



# NVIDIA HPC SDK RELEASE NOTES

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# Chapter 1.

## WHAT'S NEW

Welcome to the 21.9 version of the NVIDIA HPC SDK, a comprehensive suite of compilers and libraries enabling developers to program the entire HPC platform, from the GPU foundation to the CPU and out through the interconnect.

Key features that are new in this release of the NVIDIA HPC SDK for Linux include:

- ▶ Important performance enhancements and bug fixes are included in all components updated for the 21.9 release of the HPC SDK.
- ▶ The NVIDIA HPC SDK now includes versions 11.4 Update 1, 11.0, and 10.2 of the CUDA toolchain.

# Chapter 2.

## RELEASE COMPONENT VERSIONS

The NVIDIA HPC SDK 21.9 release contains the following versions of each component:

Table 1 HPC SDK Release Components

	Linux_x86_64			Linux_ppc64le			Linux_aarch64		
	CUDA 10.2	CUDA 11.0	CUDA 11.4	CUDA 10.2	CUDA 11.0	CUDA 11.4	CUDA 10.2	CUDA 11.0	CUDA 11.4
nvc++	21.9			21.9			21.9		
nvc	21.9			21.9			21.9		
nvfortran	21.9			21.9			21.9		
nvcc	10.2.89	11.0.221	11.4.408	10.2.89	11.0.228	11.4.408	N/A	11.0.228	11.4.408
NCCL	2.11.4	2.11.4	2.11.4	2.11.4	2.11.4	2.11.4	N/A	2.11.4	2.11.4
NVSHMEM	2.2.1	2.2.1	2.2.1	2.2.1	2.2.1	2.2.1	N/A	N/A	N/A
cuBLAS	10.2.2.89	11.2.0.252	11.5.4.8	10.2.2.89	11.2.0.252	11.5.4.8	N/A	11.2.0.252	11.5.4.8
cuFFT	10.1.2.89	10.2.1.245	10.5.2.100	10.1.2.89	10.2.1.245	10.5.2.100	N/A	10.2.1.245	10.5.2.100
cuRAND	10.1.2.89	10.2.1.245	10.2.5.100	10.1.2.89	10.2.1.245	10.2.5.100	N/A	10.2.1.245	10.2.5.100
cuSOLVER	10.3.0.89	10.6.0.245	11.2.0.100	10.3.0.89	10.6.0.245	11.2.0.100	N/A	10.6.0.245	11.2.0.100
cuSPARSE	10.3.1.89	11.1.1.245	11.6.0.100	10.3.1.89	11.1.1.245	11.6.0.100	N/A	11.1.1.245	11.6.0.100
cuTENSORFLOW	1.3.1	1.3.1	1.3.1	1.3.1	1.3.1	1.3.1	N/A	1.3.1	1.3.1
Nsight Compute	2021.2.1			2021.2.1			2021.2.1		
Nsight Systems	2021.3.1.54			2021.3.1.54			2021.3.1.54		
OpenMPI	3.1.5			3.1.5			3.1.5		
HPC-X	N/A	2.9.0	2.9.0	N/A	2.8.1	2.8.1	N/A	2.9.0	2.9.0
UCX	N/A	1.11.0	1.11.0	N/A	1.10.0	1.10.0	N/A	1.11.0	1.11.0
OpenBLAS	0.3.13			0.3.13			0.3.13		

	Linux_x86_64			Linux_ppc64le			Linux_aarch64		
	CUDA 10.2	CUDA 11.0	CUDA 11.4	CUDA 10.2	CUDA 11.0	CUDA 11.4	CUDA 10.2	CUDA 11.0	CUDA 11.4
Scalapack	2.1.0			2.1.0			2.1.0		
Thrust	1.9.7	1.9.9	1.12.1	1.9.7	1.9.9	1.12.1	1.9.7	1.9.10	1.12.1
CUB	N/A	1.9.9	1.12.1	N/A	1.9.9	1.12.1	N/A	1.9.9	1.12.1
libcu++	1.0.0	2.0.0	2.0.0	1.0.0	2.0.0	2.0.0	1.0.0	2.0.0	2.0.0

# Chapter 3. SUPPORTED PLATFORMS

## 3.1. Platform Requirements for the HPC SDK

Table 2 HPC SDK Platform Requirements

Architecture	Linux Distributions	Minimum gcc/ glibc Toolchain	Minimum CUDA Driver
x86_64	CentOS 7.2, 7.3, 7.4, 7.5, 7.6, 7.7, 7.8 CentOS 7.9, 8.0, 8.1, 8.2 Fedora 29, 30, 31, 32 OpenSUSE Leap 15.0, 15.1 RHEL 7.0, 7.1, 7.2, 7.3, 7.4, 7.5, 7.6, 7.7, 7.8, 7.9 RHEL 8.0, 8.1, 8.2 SLES 12SP4, 12SP5, 15SP1 Ubuntu 18.04, 20.04	C99: 4.8 C11: 4.9 C++03: 4.8 C++11: 4.9 C++14: 5.1 C++17: 7.1	440.33
ppc64le	RHEL 7.3, 7.4, 7.5, 7.6, 7.7, 8.0, 8.1 RHEL Pegas 7.5, 7.6 Ubuntu 18.04	C99: 4.8 C11: 4.9 C++03: 4.8 C++11: 4.9 C++14: 5.1 C++17: 7.1	440.33
aarch64	CentOS 8.1, 8.2, 8.3, 8.4	C99: 4.8 C11: 4.9	450.36

Architecture	Linux Distributions	Minimum gcc/ glibc Toolchain	Minimum CUDA Driver
	RHEL 8.1, 8.2 Ubuntu 18.04, 20.04	C++03: 4.8 C++11: 4.9 C++14: 5.1 C++17: 7.1	

The HPC Compilers require x86\_64 processors supporting a minimum of AVX instructions, which includes Sandy Bridge and newer CPUs from Intel, as well as Bulldozer and newer CPUs from AMD. POWER 8 and POWER 9 CPUs from the POWER architecture are supported. For the Arm architecture, the HPC Compilers require a minimum version of Arm v8.1.

## 3.2. Supported CUDA Toolchain Versions

The NVIDIA HPC SDK uses elements of the CUDA toolchain when building programs for execution with NVIDIA GPUs. Every HPC SDK installation package puts the required CUDA components into an installation directory called `[install-prefix]/[arch]/[nvhpc-version]/cuda`.

An NVIDIA CUDA GPU device driver must be installed on a system with a GPU before you can run a program compiled for the GPU on that system. The NVIDIA HPC SDK does not contain CUDA Drivers. You must download and install the appropriate [CUDA Driver from NVIDIA](#), including the [CUDA Compatibility Platform](#) if that is required.

The `nvaccelinfo` tool prints the CUDA Driver version in its output. You can use it to find out which version of the CUDA Driver is installed on your system.

The NVIDIA HPC SDK 21.9 includes the following CUDA toolchain versions:

- ▶ CUDA 10.2
- ▶ CUDA 11.0
- ▶ CUDA 11.4 update 1

The minimum required CUDA driver versions are listed in the table in Section 3.1.

## Chapter 4. KNOWN LIMITATIONS

- ▶ Debug information for Fortran arrays with non-constant bounds is not handled correctly and querying values will yield incorrect results. Stepping through CUDA Fortran and OpenACC kernels is partially supported, but incorrect line numbers are displayed. For additional general limitations with `cuda-gdb`, please refer to its documentation.
- ▶ When using `-stdpar` to accelerate C++ parallel algorithms, the algorithm calls cannot include virtual function calls or function calls through a function pointer, cannot use C++ exceptions, can only dereference pointers that point to the heap, and must use random access iterators (raw pointers as iterators work best).
- ▶ When `nvc++ -stdpar=multicore` is used to generate parallel code, OpenMP pragmas in the same translation unit will also be enabled.

# Chapter 5.

## DEPRECATIONS AND CHANGES

- ▶ Starting with the 21.11 version of the NVIDIA HPC SDK, the HPC-X package will no longer be shipped as part of the packages made available for the POWER architecture.
- ▶ The current default of `-gpu=implicitsections` will change in a future release to `-gpu=noimplicitsections` to adhere to the OpenACC specification.
- ▶ Starting with the 21.5 version of the NVIDIA HPC SDK, the `-cuda` option for `NVC++` and `NVFORTRAN` no longer automatically links the NVIDIA GPU math libraries. Please refer to the `-cudalib` option.
- ▶ HPC Compiler support for the Kepler architecture of NVIDIA GPUs was deprecated starting with the 21.3 version of the NVIDIA HPC SDK.
- ▶ Support for the KNL architecture of multicore CPUs in the NVIDIA HPC SDK was deprecated in the HPC SDK version 21.3.

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