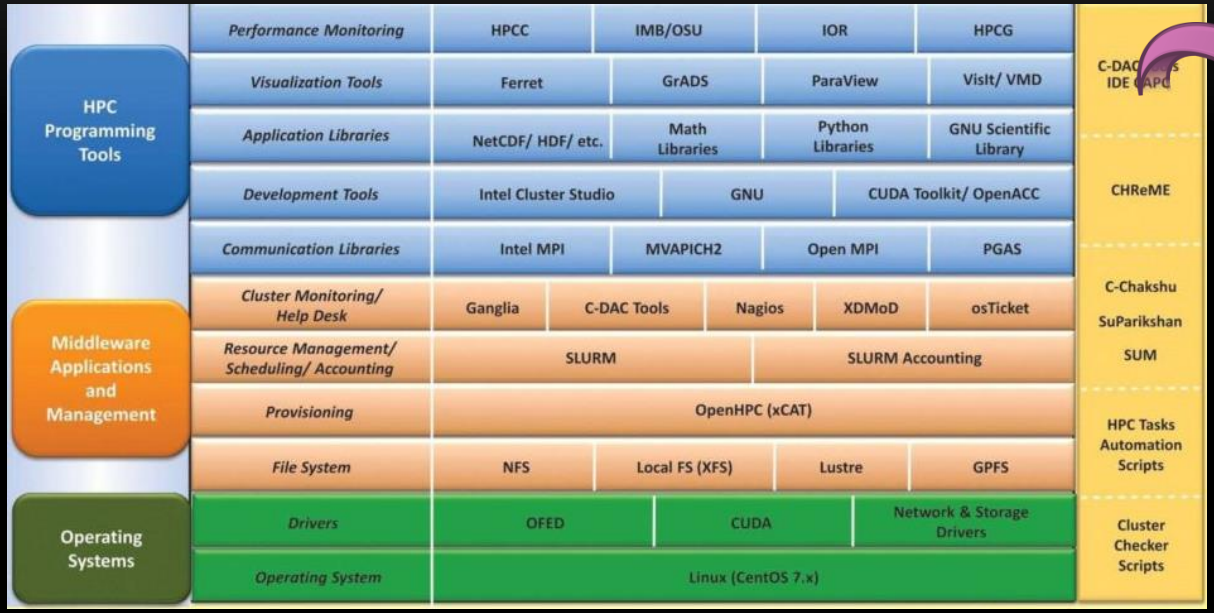
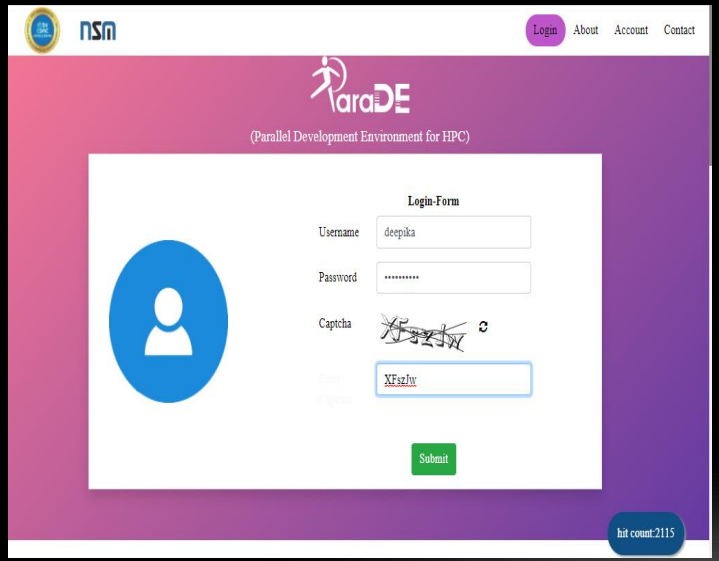
PARAM SOFTWARE STACK



ParaDE URL on Pravega :: https://parampravega.iisc.ac.in:8447/parade

ParaDE

- Integrated Development Environment for HPC



- Browser based IDE
- No installation the client machine
- Single interface for application development

WORKING ENVIRONMENT IN HPC

Using Command-line !!

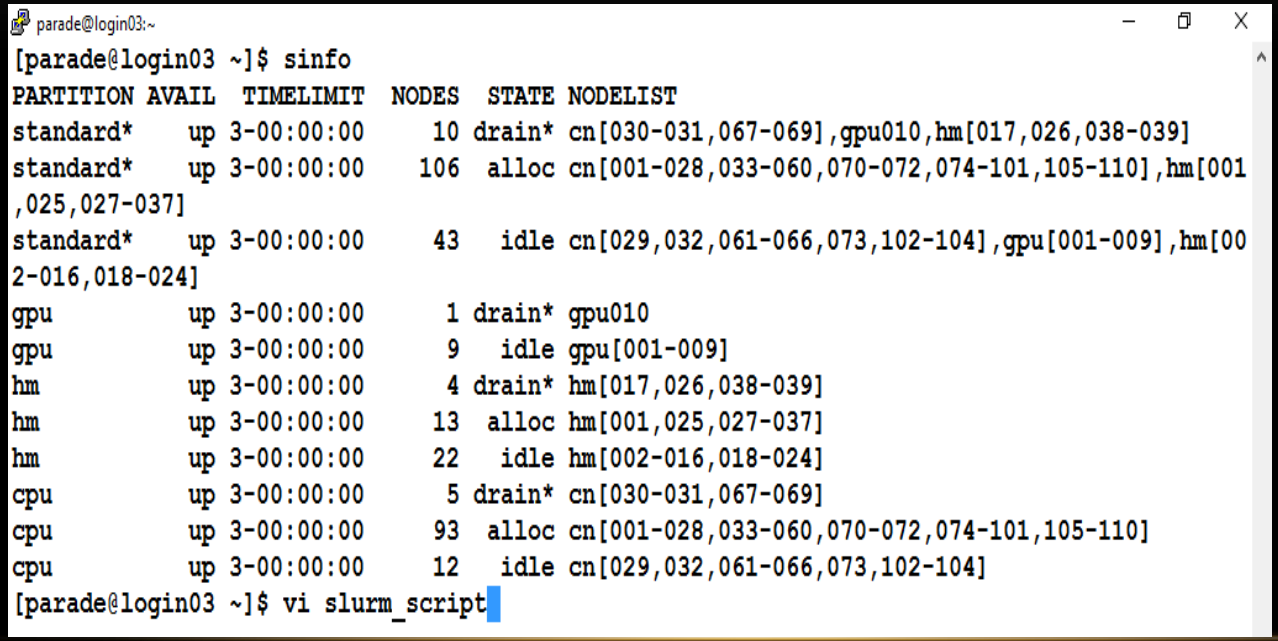
Login to the HPC Cluster

```
parade@login03:~
login as: parade
Using keyboard-interactive authentication.
If you truly desire access to this host, then you must indulge me in a simple challenge.
---------------------------------------------------------------

Observe the picture below and answer the question listed afterwards:

 _ _ _ _ _ _ _ _ _
 /\ /\ /\ /\ /\ /\ /\ /\ /\
( A | k | x | Q | E | f | O | n )
 \_/ \_/ \_/ \_/ \_/ \_/ \_/ \_/

Type the string above: AkxQEfOn
Using keyboard-interactive authentication.
Password:
Last login: Wed Apr 20 17:43:58 2022 from deepika-workstation.blr.cdac.in
[parade@login03 ~]$ vi pi-calulation.c
```

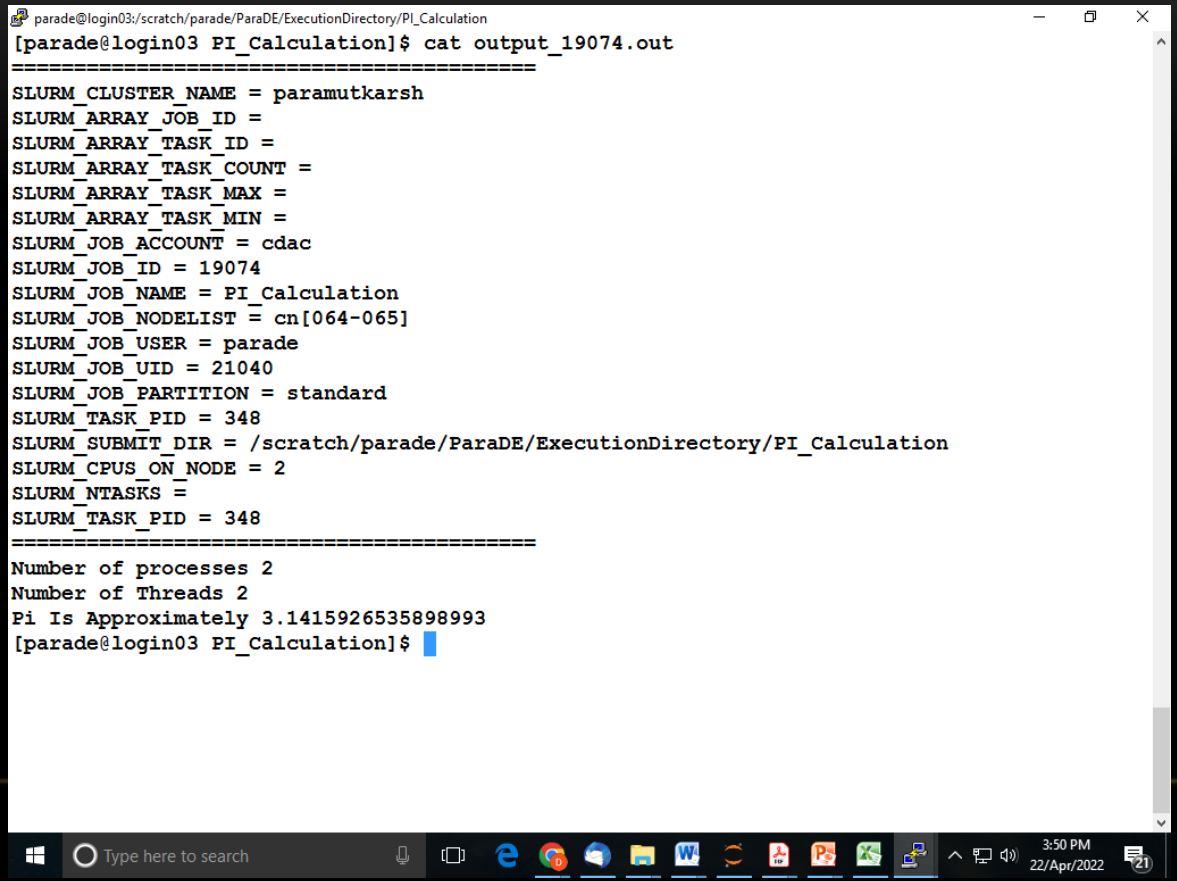
```
parade@login03:~
[parade@login03 ~]$ module avail

-------------------------------- /opt/ohpc/pub/modulefiles --------------------------------
   EasyBuild/3.9.4                          oneapi/compiler32/2021.2.0
   apps/mom_6/intel_18.2                    oneapi/dal/2021.2.0
   apps/mpiblast/1.6.0/intel_18.2           oneapi/debugger/10.1.1
   apps/roms/3.6/intel_18                   oneapi/dev-utilities/2021.2.0
   autotools                                oneapi/dnnl-cpu-gomp/2021.2.0
   charliecloud/0.11                        oneapi/dnnl-cpu-iomp/2021.2.0
   charliecloud/0.22                (D)     oneapi/dnnl-cpu-tbb/2021.2.0
   clustershell/1.8.2                       oneapi/dnnl/2021.2.0
   cmake/3.15.4                             oneapi/dpct/2021.2.0
   compiler/hpc_sdk/nvhpc/21.7              oneapi/dpl/2021.2.0
   compiler/intel/2017.7.259                oneapi/init_opencl/2021.2.0
   compiler/intel/2018.4.057                oneapi/inspector/2021.2.0
   compiler/intel/2019.5.281                oneapi/intel_ipp_ia32/2021.2.0
   compiler/intel/2020.4.304        (D)     oneapi/intel_ipp_intel64/2021.2.0
   cuda/7.5                                 oneapi/intel_ippcp_ia32/2021.2.0
   cuda/8.0                                 oneapi/intel_ippcp_intel64/2021.2.0
   cuda/9.0                                 oneapi/itac/latest
   cuda/9.2                                 oneapi/itac/2021.2.0             (D)
   cuda/10.0                                oneapi/mkl/latest
   cuda/10.1                                oneapi/mkl/2021.2.0              (D)
   cuda/10.2                                oneapi/mkl32/2021.2.0
   cuda/11.2                        (D)     oneapi/mpi/2021.2.0
   gcc/8.2.0                                oneapi/oclfpga/2021.2.0
   gnu8/8.3.0                               oneapi/tbb/2021.2.0
   hwloc/2.1.0                              oneapi/tbb32/2021.2.0
   intel/18.0.5.274                         oneapi/vpl/2021.2.2
   lib/netcdf_c/4.3.3.1/intel_18            oneapi/vtune/2021.2.0
   lib/netcdf_fortran/4.4.0/intel_18        openmpi/3.1.5
   lib/parallel_hdf5/1.8.21/intel_18        openmpi/4.0.5
```

- Write code on editor or import existing code to the cluster
- Search for compatible compilers and libraries to compile
- Now compile and create executable

- Understand the submission process on the cluster
- Create a LRM based script to execute the application



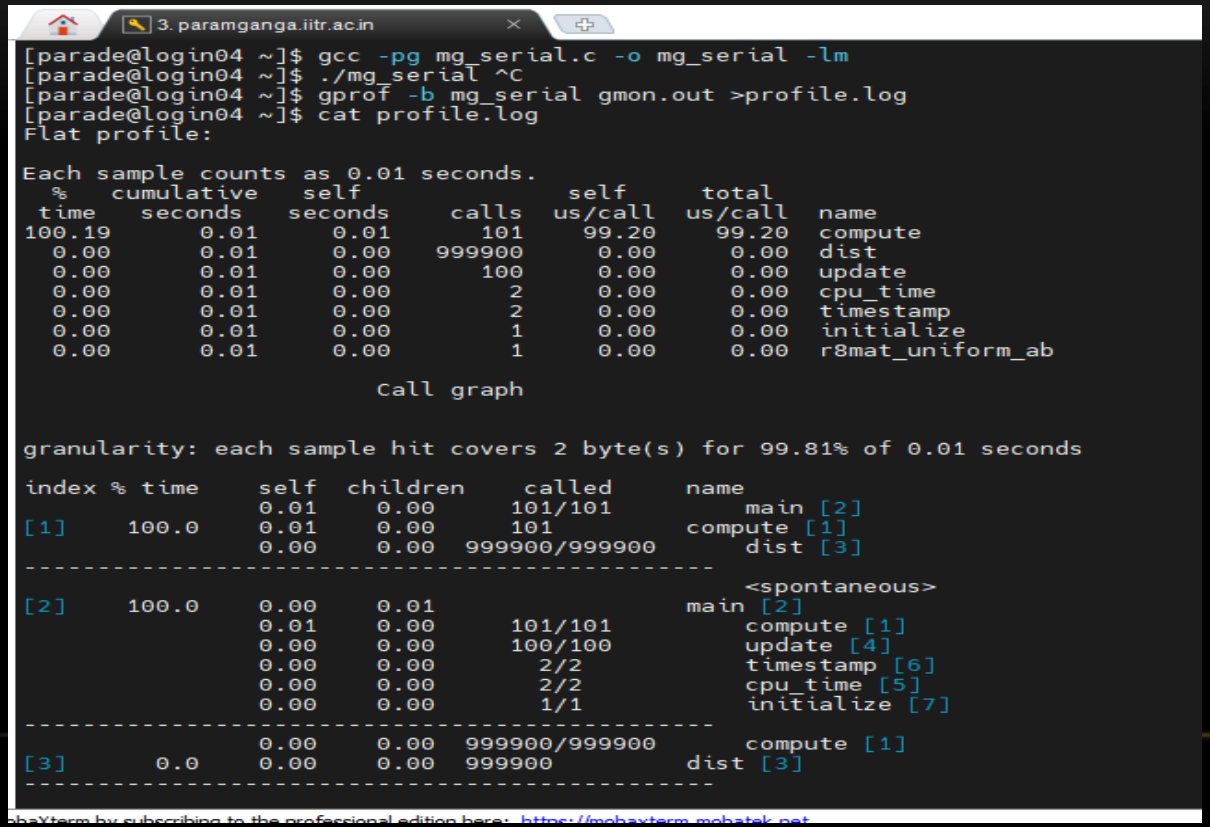
View the result and optimize if required



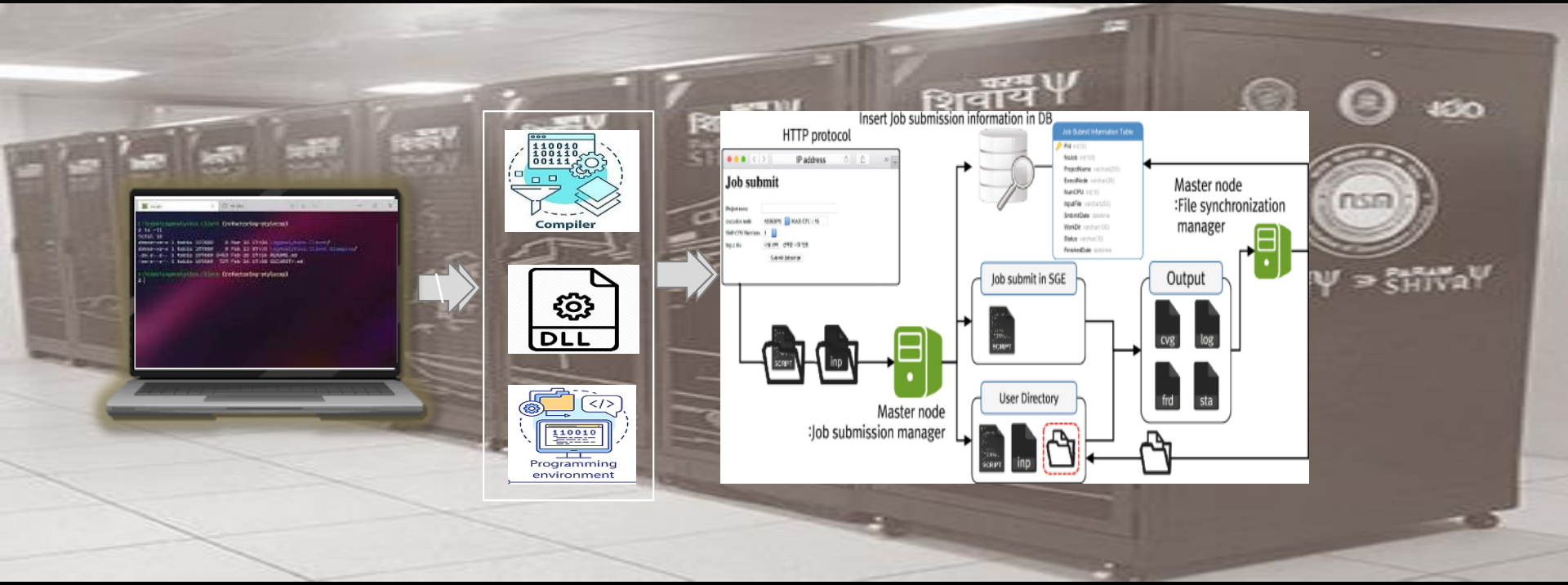
Debug code in case of errors

```
parade@login03:~
ib64/qt-3.3/bin:/usr/local/bin:/usr/bin:/usr/local/sbin:/usr/sbin:/home/parade/.local/bin:/
home/parade/bin)
[parade@login03 ~]$ module load compiler/intel/2020.4.304
[parade@login03 ~]$ mpicc test_mpi.c -g -o test_mpi
[parade@login03 ~]$ gdb ./test_mpi
GNU gdb (GDB) Red Hat Enterprise Linux 7.6.1-120.el7
Copyright (C) 2013 Free Software Foundation, Inc.
License GPLv3+: GNU GPL version 3 or later <http://gnu.org/licenses/gpl.html>
This is free software: you are free to change and redistribute it.
There is NO WARRANTY, to the extent permitted by law.  Type "show copying"
and "show warranty" for details.
This GDB was configured as "x86_64-redhat-linux-gnu".
For bug reporting instructions, please see:
<http://www.gnu.org/software/gdb/bugs/>...
Reading symbols from /home/parade/test_mpi...done.
(gdb) b main
Breakpoint 1 at 0x4008a5: file test_mpi.c, line 6.
(gdb) r
Starting program: /home/parade/./test_mpi
[Thread debugging using libthread_db enabled]
Using host libthread_db library "/lib64/libthread_db.so.1".

Breakpoint 1, main (argc=1, argv=0x7fffffffcd18) at test_mpi.c:6
6           MPI_Init(NULL, NULL);
Missing separate debuginfos, use: debuginfo-install glibc-2.17-324.el7_9.x86_64 libgcc-4.8.
5-44.el7.x86_64
(gdb) n
10          MPI_Comm_size(MPI_COMM_WORLD, &world_size);
Missing separate debuginfos, use: debuginfo-install libibverbs-54mlnx1-1.54103.x86_64 libnl
3-3.2.28-4.el7.x86_64 librdmacm-54mlnx1-1.54103.x86_64 numactl-libs-2.0.12-5.el7.x86_64 ucx
-1.11.0-1.54103.x86_64 zlib-1.2.7-19.el7_9.x86_64
(gdb)
```

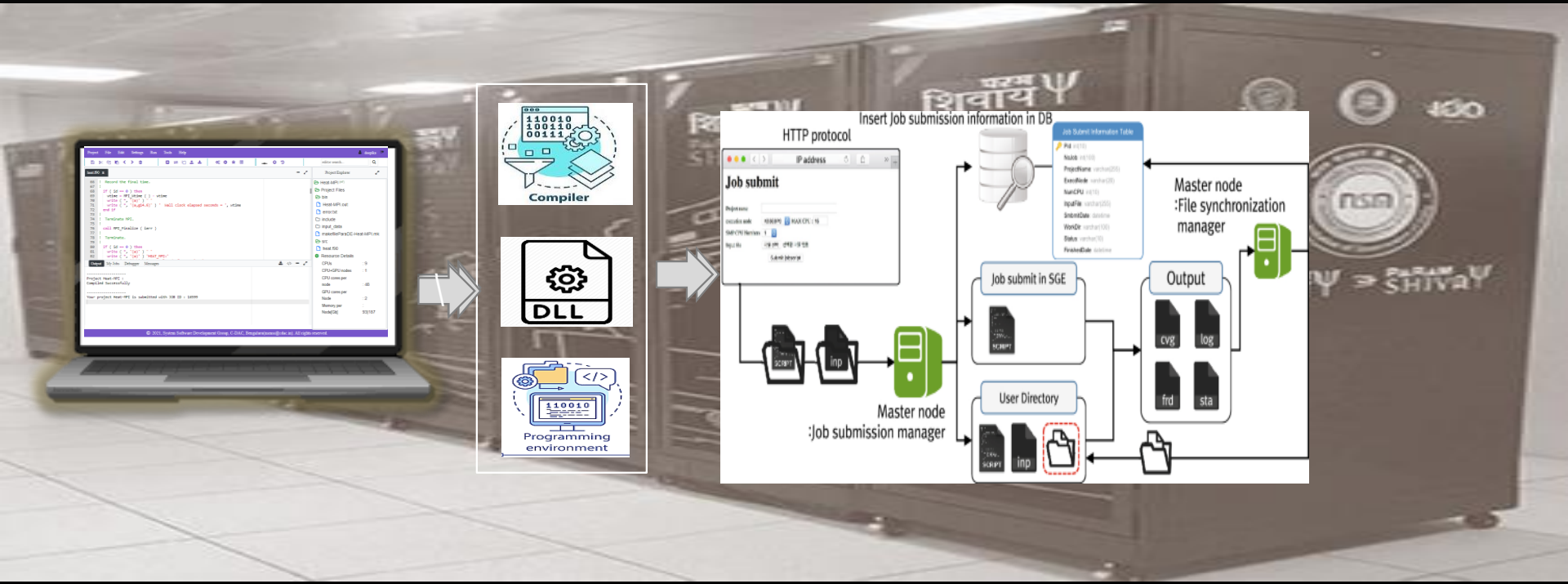
- Profile the code to analyze the program for decreasing the execution time



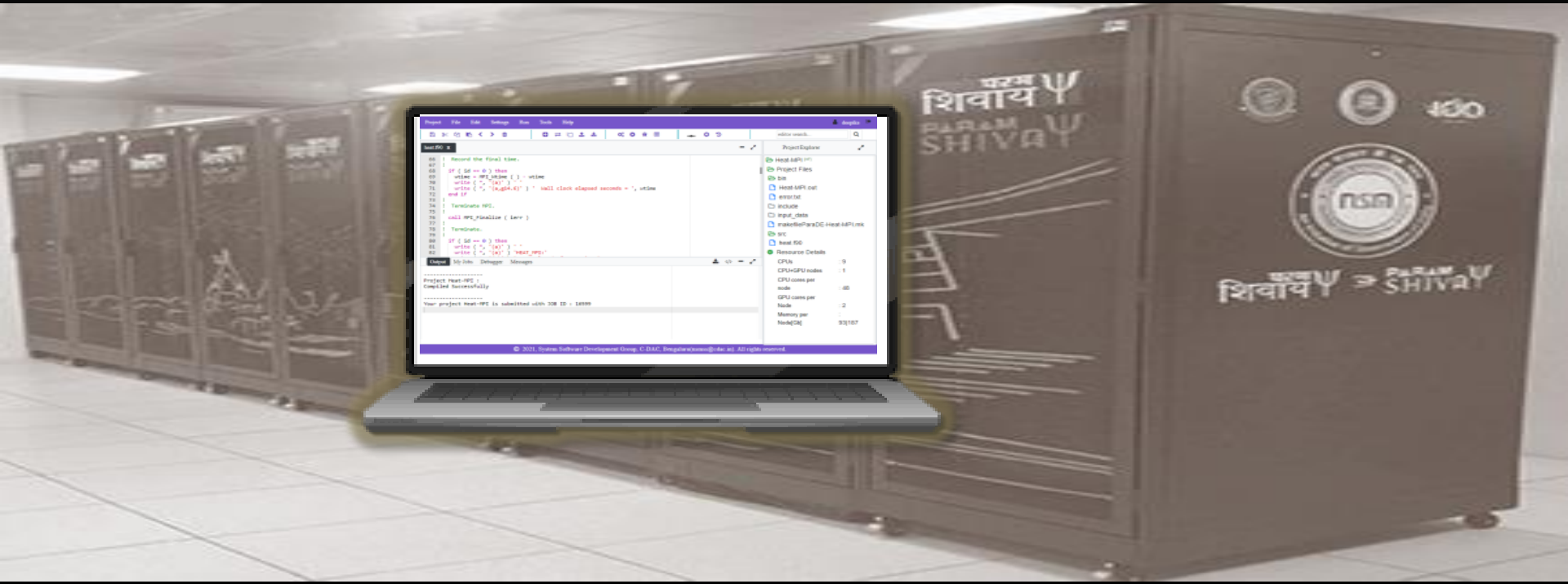
PROGRAMMING ON A SUPERCOMPUTER

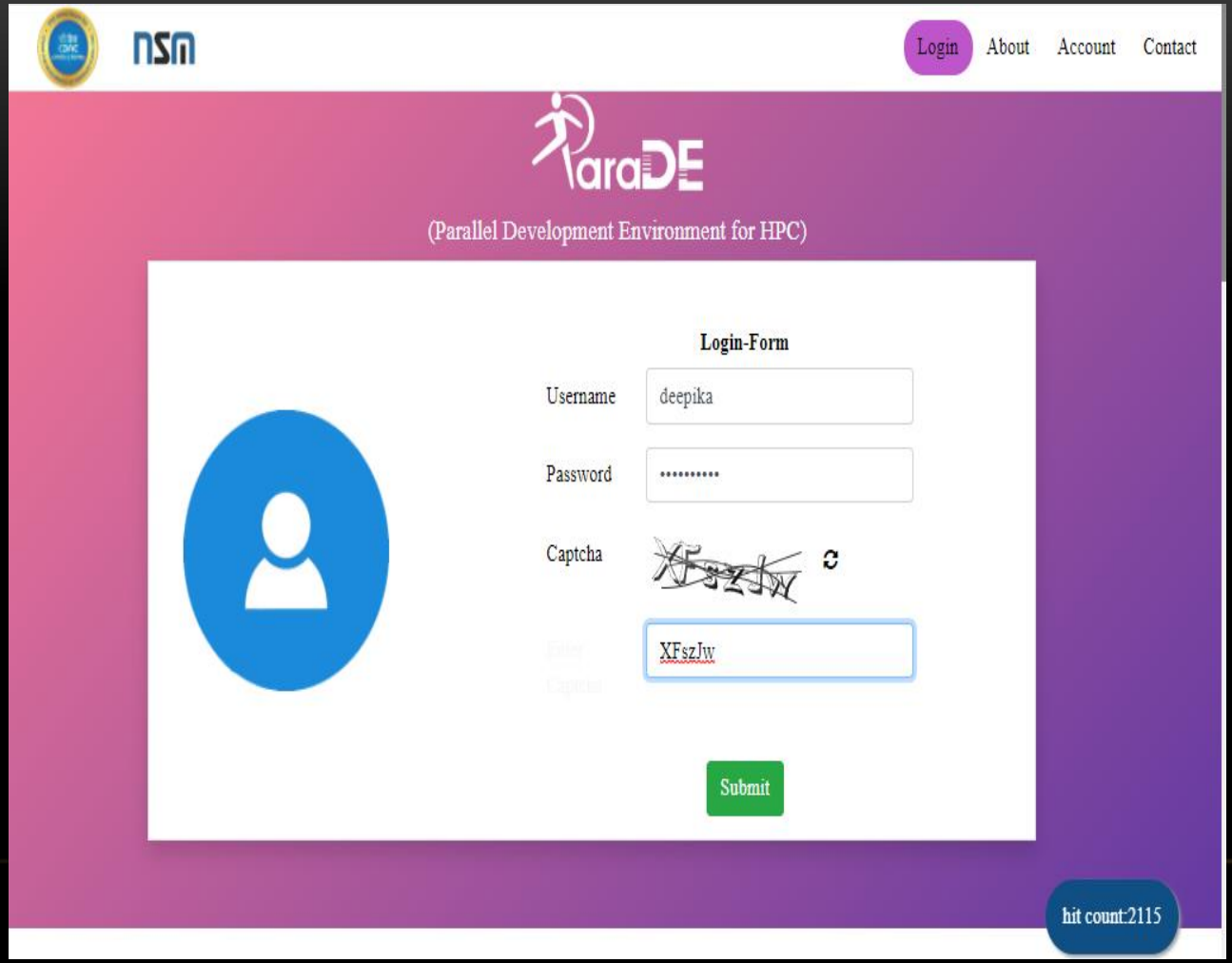


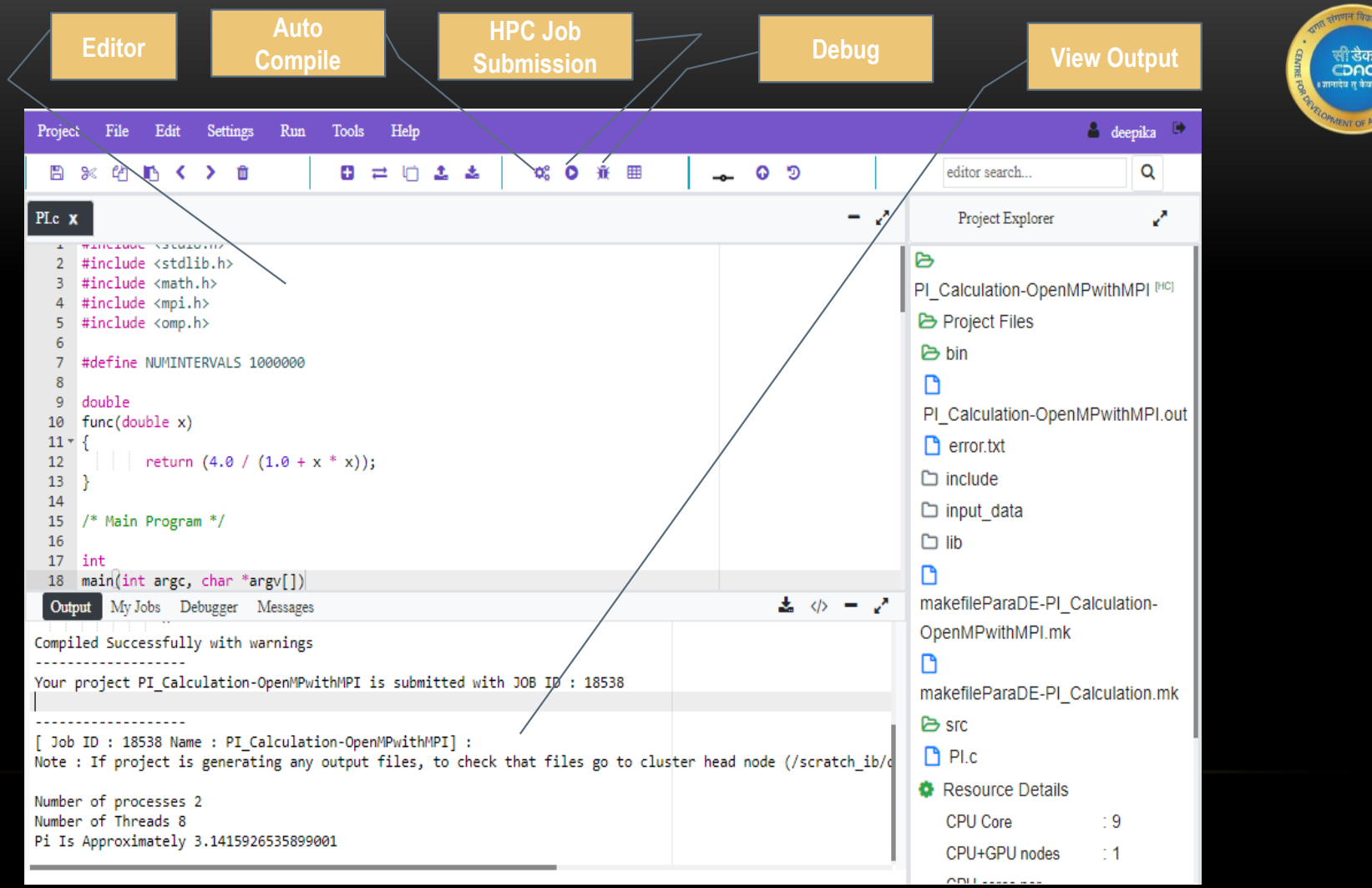
PROGRAMMING ON A SUPERCOMPUTER USING PARADE



PROGRAMMING ON A SUPERCOMPUTER USING ParaDE




NSM
Login
About
Account
Contact
ParaDE
(Parallel Development Environment for HPC)
Login-Form
Username
deepika
Password
Captcha
XFszJw
Submit
hit count:2115


Editor
Auto Compile
HPC Job Submission
Debug
View Output
Project File Edit Settings Run Tools Help
deepika
editor search...
PI.c x
#include <stdlib.h>
#include <math.h>
#include <mpi.h>
#include <omp.h>
#define NUMINTERVALS 1000000
double
func(double x)
{
return (4.0 / (1.0 + x * x));
}
/* Main Program */
int
main(int argc, char *argv[])
Output My Jobs Debugger Messages
Compiled Successfully with warnings
Your project PI_Calculation-OpenMPwithMPI is submitted with JOB ID : 18538
[Job ID : 18538 Name : PI_Calculation-OpenMPwithMPI] :
Note : If project is generating any output files, to check that files go to cluster head node (/scratch_ib/
Number of processes 2
Number of Threads 8
Pi Is Approximately 3.1415926535899001
Project Explorer
PI_Calculation-OpenMPwithMPI [HC]
Project Files
bin
PI_Calculation-OpenMPwithMPI.out
error.txt
include
input_data
lib
makefileParaDE-PI_Calculation-OpenMPwithMPI.mk
makefileParaDE-PI_Calculation.mk
src
PI.c
Resource Details
CPU Core : 9
CPU+GPU nodes : 1

DEMO

ParaDE URL :: https://parampravega.iisc.ac.in:8447/parade

FEATURES OF PARADE

Debuggers, Profiler, Converter, Libraries, etc

Auto Compile

HPC Job Submission

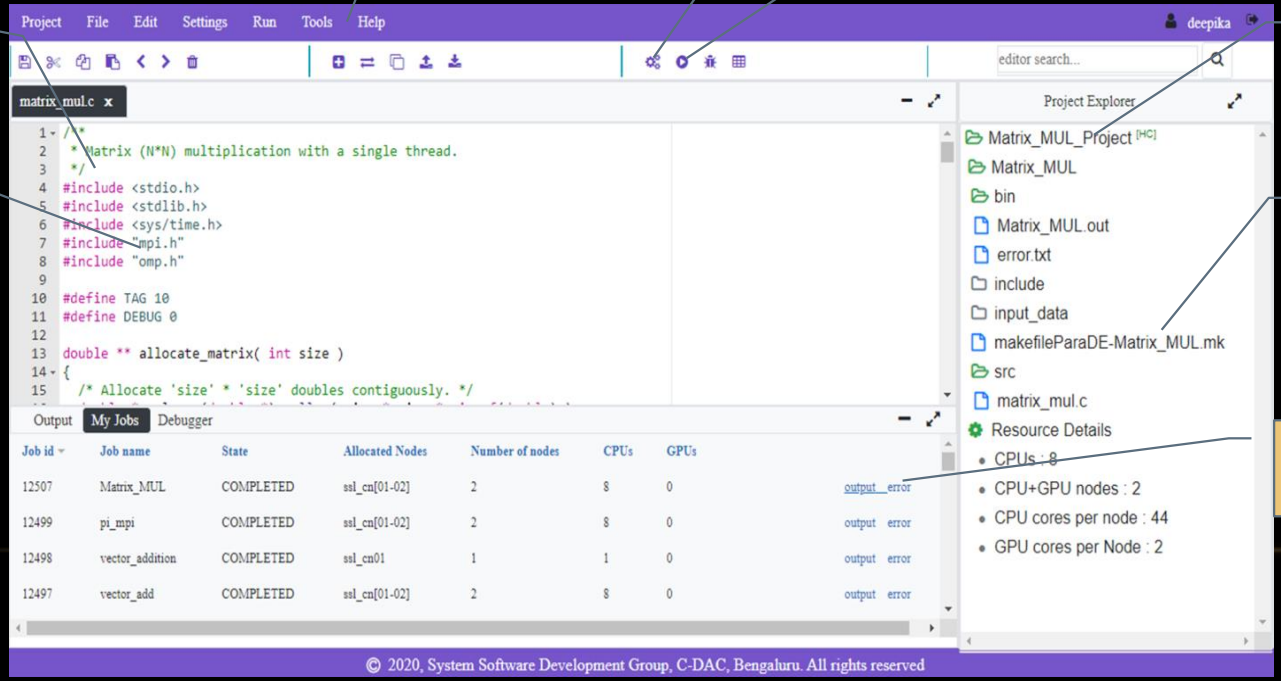
Context Sensitive Editor

Project Management

Multiple Parallel Paradigms

Automatic Makefile Generation

Output/Error Viewing



IDE FOR HPC

- Anytime
- Anywhere
- Single interface for HPC programming

Make your life easy on HPC

Contact : nsmss@cdac.in

ParaDE URL :: https://parampravega.iisc.ac.in:8447/parade

THANK YOU

Email : nsmss@cdac.in