

# Intel® MPI Library 4.1 Update 3 for Windows\* OS

## Release Notes

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### Overview

The Intel® MPI Library for Windows\* OS is a multi-fabric message passing library based on ANL\* MPICH2\* and OSU\* MVAPICH2\*.

The Intel® MPI Library for Windows\* OS implements the Message Passing Interface, version 2.2 (MPI-2.2) specification.

To receive technical support and updates, you need to register your Intel® Software Development Products. See section [Technical Support](#).

### Product Contents

The Intel® MPI Library Runtime Environment (RTO) contains the tools you need to run programs including SMPD services and supporting utilities, dynamic libraries, and documentation.

The Intel® MPI Library Development Kit (SDK) includes all of the Runtime Environment components plus include files and modules, interface libraries, debug libraries and test codes.

### Related Products and Services

Information on Intel® Software Development Products is available at <http://www.intel.com/software/products>.

Some of the related products include:

- The Intel® Software College provides training for developers on leading-edge software development technologies. Training consists of online and instructor-led courses covering all Intel® architectures, platforms, tools, and technologies.

### What's New

The Intel® MPI Library 4.1 Update 3 for Windows\* OS is an update release of the Intel® MPI Library for Windows\* OS. This release includes the following new features compared to the Intel® MPI Library 4.1 Update 2 (see product documentation for more details):

- Intel® Xeon™ E5 V2 and Intel® Xeon™ E7 V2 family processors additional performance tuning
- New online documentation format
- Bug fixes

### **32 Bit Support of Intel® MPI Library & Intel® Trace Analyzer and Collector**

Inclusion of 32-bit binaries in the Intel® MPI Library and Intel® Trace Analyzer and Collector products is being deprecated. If 32-bit support is required, we advise that you remain on Intel® MPI Library version 4.1 Updates and Intel® Trace Analyzer and Collector version 8.1 Updates, which continue to include 32-bit binaries. The Intel® MPI Library 5.0 Beta and Intel® Trace Analyzer and Collector 9.0 Beta releases will not include 32-bit binaries. Many developers have already migrated to 64-bit implementations of both their applications and of Intel libraries and tools. If you have concerns about this deprecation, please send us feedback by submitting an issue at the Intel® Premier Customer Support site (<http://premier.intel.com>) as soon as possible with your contact information.

The Intel® MPI Library 4.1 Update 2 for Windows\* OS is an update release of the Intel® MPI Library for Windows\* OS. This release includes the following new features compared to the Intel® MPI Library 4.1 Update 1 (see product documentation for more details):

- Intel® Xeon™ E5 V2 and Intel® Xeon™ E7 V2 family processors performance tuning
- Allow permuted entries in machine file when running a single instance of pmi-proxy
- Bug fixes

The Intel® MPI Library 4.1 Update 1 for Windows\* OS is an update release of the Intel® MPI Library for Windows\* OS. This release includes the following updates compared to the Intel® MPI Library 4.1 (see product documentation for more details):

- Intel® Xeon Phi™ offload model support
- Hydra\* (Scalable process manager) support on Windows\* OS (experimental)
- Microsoft\* Network Direct support
- Bug fixes

The Intel® MPI Library 4.1 for Windows\* OS is an update release of the Intel® MPI Library for Windows\* OS. This release includes the following updates compared to the Intel® MPI Library 4.0 Update 3 (see product documentation for more details):

- Support for the MPI-2.2 standard
- Backward compatibility with Intel MPI Library 4.0.x based applications
- New documentation in the HTML format
- Support for Intel® Composer XE 2013
- Support for clusters with different Intel® Architecture Processors
- Bug Fixes

The Intel® MPI Library 4.0 Update 3 for Windows\* OS is an update release of the Intel® MPI Library for Windows\* OS. This release includes the following updates compared to the Intel® MPI Library 4.0 Update 2 (see product documentation for more details):

- Performance and scalability improvements
  - Shared memory optimizations for platforms with Intel® Streaming SIMD Extensions 4.2 (Intel® SSE4.2) and Intel® AES New Instructions (Intel® AES-NI). This functionality is available for both Intel® and non-Intel microprocessors, but it may perform additional optimizations for Intel microprocessors than it performs for non-Intel microprocessors.
  - Dynamic connection mode for shared memory
  - Accelerated RDMA memory registration cache
  - Substantially accelerated and enhanced MPI tuning utility
- Usability improvements
  - Additional integrated performance monitoring (IPM) summary format
  - Extended debugging output control
  - Enhanced processor information utility `cpuinfo`
  - Bug fixes
- Extended interoperability
  - Intel® Composer XE 2011 Update 6 support

The Intel® MPI Library 4.0 Update 2 for Windows\* OS is an update release of the Intel® MPI Library for Windows\* OS. This release includes the following updates compared to the Intel® MPI Library 4.0 Update 1 (see product documentation for more details):

- Usability improvements
  - Secure DLL Loading mode. See more details in [Special Features and Known Issues](#)
  - Improved simple multi-purpose daemon (SMPD) and `mpiexec`
  - Signed Intel® MPI Library binaries
  - Improved static DAPL connections establishment in the wait mode
  - Bug fixes
- Extended interoperability
  - Intel® Composer XE 2011 Update 4 support
  - Ability to call MPI from the Co-Array Fortran programs

The Intel® MPI Library 4.0 Update 1 for Windows\* OS is an update release of the Intel® MPI Library for Windows\* OS. This release includes the following updates compared to the Intel® MPI Library 4.0 (see product documentation for more details):

- Performance and scalability improvements
  - Further optimization to several collective algorithms
- Usability improvements
  - Extended process pinning control for hybrid applications through `I_MPI_PIN_DOMAIN` and `I_MPI_PIN_CELL` environment variables
  - Improved `mpitune` for easier application tuning
- Extended interoperability
  - Intel® Composer XE 12.0 Beta support

The Intel® MPI Library 4.0 for Windows\* OS is a new release of the Intel® MPI Library for Windows\* OS. This release includes the following new features compared to the Intel® MPI Library 3.2 Update 2 (see product documentation for more details):

- New architecture for better performance and higher scalability
  - Optimized shared memory path for industry leading latency and on multicore platforms
  - New flexible mechanism for selecting the communication fabrics (I\_MPI\_FABRICS) that complements the classic Intel MPI device selection method (I\_MPI\_DEVICE)
- Updated MPI performance tuner to extract the last ounce of performance out of your installation
  - For a certain cluster, based on the Intel® MPI Benchmarks (IMB) or a user provided benchmark
  - For a certain application run
- MPI 2.1 standard conformance
- Experimental dynamic process support
- Backward compatibility with Intel MPI Library 3.x based applications

## Example

Set the I\_MPI\_FABRICS environment variable to select a particular network fabric.

- To use shared memory for intra-node communication and the DAPL\* layer for inter-node communication, do the following steps:

```
$ mpiexec -n 4 -env I_MPI_FABRICS shm:dapl ./IMB-MPI1
```

See more details in the Intel® MPI Library for Windows\* OS Reference Manual.

## Key features

This release of the Intel® MPI Library supports the following major features:

- MPI-1 and MPI-2.2 specification conformance with some limitations. See [Special Features and Known Issues](#)
- - Support for any combination of the following interconnection fabrics:
  - Shared memory
  - RDMA-capable network fabrics through DAPL\*, such as InfiniBand\* and Myrinet\*
  - Sockets, for example, TCP/IP over Ethernet\*, Gigabit Ethernet\*, and other interconnects
- (SDK only) Support for IA-32 and Intel® 64 architecture clusters using:
  - Intel® C++ Compiler version 13.1 through 14.0 and higher
  - Intel® Fortran Compiler version 13.1 through 14.0 and higher
  - Microsoft\* Visual C++\* Compilers
- (SDK only) C, C++, Fortran\* 77 and Fortran 90 language bindings
- (SDK only) Dynamic linking

## System Requirements

The following sections describe supported hardware and software

## Supported Hardware

Systems based on the Intel® 64 architecture:

- Intel® Core™2 processor family or higher
- Intel® Xeon® 5500 processor series recommended
- 1 GB of RAM per core
- 2 GB of RAM per core recommended
- 1 GB of free hard disk space

IA-32 applications running on Intel® 64 architecture are supported.

## Supported Software

### Operating Systems:

- Systems based on the Intel® 64 architecture:
  - Microsoft\* Windows\* HPC Server 2008 R2
  - Microsoft\* Windows 7\*

### (SDK only) Compilers:

- Intel® C++ Compiler 13.1 for Windows\* OS and higher
- Intel® Fortran Compiler 13.1 for Windows\* OS and higher
- Microsoft\* Visual Studio 2010\*
- Microsoft\* Visual Studio 2012\*
- Microsoft\* Visual Studio 2013\*
- Microsoft\* Visual C++\* Compilers

### Batch Systems:

- Microsoft\* job scheduler
- Altair\* PBS Pro\* 9.2 and higher

### Recommended InfiniBand Software:

- Windows\* OpenFabrics\* (WinOF\*) 2.0 or higher
- Windows\* OpenFabrics\* Enterprise Distribution (winOFED\*) 3.2 RC1 or higher for Microsoft\* Network Direct support
- Mellanox\* WinOF\* Rev 4.40 or higher

## Supported Languages

- For Intel® Professional Edition Compilers: C, C++, Fortran 77, Fortran 90

## Installation Notes

Launch the installer and follow the instructions. See *Intel® MPI Library for Windows\* OS Installation Guide* for details.

## Special Features and Known Issues

**NOTE:** The following list includes the information until Intel® MPI Library 4.1 is released. For the most up-to-date list of known issues, as well as latest tips and tricks on using the library, visit the Intel(R) MPI Library for Windows\* Knowledge Base at <http://software.intel.com/en-us/articles/intel-mpi-library-for-windows-kb/all/>.

- Intel® MPI Library 4.1 for Windows\* OS is binary compatible with the majority of Intel MPI Library 4.0.x-based applications. Recompile your application only if you use:
  - MPI C++ binding
- Intel® MPI Library 4.1 for Windows\* OS implements the MPI-2.2 standard. On top of this, the aliasing of the send and receive buffers in the following collective routines will be rejected:
  - MPI\_Gather, MPI\_Gatherv
  - MPI\_Scatter, MPI\_Scatterv
  - MPI\_Allgather, MPI\_Allgatherv
  - MPI\_Alltoall, MPI\_Alltoallv, MPI\_Alltoallw

If your application depends on the pre-MPI-2.2 behavior, set the environment variable `I_MPI_COMPATIBILITY` to 4. If your application depends on the pre-MPI-2.1 behavior, set the environment variable `I_MPI_COMPATIBILITY` to 3.

- The Intel® MPI Library 4.0 Update 2 for Windows\* OS provides enhanced security options. Use the `HKEY_LOCAL_MACHINE\Software\Intel\MPI` registry key to define the following registry entries:
  - The `SecureDynamicLibraryLoading` enables the dynamic library loading enhanced security mode. Set the value to `enable|yes|on|1`. This option is disabled by default.
  - The `I_MPI_DAT_LIBRARY` specifies the DAT library to be used in the DLL enhanced security mode.  
**NOTE:** the `I_MPI_DAT_LIBRARY` environment variable has no effect in the dynamic library loading the enhanced security mode. See the *Intel® MPI Library for Windows\* OS Reference Manual* for more details on this variable.
- Intel® MPI Library 4.0 for Windows\* OS is binary compatible with the majority of Intel MPI Library 3.x-based applications. Recompile your application only if you use:
  - MPI one-sided routines in Fortran (`mpi_accumulate()`, `mpi_alloc_mem()`, `mpi_get()`, `mpi_put()`, `mpi_win_create()`)
  - MPI C++ binding
- Intel® MPI Library 4.0 for Windows\* OS implements the MPI-2.1 standard. The functions of the following MPI routines have changed:
  - `MPI_Cart_create()`
  - `MPI_Cart_map()`
  - `MPI_Cart_sub()`
  - `MPI_Graph_create()`

If your application depends on the strict pre-MPI-2.1 behavior, set the environment variable `I_MPI_COMPATIBILITY` to 3.

- The Intel® MPI Library supports the MPI-2 process model for all fabric combinations except the following case:  
`I_MPI_FABRICS` is set to `<fabric1>:<fabric2>`, where `<fabric1>` is not `shm`, and `<fabric2>` is not equal to `<fabric1>` (for example, `dapl:tcp`).
- If communication between two existing MPI applications is established using the process attachment mechanism, the library does not control whether the same fabric has been selected for each application. This situation may cause unexpected applications behavior. Set the same `I_MPI_FABRICS` variable for each application to avoid this issue.
- The following restriction exists for the DAPL-capable network fabrics because it relates to support of the MPI-2 process model: if the size of the information about the host used to establish the communication exceeds a certain DAPL provider value, the application fails with an error message similar to:  

```
[0:host1][../../../../dapl_module_util.c:397] error(0x80060028):...: could not connect DAPL endpoints: DAT_INVALID_PARAMETER(DAT_INVALID_ARG5)
```
- The Intel® MPI Library uses dynamic connection establishment by default for 64 and more processes. To always establish all connections upfront, set the `I_MPI_DYNAMIC_CONNECTION` environment variable to "disable". This option may improve stability of certain DAPL\* providers.
- (SDK only) Provide the `msvcr71.dll` library to the end user if your product redistributes the `mpitune` utility.
- The Intel® MPI Library pins processes automatically. Use the `I_MPI_PIN` and related environment variables to control process pinning. See the *Intel® MPI Library for Windows\* OS Reference Manual* for details.
- The Intel® MPI Library enhances message-passing performance on DAPL\*-based interconnects by maintaining a cache of virtual-to-physical address translations in the MPI DAPL\* data transfer path. To disable the translation cache completely, set the environment variable `I_MPI_RDMA_TRANSLATION_CACHE` to "disable".
- (SDK only) The `nmake` utility does not work correctly if the path to the Intel® MPI Library compiler drivers contains spaces. For instance, `C:\Program Files (x86)\Intel\MPI\<version>\bin\`. Copy the Intel® MPI Library compiler drivers to another location to avoid this issue.
- An MPI application inherits the current working directory of the `mpiexec` command at the time of its invocation. Use the `-gwdir` or `-wdir` options to override this functionality.
- Intel® MKL 10.0 may create multiple threads depending on various conditions. Follow these rules to correctly use Intel® MKL:
  - Use the thread-safe version of the Intel® MPI Library in conjunction with Intel® MKL
  - Set the `OMP_NUM_THREADS` environment variable to "1" to run the application if linked against the non-thread-safe version of the Intel® MPI Library
- Follow these rules to launch the Intel MPI Library application using the MPICH2\* environment:
  - Use the `-port mpiexec` option to specify the MPICH2\* SMPD\* port number

- Set the `I_MPI_SMPD_VERSION_CHECK` environment variable to "disable"
- Some operating systems have a limitation on the number of concurrent connections. This limitation may cause job failure with the following error message: "no more connections can be made to this remote computer at this time because there are already as many connections as the computer can accept".

To reduce the probability of this issue, decrease the auto disconnect time.

From the command line do the following:

```
net config server /autodisconnect:time_before_autodisconnect
```

The default value of the auto disconnect time is usually set to 15 minutes.

- Use the `mpiexec -mapall` option if your application is located or accesses any network drive mapped to your local system.
- Disable User Account Control (UAC) to use domain-based authorization with the delegation ability.
- The following MPI-2.1 feature is not supported by the Intel® MPI Library:
  - Passive target one-sided communication when the target process does not call any MPI functions
- There is a limitation on printing small messages from an MPI application if SMPD used. Immediate print of one byte message could make the application to hang in receiving further data. Keep your messages two and more bytes long to work around this restriction.
- Experimental Hydra (Scalable Process Manager) on Windows\* OS has some known limitations such as:
  - Stdin redirection is not supported for the `-bootstrap` service option.
  - Signal handling support is restricted. It could result in hanging processes in memory in case of incorrect MPI job termination.
  - MPI job termination by specifying `I_MPI_JOB_TIMEOUT` and `I_MPI_JOB_TIMEOUT_SIGNAL` environment variables are not supported
  - Cleaning up the environment after an abnormal MPI job termination by means of `mpicleanup` utility is not supported
- For details on how to use Hydra (Scalable Process Manager) on Windows\* OS, see Intel® MPI Library for Linux\* OS Reference Manual.

For recent details on how to use Intel® Xeon Phi™ offload model on Windows\* OS please see <http://software.intel.com/mic-developer>.

**NOTE:** Many routines in the `libirc.lib` library (linked with the Intel® MPI Library) are more optimized for Intel microprocessors than for non-Intel microprocessors.

## Documentation

Intel® MPI Library for Windows\* OS Getting Started Guide contains information on the following subjects:

- First steps using the Intel® MPI Library
- First-aid troubleshooting actions

Intel® MPI Library for Windows\* OS Reference Manual contains information on the following subjects:



- Command Reference describes commands, options, and environment variables
- Tuning Reference describes environment variables that influence library behavior and performance

Intel® MPI Library for Windows\* OS Installation Guide contains information on the following subjects:

- Obtaining, installing, and uninstalling the Intel® MPI Library
- Getting technical support

## Notation Conventions

Release Notes and user guide documentation use the notation conventions listed in the following table:

Style	Definition
<i>This type style</i>	indicates an element of syntax, a reserved word, a keyword, a file name, or part of a program example (text appears in lowercase unless UPPERCASE is required)
<b>This type style</b>	indicates what you type as input
<i>This type style</i>	indicates an argument on a command line or an option's argument
[ <i>items</i> ]	indicates that the items enclosed in brackets are optional
{ <i>item</i>   <i>item</i> }	indicates a set of choices from which you must select one
... (ellipses)	indicates that an argument can be repeated several times

## Technical Support

Your feedback is very important to us. To receive technical support for the tools provided in this product and technical information including FAQ's and product updates, you need to register for an Intel® Premier Support account at the [Registration Center](#).

**NOTE:** Registering for support varies for release product or pre-release products (alpha, beta, etc) - only released products have support web pages on <http://support.intel.com/>.

To register for an account, please visit the [Intel® Registration Center](#) web site. If you have forgotten your password, please email a request to: [quad.support@intel.com](mailto:quad.support@intel.com). Please do not email your technical issue to this email address.

The Intel(R) MPI Library support web site, <http://software.intel.com/en-us/articles/intel-mpi-library-for-windows-kb/all/> provides the latest top technical issues, frequently asked questions, product documentation, and product errata.

There is an [HPC and Intel® Cluster Tools Forum](#) for HPC experts and enthusiasts to share their knowledge, resources, and insights for the advancement of HPC solutions, cluster solutions, and the computing architectures that implement them.

## Submitting Issues

Before submitting a support issue, see the *Intel® MPI Library for Windows\* OS Getting Started Guide* for details on post-install testing to ensure that basic facilities are working.

When submitting a support issue to Intel® Premier Support, please provide specific

details of your problem, including:

- The Intel® MPI Library package name and version information
- Host architecture
- Compiler(s) and versions
- Operating system(s) and versions
- Specifics on how to reproduce problems. Include makefiles, command lines, small test cases, and build instructions.  
Use /test sources as test cases, when possible.

You can obtain version information for the Intel® MPI Library package in the file mpisupport.txt.

Steps to submit an issue

1. Go to <https://premier.intel.com/>
2. Log in to the site. Note that your username and password are case-sensitive.
3. Click on the "Submit Issue" link in the left navigation bar.
4. Choose "Development Environment" from the "Product Type" drop-down list.
5. If this is a software or license-related issue, choose "Intel® MPI Library, Windows" from the "Product Name" drop-down list.
6. Enter your question and complete the fields in the windows that follow to successfully submit the issue.

**NOTE:** Please notify your support representative prior to submitting source code where access needs to be restricted to certain countries to determine if this request can be accommodated.

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The Intel® MPI Library is based on MPICH2\* from Argonne National Laboratory\* (ANL) and MVAPICH2\* from Ohio State University\* (OSU).

See the information below for additional licenses of the following 3rd party tools used within the Intel® MPI Library: Python\*, Windows Installer XML\* (WiX), and AVL Trees\*.

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### **Windows Installer XML\* (WiX)**

<http://www.opensource.org/licenses/cpl1.0.php>

### **AVL Trees\***

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The Intel® MPI Library includes altered AVL Trees\* source codes.

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