

Clang for NVIDIA Grace CPU

Release Notes 19.24.10

Document History

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Version	Date	Authors	Description of Change
4	Nov, 2024	NVIDIA	Update for 19.24.10 release
3	May, 2024	NVIDIA	Update for 18.24.05 release
2	November, 2023	NVIDIA	Update for 17.23.11 release
1	August, 2023	NVIDIA	Initial release

Table of Contents

Overview 4
- Release Deliverables 4
  - OS Distribution Matrix 4
- Dependencies 5
- New Features 5
- Getting Started 6
  - Ubuntu: 6
  - Tarballs 6
  - Testing the installation 7
  - Known Issues and Limitations 7
- FAQ 7
  - Report Issues 8
  - References 8

Overview

This package is NVIDIA®'s build of Clang for the NVIDIA Grace™ CPU. It is based on v19.1.1 of the LLVM™ repository. This has experimental host compiler support for NVIDIA® CUDA® on Grace Hopper™.

Release Deliverables

This build of Clang for Grace CPUs is suitable for building C or C++ applications on GNU/Linux systems.

- C compiler driver binary - clang
- C++ compiler driver binary - clang++
- LLVM Linker - lld (Default linker)
- OpenMP Runtime support - libomp

OS Distribution Matrix

Architecture	Linux Distributions	CUDA Toolkit
AArch64	Ubuntu 22.04 RHEL 9 CentOS 9 SLES 15-SP4	12.6 U3 (See Feature list)

Dependencies

This package is designed to be executed on GNU/Linux OS platforms and distributions. The dependencies on the system are listed in the table below:

Dependency	Notes
TBB	Install the appropriate package of oneTBB or libtbb that works with the C++ runtime package on your distribution. This is required if your workload incorporates features from stdpar in c++17.
libstdc++	Developer package of libstdc++ for the appropriate Linux distribution you are using. On Ubuntu or Debian this would be the libstdc++-developer package. On RHEL and SLES, this would be the libstdc++-developer package.
libpython	Version 3.11. This is required for being able to provide the relevant integration between the OpenMP runtime and GDB as with the scripts in the `share/gdb/python/ompd` directory in the release package.

New Features

- The compiler binaries have been optimized to improve compile-time performance. LLVM compilation can be up to 15% faster compared to a non-compiletime optimized clang build on the Grace CPU.
- Experimental CUDA Support - To use this experimentally with CUDA, users are expected to add `-allow-unsupported-compiler` option to NVCC in their build systems. This release of the clang binaries has been tested lightly with this option with CUDA 12.6 U3. We expect full support with a future release of the CUDA Toolkit.

Getting Started

Ubuntu:

- Download the Debian (.deb) package from: www.developer.nvidia.com/grace/clang
- Install the package as:

```
apt install /path/to/clang-grace-toolchain_19.24.10_arm64.deb
```

  - The default installation location is:

```
/opt/nvidia/clang/19.24.10
```

  - The user can change the install location using `-x` option to `dpkg-deb`. For example,

```
dpkg-deb -x clang-grace-toolchain_19.24.10_arm64.deb /home/username/install
```

RHEL/SLES/CentOS:

- Download the RPM (.rpm) package from: www.developer.nvidia.com/grace/clang
- Use the appropriate packaging tool (yum, dnf or zypper) depending on the distribution to install. For example:

```
if [ -f /etc/redhat-release ]; then
   PACKAGING_TOOL = dnf
else
   PACKAGING_TOOL = zypper
fi
```

- Install the package as:

```
${PACKAGING_TOOL} install clang-grace-toolchain-19.24.10-1.aarch64.rpm
```

Tarballs

- Unpack the downloaded tar file using the standard tar utility on the system:

```
tar xvzf clang-grace-toolchain-19.24.10.tgz -C <path>
```

NB: If you install the compiler using OS packages, the installation happens under the directory named after the compiler version. Thus, two versions of the compiler can co-exist.

Testing the installation

- You can verify if your installation is clean by compiling a simple HelloWorld C++ program.

```
#include <iostream>
int main() {
  std::cout << "Hello World\n";
  return 0;
}
```

- The above code should compile without error with the installed Clang.

For example:

```
<installation_path>/bin/clang++ HelloWorld.cpp
```

should not result in any compiler or linker error.

Known Issues and Limitations

- stdpar with C++17 has not been validated with this release.
- OpenMP target offloading has been disabled in this release.

FAQ

1. How can a user set defaults at installation time to target NVIDIA Grace CPU?

Answer: A user can default to Neoverse-V2 CPU with Clang using the configuration files mentioned in the references (1) section.

For example:

```
$> cat grace.config
-mcpu=neoverse-v2
```

The user can invoke Clang as shown in the example command below to default to generating code for the Grace CPU.

```
$> clang --config grace.config file.cpp
```

Such a config file can be used to extend any further default options one might want to deploy in the installation.

2. How can a developer use a different linker than the one shipped in the package?

Answer: The Clang shipped in the package defaults to lld as the linker. The Clang driver will pick up `lld` from the bin/ directory in the installation location. However, the user can override the default linker using the `-fuse-ld=<linker>` option.

For example, to use the GNU `ld` located in `/usr/bin/`, you can use the following command:

```
$> clang -fuse-ld=/usr/bin/ld file.cpp
```

Report Issues

We would love to hear back from you. Please report issues and provide feedback through grace-compiler-feedback@nvidia.com.

References

1. Clang configuration files: https://clang.llvm.org/docs/UsersManual.html#configuration-files
2. Release notes for upstream components:

    - Clang Release Notes
    - LLVM Release Notes
    - LLD Release Notes

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