Intel® Inspector 2017 Release Notes for Linux* OS

Installation Guide and Release Notes

14 July 2016

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1 Introduction

Intel® Inspector 2017 helps developers identify and resolve memory and threading correctness issues in their C, C++ and Fortran programs.

Intel Inspector is a static and dynamic error checking tool for developing multithreaded applications on Windows* or Linux* operating systems. Intel Inspector maximizes code quality and reliability by quickly detecting memory, threading, and source code security errors during the development cycle. You can also use the Intel Inspector to visualize and manage Static Analysis results created by Intel® compilers in various suite products. Intel Inspector is an easy, comprehensive solution that delivers rapid results in isolating memory and multithreading errors.

Intel Inspector has a standalone graphical user interface (GUI) as well as a command line interface (CLI).

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. For documentation, open the `documentation_inspector.htm` file in the following directory: `<install-dir>\documentation\<locale>\`. For example, if you choose the default installation path, you can find the `documentation_inspector.htm` file in the `/opt/intel/inspector_2017/documentation/en` 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 2017

- 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
- Variable name detection for threading analysis (global, static and stack variables)
- Support for Intel® Xeon Phi™ processor (codename: Knights Landing)
- Bug fixes

3 System Requirements

Supported Architectures and Terminology

Intel® Inspector 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 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, 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 operating systems:
    - Red Hat* Enterprise Linux* 6 and 7
    - CentOS* versions equivalent to Red Hat* Enterprise Linux* versions listed above
    - Fedora* 23 and 24 (`pangox-compat` package should be installed)
    - SUSE* Linux Enterprise Server* 11 and 12
    - Debian* 7 and 8
    - Ubuntu* 14.04, 16.04

  Note: Support for SUSE* Linux Enterprise Server* 10 and Red Hat* Linux* 5.10 is deprecated. Support may be removed in a future release of the Intel Inspector.

- Recommended compilers:
    - Intel® C/C++ Compiler XE 12.0 and higher
    - Intel® Fortran Compiler XE 12.0 and higher
    - GNU* C/C++ Compiler 3.4.6 and higher

- Supported debuggers:
    - Intel® Composer XE 2015 debugger or later
    - GNU gdb* debugger versions 6.3 or later with working remote debugging support (there are known issues with gdb-7.1-xx.fc13 versions)

- Application coding requirements:
    - Supported programming languages:
        - Fortran
        - C
        - C++
    - Supported threading methodologies:
        - Intel® Threading Building Blocks (Intel® TBB)
        - POSIX* Threads on Linux* OS
        - OpenMP* (see note below)
        - Intel® C++ Compiler parallel language extensions

- Sun* or Oracle* JRE 1.6 or higher is required to run Intel® Software Manager which enables automatic product updates and is one of the components of the Intel Inspector installation.

- PDF reader software such as Adobe* Reader* 7.0 or later is needed to read installed documentation

Note:

Intel Inspector analysis is best done with applications built with the Intel Fortran Compiler XE version 12.0 or higher, the Intel C++ Compiler XE version 12.0 or higher, and the GNU C/C++ Compiler 3.4.6 or later. Applications that use OpenMP technology and are built with the GNU* compiler must link to the OpenMP compatibility library as supplied by an Intel compiler.

4 Installation Notes

This product package can be used to install the software on both IA-32 systems and Intel® 64 systems. The installer determines the system architecture and installs the appropriate files. Both 32-bit and 64-bit versions of the software are automatically installed on an Intel 64 system.

The installation of the Intel® Inspector removes any earlier installed minor version of this product (with the same major version number). Different major versions can co-exist with each other.

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.

To install, perform the following steps:

1. Uncompress the package: `gunzip <package-name>.tar.gz`
2. Extract the files: `tar xf <package-name>.tar`
3. Start the installation. (**Note**: For successful installation, you should have read and write permissions for the `/tmp` directory.)
    - To install on a local system enter the following:

      ```
      cd <package-name>
      ```

    - `./install.sh`
      Note: If you want to install the software for use by any user, you must do this as the root user. To install to a network-mounted drive or shared file system for multiple users, become the root user then enter:

      ```
      cd <package-name>

      ./install.sh --SHARED_INSTALL
      ```

4. Follow the prompts to complete the installation and activation of the software.

Activation

You must activate the product to finish installation. 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:

```
/opt/intel/inspector_2017
```

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

Installing Collectors on Remote Systems

You can install just the data collection support features of the product on remote systems where run-time license checking is not feasible. The results of any data collection that is run on the remote system must then be copied to the system where the regular install was done for analysis, viewing, and reporting.

To do this:

1. Copy the `CLI_install` folder (found at the top level in the untarred product install package) to the remote machine.
2. Execute the `./install.sh` script file (this file is located inside the `CLI_install` folder). Activation is not required.

Activating Your Evaluation Software After Purchase

If you installed an evaluation version of Intel Software 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.

Run the Intel Software Manager from /opt/intel/ism/ism. Click **Activate**, and supply a valid product serial number to convert your evaluation software to a fully licensed product.

Be sure to login or `su` to root to run if you want the product license to be available to all system users.

Removing the Product

To remove the product, execute the following commands:

> **Note:** Replace `/opt/intel` with the chosen install folder name if the default folder was not used.

1. `cd /opt/intel/inspector_2017`
2. `uninstall.sh` (as a root user or the same user who performed the install)

Setting up the Intel Inspector Command Line Environment

To easily access the command line interface, set up the Intel Inspector XE environment settings in a terminal session using the following command from a bash shell:

```
source <install-dir>/inspxe-vars.sh
```

When using a C shell, source the .csh script instead.

5 Issues and Limitations

General Issues

- On some hardware, the Intel Inspector may report data race problems on simple operations (such as variable load or store operations) assumed to be atomic operations instead of explicit atomic instructions. In particular, the Intel Inspector reports false data race issues on C++ 11, std::atomic class operations compiled with the GNU gcc* compiler. Intel and Microsoft* compilers use explicit atomic instructions; therefore, code generated with these compilers is not impacted.

- Running the Intel Inspector on a Fedora* 22 operating system may generate the following error: *Error: This operating system is not supported. Suggestion: Check the Release Notes for a list of supported operating systems*.
  Recommendation: Do one of the following to resolve:
  - Set the following environment variable: INSPXE_PIN_OPTIONS='-ifeellucky
  - If you are running a bash shell, use the following command: export INSPXE_PIN_OPTIONS='-ifeellucky'
- Intel® Inspector 2017 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.
- When using Intel Inspector with Linux desktop window managers on Linux OS like TWM and Ubuntu/Unity* window managers, there are known Linux window manager issues which may cause unexpected behavior (like disappearance of controls or even the whole GUI) or even spontaneous crashes of Intel Inspector.
  Recommendation: Switch to another window manager.
- In the Intel Inspector, the Code complexity metrics feature isn't available for Fortran code.
- Intel does not guarantee this software tool 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.
- You can use the Intel Inspector 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 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 may crash or hang the Intel Inspector 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 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 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 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 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 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 does not detect or report issues in excluded modules.
- On Ubuntu* 10.04 systems with Ambience and Radiance themes, the error message "CRITICAL **: murrine_style_draw_box: assertion `width >= -1' failed" is printed in console for `inspxe-gui`. [200159955]
  Recommendation: Change to another theme. See https://bugs.launchpad.net/ubuntu/+source/light-themes/+bug/538499/ for more information.
- Intel Inspector does not currently support Security-enhanced Linux* settings (SELinux); it supports only Permissive mode.
  Recommendation: Either disable SELinux (set the line "`SELINUX=disabled`" in your `/etc/sysconfig/selinux` file or add the "`selinux=0`" kernel argument in `lilo.conf` or `grub.conf` files) or make a SELinux mode adjustment (set the line "`SELINUX=permissive`" in your `/etc/sysconfig/selinux` file or ask your system administrator to make a SELinux mode adjustment). You may need to reboot your system after changing the system parameters. See http://www.nsa.gov/selinux/ for more information about SELinux.[200155374]
- If a child application is selected for analysis, the Intel Inspector analyzes only the first instance of that application, even if multiple instances of that application occur.
- Intel Inspector cannot launch a debugger when the terminal type konsole is used on KDE* versions older than 4.6.
  Recommendation: Use a terminal such as xterm on older KDE versions when using the analysis with debug feature. [200223810]
- When running a multi-threaded application, use of `Enable debugger when problem detected (-appdebug=on-error)` can result in multiple debugger sessions being opened. Only the first occurrence will be connected and able to debug the application under analysis. The workaround is to use `Select analysis start location with debugger (-appdebug=on-start)` so that only one debug session will be started and then turn on analysis by entering the extended debugger command `monitor begin-analysis` then continue to resume execution until it encounters a problem.
- If you try to store results on a Parallel Virtual File System 2 (pvfs2), Intel Inspector analysis fails with the following error: "Error: Failed to create a database. Cannot continue."
  Recommendation: Specify a result directory location that is not on a pvfs2 file system. [200213391]

- If you encounter problems searching Intel inspector help using a certain web browser, consider using a newer version of that browser or use a different web browser as your default browser.
- When using interactive debugging with gdb on Fortran programs on Linux, the 'next' and 'step' commands in the debugger can take a very long time to execute.
  Recommendation: use the Intel debugger with Fortran programs. The launched debugger can be changed in the GUI from the File->Options menu. It can be set for the CLI using the `INSPXE_DEBUGGER` environment variable or the `-debug-using` command line option.
- Memory and threading analysis require ptrace to be enabled on Linux platforms. Some newer Linux distributions, including Ubuntu* 12 disable it by default. Message reads, "`Error: Failed to start the analysis because the scope of ptrace() system call application is limited.`"
  Recommendation: Enable ptrace by setting `/proc/sys/kernel/yama/ptrace_scope` to 1. [200317488]
- When taking advantage of the Intel Inspector XE custom filter by source, be aware that this filter does not persist when reloading results.
- There is an issue on RHEL 5.10 when installing the Intel® Parallel Studio XE 2015 or the Intel Parallel Studio XE 2015 bundles (with an old version of the Intel Inspector XE inside) over the current product releases before Intel® Parallel Studio XE 2013 SP1. This issue breaks product functionality and makes it impossible to uninstall the product using the uninstaller.
  - If the bundle has not been installed:
    1. Uninstall the current Intel® Inspector XE
    2. Install the Intel Parallel Studio XE 2015 bundle
    3. Install the current Intel Inspector XE release over the bundle release.
  - If the bundle has already been installed:
    1. Locate the distribution package (webimage) of the current product release and copy the file `pset/mediaconfig.xml` from it into the `uninstall` directory under the Intel Inspector XE installation directory (e.g. /opt/intel/inspector_xe_2013/uninstall/)
    2. Uninstall the Intel Inspector XE (e.g. /opt/intel/inspector_xe_2013/uninstall_GUI.sh)
    3. Run the Intel Parallel Studio XE installer, select **Modify** mode, deselect the Intel Inspector and proceed to modification
    4. Install the current Intel Inspector release one more time
- The message "detected an attempt to suspend an internal thread…" happens when the target application attempts to suspend all threads, causing the Intel 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]

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 memory analysis works with Intel Cilk Plus programs that have well-defined semantics 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 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 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.
- The memory error analysis type with the narrowest scope may be slow for binaries that do not contain a binary search table in the `.eh_frame_hdr` section. [200154305]
- Memory error analysis of applications that use Qt* APIs may report false positives.
- Intel Inspector 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]
- 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]

Threading Error Analysis Issues

- Intel Inspector does not capture the main thread creation site if the binary is built without debug symbol information.
- Intel Inspector 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 does not detect inter-process data races or deadlocks.
- Intel Inspector 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 is not a replacement for a traditional debugger, such as the Microsoft Visual Studio* debugger on Windows* operating systems or GNU gdb* debugger on Linux* operating systems. If an application crashes inside/outside the Intel Inspector, try running the application inside the debugger to reproduce and fix the crash.
- Intel Inspector may report false positives if you have `libc` or `libpthread` statically linked in the application.

Recommendation: Build your application with `libc` and `libpthread` 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

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ICU License - ICU 1.8.1 and later

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A "png_get_copyright" function is available, for convenient use in "about"
boxes and the like:

```
printf("%s",png_get_copyright(NULL));
```

Also, the PNG logo (in PNG format, of course) is supplied in the
files "pngbar.png" and "pngbar.jpg (88x31) and "pngnow.png" (98x31).

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June 14, 2012

Libjpeg

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The IJG distribution formerly included code to read and write GIF files.
To avoid entanglement with the Unisys LZW patent, GIF reading support has
been removed altogether, and the GIF writer has been simplified to produce
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