DiffAnalyst User's Manual

DiffAnalyst Software
for Linux®

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Chapter 1. Introduction

1.1. Introduction

The AMD DiffAnalyst software is a profile differential (diff) tool used in conjunction with the AMD CodeAnalyst tool. The AMD DiffAnalyst tool compares any two profiles collected by using CodeAnalyst. The AMD DiffAnalyst tool is distributed as part of the CodeAnalyst performance analyst and tuning suite. DiffAnalyst is designed to help identify performance differences of any two binaries (i.e., executables or libraries). Users can compare performance data starting from the module level all the way down into each function and disassembly instruction.

Examples of cases for using the tool are:

- Compare performance from multiple profile runs of an application—The tool can help set up application behavior under different inputs, variables, or environment settings. An example of such a case is a scalability study where the application runs using various problem sizes to determine the upper limit of where performance starts to diminish. Profile comparison can help discover any limiting factors.

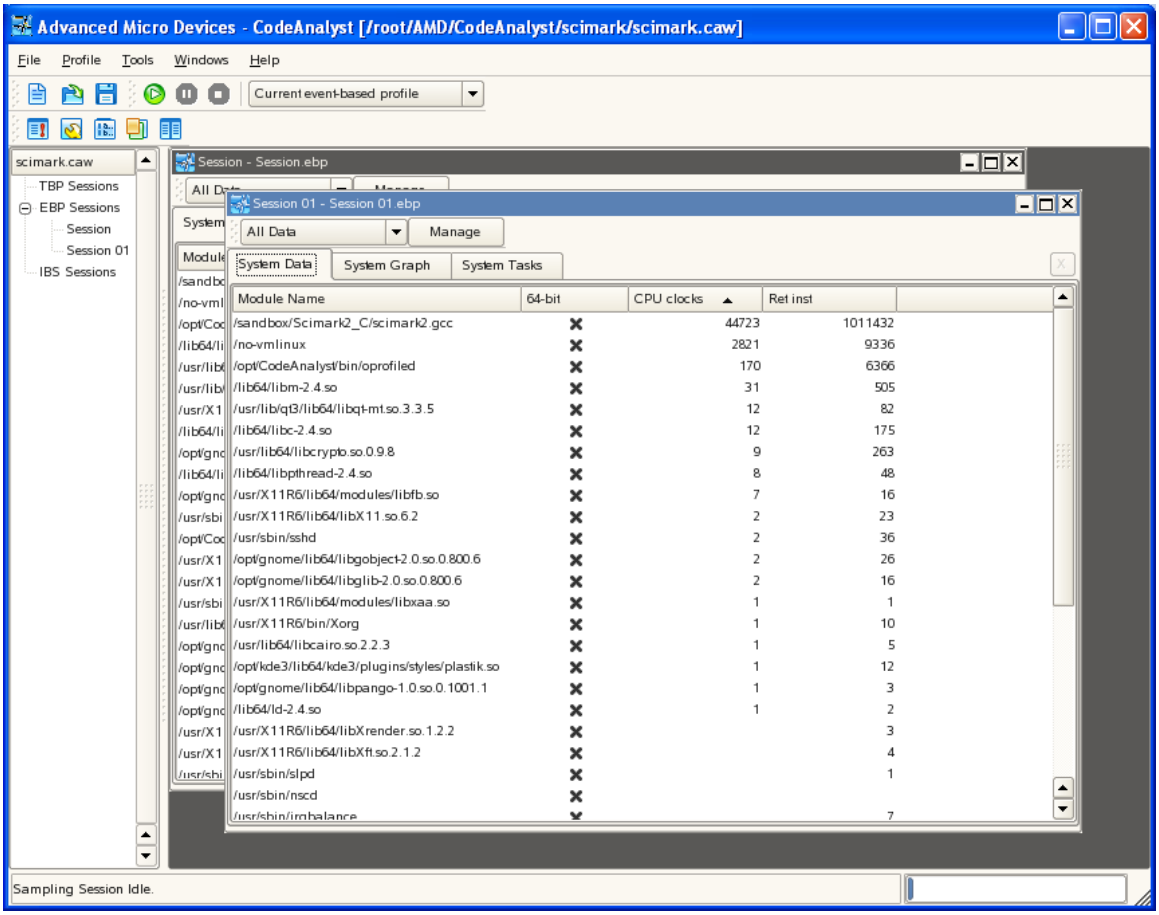
Another example is tuning an application where input is fixed and the application runs under different variables or different environment settings. Users can set up experiments, collect profiles, and then compare the profile data to reveal any interesting behaviors.

- Compare performance of various binaries of an application that are generated differently (i.e., different compilers or compiler options)—The tool can help determine how the binaries generated by different compilers may behave differently, or how compiler options might improve or worsen the overall performance of an application.

1.2. Overview of the AMD DiffAnalyst Tool

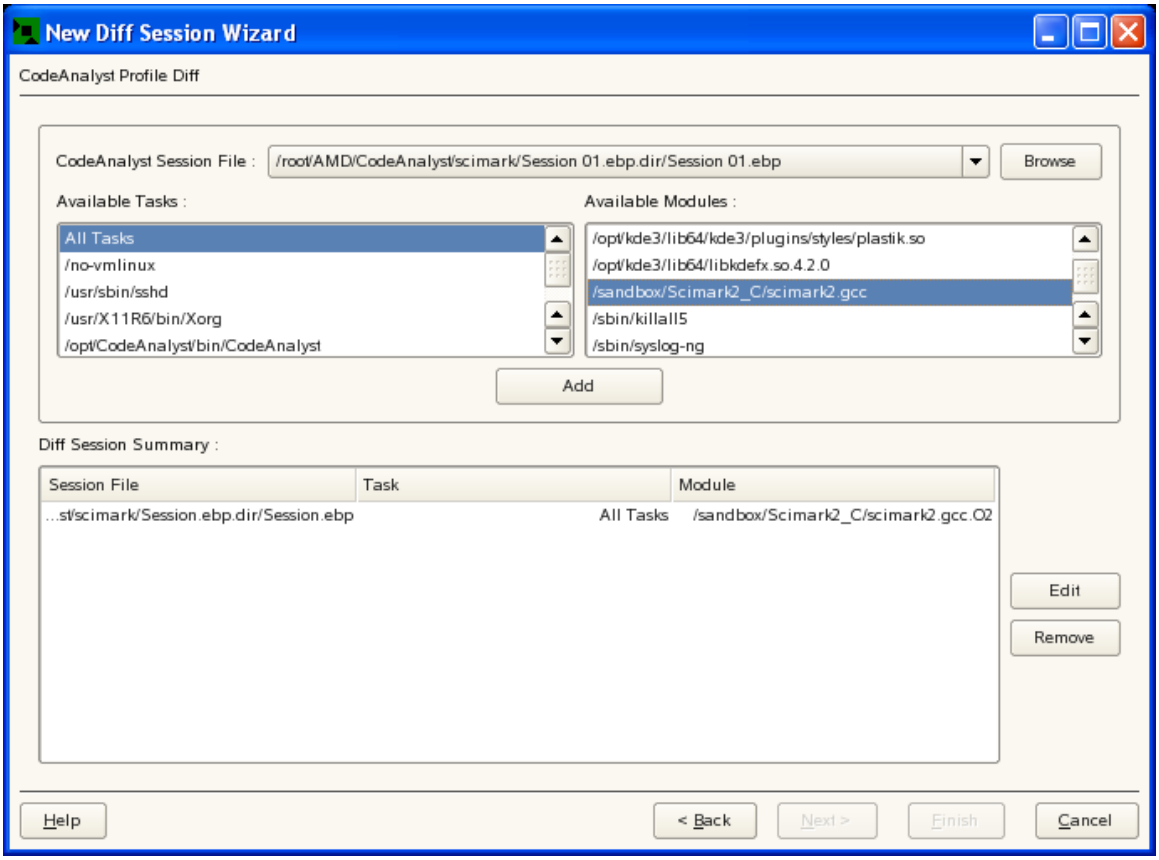
The AMD DiffAnalyst tool compares TBP or EBP files generated by the AMD CodeAnalyst tool. These files contain system-wide profiling data (known as “profiling sessions”) from a time-based, event-based, or instruction-based profile generated by the AMD CodeAnalyst tool. In DiffAnalyst, users begin by selecting any two profiling sessions. The following example shows two .ebp (event-based) profiling sessions.

Figure 1.1. Two Event-Based Profiling Sessions



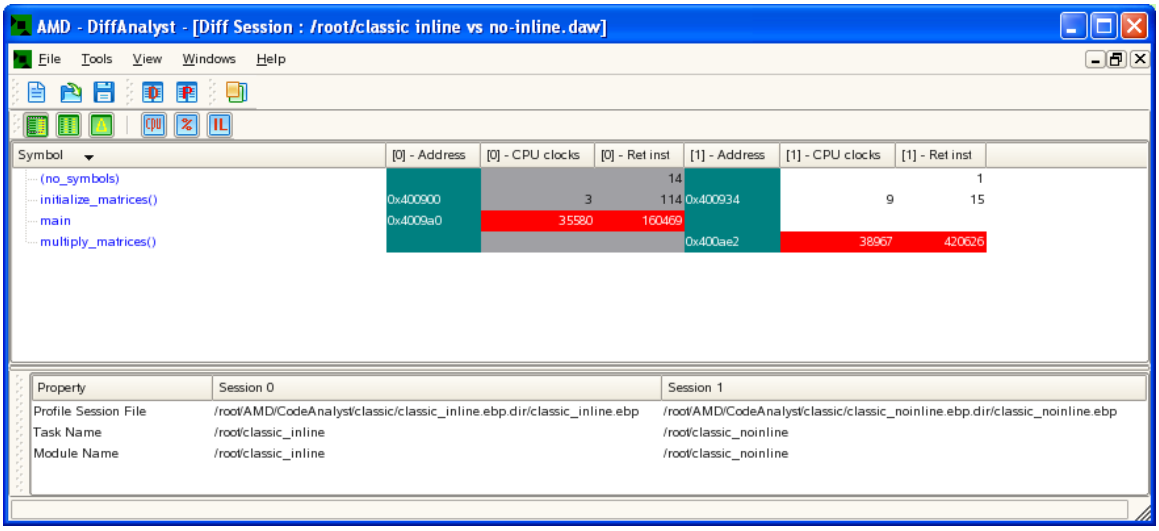
A system-wide profile generally consists of modules (i.e., an executable and various shared libraries). A TBP/EBP file stores profiling data of these modules during a profiling session. The AMD DiffAnalyst tool allows users to select any two modules and compares them based on the module's **symbol** information. Typically, a **symbol** is a compiler-generated equivalent of a function in C/C++ programs.

Figure 1.2. New Diff Session Wizard



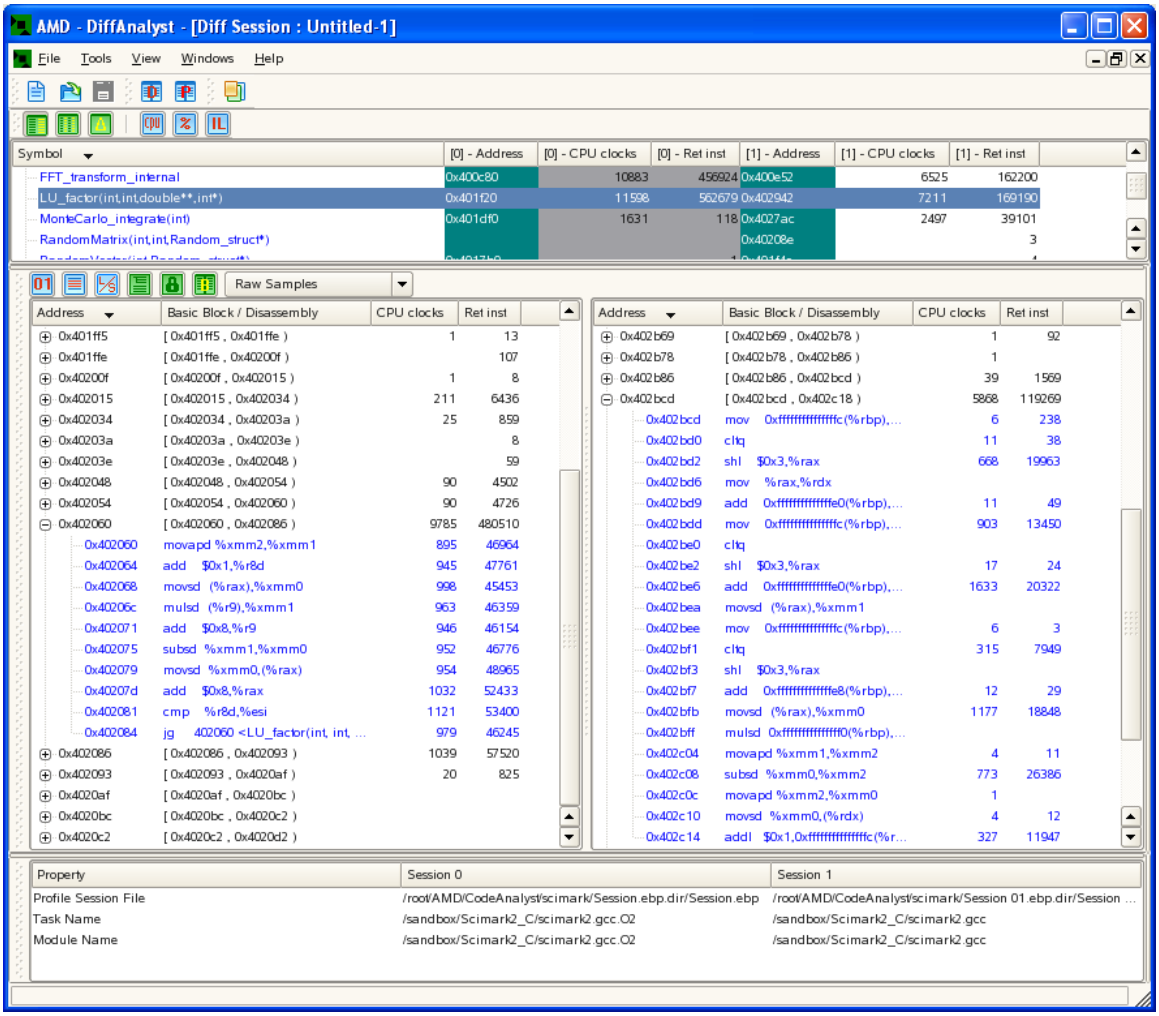
In the AMD DiffAnalyst Symbol Diff view, the tool compares profile data from different modules based on the fully-qualified function name. For each function, DiffAnalyst presents two sets of data, each from the selected modules. The user can choose different ways to view the data, which is discussed in Symbol Diff View [exploring_workspace_gui.dita].

Figure 1.3. DiffAnalyst Symbol Diff view



After examining the module, comparing the disassembly of any particular function can be done in the Disassembly Diff View. This view displays disassembly instructions, basic block, identify load/store instructions, and identifies in-line instances.

Figure 1.4. Disassembly Diff View



Chapter 2. Features

2.1. Exploring the Workspace and GUI

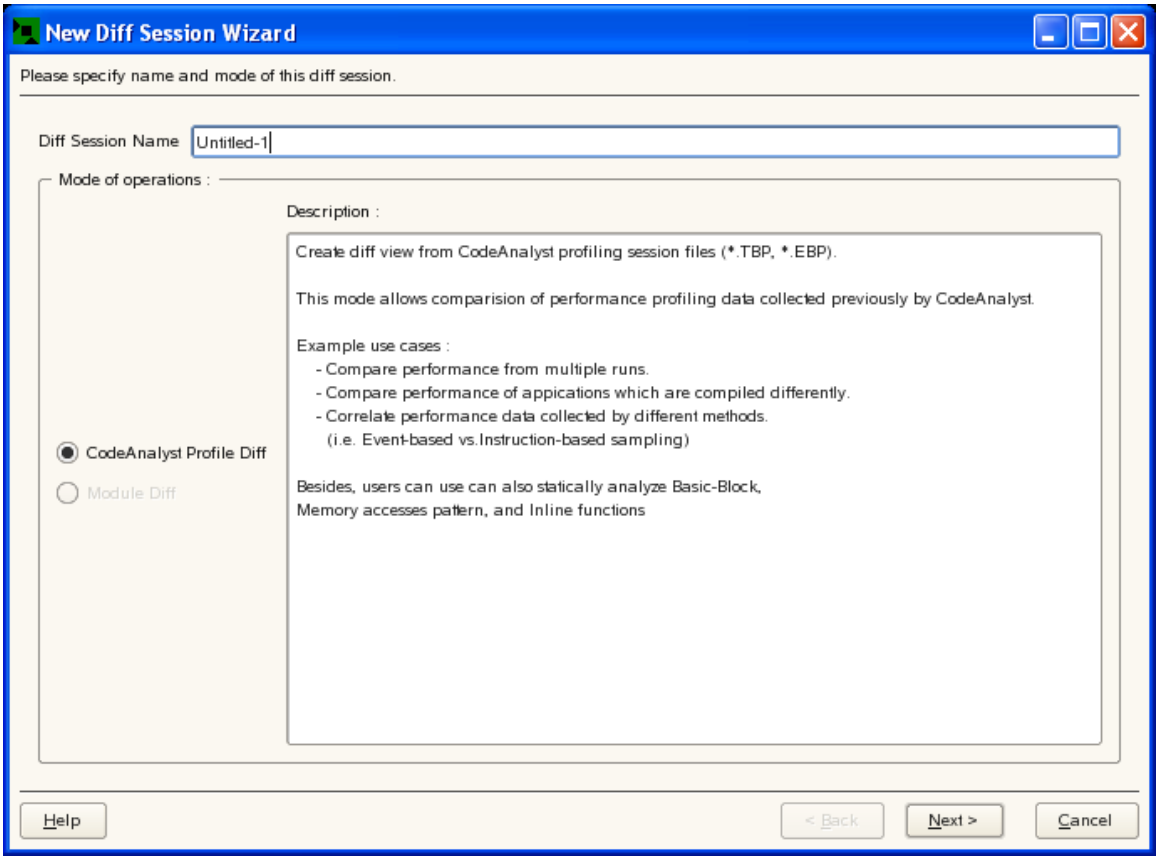
2.1.1. New Diff Session Wizard and Dialog

The New Diff Session Wizard is the first step in generating a session. The wizard can be accessed by one of the following steps:

- On the DiffAnalyst menu bar select **File > New**.
- On the DiffAnalyst menu bar select New Tool icon.
- On the CodeAnalyst toolbar select Create diff session icon.
- On the CodeAnalyst project navigator, right-click on **Session** and select **Create diff session**.

Once the New Diff Session Wizard is open, create a Diff session name. This name identifies each diff session because multiple diff sessions can be viewed at a time.

Figure 2.1. New Diff Session Wizard

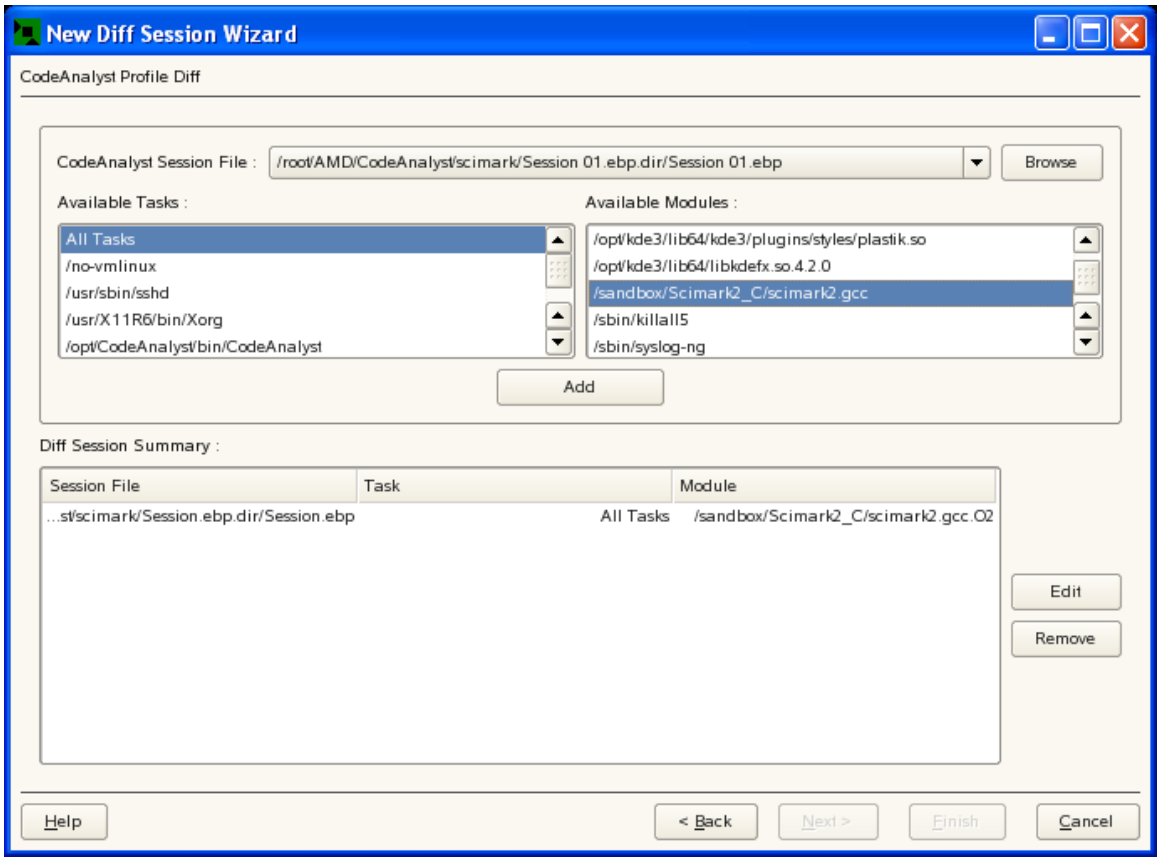


Next, specify a mode of operation. A mode description displays when the mode is selected. Available modes are:

- **CodeAnalyst Profile Diff Mode:** This mode compares any CodeAnalyst profiling output (. tbp or . ebp file). Use the **Browse** button to open a file navigation dialog to select a . tbp or . ebp file.

Once a . tbp or . ebp file is selected, a list of available tasks (application processes) displays. Use the list to choose a particular task or all tasks. The list of available modules update accordingly. When done, click **Add** to add the current selection to the Diff Session Summary list. Use **Edit** or **Remove** to manipulate the list. Once two profiling sessions are selected, click **Finish** to generate the specified diff session.

Figure 2.2. CodeAnalyst Profile Diff

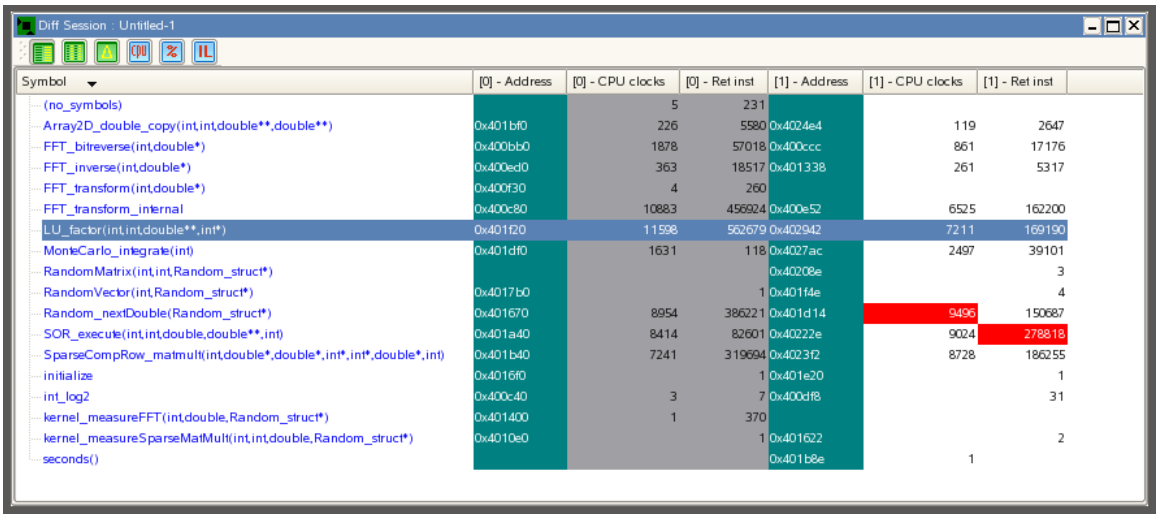


- **Module Diff Mode:** This mode compares any binary files without profiling data. (Not yet available)

2.1.2. Symbol Diff View

Symbol Diff View displays functions using their symbol names. Names display in the “Symbols” column when the function contains samples. The following figure shows an example of Symbol Diff view.

Figure 2.3. Symbol Diff View



Symbol	[0] - Address	[0] - CPU clocks	[0] - Ret inst	[1] - Address	[1] - CPU clocks	[1] - Ret inst
(no_symbols)		5	231			
Array2D_double_copy(int,int,double**,double**)	0x401bf0	226	5580	0x4024e4	119	2647
FFT_bitreverse(int,double*)	0x400bb0	1878	57018	0x400ccc	861	17176
FFT_inverse(int,double*)	0x400ed0	363	18517	0x401338	261	5317
FFT_transform(int,double*)	0x400f30	4	260			
FFT_transform_internal	0x400c80	10883	456924	0x400e52	6525	162200
LU_factor(int,int,double**,int*)	0x401f20	11598	562679	0x402942	7211	169190
MonteCarlo_integrate(int)	0x401df0	1631	118	0x4027ac	2497	39101
RandomMatrix(int,int,Random_struct*)				0x40208e		3
RandomVector(int,Random_struct*)	0x4017b0		1	0x401f4e		4
Random_nextDouble(Random_struct*)	0x401670	8954	386221	0x401d14	9496	150687
SOR_execute(int,int,double,double**,int)	0x401a40	8414	82601	0x40222e	9024	278818
SparseCompRow_matmult(int,double*,double*,int*,int*,double*,int)	0x401b40	7241	319694	0x4023f2	8728	186255
initialize	0x4016f0		1	0x401e20		1
int_log2	0x400c40	3	7	0x400df8		31
kernel_measureFFT(int,double,Random_struct*)	0x401400	1	370			
kernel_measureSparseMatMult(int,int,double,Random_struct*)	0x4010e0		1	0x401622		2
seconds()				0x401b8e	1	

Each row represents a symbol. Each symbol has two address columns (white text with green background) showing symbol address associated with each module. Performance data sets are shown in two groups differentiated by color (black text with white background and black text with gray back ground).

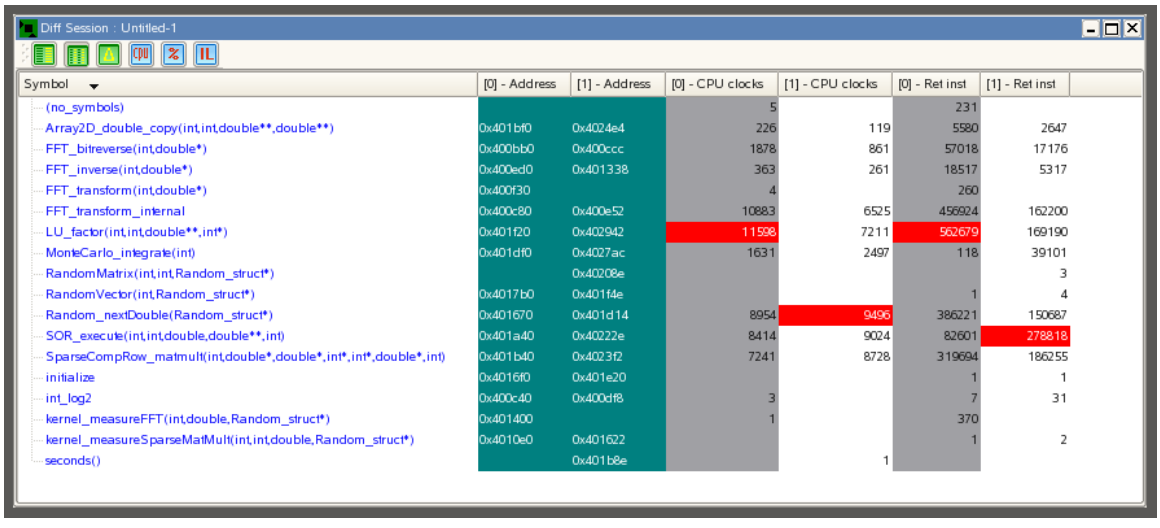
This view shows the symbol only if the function contains samples. For example, function main() does not contain any samples and is not shown here. Also, if a symbol is only present in one module, Symbol Diff View displays it but leaves the other module blank.

Cells with white text and red background contain the maximum value within the column, helping to identify hotspots of each performance event.

2.1.2.1. Symbol Diff View Toolbar

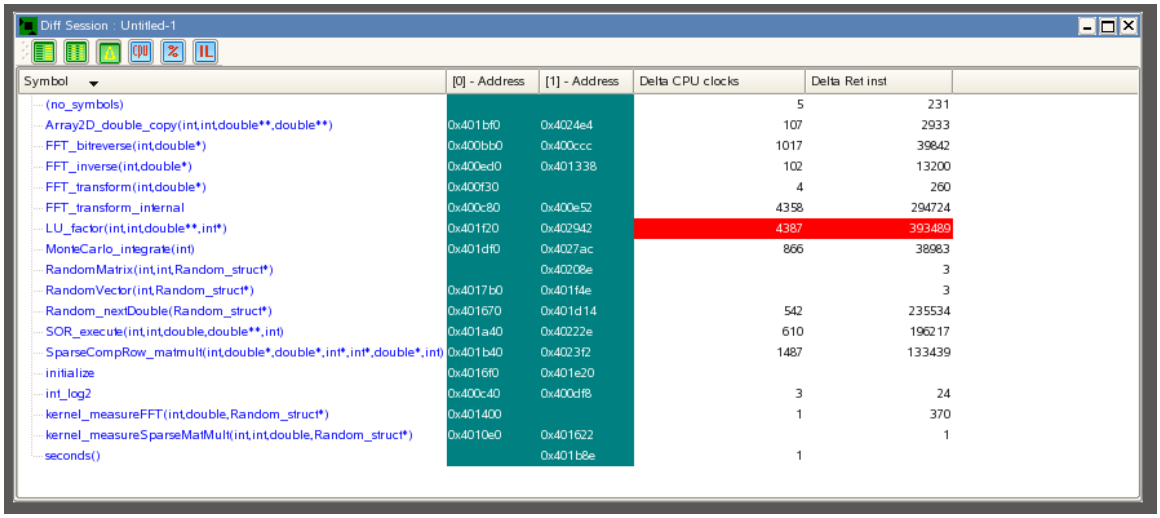
The Symbol Diff view toolbar contains the following icons and options for viewing:

- **Left-Right View:** This view groups performance data of each profiling session together.
- **Side-by-Side View:** This view groups each performance event from each profiling session together.



Symbol	[0] - Address	[1] - Address	[0] - CPU clocks	[1] - CPU clocks	[0] - Ret inst	[1] - Ret inst
(no_symbols)			5		231	
Array2D_double_copy(int,int,double**,double**)	0x401bf0	0x4024e4	226	119	5580	2647
FFT_bitreverse(int,double*)	0x400bb0	0x400ccc	1878	861	57018	17176
FFT_inverse(int,double*)	0x400ed0	0x401338	363	261	18517	5317
FFT_transform(int,double*)	0x400f30		4		260	
FFT_transform_internal	0x400c80	0x400e52	10883	6525	456924	162200
LU_factor(int,int,double**,int*)	0x401f20	0x402942	11598	7211	562679	169190
MonteCarlo_integrate(int)	0x401df0	0x4027ac	1631	2497	118	39101
RandomMatrix(int,int,Random_struct*)		0x40208e				3
RandomVector(int,Random_struct*)	0x4017b0	0x401f4e			1	4
Random_nextDouble(Random_struct*)	0x401670	0x401d14	8954	9496	386221	150687
SOR_execute(int,int,double,double**,int)	0x401a40	0x40222e	8414	9024	82601	278818
SparseCompRow_matmult(int,double*,double*,int*,int*,double*,int)	0x401b40	0x4023f2	7241	8728	319694	186255
initialize	0x4016f0	0x401e20			1	1
int_log2	0x400c40	0x400df8	3		7	31
kernel_measureFFT(int,double,Random_struct*)	0x401400		1		370	
kernel_measureSparseMatMult(int,int,double,Random_struct*)	0x4010e0	0x401622			1	2
seconds()		0x401b8e		1		

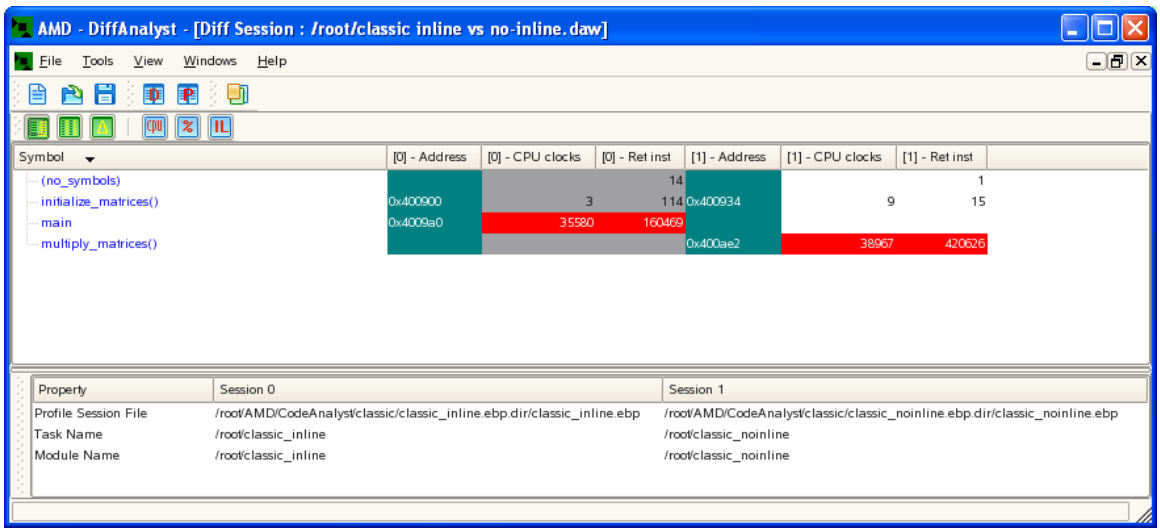
- **Delta View:** This view shows the delta value of each performance event from each profiling session.



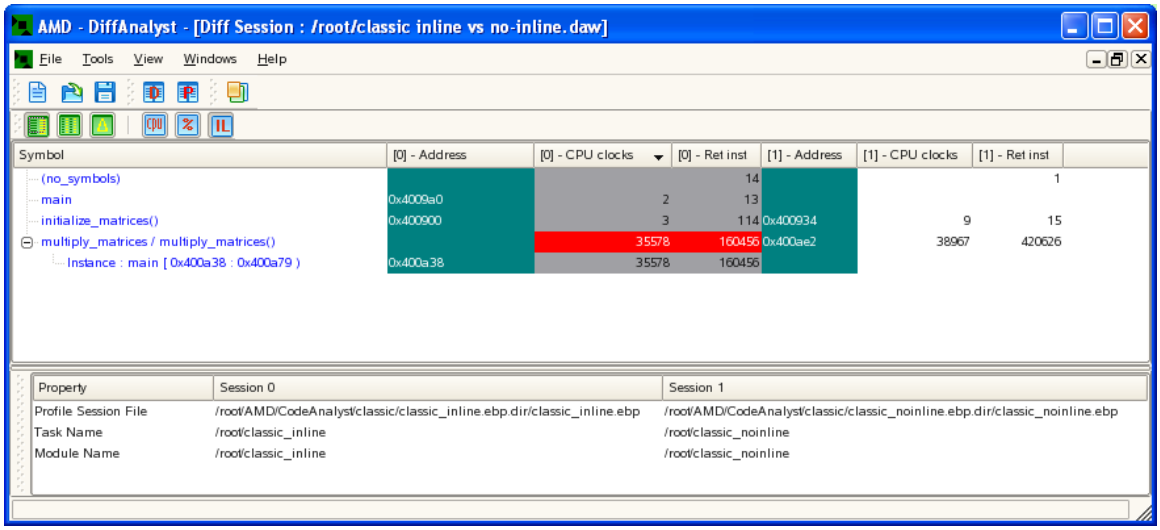
- **Separated by CPUs:** This option shows samples of performance events collected separately on each CPU.

- **Show Percentage:** This option shows sample percentage of each symbol with respect to the number of samples within this module for a particular performance event.

- **Aggregate Samples into In-line Function:** When the module contains in-line functions, this option aggregates samples into the original in-line function instead of the caller function.



In each in-line function, samples are separated into a different in-line instance. In session 1 (right) of above figure, multiply_ matrices () is declared as in-line function, and called by main(). Therefore, the samples that belong to the function multiply_ matrices () becomes part of main().



In session 1 (right) of above figure, the last item in the list shows the in-line instance of function multiply_ matrices () inside main().

2.1.2.2. Merge Symbol

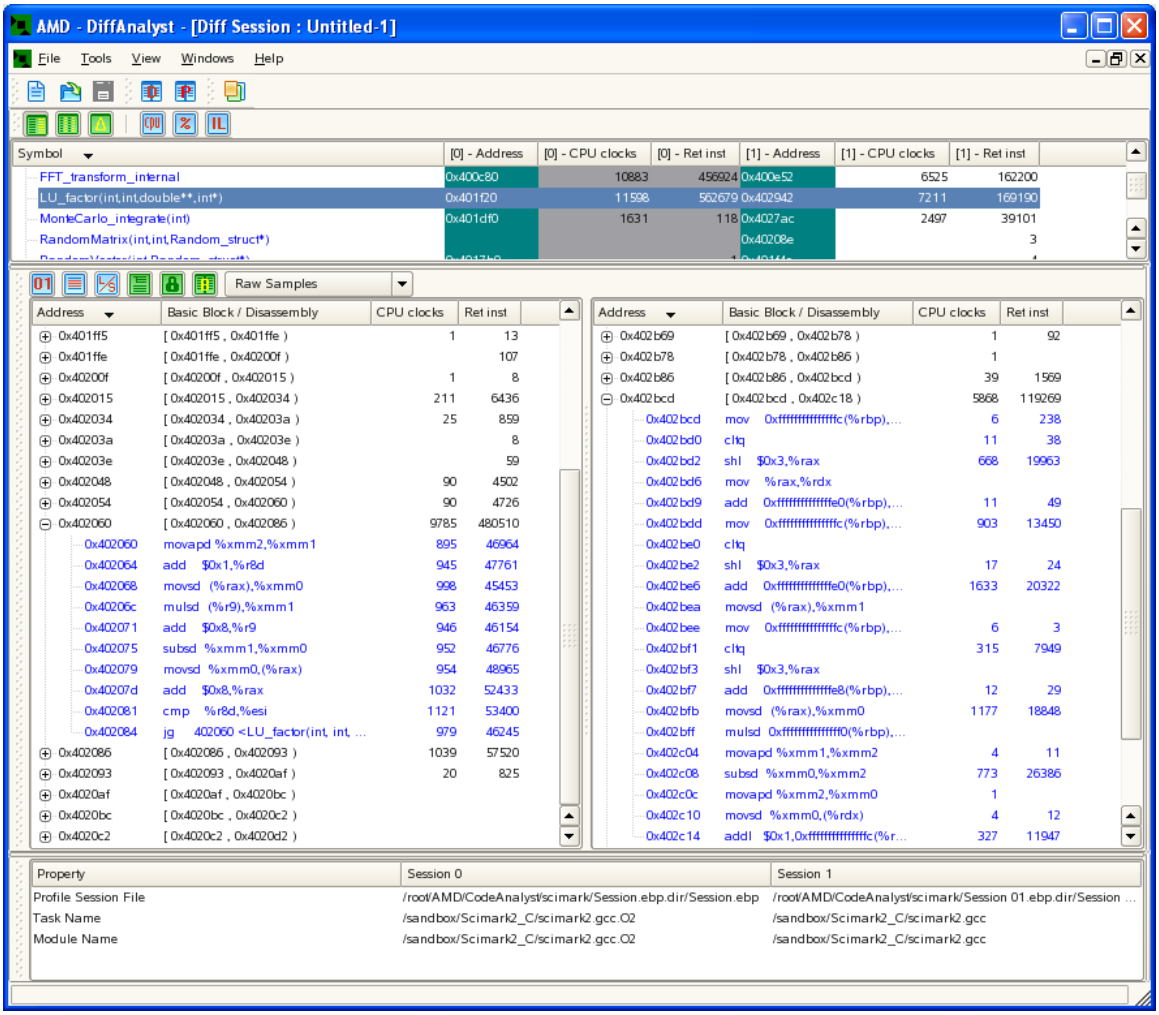
Different compilers usually have different symbol naming conventions. When compiling an application with different compilers, output binaries often contain functions with mismatched symbol names. This mismatching affects the Symbol Diff view because the tool tries to match symbols using the fully-qualified symbol name. In this case, a single symbol may be shown as two different symbols.

The Symbol Diff view tries to account for most of these scenarios in its symbol name-matching algorithm. However, if this problem continues, the user can manually merge the entries of the symbols. Select any two symbols, right-click, and select Merge symbol data. The data of selected symbols merge into one entry in the Symbol Diff view.

2.1.3. Disassembly Diff View

The DiffAnalyst disassembly diff view is a docked window consisting of two separate lists for viewing disassembly of the function pair. To open to this view, double-click any entry in Symbol Diff view. This docked window can be moved or undocked. It can also be hidden by closing (**X**) or clear the check box for the option under **Tools > Show Dasm Diff View**.

Figure 2.4. Disassembly Diff View



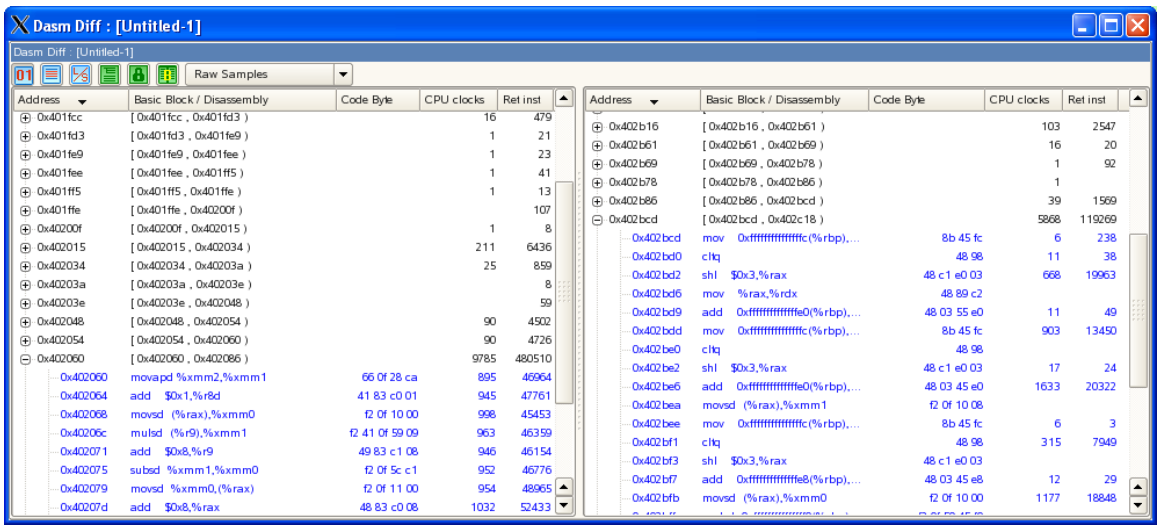
The first level of each list contains basic block information sorted by address (in black text with white background). The Basic Block / Disassembly column displays a section of code that represents a serialized execution path, which does not contain any kind of control transfer instruction (i.e., jump or call.). The beginning of a basic block is usually the destination of a single/multiple control transfer instruction and the ending is a control transfer instruction.

Each basic block is denoted using an address range notation. For example, “[0x400875, 0x4008c7)” means the basic block starts from address 0x400874 to 0x4008c6. Each basic block expands to reveal the contained disassembly instructions (displayed in blue text with white background).

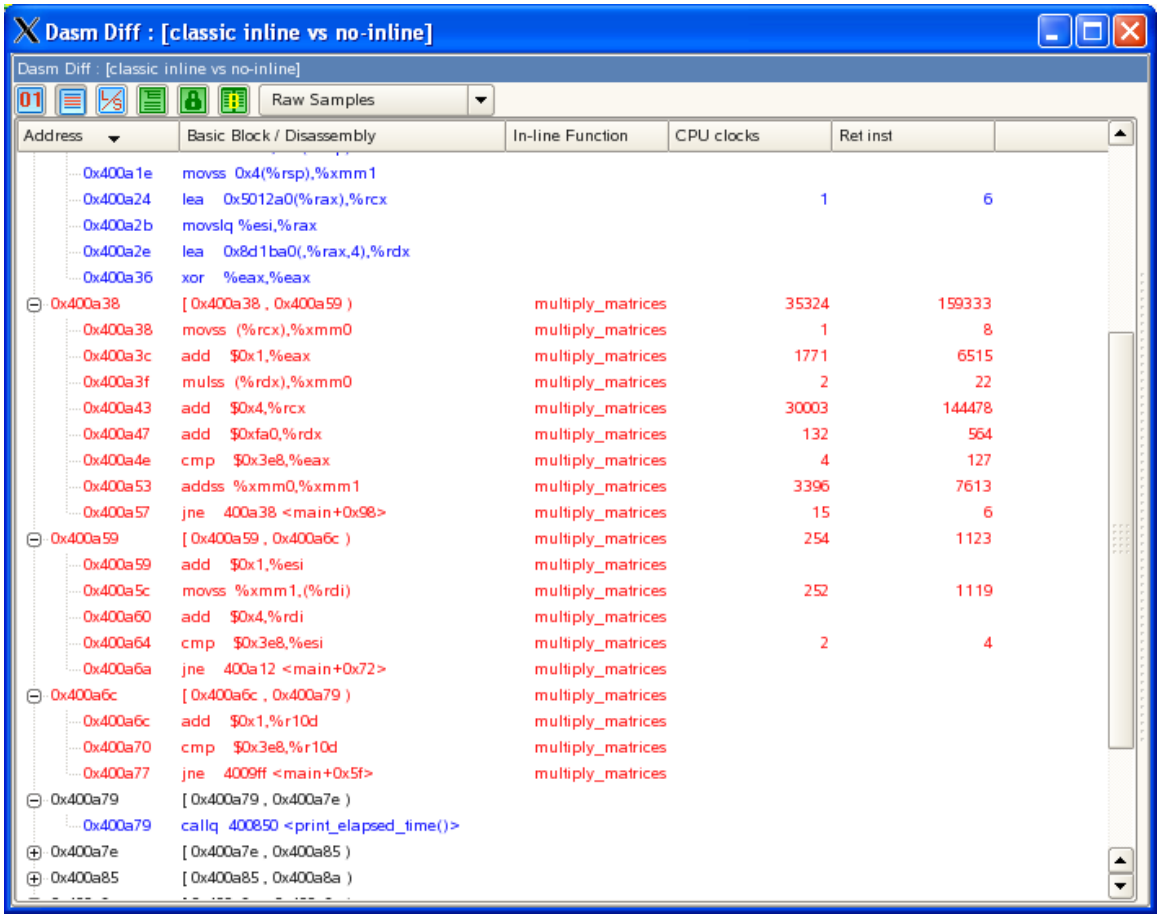
2.1.3.1. Disassembly Diff View Toolbar

This option displays the Disassembly Diff View toolbar which contains various options for the view. Available options are:

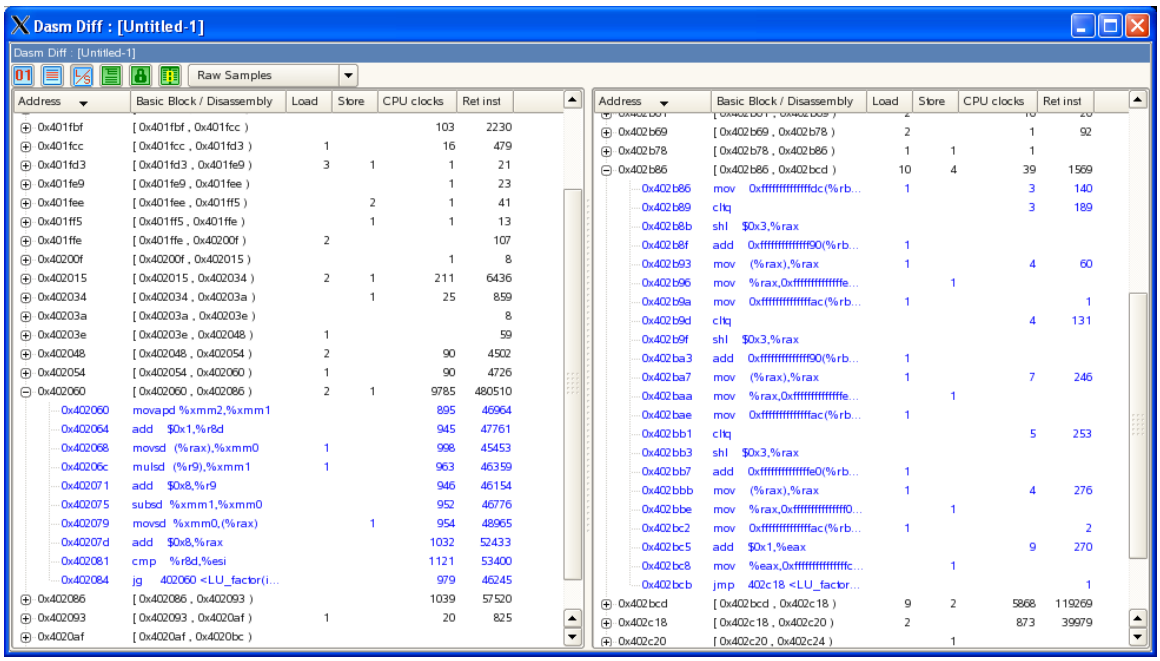
- **Show/Hide Code Byte:** Toggles to show or hide a code byte column.



- **Show In-line Instance:** Toggles to show or hide the in-line function name column. In-line instances are shown in red text with white background.



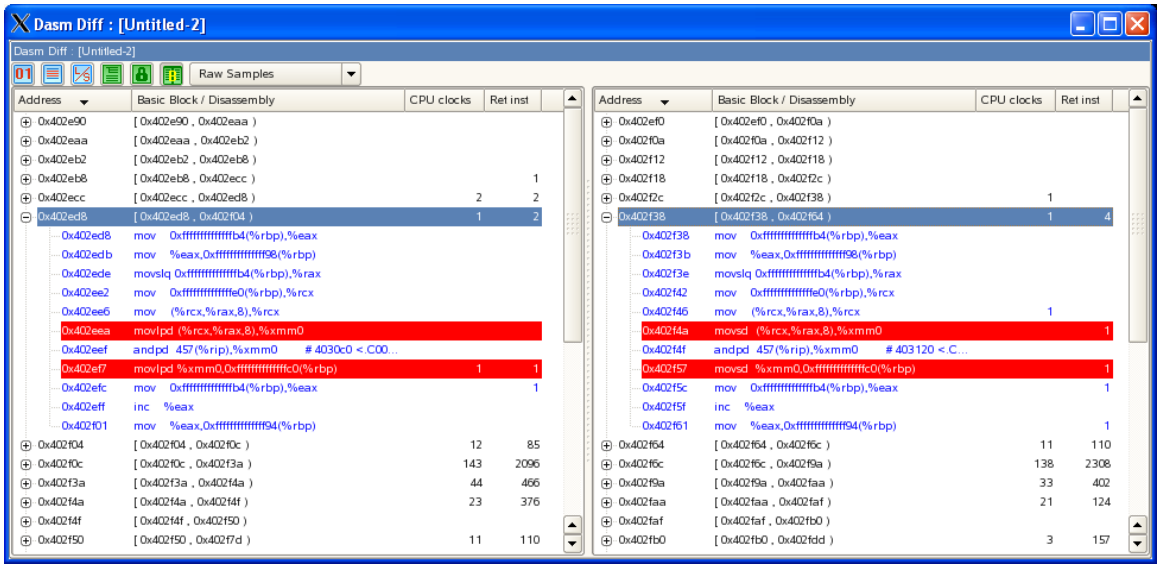
- **Show Load/Store Statistics:** Toggles to show or hide the load or store statistics column.



- **Expand/Collapse All Basic Block:** Expands or collapses all basic blocks in both disassembly lists.

- **Synchronize Disassembly View:** Allows for synchronizing (locking) scrolling actions. If left and right basic blocks are aligned, expand/collapse actions are also synchronized.

- **Highlight Difference within Basic Block:** Compares disassembly instructions within the selected basic blocks in each list.



- **Show Percentage Combo Box:** Combo box selection of what type of information displays in each performance event column. The available options are:

  - Raw Samples—Shows the amount of samples for each performance event.

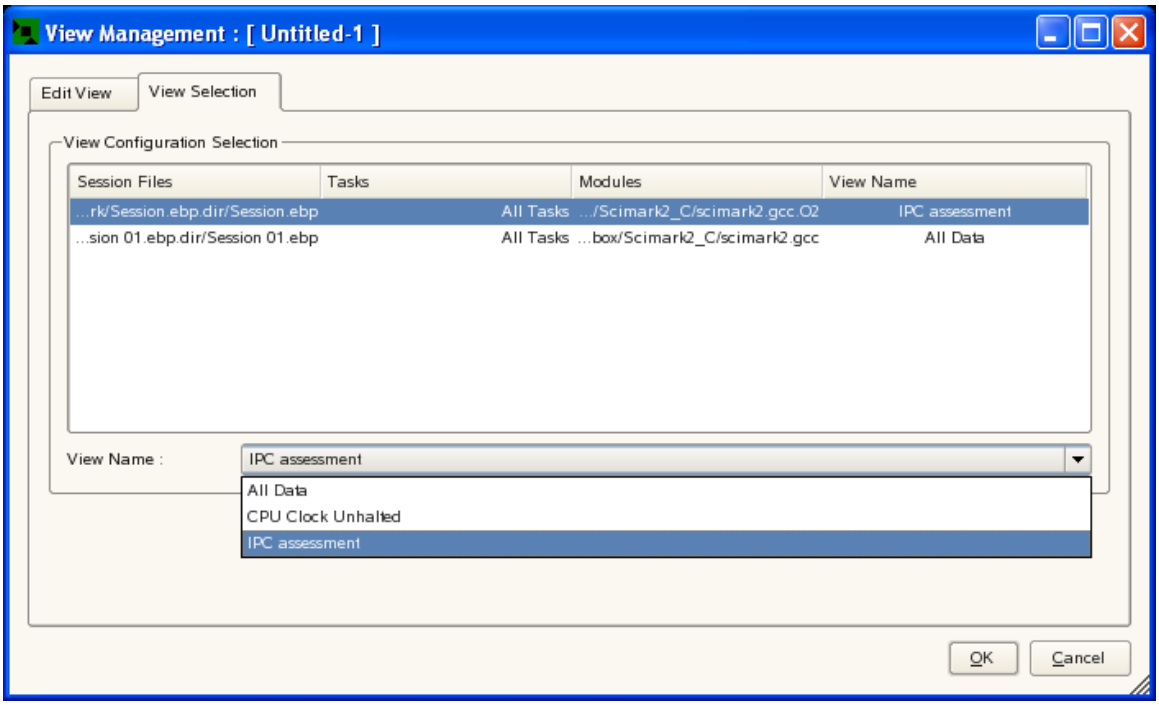
- Function Percentage—Shows the percentage of samples for each performance event with respect to the function.
- Basic Block Percentage—Shows the percentage of samples for each performance event with respect to the basic block.

2.1.4. View Management Dialog

View Management dialog allows for customization of the performance events being shown. Each view is specific to hardware platforms and performance events available in each profiling session. A set of predefined views are provided for user's convenience.

The View Management dialog contains two tabs—Edit View and View Selection—as shown in the following example.

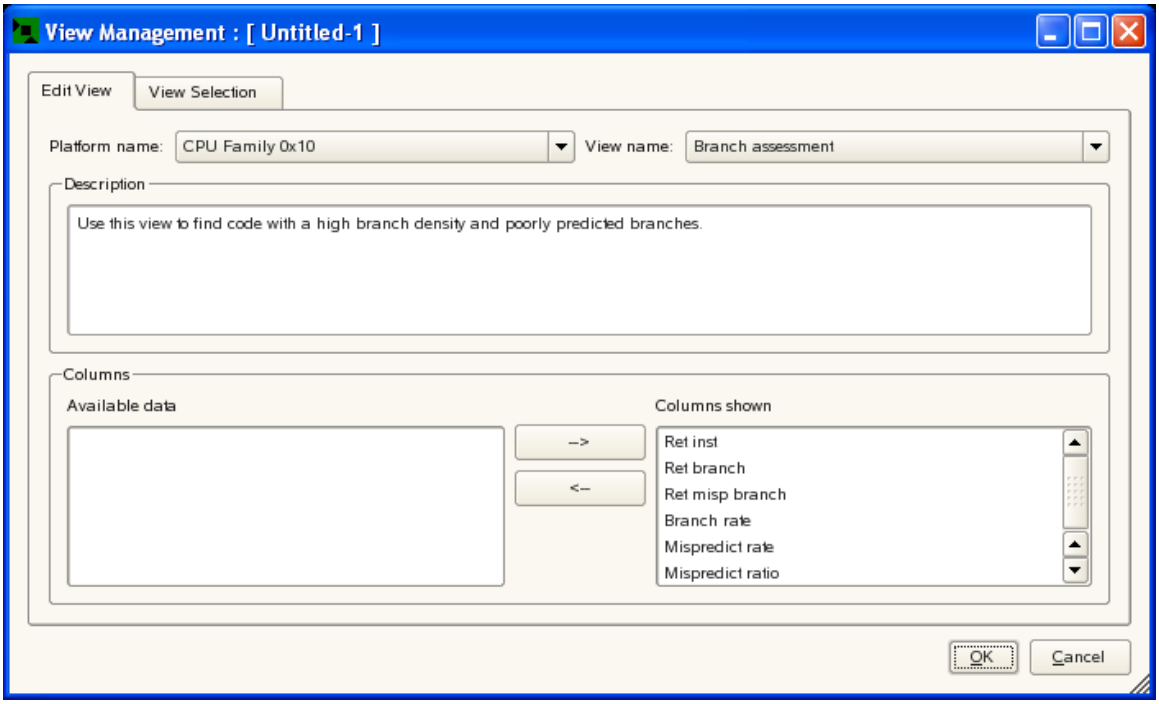
Figure 2.5. View Management Dialog



2.1.4.1. Edit View Tab

The Edit View tab allows users to customize the set of performance events to be shown in each view. Users begin by selecting a **Platform name**, which updates the **View name** combo box with available views for the selected platform. Users can use the right-arrow button to remove, and left-arrow button to add or delete performance events between the **Available data** and **Columns shown** lists.

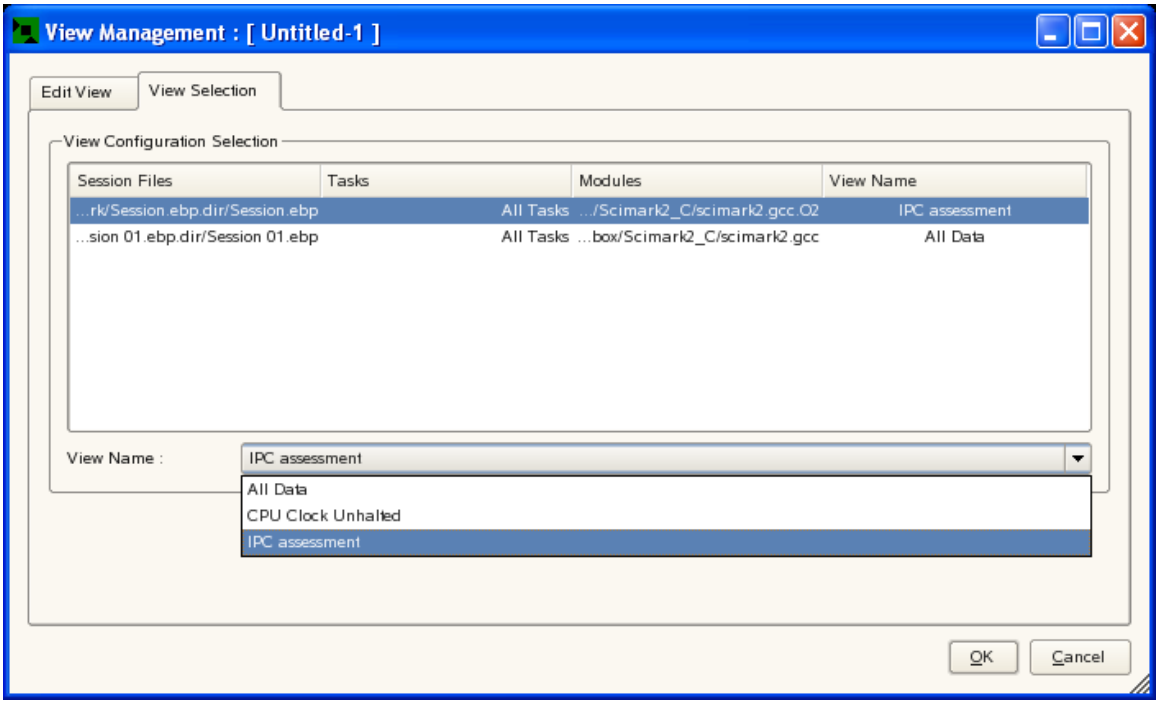
Figure 2.6. Edit View Tab



2.1.4.2. View Selection Tab

The View Selection tab manages view selection of each profiling session to be compared. The user selects a profiling session from the **View Configuration Selection** list and uses the **View Name** combo box to choose the view of interest.

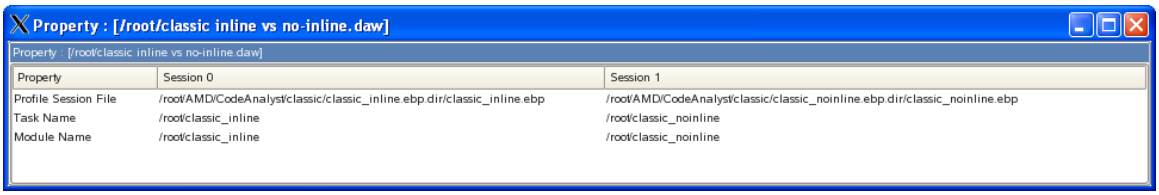
Figure 2.7. View Selection Tab



2.1.5. Property View

Property View is a docked window that contains a list of currently viewed profiling sessions. This dock window can be moved or undocked. It can also be hidden by closing (**X**) or clearing the check box for the option under **Tools > Show Property View**. Properties shown are profiling session files, task names, and module names.

Figure 2.8. Property View



Chapter 3. Support

3.1. Enhancement Request

Please email the following information about a desired enhancement or change to CodeAnalyst.support@amd.com [mailto:CodeAnalyst.support@amd.com]:

- State which version of AMD CodeAnalyst you are using. Choose Help > About to view the About AMD CodeAnalyst dialog box.
- Describe the desired enhancement or change.
- Indicate to us how important this is to you using a scale of 1 to 5 where 1 is most important and 5 least important.

3.2. Problem Report

If a problem is found, take the following action:

1. Run careport.sh script which is located in CodeAnalyst root directory of the source tree, or /opt/CodeAnalyst/bin/careport.sh. This script will generate a report file called CAReport.txt.
2. Please provide the following information:
   - Give a description of the problem or issue.
   - Briefly describe the steps or sequence of events leading to the observation.
   - State how frequently problem occurred.
   - Describe the messages AMD CodeAnalyst displayed.
   - State which version of the AMD CodeAnalyst was used (under Help > System Info or opcontrol --version).
   - Describe the application analyzed.
3. Please send the report file (CAReport.txt) in step 1 and information in step 2 to CodeAnalyst.support@amd.com [mailto:CodeAnalyst.support@amd.com].

Appendix A. GNU General Public License

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USA

Version 2, June 1991

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Bibliography

BIOS and Kernel Developer's Guide (BKDG)

BIOS and Kernel Developer's Guide (BKDG) For AMD Family 11h Processor
[http://support.amd.com/us/Processor_TechDocs/41256.pdf]

BIOS and Kernel Developer's Guide (BKDG) For AMD Family 10h Processor
[http://support.amd.com/us/Processor_TechDocs/31116.pdf]

BIOS and Kernel Developer's Guide for AMD Athlon™ and AMD Opteron™ Processors (Rev. A-E)
http://support.amd.com/us/Processor_TechDocs/26094.PDF

BIOS and Kernel Developer's Guide for AMD NPT Family 0Fh Processors (Rev. F-G)
http://support.amd.com/us/Processor_TechDocs/32559.pdf

General Documentation

Basic Performance Measurements for AMD Athlon™ 64, AMD Opteron™ and AMD Phenom™ Processors
http://developer.amd.com/Assets/Basic_Performance_Measurements.pdf

Increased performance with AMD CodeAnalyst software and Instruction-Based Sampling (on Linux)
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An introduction to analysis and optimization with AMD CodeAnalyst Performance Analyzer
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Improving program performance with AMD CodeAnalyst for Linux®
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Instruction-Based Sampling: A New Performance Analysis Technique for AMD Family 10h Processors
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