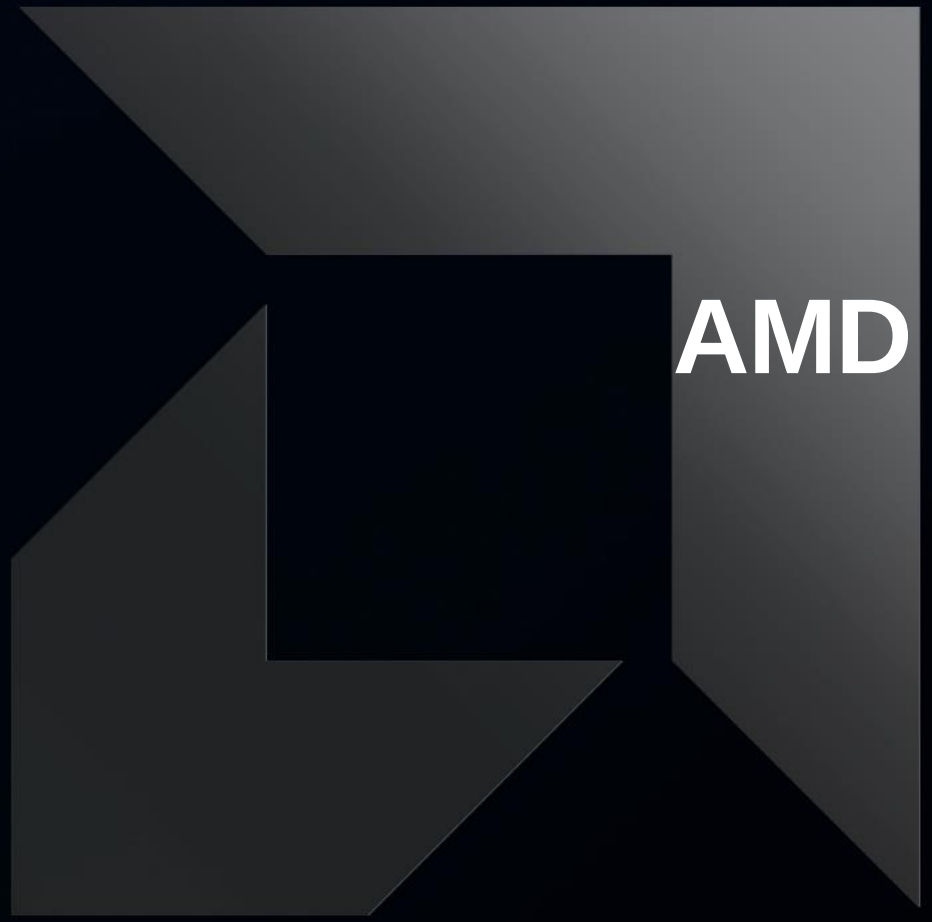

AMD Presentation Roadmap

DiRAC Pre-Hackathon
Gina Sitaraman, Bob Robey,
Giacomo Capodaglio and Thomas Gibson
Data Center GPUs, AMD

AMD
together we advance_

Training Workshop Guidelines – help us create a positive environment

Please help us create a positive collaborative environment for this event. Our top goal is to attract and build the community in high performance computing. Please consider not only the technical aspects of your interactions, but also how it affects other participants.

- Start your comments with a positive statement before your comment or question
- Give equal time to all participants
- Please, help others with technical issues and without negative comments
- And most importantly, respect all participants, regardless of background, language, culture

Day 1 Schedule – Tuesday, 11 March 2025

Time (GMT)	Topic	Presenter
13:00	DiRAC Introduction	
13:10	AMD Presentation Roadmap and Introduction to System for Exercises	Bob Robey
13:30	APU Programming Model	Bob Robey
13:50	Programming Model Exercises	Bob Robey
14:00	Break	
14:10	Introduction to OpenMP® Offloading	Giacomo Capodaglio
14:40	OpenMP® Exercises	Giacomo Capodaglio
14:55	Break	
15:10	Real-World OpenMP® Language Constructs	Giacomo Capodaglio
16:10	OpenMP® Language Constructs Exercises	Giacomo Capodaglio
16:25	Advanced OpenMP® – debugging and optimization	Bob Robey
16:40	Advanced OpenMP® Exercises	Bob Robey
16:55	Wrap-up	Bob Robey

Day 2 Schedule – Wednesday, 12 March 2025

Time (CET)	Topic	Presenter
13:00	HIP and ROCm	Thomas Gibson
13:40	HIP and ROCm Exercises	Thomas Gibson
13:50	Porting code to HIP and Portable Build System	Bob Robey
14:10	HIP Exercises	Bob Robey
14:30	Break	
14:40	Optimizing HIP Code	Gina Sitaraman
15:00	HIP Optimization Exercises	Gina Sitaraman
15:10	Break	
15:20	OpenMP® and HIP Interoperability	Bob Robey
15:40	Interoperability Exercises	Bob Robey
16:00	Intro to ML/AI Exercises	Giacomo Capodaglio
16:40	ML/AI Exercises	Giacomo Capodaglio
16:55	Wrap-up	Bob Robey

Day 3 Schedule – Thursday, 13 March 2025

Time (GMT)	Topic	Presenter
13:00	Timeline profiling with Rocprof and Rocprof-sys	Gina Sitaraman
13:40	Timeline Exercises	Gina Sitaraman
14:00	Break	
14:10	Kernel profiling with Rocprof and Rocprof-compute	Gina Sitaraman
14:45	Kernel Profiling Exercises	Gina Sitaraman
15:00	Overview of Other Tools – AMD and HPC Community	Bob Robey
15:30	HPC Community Tool Exercises	Bob Robey
16:10	AI Programming Assistant	Giacomo Capodaglio
16:45	Additional Training Resources	Bob Robey
16:55	Wrap-up	Bob Robey

Notes

- Bob Robey, Bob.Robey@amd.com
- Gina Sitaraman, Gina.Sitaraman@amd.com
- Giacomo Capodaglio, Giacomo.Capodaglio@amd.com
- Thomas Gibson, thomas.gibson@amd.com

- Hands-on Exercises – two locations
  - On the web: git clone https://github.com/AMD/HPCTrainingExamples
  - On the AAC system: directory /Shared/HPCTrainingExamples – copy the directory with
    - mkdir HPCTrainingExamples && cp –r /Shared/HPCTrainingExamples/* HPCTrainingExamples

Introduction to AMD Accelerator Cloud (AAC) for Exercises

AAC notes

- You should have gotten an invite to participate in the workshop
  - Problems, request support by email to Bob.Robey@amd.com, Giacomo.Capodaglio@amd.com or in the Slack channel
- AMD Accelerator Cloud (AAC) Training Container
  - Ubuntu® 22.04
  - ROCm version 6.3.3
  - GCC is version 11
  - Clang/LLVM is version 18

File spaces

- Home Directory
  - Persistent storage is at `/home/aac/shared/teams/dcgpu_training/dirac/$USER. Your home directory will be set to this directory.
  - $HOME=/ home/aac/shared/teams/dcgpu_training/dirac/$USER
  - Files in your home directory should persist across container restarts and be available from another container with the same userid on systems at the same hosting location.

Logging into AAC

- Accessing AAC
- ssh USERNAME@aac6.amd.com -p <###>

- To simplify the login to AAC, you can add the following to your .ssh/config file.

- # AAC
  - Host aac
  - User <USERNAME>
  - Hostname aac1.amd.com
  - #IdentityFile <path>/<private key file> # customize location of key file
  - IdentityFile id_ed25519 # file is in .ssh directory
  - ServerAliveInterval 600
  - ServerAliveCountMax 30

- The ServerAlive* lines in the config file may be added to avoid timeouts when idle.

- Now you can login with ssh aac -p <###>

File copying

You should be able to copy files in or out with the `scp` command.

- In: `scp -i <path>/<keyfile> -P #### <file> USER@aac6.amd.com:~/<path>/<file>`
- Out: `scp -i <path>/<keyfile> -P #### USER@aac6.amd.com:~/path/to/your/file ./`

You can also use `rsync` command

- `rsync -avz -e "ssh -i <path>/<keyfile> -p ####" <file> <USER>@aac6.amd.com:~/path/to/your/files`

Environment -- modules

Modules using Lua modules

- Linux®
  - clang/14-15 -- Clang/LLVM standard compiler installations
  - gcc/11-13 -- GCC standard compiler installations with offload modules
  - miniconda3/24.9.2 – Python™ environment
  - Miniforge3/24.9.0 – alternate Python™ environment
- ROCm
  - rocm/6.3.3 -- ROCm software stack including hip and hip libraries
  - amdclang/18.0.0-6.3.3 -- OpenMP® compiler
  - hipfort/6.3.3-- Fortran wrappers for hip calls
  - opencl/6.3.3 – OpenCL™ language
  - rocprofiler-compute/6.3.3 Kernel profiler, built-in version
  - rocprofiler-systems/6.3.3 Timeline profiler, built-in version
- ROCmPlus -- MPI
  - openmpi/5.0.7-ucc1.3.0-ucx1.18.0 – OpenMPI with GPU-aware MPI
  - mvapich2/3.0 – MVAPICH with GPU-aware MPI – install not working on Ubuntu®
    mpi4py/4.0.1 – python interface to MPI

Environment -- modules

Modules using Lua modules

- ROCmPlus -- Latest Compilers
  - amdflang-new-beta-drop/rocm-afar-7110-drop-5.3.0 -- AMD Next Gen Fortran compiler
  - aomp/amdclang-19.0
  - hipfort/6.3.3
- ROCmPlus-AI
  - cupy/14.0.0a1
  - jax/0.4.35
  - pytorch/2.6.0
- Misc
  - fftw/3.3.10
  - hdf5/1.14.5
  - hipifly/dev
  - hpctoolkit/2024.11.27dev
  - kokkos/4.5.01
  - netcdf-c/4.9.3-rc1
  - netcdf-fortran/4.6.2-rc1
  - scorep/9.0-dev
  - tau/dev

Environment -- modules

Modules using Lua modules

- ROCmPlus -- Latest Compilers
  - amdflang-new-beta-drop

    AMD is working on a Fortran compiler and soon will include it in ROCm. During the training, **DiRAC will have hands-on access to the beta**. The beta itself contains early access to open-sourced pre-release features. Going forward, AMD is able to provide continued early access via AFARs (Advanced Feature Access Releases) as improvements and features are added to the beta. As with any beta, we looking to gather feedback on functionality, usability and user experience.

PRE-PRODUCTION SOFTWARE: The software accessible on this page may be a pre-production version, intended to provide advance access to features that may or may not eventually be included into production version of the software. Accordingly, pre-production software may not be fully functional, may contain errors, and may have reduced or different security, privacy, accessibility, availability, and reliability standards relative to production versions of the software. Use of pre-production software may result in unexpected results, loss of data, project delays or other unpredictable damage or loss. Pre-production software is not intended for use in production, and your use of pre-production software is at your own risk.

Environment -- modules

Modules using Lua modules

Compiler modules set the CC, CXX, FC flags. Only one compiler module can be loaded at a time. hipcc is in the path when the rocm module is loaded.

Module commands

- module avail
- module load <package>
- module unload <package>

Environment -- Slurm

Slurm configuration with single queue LocalQ

sinfo

```
| PARTITION | AVAIL  | TIMELIMIT | NODES | STATE | NODELIST   |
|-----------|--------|-----------|-------|-------|------------|
| LocalQ    |  up    | 2:00:00   | 1     | idle  | localhost  |
```

Slurm commands

- salloc can be used to schedule a long-term interactive session
- sbatch is used to submit a job to the batch queue
- squeue will show the jobs running in the batch queue

- The slurm configuration is sort of a combination of a login node and backend compute resources
  - Queue resources are the same as the local node
  - GPUs are still available without going through Slurm

Installed software

- emacs
- vim
- autotools
- cmake
- tmux
- boost
- eigen
- fftw
- gmp
- gsl
- hdf5-openmpi
- lapack
- magma
- matplotlib
- parmetis
- mpfr
- mpi4py
- openblas
- openssl
- swig
- numpy
- scipy
- h5sparse

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