























































 Full vendor support  
 Vendor support, but not (yet) entirely comprehensive  
 Indirect, but comprehensive support, by vendor

 Comprehensive support, but not by vendor  
 Limited, probably indirect support – but at least some  
 No direct support available, but of course one could ISO-C-

bind your way through it or directly link the libraries  
**C++** C++ (sometimes also C)  
**Fortran** Fortran

	CUDA		HIP		SYCL		OpenACC		OpenMP		Standard		Kokkos		ALPAKA		Python
	C++	Fortran	C++	Fortran	C++	Fortran	C++	Fortran	C++	Fortran	C++	Fortran	C++	Fortran	C++	Fortran	
NVIDIA	 1	 2	 3	 4	 5	 6	 7	 8	 9	 10	 11	 12	 13	 14	 15	 16	 17
AMD	 18	 19	 20	 4	 21	 6	 22	 23	 24	 24	 25	 25	 26	 14	 27	 16	 28
Intel	 29	 30	 31	 4	 32	 6	 33	 33	 34	 34	 35	 36	 37	 14	 38	 16	 39

- 1: CUDA C/C++, supported through CUDA Toolkit
- 2: CUDA Fortran, proprietary Fortran extension supported by NVIDIA HPC SDK
- 3: HIP programs can directly use NVIDIA GPUs via a CUDA backend; HIP is maintained by AMD
- 4: No such thing like HIP for Fortran
- 5: SYCL can be used on NVIDIA GPUs with *experimental* support either in SYCL directly or in DPC++, or via [hipSYCL](#)
- 6: No such thing like SYCL for Fortran
- 7: OpenACC C/C++ supported on NVIDIA GPUs directly (and best) through NVIDIA HPC SDK; additional, somewhat limited support by GCC C compiler and Clacc
- 8: OpenACC Fortran supported on NVIDIA GPUs directly (and best) through NVIDIA HPC SDK; additional, somewhat limited support by GCC Fortran compiler and [Flacc](#)
- 9: OpenMP in C++ supported on NVIDIA GPUs through NVIDIA HPC SDK (albeit with a few limits), by GCC, and Clang; see [OpenMP ECP BoF on status in 2022](#).
- 10: OpenMP in Fortran supported on NVIDIA GPUs through NVIDIA HPC SDK (but not full OpenMP feature set available), by GCC, and Flang
- 11: pSTL features supported on NVIDIA GPUs through NVIDIA HPC SDK
- 12: Standard Language parallel features supported on NVIDIA GPUs through NVIDIA HPC SDK
- 13: Kokkos supports NVIDIA GPUs by calling CUDA as part of the compilation process
- 14: Kokkos is a C++ model, but an official compatibility layer ([Fortran Language Compatibility Layer, FLCL](#)) is available.
- 15: Alpaka supports NVIDIA GPUs by calling CUDA as part of the compilation process
- 16: Alpaka is a C++ model
- 17: There is a vast community of offloading Python code to NVIDIA GPUs, like CuPy, Numba, cuNumeric, and many others; NVIDIA actively supports a lot of them, but has no direct product like CUDA for Python; so, the status is somewhere in between
- 18: [hipify](#) by AMD can translate CUDA calls to HIP calls which runs natively on AMD GPUs
- 19: AMD offers a Source-to-Source translator to convert some CUDA Fortran functionality to OpenMP for AMD GPUs ([gpubfort](#)); in addition, there are ROCm library bindings for Fortran in [hipfort](#) OpenACC/CUDA Fortran Source-to-Source translator [gpubfort](#).
- 20: HIP is the preferred native programming model for AMD GPUs
- 21: SYCL can use AMD GPUs, for example with [hipSYCL](#) or [DPC++ for HIP AMD](#)
- 22: OpenACC C/C++ can be used on AMD GPUs via GCC or Clacc; also, [Intel's OpenACC to OpenMP Source-to-Source translator](#) can be used to generate OpenMP directives from OpenACC directives
- 23: OpenACC Fortran can be used on AMD GPUs via GCC; also, AMD's [gpubfort](#) Source-to-Source translator can move OpenACC Fortran code to OpenMP Fortran code, and also Intel's translator can work
- 24: AMD offers a dedicated, Clang-based compiler for using OpenMP on AMD GPUs: AOMP; it supports both C/C++ (Clang) and Fortran (Flang, [example](#))
- 25: Currently, no (known) way to launch Standard-based parallel algorithms on AMD GPUs
- 26: Kokkos supports AMD GPUs through HIP
- 27: Alpaka supports AMD GPUs through HIP
- 28: AMD does not officially support GPU programming with Python (also not semi-officially like NVIDIA), but third-party support is available, for example through [Numba](#) (currently inactive) or a [HIP version of CuPy](#)
- 29: [SYCLomatic](#) translates CUDA code to SYCL code, allowing it to run on Intel GPUs; also, Intel's [DPC++ Compatability Tool](#) can transform CUDA to SYCL
- 30: No direct support, only via ISO C bindings, but at least an example can be [found on GitHub](#); it's pretty scarce and not by Intel itself, though
- 31: [CHIP-SPV](#) supports mapping CUDA and HIP to OpenCL and Intel's Level Zero, making it run on Intel GPUs
- 32: SYCL is the prime programming model for Intel GPUs; actually, SYCL is only a standard, while Intel's implementation of it is called DPC++ (*Data Parallel C++*), which extends the SYCL standard in places
- 33: OpenACC can be used on Intel GPUs by translating the code to OpenMP with [Intel's Source-to-Source translator](#)
- 34: Intel has [extensive support for OpenMP](#) through their latest compilers
- 35: Intel supports pSTL algorithms through their [oneAPI DPC++ Library](#) (oneDPL; [GitHub](#)). It's heavily namespaced and not yet on the same level as NVIDIA.
- 36: With [Intel oneAPI 2022.3](#), Intel supports DO CONCURRENT with GPU offloading
- 37: Kokkos supports Intel GPUs through SYCL
- 38: [Alpaka v0.9.0](#) introduces experimental SYCL support
- 39: Not a lot of support available at the moment, but notably [DPNP](#), a SYCL-based drop-in replacement for Numpy, and [numba-dpex](#), an extension of Numba for DPC++.