Get Started with Intel® MPI Library

for Intel® oneAPI on Windows* OS

The Intel® MPI Library is a multi-fabric message passing library that implements the Message Passing Interface, version 3.1 (MPI-3.1) specification. Use the library to develop applications that can run on multiple cluster interconnects.

Intel® MPI Library has the following features:

- Low overhead enables analysis of large amounts of data
- MPI tuning utility for accelerating your applications
- Interconnect independence and flexible runtime fabric selection

Intel® MPI Library is available as a standalone product, as part of the Intel® Parallel Studio XE Cluster Edition, and as part of the Intel® oneAPI HPC Toolkit.

Product Contents

The product comprises the following main components:

- Compilation tools, including compiler drivers such as `mpiicc` and `mpifort`
- Include files and modules
- Dynamic (`.dll`) libraries, debug libraries, interface libraries, and program database (`.pdb`) files
- Process Manager and tools to run programs
- Test code
- Documentation provided as a separate package or available from the Intel Developer Zone

Besides the components above, Intel MPI Library also includes Intel® MPI Benchmarks, which enable you to measure MPI operations on various cluster architectures and MPI implementations. For details, see the *Intel MPI Benchmarks User Guide*. Source code is available in the GitHub repository.

Key Features

Intel MPI Library has the following major features:

- MPI-1, MPI-2.2, and MPI-3.1 specification conformance
- Interconnect independence
- C, C++, Fortran* 77, and Fortran 90 language bindings

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Prerequisites

Before you start using Intel MPI Library make sure to complete the following steps:

1. Set the environment variables: from the installation directory (the default directory is shown below), run the `vars.bat` batch file:

   ```
   > <install-dir>\mpi\<version>.<update>\env\vars.bat
   ```

   where *<install-dir>* is the Intel MPI Library installation directory (by default, `C:\Program Files (x86)\Intel\oneAPI`).

2. Install and run the Hydra services on the compute nodes. In the command prompt, enter:

   ```
   > hydra_service -install
   ```

   ```
   > hydra_service -start
   ```

3. Register your credentials:

   ```
   > mpiexec -register
   ```

For detailed system requirements, see the "System Requirements" section in *Release Notes*.

Building and Running MPI Programs

Compiling an MPI Program

1. Make sure you have the desired compiler installed and configured properly. For example, for the Intel® C++ Compiler, run:

   ```
   > icl
   ```

   If the command is not recognized, add the compiler to your `PATH`. For the Intel® compilers, you can run the `vars.bat` script from corresponding directory.

2. Compile your program using the appropriate compiler driver. For example, for a test C program:

   ```
   > mpiicc -o test.exe <install-dir>\test\test.c
   ```

Running an MPI Program

Execute the program using the `mpiexec` command. For example, for the test program:

```
> mpiexec -n <# of processes> test.exe
```

To specify the hosts to run the program on, use the `-hosts` option:

```
> mpiexec -n <# of processes> -ppn <# of processes per node> -hosts
<host1>,<host2>,...,<hostN> test.exe
```

Troubleshooting

If you encounter problems when using Intel MPI Library, go through the following general procedures to troubleshoot them:

- Check system requirements and known issues in the *Release Notes*.
- Check hosts accessibility. Try to run a simple non-MPI application (for example, `hostname` utility) on the problem hosts with `mpiexec`. This check helps you reveal the environmental or connectivity problem (for example, unreachable hosts).
- Run MPI application with debug information enabled. To enable the debug information, set the environment variable `I_MPI_DEBUG=6`. You can also set a different debug level to get more detailed information. This action helps to find out the problem component.

See more details in the "Troubleshooting" section of the *Developer Guide*.

Training and Documentation

- Online Training: An excellent resource for learning the Intel MPI Library capabilities through various guides, videos, webinars, and more.
- Release Notes: Up-to-date information about the product, including: what's new, key features, system requirements, and known limitations.
- Online Documentation: Links to all available Intel MPI Library documents.

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