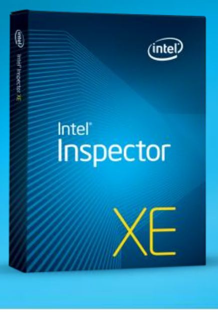


MEMORY AND THREAD DEBUGGER

Intel® Inspector XE 2013

Product Brief

Top Features

- Inspect C, C++, C# and Fortran
- No special builds required. Use your normal compiler and build.
- Inspects all code, even if the source is unavailable
- Highlights the error at multiple source code locations, provides corresponding call stacks
- New! Debugger breakpoints for easier diagnosis of difficult bugs
- New! Heap growth analysis finds cause of heap growth in a problematic region

> **"We struggled for a week with a crash situation, the corruption was identified but the source was really hard to find. Then we ran Intel® Inspector XE and immediately found the array out of bounds that occurred long before the actual crash. We could have saved a week!"**
>
> Mikael Le Guerroué,
> Senior Codec Architecture Engineer,
> Envivio

Intel Inspector XE is included in these suites:

- Intel® Parallel Studio XE
- Intel® C++ Studio XE
- Intel® Fortran Studio XE
- Intel® Cluster Studio XE

OS Support:

- Windows*
- Linux*

Deliver More Reliable Applications

Intel® Inspector XE 2013 is an easy to use dynamic memory and threading error detector for Windows* and Linux*. Enhance productivity, cut cost and speed time-to-market.

Find memory and threading defects early in the development cycle. The earlier an error is found, the lower the cost. Intel Inspector XE makes it easy to find and diagnose errors early.

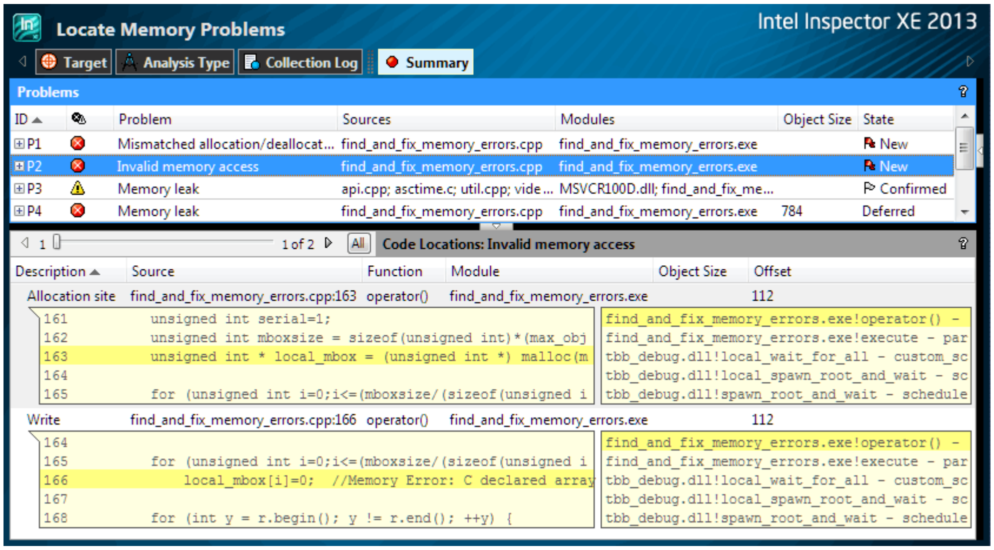
Find errors that traditional regression testing and static analysis miss. Intel Inspector XE finds latent errors on the executed code path plus intermittent and non-deterministic errors, even if the error-causing timing scenario does not happen.

Memory Errors	Threading Errors
▪ Memory leaks ▪ Memory corruption and Illegal Accesses ▪ Allocation / de-allocation API mismatches ▪ Inconsistent memory API usage	▪ Data races – Heap races – Stack races ▪ Deadlocks

C, C++, C# and Fortran. Or any mix. Is your GUI in C# with performance sensitive code in C++? Got legacy code in Fortran? Using libraries without the source? No problem, it all works. Dynamic instrumentation enables inspection of all code including third party libraries where the source is not available.

Fits your workflow. No special compilers or builds are required, just use your normal debug or production build. Inspect the same code you are debugging and shipping. Use the graphical user interface or automate regression testing with the command line. The user interface can be used standalone on both Windows* and Linux* or integrated with Microsoft Visual Studio*.

Bonus: Get static analysis and pointer checker features when you buy a suite. The Intel® compiler is not required to use Intel Inspector XE, but you do get additional Intel compiler-based features when you purchase a suite. Static analysis finds security issues. Pointer Checker is a compiler-based diagnostic that traps memory accesses beyond allocated addresses.



Problems

ID		Problem	Sources	Modules	Object Size	State
P1	⊗	Mismatched allocation/deallocat…	find_and_fix_memory_errors.cpp	find_and_fix_memory_errors.exe		New
P2	⊗	Invalid memory access	find_and_fix_memory_errors.cpp	find_and_fix_memory_errors.exe		New
P3	⚠	Memory leak	api.cpp; asctime.c; util.cpp; vide…	MSVCR100D.dll; find_and_fix_me…		Confirmed
P4	⊗	Memory leak	find_and_fix_memory_errors.cpp	find_and_fix_memory_errors.exe	784	Deferred

1 1 of 2 All Code Locations: Invalid memory access

Description	Source	Function	Module	Object Size	Offset
Allocation site	find_and_fix_memory_errors.cpp:163	operator()	find_and_fix_memory_errors.exe		112

```
161         unsigned int serial=1;
162         unsigned int mboxsize = sizeof(unsigned int)*(max_obj
163         unsigned int * local_mbox = (unsigned int *) malloc(m
164
165         for (unsigned int i=0;i<=(mboxsize/(sizeof(unsigned i
```

```
find_and_fix_memory_errors.exe!operator() -
find_and_fix_memory_errors.exe!execute - par
tbb_debug.dll!local_wait_for_all - custom_sc
tbb_debug.dll!local_spawn_root_and_wait - sc
tbb_debug.dll!spawn_root_and_wait - schedule
```

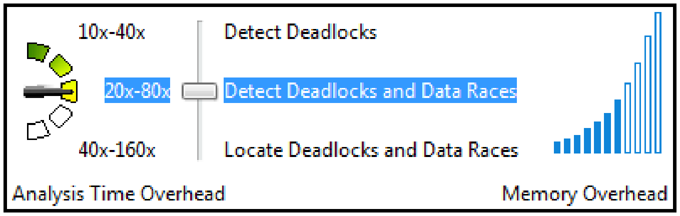
Description	Source	Function	Module	Object Size	Offset
Write	find_and_fix_memory_errors.cpp:166	operator()	find_and_fix_memory_errors.exe		112

```
164
165         for (unsigned int i=0;i<=(mboxsize/(sizeof(unsigned i
166             local_mbox[i]=0;  //Memory Error: C declared array
167
168         for (int y = r.begin(); y != r.end(); ++y) {
```

```
find_and_fix_memory_errors.exe!operator() -
find_and_fix_memory_errors.exe!execute - par
tbb_debug.dll!local_wait_for_all - custom_sc
tbb_debug.dll!local_spawn_root_and_wait - sc
tbb_debug.dll!spawn_root_and_wait - schedule
```

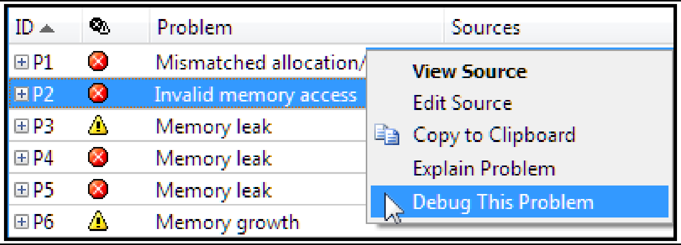
Intel Inspector XE takes you to the source locations of threading and memory errors and provides a call stack to help you determine how you got there.

Top Features



Choose Your Level - Go Fast or Be Thorough

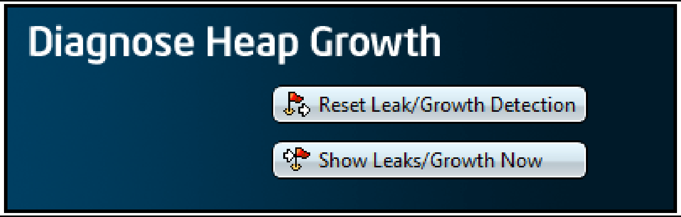
The first level of analysis has very little overhead. Use it during development because it is fast. The second level (shown) takes more time and detects more issues. It is often used before checking in a new feature. The third level is great for regression testing and finding bugs.



ID ▲		Problem	Sources
P1	⊗	Mismatched allocation/	
P2	⊗	Invalid memory access	
P3	⚠	Memory leak	
P4	⊗	Memory leak	
P5	⊗	Memory leak	
P6	⚠	Memory growth	

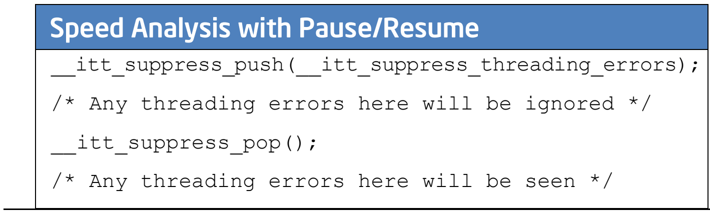
Debugger Breakpoints Simplify Diagnosis

Debugger breakpoints make it easier to diagnose difficult errors by breaking into the debugger just before the error occurs. Examine variables and look at other threads to diagnose the problem. Microsoft Visual Studio*, GDB and IDB debuggers are supported. Just select the error and choose "Debug This Problem" from the pop-up menu.



Analyze Heap Growth + New "Instant" leak report

Puzzled about what is causing your memory use to grow and grow as your app continues to run? Heap growth analysis helps you diagnose the cause. Get an instant heap growth report of allocations not deallocated since the last baseline. New! Now you can also get an instant report of leaks since the last baseline.

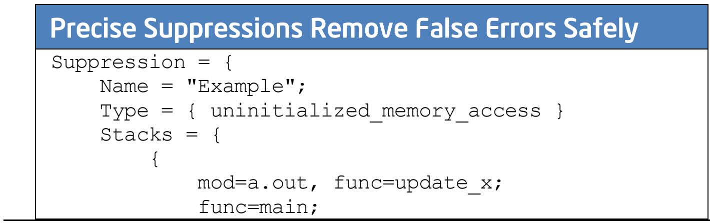


Speed Analysis with Pause/Resume

```
__itt_suppress_push(__itt_suppress_threading_errors);
/* Any threading errors here will be ignored */
__itt_suppress_pop();
/* Any threading errors here will be seen */
```

Pause/Resume Speeds Up Analysis

Speed-up analysis by limiting its scope. Turn on analysis only during the execution of the suspected problem. Instrumentation overhead is reduced to speed through long irrelevant sections of code. Used carefully, this can be very powerful in situations where long run times are required to reach the error.

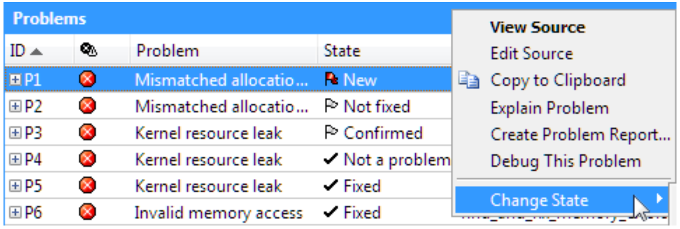


Precise Suppressions Remove False Errors Safely

```
Suppression = {
    Name = "Example";
    Type = { uninitialized_memory_access }
    Stacks = {
        {
            mod=a.out, func=update_x;
            func=main;
```

Suppress False Errors, Share with the Team

False errors are easily added to a suppression list so you don't need to investigate them next time. Multiple lists are supported and can be shared with other project members. Create your own private suppressions to block errors that are not in your code. Suppressing an entire module can also reduce collection time.

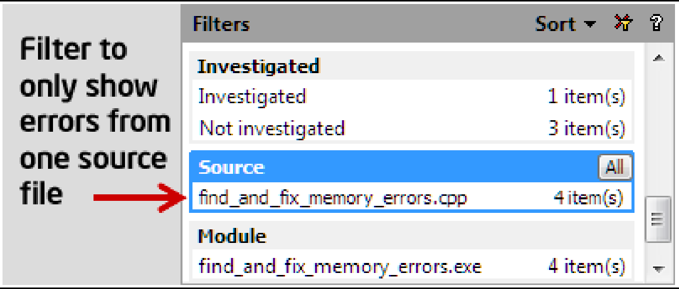


Problems

ID ▲		Problem	State
P1	⊗	Mismatched allocatio…	New
P2	⊗	Mismatched allocatio…	Not fixed
P3	⊗	Kernel resource leak	Confirmed
P4	⊗	Kernel resource leak	✓ Not a problem
P5	⊗	Kernel resource leak	✓ Fixed
P6	⊗	Invalid memory access	✓ Fixed

Team Collaboration

Each error reported contains state information (New, Confirmed, Fixed, Not Fixed, Regression, Not a Problem, Deferred) to help you sort and prioritize errors. State information from multiple developers can now be merged and shared. Users can optionally comment on errors to explain why a certain state was set.



Filter to only show errors from one source file

Filters

Investigated	
Investigated	1 item(s)
Not investigated	3 item(s)
Source	All
find_and_fix_memory_errors.cpp	4 item(s)
Module	
find_and_fix_memory_errors.exe	4 item(s)

Filters Manage the Error List

Just want to see the errors from your source file? Just click and only those errors are shown. Working through the new errors and only want to see the highest severity? Just click. Filters are available for many categories: Severity, problem type, state, module, etc. They weed out the noise and let you focus on what is most important.

Find difficult to diagnose out-of-bounds accesses

Pointer Checker** is a compiler-based diagnostic that traps memory accesses beyond allocated addresses.□Find dangling pointers, buffer overflows, etc. Speed-up diagnosis by breaking into the debugger when the exception occurs.

**Bonus feature available when purchased as a part of one of the Intel® Parallel Studio XE family of tool suites (see page 4).

Details

Fewer False Positives, Better Error Messages

Intel® Inspector XE understands the semantics of the Intel® Threading Building Blocks (Intel® TBB), Intel® OpenMP and Intel® Cilk™ Plus parallel programming models. This saves time.

1) It reports fewer false positives than competitive products.
2) Errors are described using familiar terms from the source, not with cryptic internal runtime labels.

Dynamic Instrumentation: Simple, Reliable, Accurate

Unlike other memory and threading analysis tools, Intel Inspector XE never requires any special recompiles for analysis. Just use your normal debug or production build. (Include symbols so we can map to the source.) This not only makes your workflow faster and easier, it increases reliability and accuracy. Competitive products that use static compilation based instrumentation techniques struggle with dynamically generated or linked code. Intel Inspector XE inspects all code including third party libraries where the source is not available.

Multi-OS (Windows* & Linux*) – Same User Interface

Are you developing for both Windows* and Linux*? Wouldn't it be easier to use the same analysis tools for both OSs? Intel Inspector XE has the same user interface on both Windows and Linux. On Windows it can be used stand alone or integrated with Microsoft Visual Studio*.

Analyze MPI Applications for Memory and Threading Errors

With the advent of multicore and hyperthreading, some MPI applications are adding thread parallelism. Intel Inspector XE can be used to find both memory and threading errors on MPI applications. Performing an initial analysis on a single shared memory system will identify many errors, and additional analysis can also be run on a cluster. Results are sorted by rank.

What's New

Feature	Benefit
Debugger Breakpoints	Debugger breakpoints make it easier to diagnose difficult errors by breaking into the debugger just before the error occurs. Examine variables and look at other threads to diagnose the problem. Visual Studio, GDB and IDB debuggers are supported.
Analyze Heap Growth	Puzzled about what is causing your memory use to grow and grow as your app continues to run? Heap growth analysis helps you diagnose the cause. It creates a list of memory allocations that are not freed in an interval specified with the GUI or an API.
On-Demand Leak Report★	Ask for a leak report any time during the run of the program and get it immediately. Set/reset a baseline for leak analysis – see just the leaks since the baseline. This lets you focus on leaks only in a given section of time or a given section of the code. Available via GUI buttons or API calls.
Pause/Resume Analysis	Speed-up analysis by limiting its scope. Use an API to turn on analysis only during the execution of the suspected problem. Used carefully, this can be very powerful in situations where longer run times are required to reach the error.
Limit Analysis Range	Eliminate false errors and speed up analysis by using an API to mark memory that should not be analyzed (e.g., it contains a synchronization data structure)
Precision Suppressions★	Choose the exact stack frame or frames to suppress. Eliminate the false error without suppressing potential real errors. Share suppressions with your team.
Compatible Suppressions★	Import suppression lists from other popular memory debuggers like Purify* and Valgrind*. Use Intel Inspector XE without wasting time recreating suppression lists. Now in an easy to edit text format.
Better Team Collaboration	State information for the errors (confirmed, not a problem, fixed, not fixed, etc.) that is changed by multiple team members can be merged and shared. Team communication is improved with comments on state information.
Inspect Software for Intel® Xeon Phi™ coprocessor	Intel Inspector XE can be used to analyze software for Intel® Xeon Phi™ coprocessor even though the analysis does not run on Intel Xeon Phi coprocessor. Inspecting your application with Intel Inspector XE running your application on a multicore processor will detect memory errors and threading errors that will occur when running on Intel Xeon Phi coprocessor.
Analyze MPI Applications	Find memory errors on MPI applications. Find memory and threading errors on hybrid applications written using MPI and OpenMP. Easy install on a cluster. View results sorted by rank.
OpenMP 4.0★	Inspector XE understands the semantics of OpenMP so it can report errors in familiar terms from the source, not with cryptic internal runtime labels and reports fewer false errors.

★ – New since the original gold release. New features are continuously released in product updates, free with a current support subscription

Purchase Options: Language Specific Suites

Several suites are available combining the tools to build, verify and tune your application. The product covered in this product brief is highlighted in blue. Named-user or multi-user licenses along with volume, academic, and student discounts are available.

	Suites >>	Intel® Cluster Studio XE	Intel® Parallel Studio XE	Intel® C++ Studio XE	Intel® Fortran Studio XE	Intel® Composer XE	Intel® C++ Composer XE	Intel® Fortran Composer XE
Components	Intel® C / C++ Compiler	●	●	●		●	●	
	Intel® Fortran Compiler	●	●		●	●		●
	Intel® Integrated Performance Primitives[3]	●	●	●		●	●	
	Intel® Math Kernel Library[3]	●	●	●	●	●	●	●
	Intel® Cilk™ Plus	●	●	●		●	●	
	Intel® Threading Building Blocks	●	●	●		●	●	
	Intel® Inspector XE	●	●	●	●			
	Intel® VTune™ Amplifier XE	●	●	●	●			
	Intel® Advisor XE	●	●	●	●			
	Static Analysis	●	●	●	●			
	Intel® MPI Library	●						
	Intel® Trace Analyzer & Collector	●						
	Rogue Wave IMSL* Library[2]							●
	Operating System[1]	W, L	W, L	W, L	W, L	W, L	W, L, O	W, L, O

Note: [1] Operating System: W=Windows, L= Linux, M= OS X*. [2] Available in Intel® Visual Fortran Composer XE for Windows with IMSL*
[3] Not available individually on OS X, it is included in Intel® C++ & Fortran Composer XE suites for OS X

Technical Specifications

Specs at a Glance	
Processor Support	Intel® processors and compatible processors when analyzing applications containing Intel® instructions.
Operating Systems	Windows* and Linux*
Development Tools and Environments	Compatible with compilers from vendors that follow platform standards (e.g., Microsoft*, GCC, Intel compilers). Can be integrated with Microsoft Visual Studio* 2008, 2010 and 2012. See http://www.intel.com/software/products/systemrequirements for the latest details.
Programming Languages	C, C++, C#, Fortran.
System Requirements	See http://www.intel.com/software/products/systemrequirements for details
Support	All product updates, Intel® Premier Support services and Intel® Support Forums are included for one year. Intel Premier Support gives you secure, web-based, engineer-to-engineer support.
Community	Join the Intel® Support Forums community to learn, contribute, or just browse! http://software.intel.com/en-us/forums

Learn more about Intel Inspector XE

- Click or enter the link below:
  http://intel.ly/inspector-xe
- Or scan the QR code on the left

Download a free 30-day evaluation

- Click or enter the link below:
  http://intel.ly/sw-tools-eval
- Click on 'Memory and Thread Debuggers' link

Optimization Notice Notice revision #20110804

Intel's compilers may or may not optimize to the same degree for non-Intel microprocessors for optimizations that are not unique to Intel microprocessors. These optimizations include SSE2, SSE3, and SSSE3 instruction sets and other optimizations. Intel does not guarantee the availability, functionality, or effectiveness of any optimization on microprocessors not manufactured by Intel. Microprocessor-dependent optimizations in this product are intended for use with Intel microprocessors. Certain optimizations not specific to Intel microarchitecture are reserved for Intel microprocessors. Please refer to the applicable product User and Reference Guides for more information regarding the specific instruction sets covered by this notice.