

Intel® Inspector XE 2016 for Windows* Release Notes

Installation Guide and Release Notes

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1 Introduction

Intel® Inspector XE 2016 helps developers identify and resolve memory and threading correctness issues in their unmanaged C, C++ and Fortran programs as well as in the unmanaged portion of mixed managed and unmanaged programs. Additionally the tool identifies threading correctness issues in managed .NET* C# programs.

Intel Inspector XE is a dynamic error checking tool for developing multithreaded applications on Windows* or Linux* operating systems. Intel Inspector XE maximizes code quality and reliability by quickly detecting memory, threading, and source code security errors during the development cycle. Intel Inspector XE is an easy, comprehensive solution that delivers rapid results by isolating memory and multithreading errors.

Intel Inspector XE has a standalone graphical user interface (GUI) as well as a command line interface (CLI). In addition, the Intel Inspector XE integrates into the Microsoft Visual Studio* 2010 and later versions.

This document provides system requirements, installation instructions, issues and limitations, and legal information.

Use the Getting Started tutorial and reference documentation to learn more about the Intel Inspector XE. For documentation, open the `documentation_inspector_xe.htm` file.. For example, if you choose the default installation path, you can find the `documentation_inspector_xe.htm` file in the `C:\Program Files (x86)\IntelSWTools\documentation_2016\en\Inspector XE` directory. You can

now access the product help in a web browser by opening the index.htm in the documentation help directory.

If you did not register this product during installation, do so at the Intel® Software Development Products Registration Center (<https://registrationcenter.intel.com/>). Registration entitles you to free technical support, product updates and upgrades for the duration of the support term.

For Technical Support, Product Updates, User Forums, FAQs, tips and tricks, and other support information, visit <http://www.intel.com/software/products/support/>. **Note:** If your distributor provides technical support for this product, contact them for support rather than Intel Corporation.

2 What's New

Intel® Inspector XE 2016 Update 3

- Fix for suppression file usage when run in command line mode
- Added support for C++11 synchronization primitives during threading analysis
- Fixes for analyzing MPI applications

Intel® Inspector XE 2016 Update 2

- Bug fixes

Intel® Inspector XE 2016 Update 1

- Microsoft Visual Studio* 2015 IDE integration
- Microsoft Windows* 10 OS support

3 System Requirements

Supported Architectures and Terminology

Intel Inspector XE supports the following architectures:

- **IA-32 Architecture** refers to systems based on 32-bit processors generally compatible with the Intel® Pentium® processors (such as Intel® Pentium® 4 processor), or processors from other manufacturers supporting the same instruction set, running a 32-bit operating system.
- **Intel® 64 Architecture** refers to systems based on IA-32 architecture processors that have 64-bit architectural extensions (such as, Intel® Core™2 processor family), running a 64-bit operating system. If the system is running a 32-bit operating system, then IA-32

architecture applies instead. Processors from other manufacturers supporting the same instruction set and running a 64-bit operating system are also supported.

Minimum System Requirements

- A system based on an IA-32 or Intel® 64 architecture processor supporting the Intel® Streaming SIMD Extensions 2 (Intel® SSE2) instructions (Intel Pentium 4 processor or later, or compatible non-Intel processor)
 - Intel Inspector XE requires specific knowledge of assembly-level instructions. Its analysis may not operate correctly if a target executable contains instructions not supported by IA-32 or Intel 64 architectures. In this case, run the analysis with a target executable that contains only supported instructions. After you finish using the Intel Inspector XE, you can revert to using unsupported instructions in the target executable.
 - For the best experience, a multi-core or multiprocessor system is recommended.
- 4GB RAM
- 350M free disk space for all tool features and architectures
- Supported Microsoft* operating systems (embedded editions not supported):
 - Microsoft Windows 7* SP1
 - Microsoft Windows Server* 2008 SP2 and 2008 R2 SP1
 - Microsoft Windows HPC Server 2008 and 2008 R2
 - Microsoft Windows 8* operating system
 - Microsoft Windows 8.1* operating system
 - Microsoft Windows 10* operating system
 - Microsoft Windows Server* 2012
- Supported Microsoft Visual Studio* versions:
 - Microsoft Visual Studio* 2012
 - Microsoft Visual Studio* 2013
 - Microsoft Visual Studio* 2015
- Recommended compilers:
 - Intel® C/C++ Compiler XE 12.0 or higher
 - Intel® Visual Fortran Compiler XE 12.0 or higher
- Native Application coding requirements
 - Supported programming languages:
 - Fortran
 - C
 - C++
 - Supported threading methodologies:
 - Intel® Threading Building Blocks (Intel® TBB)
 - Win32* Threads on Windows* OS
 - OpenMP* (*via Intel® OpenMP compatibility library*)
 - Intel® C++ Compiler parallel language extensions

- Intel® Cilk™ Plus
- Microsoft PPL* (*via Intel TBB*)
- Managed Application coding requirements
 - Supported programming languages:
 - C# (full support for .NET* versions between 2.0 to 3.5 inclusive)
 - C# (limited support for .NET 4.0 – see note below).
- Adobe* Reader* 7.0 or later for reading installed documentation

Note:

Intel Inspector XE has limited support for .NET 4.0:

- The Microsoft * Task Parallel Library classes and algorithms in the System.Threading.Tasks namespace are not supported.
- The following synchronization class in the System.Threading namespace (new in .NET 4.0) is not supported: Barrier.

4 Installation Notes

The installation of the Intel® Inspector XE removes any earlier installed minor version of this product (with the same major version number). Different major versions can co-exist with each other, however, only one version can be integrated with any one particular Microsoft Visual Studio* installation at a given time.

If you are installing the product for the first time, you need the product serial number or a valid license file to activate the product.

The product installation package is a self-extracting compressed executable file with one IA-32 package that you can install on either a 32-bit or 64-bit system. If downloaded, this compressed file may be located at: `C:\Users\<username>\Download`

To begin the installation, double-click the compressed self-extracting `<package_name>_setup.exe` file as a user with administrative privileges. Select the full installation option to use default install settings and get the complete set of user interfaces (includes a GUI front-end for using the Intel Inspector XE as well as Visual Studio integration). Activation is required.

Activation

You must activate the product to allow installation to proceed. There are several methods for product activation:

- Activate using a serial number. Internet connection is required.
- Activate remotely using a serial number. Use when your computer is not connected to the Internet. You can use another computer with Internet access.

- Activate using a license file.
- Activate using a license server.

You can also evaluate the product for 31 days.

Floating licensing service requirements

Intel® Software License Manager version 2.3, available on the [Intel® Registration Center](#) (choose the right OS and platform; only users with floating license registrations have access to this link).

For more details please refer to the <https://software.intel.com/en-us/articles/intel-software-license-manager-getting-started-tutorial>

Intel® Software Manager

Intel® Software Manager is a utility that lets you:

- Download and install updates for your Intel® Software Development Products.
- Manage subscription status of installed software.
- Activate serial numbers.
- Find out about the latest news for Intel Software Development Products.

Intel Software Manager requires an Internet connection to connect to a remote server for information and updates.

Intel Software Manager installs with Intel Software Development Products on Windows*, Linux*, and Mac OS* X operating systems.

To obtain more information about the Intel Software Manager, please refer to the <https://registrationcenter-ssl.intel.com/Docs/ism.htm> web page.

Default Installation Folders

The default top-level installation folder for this product is:

```
C:\Program Files (x86)\IntelSWTools\Inspector XE 2016
```

You can select a different top-level folder name as part of a custom installation.

Activating Your Evaluation Software After Purchase

If you installed an evaluation version of Intel Developer Products and then decided to purchase the product, you can use the Intel Software Manager to enter a valid product serial number to convert your evaluation license to fully licensed status.

You can run Intel Software Manager from `C:\Program Files (x86)\Common Files\Intel\Intel Software Manager\ism.exe`. Click **Activate**, and supply a valid product serial number to convert your evaluation software to a fully licensed product.

Changing, Updating or Removing the Product

If you want to add or remove components from an installation, open the **Control Panel**, select the **Add or Remove Programs** applet, select **Intel Inspector XE 2015 Update X**, and click **Change/Remove** (or **Uninstall/Change** in the Microsoft Windows 7* operating system).

Installing Silently (Non-interactive)

Silent installation allows you to install, repair or remove the product without requiring your input (batch mode) during the execution of the install. Options typed on the command line allow you to activate the product with a license file or serial number and customize the installation location.

To install the Intel Inspector XE in silent mode, invoke the setup using the following command:

```
<package_name>_setup.exe --s --a install --eula=accept [{--  
license=<path-to-license-file> | --sn=<serial number>}] --  
output=<report-file>
```

With this command, the compressed `<package_name>_setup.exe` self-extracting file silently uncompresses to `%ProgramFiles%\Intel\Download\Inspector_XE_2016_setup` (the default extract location) and executes `setup.exe`, passing all arguments following option `--a`. In turn, the uncompressed application `setup.exe` installs the product into a default directory using the specified license file or serial number for activation.

- The following options are **required** after the `--a` option (they are passed to the uncompressed `setup.exe`): The use of `--eula=accept` means you accept all terms and conditions of the End User License Agreement.
- Unless you already have an existing license, specify either `--sn` or `--license`. If you have a serial number, choose the `--sn` option. If you have a license file, choose the `--license` option. If you omit both options, the install will look for an existing license.
- The `--output` option writes log information reported during the install into the file specified. View this file to see installation progress and any warnings or errors encountered.

To specify a non-default installation directory, type the `--installdir` option.

To get more help on options for the self-extracting compressed file, type the following command:

```
<package_name>_setup.exe -help
```

To get more help on uncompressed `setup.exe` options, type the following command:

```
setup.exe --help
```

Installing Collectors on Remote Systems

You can install the Intel Inspector XE collectors on a remote system after installing and activating the full product on one system. This is intended for use on systems where space or license checking is an issue. No product activation is required to install and run the collectors on a remote system, but the analysis results may not be viewed on the remote system. Result folders must be copied or made available through the network to the system where the full product was installed and activated, since the visualization of results and command-line reporting option require an activation check.

To install the Intel Inspector XE collectors on a remote system:

- 1) Run `<package_name>_setup.exe -x` to extract the installer files into the default location: `%ProgramFiles%\Intel\Download\Inspector_XE_2016_setup`. If you need another location, use the command `<package_name>_setup.exe -x -f <location>`. **Note:** You can skip this step if you know the extraction location for the original installation.
- 2) Locate and copy the folder `Installs\cs_he_cli` to the remote machine.
- 3) On a remote machine, run `Installs\cs_he_cli\Inspector_XE.msi` and follow the installer instructions.
- 4) To install collectors silently, use:
`msiexec.exe -i Installs\cs_he_cli\Inspector_XE.msi -qn -log <log-file>`

IMPORTANT: While no activation is required to install and run collectors on a remote machine, you are still bound by the terms and conditions of the End User License Agreement in the original install and included with the collectors remote install after you install the collectors.

Setting up the Intel Inspector XE Command Line Environment

To easily access the command line interface, use a command prompt window with the proper environment settings. You can open such a window from the **Start** menu, using a shortcut under **All Programs > Intel Parallel Studio XE 2016 > Analyzers > Command Prompt**.

Alternatively, you can open a command prompt window and use the following command to setup the proper environment:

```
C:\Program Files (x86)\IntelSWTools\Inspector XE 2016\inspxe-  
vars.bat
```

Known Installation and Configuration Issues

- In very rare situations, the installer may hang during the phase *Configuring integration with Microsoft* Visual Studio 20xx software...* phase. If the installer hangs for more than 20 minutes, locate process `devenv.exe` and shut down the process. Make sure that you do

not have any running instances of Visual Studio software. Reboot the machine and then install the product again.

- When installing the Intel Inspector XE for the first time on a Visual Studio 2010 system, you may be asked to initialize the Local Store for documentation. Follow `Help Library Manager` installation wizard instructions to register and install the Intel Inspector XE Help documentation. You do not need to re-register the Intel Inspector XE Help documentation when you install future Intel Inspector XE updates. For more information, see <http://msdn.microsoft.com/en-us/library/dd264831.aspx>. If you encounter problems viewing the Intel Inspector XE (local) help: Choose `Help > Manage Help Settings > Settings`, and check `I want to use local help`.
- By default, Visual Studio 2012 software sets the **Launch in Browser** option to display documentation for integrated products. To view the Intel Inspector XE local help documentation: Choose **Help > Intel Inspector XE 2016 > Intel Inspector XE 2016 Help** or use context-sensitive help. If you still encounter problems viewing the help, Choose **Help > Set Help Preferences > Launch in Help Viewer**.
- If you have problems viewing Microsoft Visual Studio 2012 help pages, check the settings for Internet Explorer in **Tools > Internet Options > Security**. To allow correct display of help, in the **Internet zone** enable **MIME Sniffing** and **Active scripting**. Alternatively, from **Tools > Internet Options > Security** add “**about:internet**” to the list of trusted sites.

5 Issues and Limitations

General Issues

- Intel® Inspector XE could report a false-positive data race on some platforms where GNU gcc* implements atomic operations without explicit usage of atomic instructions.
- Your target application might crash or freeze in case when you are using one of the Intel® Inspector debug analysis options in Microsoft Visual Studio* IDE running on systems with Intel(R) Xeon(R) processor E5 v2 and v3 family.
- Intel® Inspector XE does not support development of new Windows 8* Store Apps and use of WinRT APIs.
- Intel Inspector XE supports the .NET 4.0 Runtime with the exception of the new Task Parallel Library classes.
- Intel Inspector XE may report false positives when analyzing applications that use the Microsoft C++ runtime in Visual Studio 2012.
- Intel Inspector XE collected results may not be visible after closing and re-opening of the solution (.sln file) during a single Visual Studio 2012 work session. This is due to a known bug in Visual Studio 2012.
Recommendation: Restart Visual Studio 2012.
- Some errors in the new C++11 extensions supported in Visual Studio 2012 are not currently detectable.
- Intel® Inspector XE 2015 does not support processing of results generated by the legacy Intel® Thread Checker product. However, such Intel® Thread Checker generated results

can still be processed and converted by Intel® Inspector XE 2011 product (either Standalone or Visual Studio integrated version of the product).

- Intel does not guarantee that the Intel Inspector XE will detect or report every memory and threading error in an application.
 - Not all logic errors are detectable.
 - Heuristics used to eliminate false positives may hide real issues.
 - Highly correlated events are grouped into a single problem.
- In the Intel Inspector XE, the Code complexity metrics feature isn't available for Fortran code.
- You can use the Intel Inspector XE to analyze applications in debug and release modes. To learn more about options necessary to produce the most accurate, complete results, refer to the following related resources:
 - Memory error analysis: <http://software.intel.com/en-us/articles/compiler-settings-for-memory-error-analysis-in-intel-inspector-xe/>
 - Threading error analysis: <http://software.intel.com/en-us/articles/compiler-settings-for-threading-error-analysis-in-intel-inspector-xe/>
- If no symbols are found for a module in which a problem is detected, the Intel Inspector XE displays the call stack and observation source code of the first location where it can find symbols. If it cannot find any location in the call stack with symbols, it displays the module name and relative virtual address (RVA) for the location.
- Applications that crash when run outside the Intel Inspector XE may crash or hang the Intel Inspector XE runtime analysis engine. For example, a corrupt return address on an application call stack crashes the runtime analysis engine. If a crash occurs, problems detected prior to that time can be viewed, but memory leaks will not be reported.
Recommendation: Review the reported problems – it is likely one of them caused the crash.
- Intel Inspector XE uses a socket to communicate between the graphical user interface and the runtime analysis engine. Preventing an application from opening a socket prevents an analysis of the application from being started by the graphical user interface. The command-line interface can be used to run an analysis in this case and the results can subsequently be viewed using the graphical interface.
- Intel Inspector XE may report an incorrect call stack following an interruption of normal call flow, such as when an exception is thrown and caught. While the Intel Inspector XE recognizes and attempts to correct result data when this situation occurs, it is possible for a threading or memory problem to be reported before the call stack is fully corrected.
- If the Intel Inspector XE reports insufficient memory errors while analyzing OpenMP* applications, try setting OMP_NUM_THREADS to limit the number of OpenMP threads. In most cases, OMP_NUM_THREADS=2 is sufficient.
- If the Intel Inspector XE reports insufficient memory errors during analysis, try analyzing your application in sections by running several analyses and excluding a different set of modules for each run.
Note: The Intel Inspector XE does not detect or report issues in excluded modules.
- To analyze applications using Boost* on a Windows* operating system, you must compile your application and Boost libraries (for example, `boost_thread-vc80-mt-gd-1_42.dll` etc.) with debugging information enabled (`/Zi`), optimization disabled (`/Od`), and the C runtime library dynamically linked in. To make sure you have debugging information enabled and optimization disabled, you can download the Boost source and build the libraries yourself. The `.pdb` files need to be placed next to the

binaries or at the location of pdb paths coded in the binaries. To learn more, see: <http://software.intel.com/en-us/articles/building-boost-for-applications-analyzed-by-intel-inspector-xe/>.

- If a child application is selected for analysis, the Intel Inspector XE analyzes only the first instance of that application, even if multiple instances of that application occur.
- If the Intel Inspector XE is integrated with Visual Studio* software, it is not possible to remove the last module from the include/exclude module list in the Target tab of the Project Properties dialog box. [200217183]
Recommendation: Deselect the “Inherit system environment variables” check box on the same tab to enable removal of the last module from the list.
- To debug an application that is running an Intel Inspector XE analysis you must choose one of the Intel Inspector XE debug analysis options when starting the application. Using the Visual Studio Debugger “attach” command after starting an application under analysis does not have the same effect and will result in debugging the Inspector analysis tool and not the application. When starting a debug analysis session in the documented manner, the Intel Inspector XE uses a probe in the Visual Studio process to intercept and modify the Visual Studio Debugger behavior such that it controls execution and displays information about the target application rather than the analysis tool.
- When taking advantage of the Intel Inspector XE custom filter by source, be aware that this filter does not persist when reloading results.
- Detaching an active Intel Inspector XE debug session is not supported on Visual Studio* IDEs and will cause the debug session and collection to terminate. [200233639]
- On-demand leak detection will not report memory leaks until the end of the basic block in which they occur, as there is still an internal reference in the program to that memory. If the baseline for leak detection is not reset, these leaks will be reported at the next request [200348282]
- The definition of `std::cv_status` changed in Microsoft Visual Studio* 2013 in a way that makes it impossible for the Intel Inspector XE to support running Visual Studio* 2012 and Visual Studio* 2013 simultaneously. By default, the Intel Inspector XE supports the 2013 version. If you need to support the 2012 version, set `INSPXE_USE_CPP11_VS2012` in your environment before performing an analysis.
- The message detected an attempt to suspend an internal thread... happens when the target application attempts to suspend all threads, causing Inspector XE thread suspension as well. To avoid this error:
 - Disable the Enable collection progress information checkbox in the Target tab of the Project Properties dialog box.
 - Disable the Enable interactive memory growth detection checkbox in the Analysis Type pane.
 - Rerun the analysis.
 - Also avoid running an interactive debugging session during analysis. [200238394]
- Inspector XE 2015 Update 1 only has limited support for Windows* fibers.

Memory Error Analysis Issues

- An Intel® Cilk™ Plus program that does not run to completion when serialized will not run successfully under memory analysis. Intel Inspector XE memory analysis works with Intel Cilk Plus programs that have well defined semantics. These semantics are defined with respect to program serialization (see the following resource for more details: http://software.intel.com/sites/products/documentation/hpc/composerxe/en-us/cpp/mac/cref_cls/common/cilk_serial.htm). [200174735]
- Intel Inspector XE may report false positives when the analyzed application uses custom memory allocators. Use of `_itt_notify` to annotate your source code can reduce these false positives.
- If the semantics of standard C runtime allocators are changed, the behavior of the Intel Inspector XE is unknown and could lead to abnormal analysis termination. For instance, if the application is using non-standard versions of these allocators where the memory returned by the allocator is initialized when it would normally be uninitialized.
- Memory error analysis of applications that use Qt* APIs may report false positives.
- If you turn on `Analyze stack accesses` for a memory analysis, then make sure the application being analyzed is not compiled with the default Microsoft Visual C++* setting `/RTC1` or with `/RTCs`. These options cause a basic runtime check for stacks which uses a fill technique to detect uninitialized accesses that hides errors from the Intel Inspector XE's memory analysis.
- Intel Inspector XE memory analysis may miss memory releases in `atexit()` registered functions with analysis type `mi2` and above and therefore report leaks of the memory released in these functions. [200233761]

Threading Error Analysis Issues

- Intel Inspector XE is not a replacement for a traditional debugger, such as the Visual Studio* debugger on Windows* operating systems or GNU gdb* debugger on Linux* operating systems. If an application crashes inside/outside the Intel Inspector XE, try running the application inside the debugger to reproduce and fix the crash.
- Intel Inspector XE does not capture the main thread creation site if:
 - The binary is built without debug symbol information.
 - The `.pdb` symbol file is not in the location specified within the `.exe` or `.dll` executable file or in the location containing the `.exe` or `.dll` executable file.
- Intel Inspector XE does not detect deadlocks or potential deadlocks created with:
 - Some types of locks via Intel C/C++ parallel extension (`__critical`) provided by the Intel® Compiler Professional Edition 11.0.
 - Some types of locks in Intel® Threading Building Blocks (Intel® TBB) (`spin_mutex`, `spin_rw_mutex`)
 - Non-exclusive ownership synchronization objects involved, for example, condition variables, semaphores and events and reader/writer locks.
- Intel Inspector XE does not detect inter-process data races or deadlocks.
- Intel Inspector XE does not detect data races or deadlocks in system modules (say modules residing in `windows\system32` directory). For example, DX9 libraries and memory accessed by DX libraries installed in Windows system directory are not analyzed. To enable detection of the issues, move the modules to a non-system directory (say to the Windows* `Program Files` directory). [200139450]

- Intel Inspector XE may report false positives for analyzed applications using customized synchronization primitives. Use of `_itt_notify` to annotate your source code can reduce these false positives.
- Intel Inspector XE may report false positives when analyzing applications that use the Microsoft* Concurrency Runtime framework (Parallel Patterns Library, Asynchronous Agents Library, etc.).
- Intel Inspector XE may report false positives if you have `Microsoft C runtime` statically linked in the application.
Recommendation: Build your application with `Microsoft C Runtime` dynamically linked in.
- To enable correct analysis of Intel TBB applications, set the following required macros before compiling:
 - **TBB_USE_DEBUG** (which sets **TBB_USE_THREADING_TOOLS**) if you use Intel TBB debug libraries
 - **TBB_USE_THREADING_TOOLS** if you use Intel TBB release libraries
- Using multiple versions of the Microsoft .NET* framework in the same application may cause the Intel Inspector XE to hang.

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wxWindows Library

This tool includes wxWindows software which can be downloaded from <http://www.wxwidgets.org/downloads>.

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```
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