

# PrintAssembly

Puzzled by a performance glitch? You might have to look at the generated code.

## Examining generated code

The following HotSpot options (with an `-XX:` prefix on the command line) require OpenJDK 7 and an externally loadable disassembler plugin:

- `+PrintAssembly` print assembly code for bytecoded and native methods
- `+PrintNMethods` print nmethods as they are generated
- `+PrintNativeNMethods` print native method wrappers as they are generated
- `+PrintSignatureHandlers` print native method signature handlers
- `+PrintAdapterHandlers` print adapters (i2c, c2i) as they are generated
- `+PrintStubCode` print stubs: deopt, uncommon trap, exception, safepoint, runtime support
- `+PrintInterpreter` print interpreter code

These flags are "diagnostic", meaning that they must be preceded by `-XX:+UnlockDiagnosticVMOptions`. On the command line, they must all be preceded by `-XX:`. They may also be placed in a flags file, `.hotspotrc` by default, or configurable as `-XX:Flags=myhotspotrc.txt`.

The disassembly output is annotated with various kinds of debugging information, such as field names and source locations. The quality of this information improved markedly in January 2010 ([bug fix 6912062](#)).

## Examples

```
0x0188272f: mov      ecx, [ecx+0x1A8B8B30] ; {oop(cache [42] for constant pool [234]/invokedynamic for
'SumWithIndy' cache=0x1a8b8b30)}
0x01882735: mov      edx, [ecx+0x10]
0x01882738: cmp      edx, a 'sun/dyn/ToGeneric$A2'
                                ; {oop(a 'sun/dyn/ToGeneric$A2')}
0x0188273e: jnz      0x018827c1 ;*invokedynamic
                                ; - SumWithIndy::test@17 (line 90)
0x01882744: mov      edi, 0x00000150
0x01882749: mov      edx, [edi+0x1A8B9110] ;*getstatic cache
                                ; - java.lang.Integer::valueOf@35 (line 651)
                                ; - sun.dyn.ToGeneric$A2::targetA2@3 (line 663)
                                ; - sun.dyn.ToGeneric$A2::invoke_L@4 (line 672)
                                ; - java.dyn.InvokeDynamic::invokeExact@4
                                ; - SumWithIndy::test@17 (line 90)
                                ; {oop('java/lang/Integer$IntegerCache')}
```

Complete file: [sample-disassembly.txt](#)

## Plugin Implementations

There are 2 implementations around:

OpenJDK [sources](#) (defines the plugin API)

This version of the plugin requires the Gnu disassembler, which is available separately as part of the [binutils](#) project.

Look at the [README](#) for instructions on building.

With recent binutils version (i.e. binutils-2.23.2) you may get the following build error:

```
WARNING: `makeinfo' is missing on your system. You should only need it if
you modified a `.texi' or `.texinfo' file, or any other file
...
```

This is because of "[Bug 15345](#) - [2.23.2 regression] binutils-2.23.2 tarball doesn't build without makeinfo". The simplest workaround is to touch `'bfd/doc/bfd.info'` in the binutils source directory.

Pre-built binaries do not seem to be available (*help... anyone?*). Prebuilt binaries for Windows-x86: [hsdis-i386.dll](#)

Kenai project [base-hsdis](#)

This is a from-scratch implementation which uses code from the [Bastard project](#) at SourceForge. The copyrights on this code are non-restrictive.

The Kenai project offers [binary downloads](#).

## Installing the Plugin

Once you succeed in building or downloading the `hsdis` binary library (in the following named DLL), you have to install it next to your `libjvm.so` (`jvm.dll` on Windows), in the same folder. (Alternatively, you can put it anywhere on your `LD_LIBRARY_PATH`.) The DLL must be given the name that the JVM will be looking for. The core of the name will be `hsdis-i386` for 32-bit Intel JVMs. Other names in use are `hsdis-amd64`, `hsdis-sparc`, and `hsdis-sparcv9`. A prefix and/or suffix will be required, according to system-dependent rules for naming DLLs.

### installing the plugin on Solaris

```
$ JDK7=my/copy/of/jre1.7.0
$ cp -p hsdis/.libs/hsdis.so $JDK7/lib/i386/client/hsdis-i386.so
$ cp -p hsdis/.libs/hsdis.so $JDK7/lib/i386/server/hsdis-i386.so
$ XJAVA="$JDK7/bin/java -XX:+UnlockDiagnosticVMOptions -XX:+PrintAssembly"
$ $XJAVA -Xcomp -cp ~/Classes hello
$ $XJAVA -Xcomp -cp ~/Classes -XX:PrintAssemblyOptions=hsdis-print-bytes hello
$ $XJAVA -XX:-PrintAssembly -XX:+PrintStubCode
$ $XJAVA -XX:-PrintAssembly -XX:+PrintInterpreter
$ $XJAVA -XX:-PrintAssembly -XX:+PrintSignatureHandlers
$ $XJAVA -Xbatch -cp ~/Classes -XX:+PrintCompilation myloopingbenchmark
```

The last line (with `myloopingbenchmark`) is most typical, since it uses the batch execution mode common with benchmarks. The `-XX:+PrintCompilation` flag will let you know which (if any) methods are being compiled.

## Filtering Output

The `-XX:+PrintAssembly` option prints everything. If that's too much, drop it and use one of the following options.

Individual methods may be printed:

- `CompileCommand=print,*MyClass.myMethod` prints assembly for just one method
- `CompileCommand=option,*MyClass.myMethod,PrintOptoAssembly` (debug build only) produces the old print command output
- `CompileCommand=option,*MyClass.myMethod,PrintNMethods` produces method dumps

These options accumulate.

If you get no output, use `-XX:+PrintCompilation` to verify that your method is getting compiled at all.

## Reading the compiler's mind

The `-XX:+LogCompilation` flag produces a low-level XML file about compiler and runtime decisions, which may be interesting to some. The `-XX:+UnlockDiagnosticVMOptions` must come first. The dump is to `hotspot.log` in the current directory; use `-XX:LogFile=foo.log` to change this.

The `LogCompilation` output is basic line-oriented XML. It can usefully be read in a text editor, and there are also tools for parsing and scanning it.