



# Performance Tuning Random Slowdowns in Recurring Functionalites

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# Agenda

Problem Definition

Overview of the Intel® VTune™ Amplifier XE 2013

Frame Analysis

- APIs
- Results Interpretation

Demonstration

# Problem Definition

Repetitive high level SW functionality that slows down at seemingly random times

Examples:

- Game - Video frames
- Database – Transaction response times
- Computation – Convergence

How to diagnose the cause?

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# Intel® VTune™ Amplifier XE 2013

## Second Generation VTune™ Analyzer



### Fast, Accurate Performance Profiles

- Hotspot (Statistical call tree)
- Hardware-Event Based Sampling<sup>1</sup>

### Thread Profiling

- Visualize thread interactions on timeline
- Balance workloads

### Easy set-up

- Pre-defined performance profiles
- Use a normal production build

### Compatible

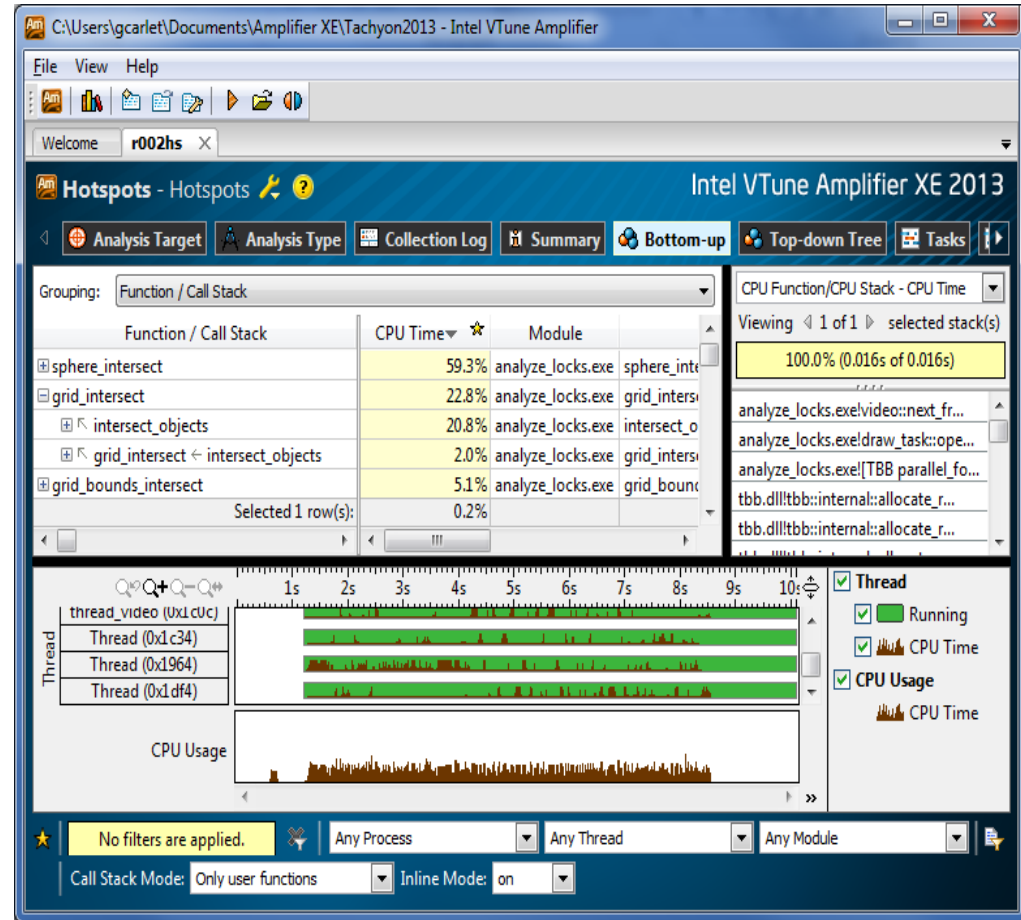
- Microsoft, GCC, Intel compilers
- C/C++, Fortran, Assembly, .NET, Java\*
- Latest Intel® processors and compatible processors<sup>1</sup>

### Find Answers Fast

- Filter extraneous data
- View results on the source / assembly
- Event multiplexing

### Windows or Linux

- Visual Studio Integration (Windows)
- Standalone user i/f and command line
- 32 and 64-bit



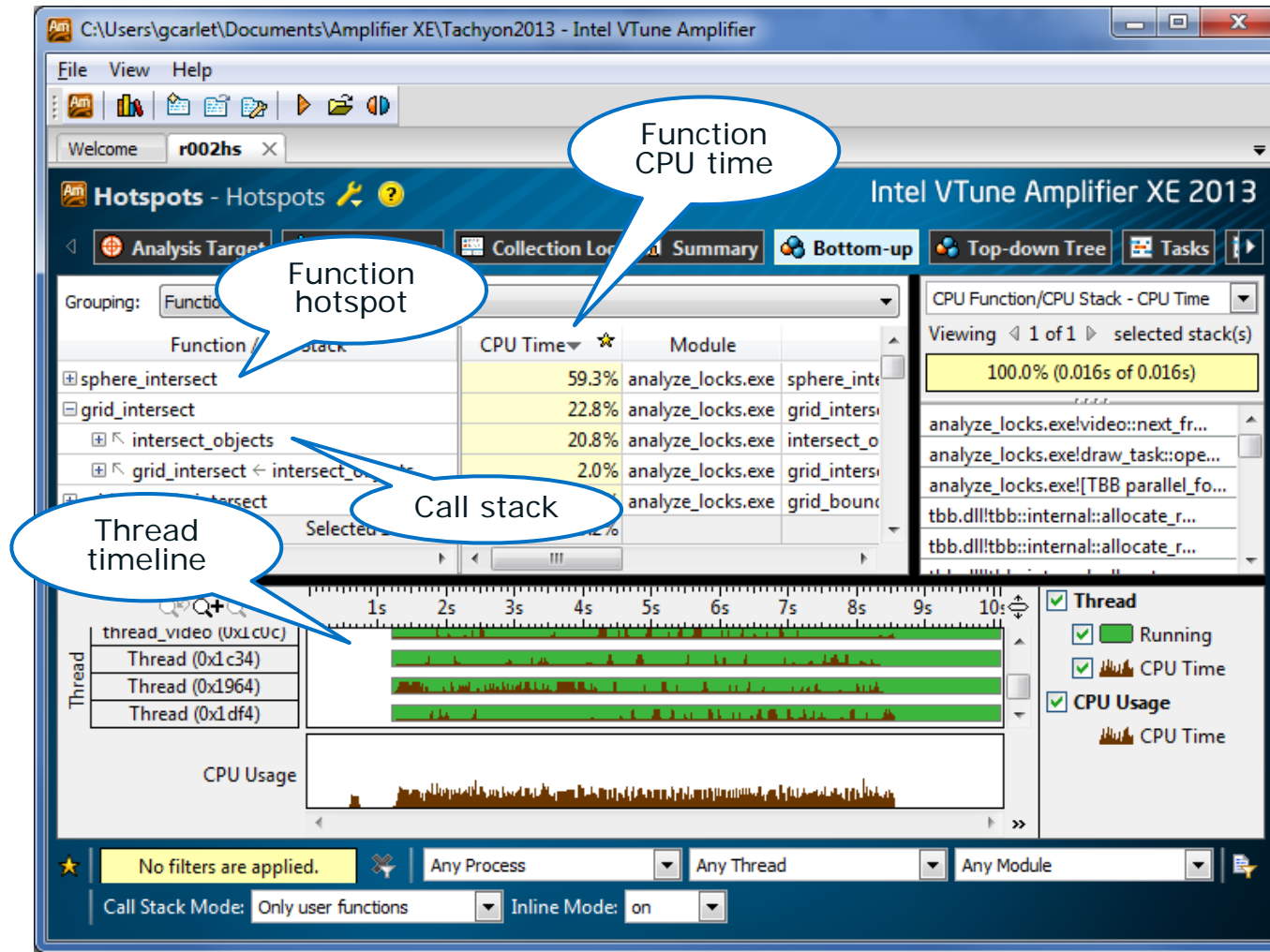
<sup>1</sup> IA32 and Intel® 64 architectures. Many features work with compatible processors. Event based sampling requires a genuine Intel® Processor.

# Sampling Technology

Gather SW performance data by generating occasional HW interrupts

- Save observed execution context in ring buffer
  - Spilled to disk when full
  - No profile build or other instrumentation required
  - Fully optimized build with symbols enabled
- Would like to focus on those samples that occurred when functionality was slow

# Hotspots analysis



# Hotspots analysis – Source View

The screenshot displays the Intel VTune Amplifier XE 2013 interface in Source View. The window title is "C:\Users\gcarlet\Documents\Amplifier XE\Tachyon2013 - Intel VTune Amplifier". The main area shows a table of source code with CPU time percentages. The following table represents the data shown in the screenshot:

Source	CPU Time
578 else if (tmax.z < tmax.y) {	0.0%
579 cur = g->cells[voxindex];	1.2%
580 while (cur != NULL) {	0.0%
581 if (ry->mbox[cur->obj->id] != ry->serial) {	5.9%
582 ry->mbox[cur->obj->id] = ry->serial;	5.5%
Selected 1 row(s):	5.9%

The interface also features a "Thread" view at the bottom, showing a timeline for threads: thread\_video (0x1c0c), Thread (0x1c34), Thread (0x1964), and Thread (0x1df4). The CPU Usage view shows a bar chart of CPU usage over time. The bottom status bar indicates "No filters are applied." and "Call Stack Mode: Only user functions".



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# Finding Random Slowdowns in Repeating Functionalities

## (Frame Analysis)

Frame: a functionality that executes repeatedly

- DirectX video frames, or
- User-Defined frames via APIs

API marks start and finish points in time of each frames occurrence

### Application

```
void algorithm_1();  
void algorithm_2(int myid);  
double GetSeconds();  
DWORD WINAPI do_xform (void * lpmyid);  
bool checkResults();  
__itt_frame = __itt_frame_createA("myDomain");
```

### Region (Frame)

```
while( gRunning ) {  
    __itt_frame_begin(itt_frame);  
    ...  
    //Do Work  
    ...  
    __itt_frame_end(itt_frame);  
}
```

```
for (int k = 0; k < N; ++k) {  
    int ik = i*N + k;  
    int kj = k*N + j;  
    c2[ij] += a[ik]*b[kj];  
}
```

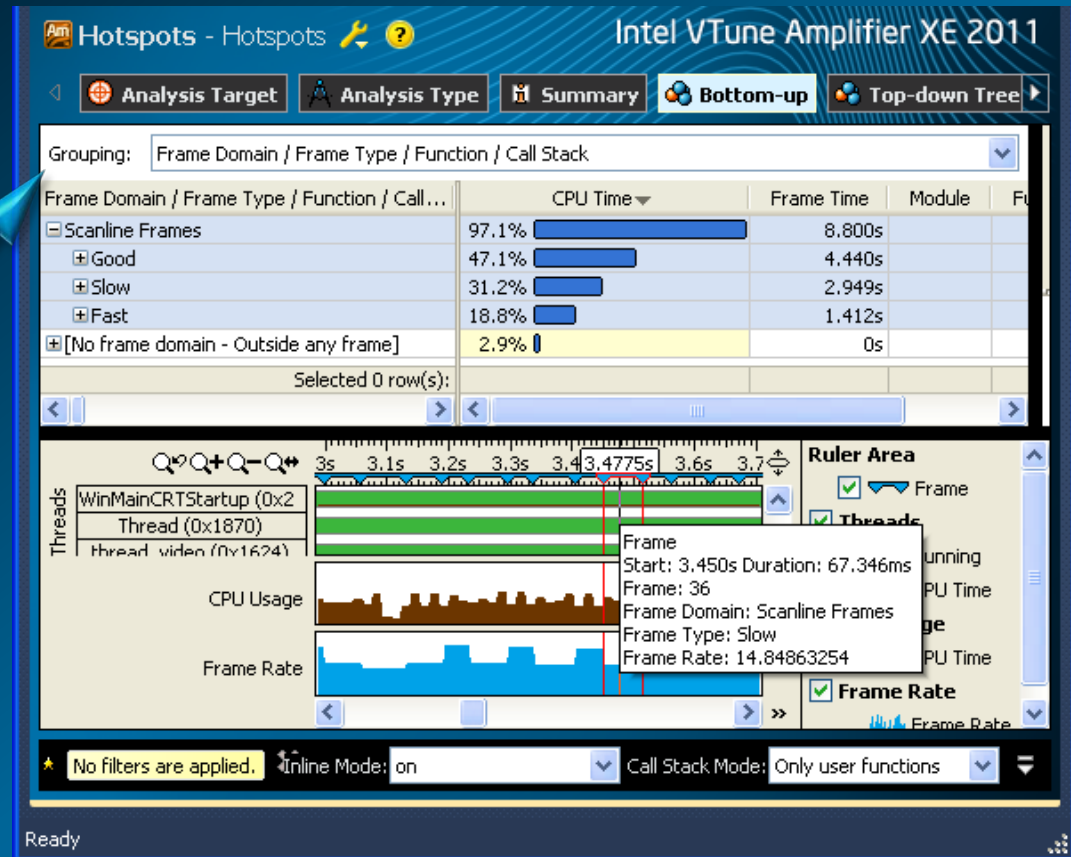
# Intel® VTune™ Amplifier XE

## Find Slow Frames With One Click

### (1) Regroup Data

- Function - Call Stack
- Module - Function - Call Stack
- Source File - Function - Call Stack
- Thread - Function - Call Stack
- Function - Thread - Call Stack
- OpenMP Region - Function - Call Stack
- Task Type - Function - Call Stack
- Frame Domain - Frame - Function - Call Stack
- Frame Domain - Frame Type - Function - Call Stack**
- ... (Partial list shown)

### Result:



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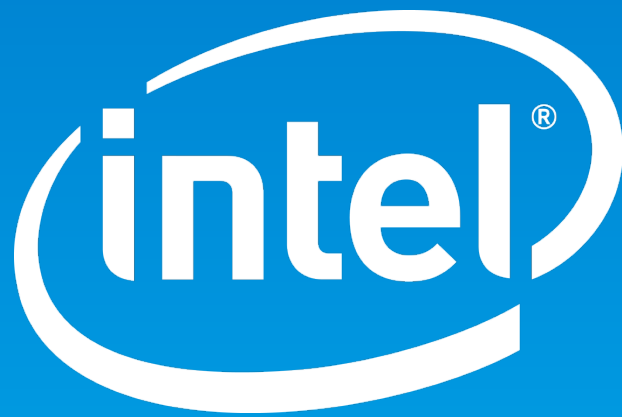
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