Java Code Conventions

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1 - Introduction

1.1 Why Have Code Conventions

Code conventions are important to programmers for a number of reasons:

• 80% of the lifetime cost of a piece of software goes to maintenance.

• Hardly any software is maintained for its entire life by the original author.

• Code conventions improve the readability of the software, allowing engineers to understand new code more quickly and thoroughly.

• If you ship your source code as a product, you need to make sure it is packaged and clean as any other product you create.

1.2 Acknowledgments

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Comments on this document should be submitted to our feedback form at http://java.sun.com/ docs/forms/sendusmail.html.

2 - File Names

This section lists commonly used file suffixes and names

2.1 File Suffixes

JavaSoft uses the following file suffixes:

File Type	Suffix
Java source	.java
Java bytecode	.class

2.2 Common File Names

Frequently used file names include:

File Name	Use
README	The preferred name for the file that summarizes the contents of a particular directory

3 - File Organization

A file consists of sections that should be separated by blank lines and an optional comment identifying each section.

Files longer than 2000 lines are cumbersome and should be avoided.

For an example of a Java program properly formatted, see “Java Source File Example” on page 19.

3.1 Java Source Files

Each Java source file contains a single public class or interface. When private classes and interfaces are associated with a public class, you can put them in the same source file as the public class. The public class should be the first class or interface in the file.

Java source files have the following ordering:

• Package and Import statements; for example: import java.applet.Applet; import java.awt.*; import java.net.*;

• Class and interface declarations (see “Class and Interface Declarations” on page 4)

3.1.1 Package and Import Statements

The first non-comment line of most Java source files is a package statement. After that, import statements can follow. For example: package java.awt; import java.awt.peer.CanvasPeer;

3.1.2 Class and Interface Declarations

The following table describes the parts of a class or interface declaration, in the order that they should appear. See “Java Source File Example” on page 12 for an example that includes comments.

	Part of Class/Interface Declaration	Notes
1	Class/interface documentation comment (/**...*/)	See “Documentation Comments” on page 9 for information on what should be in this comment.
2	class or interface statement	
3	Class/interface implementation comment (/*...*/), if necessary	This comment should contain any class-wide or interface-wide information that wasn’t appropriate for the class/interface documentation comment
4	Constructors	
5	Methods	These methods should be grouped by functionality rather than by scope or accessibility. For example, a private class method can be in between two public instance methods. The goal is to make reading and understanding the code easier.
6	Class (static) variables	First the public class variables, then the protected, and then the private
7	Instance variables	First public, then protected, and then private.

4 - Indentation

Four spaces should be used as the unit of indentation. The exact construction of the indentation (spaces vs. tabs) is unspecified. Tabs must be set exactly every 8 spaces (not 4).

4.1 Line Length

Avoid lines longer than 100 characters, since they’re not handled well by many terminals and tools.

Note: Examples for use in documentation should have a shorter line length—generally no more than 70 characters.

4.2 Wrapping Lines

When an expression will not fit on a single line, break it according to these general principles:

- Break after a comma.
- Break before an operator.
- Prefer higher-level breaks to lower-level breaks.
- Align the new line with the beginning of the expression at the same level on the previous line.
- If the above rules lead to confusing code or to code that's squished up against the right margin, just indent 8 spaces instead.

Here are some examples of breaking method calls:

```
function(longExpression1, longExpression2, longExpression3,
         longExpression4, longExpression5);

var = function1(longExpression1,
                function2(longExpression2,
                          longExpression3));
```

Following are two examples of breaking an arithmetic expression. The first is preferred, since the break occurs outside the parenthesized expression, which is at a higher level.

```
longName1 = longName2 * (longName3 + longName4 - longName5)
            + 4 * longname6; // PREFER

longName1 = longName2 * (longName3 + longName4
                         - longName5) + 4 * longname6; // AVOID
```

Following are two examples of indenting method declarations. The first is the conventional case. The second would shift the second and third lines to the far right if it used conventional indentation, so instead it indents only 8 spaces.

```
//CONVENTIONAL INDENTATION
someMethod(int anArg, Object anotherArg, String yetAnotherArg,
           Object andStillAnother) {
    ...
}

//INDENT 8 SPACES TO AVOID VERY DEEP INDENTS
private static synchronized horkingLongMethodName(int anArg,
        Object anotherArg, String yetAnotherArg,
        Object andStillAnother) {
    ...
}
```

Line wrapping for if statements should generally use the 8-space rule, since conventional (4 space) indentation makes seeing the body difficult. For example:

```
//DON'T USE THIS INDENTATION
if ((condition1 && condition2)
    || (condition3 && condition4)
    ||!(condition5 && condition6)) { //BAD WRAPS
    doSomethingAboutIt();           //MAKE THIS LINE EASY TO MISS
}

//USE THIS INDENTATION INSTEAD
if ((condition1 && condition2)
        || (condition3 && condition4)
        ||!(condition5 && condition6)) {
    doSomethingAboutIt();
}

//OR USE THIS
if ((condition1 && condition2) || (condition3 && condition4)
        ||!(condition5 && condition6)) {
    doSomethingAboutIt();
}
```

Here are three acceptable ways to format ternary expressions:

```
alpha = (aLongBooleanExpression) ? beta : gamma;

alpha = (aLongBooleanExpression) ? beta
                                 : gamma;

alpha = (aLongBooleanExpression)
        ? beta
        : gamma;
```

5 - Comments

Java programs can have two kinds of comments: implementation comments and documentation comments. Implementation comments are those found in C++, which are delimited by /*...*/, and //. Documentation comments (known as "doc comments") are Java-only, and are delimited by /**...*/. Doc comments can be extracted to HTML files using the javadoc tool.

Implementation comments are mean for commenting out code or for comments about the particular implementation. Doc comments are meant to describe the specification of the code, from an implementation-free perspective. to be read by developers who might not necessarily have the source code at hand.

Comments should be used to give overviews of code and provide additional information that is not readily available in the code itself. Comments should contain only information that is relevant to reading and understanding the program. For example, information about how the corresponding package is built or in what directory it resides should not be included as a comment.

Discussion of nontrivial or nonobvious design decisions is appropriate, but avoid duplicating information that is present in (and clear from) the code. It is too easy for redundant comments to get out of date. In general, avoid any comments that are likely to get out of date as the code evolves.

Note: The frequency of comments sometimes reflects poor quality of code. When you feel compelled to add a comment, consider rewriting the code to make it clearer.

Comments should not be enclosed in large boxes drawn with asterisks or other characters. Comments should never include special characters such as form-feed and backspace.

5.1 Implementation Comment

Formats Programs can have four styles of implementation comments: block, single-line, trailing and end-of-line.

5.1.1 Block Comments

Block comments are used to provide descriptions of files, methods, data structures and algorithms. Block comments should be used at the beginning of each file and before each method. They can also be used in other places, such as within methods. Block comments inside a function or method should be indented to the same level as the code they describe.

A block comment should be preceded by a blank line to set it apart from the rest of the code. Block comments have an asterisk "*" at the beginning of each line except the first.

```
/*
 * Here is a block comment.
 */
```

5.1.2 Single-Line Comments

Short comments can appear on a single line indented to the level of the code that follows. If a comment can't be written in a single line, it should follow the block comment format (see section 5.1.1). A single-line comment should be preceded by a blank line. Here's an example of a single-line comment in Java code (also see "Documentation Comments" on page 9):

```
if (condition) {

    /* Handle the condition. */
    ...
}
```

5.1.3 Trailing Comments

Very short comments can appear on the same line as the code they describe, but should be shifted far enough to separate them from the statements. If more than one short comment appears in a chunk of code, they should all be indented to the same tab setting. Avoid the assembly language style of commenting every line of executable code with a trailing comment.

Here's an example of a trailing comment in Java code (also see "Documentation Comments" on page 8):

```
if (a == 2) {
    return TRUE;            /* special case */
} else {
    return isprime(a);      /* works only for odd a */
}
```

5.1.4 End-Of-Line Comments

The // comment delimiter begins a comment that continues to the newline. It can comment out a complete line or only a partial line. It shouldn't be used on consecutive multiple lines for text comments; however, it can be used in consecutive multiple lines for commenting out sections of code. Examples of all three styles follow:

```
if (foo > 1) {

    // Do a double-flip.
    ...
}
else
    return false;          // Explain why here.

//if (bar > 1) {
//
//    // Do a triple-flip.
//    ...
//}
//else
//    return false;
```

5.2 Documentation Comments

Note: See "Java Source File Example" on page 19 for examples of the comment formats described here.

For further details, see "How to Write Doc Comments for Javadoc" which includes information on the doc comment tags (@return, @param, @see):

http://java.sun.com/products/jdk/javadoc/writingdoccomments.html

For further details about doc comments and javadoc, see the javadoc home page at:

http://java.sun.com/products/jdk/javadoc/

Doc comments describe Java classes, interfaces, constructors, methods, and fields. Each doc comment is set inside the comment delimiters /**...*/, with one comment per API. This comment should appear just before the declaration:

```
/**
 * The Example class provides ...
 */
class Example { ...
```

Notice that classes and interfaces are not indented, while their members are. The first line of doc comment (/**) for classes and interfaces is not indented; subsequent doc comment lines each have 1 space of indentation (to vertically align the asterisks). Members, including constructors, have 4 spaces for the first doc comment line and 5 spaces thereafter.

If you need to give information about a class, interface, variable, or method that isn't appropriate for documentation, use an implementation block comment (see section 5.1.1) or single-line (see section 5.1.2) comment immediately after the declaration. For example, details about the implementation of a class should go in in such an implementation block comment following the class statement, not in the class doc comment.

Doc comments should not be positioned inside a method or constructor definition block, because Java associates documentation comments with the first declaration after the comment.

6 - Declarations

6.1 Number Per Line

One declaration per line is recommended since it encourages commenting. In other words,

```
int level; // indentation level
int size;  // size of table
```

is preferred over

```
int level, size;
```

In absolutely no case should variables and functions be declared on the same line. Example:

```
long dbaddr, getDbaddr(); // WRONG!
```

Do not put different types on the same line. Example:

```
 int foo,  fooarray[]; //WRONG!
```

Note: The examples above use one space between the type and the identifier. Another acceptable alternative is to use tabs, e.g.:

```
int       level;         // indentation level
int       size;          // size of table
Object    currentEntry; // currently selected table entry
```

6.2 Class and Interface Declarations

When coding Java classes and interfaces, the following formatting rules should be followed:

• No space between a method name and the parenthesis "(" starting its parameter list

• Open brace "{" appears at the end of the same line as the declaration statement

• Closing brace "}" starts a line by itself indented to match its corresponding opening statement, except when it is a null statement the "}" should appear immediately after the "{"

```
class Sample extends Object {
    int ivar1;
    int ivar2;

    Sample(int i, int j) {
        ivar1 = i;
        ivar2 = j;
    }

    int emptyMethod() {}

    ...
}
```

• Methods are separated by a blank line

7 - Statements

7.1 Simple Statements

Each line should contain at most one statement. Example:

```
argv++; argc--;        // AVOID!
```

Do not use the comma operator to group multiple statements unless it is for an obvious reason. Example:

```
if (err) {
    Format.print(System.out, "error"), exit(1); //VERY WRONG!
}
```

7.2 Compound Statements

Compound statements are statements that contain lists of statements enclosed in braces "{ statements }". See the following sections for examples.

• The enclosed statements should be indented one more level than the compound statement.

• The opening brace should be at the end of the line that begins the compound statement; the closing brace should begin a line and be indented to the beginning of the compound statement.

• Braces are used around all statements, even singletons, when they are part of a control structure, such as a if-else or for statement. This makes it easier to add statements without accidentally introducing bugs due to forgetting to add braces.

7.3 return Statements

A return statement with a value should not use parentheses unless they make the return value more obvious in some way. Example:

```
return;

return myDisk.size();

return (size ? size : defaultSize);
```

8 - Naming Conventions

Naming conventions make programs more understandable by making them easier to read. They can also give information about the function of the identifier—for example, whether it's a constant, package, or class—which can be helpful in understanding the code.

The conventions given in this section are high level. Further conventions are given at (to be determined).

Identifier Type	Rules for Naming	Examples
Classes	Class names should be nouns, in mixed case with the first letter of each internal word capitalized. Try to keep your class names simple and descriptive. Use whole words— avoid acronyms and abbreviations (unless the abbreviation is much more widely used than the long form, such as URL or HTML)	class Raster; class ImageSprite;
Interfaces	Interface names should be capitalized like class names.	interface RasterDelegate; interface Storing;

Methods	Methods should be verbs, in mixed case with the first letter lowercase, with the first letter of each internal word capitalized.	run();
		runFast();
		getBackground();

Variables	Except for variables, all instance, class, and class constants are in mixed case with a lowercase first letter. Internal words start with capital letters. Variable names should be short yet meaningful. The choice of a variable name should be mnemonic— that is, designed to indicate to the casual observer the intent of its use. One-character variable names should be avoided except for temporary "throwaway" variables. Common names for temporary variables are i, j, k, m, and n for integers; c, d, and e for characters	İnt i; Char *cp; float myWidth;

Constants	The names of variables declared class constants and of ANSI constants should be all uppercase with words separated by underscores ("_"). (ANSI constants should be avoided, for ease of debugging.)	int MIN_WIDTH = 4;
		int MAX_WIDTH = 999;
		int GET_THE_CPU = 1;

9 - Code Examples

```
/*
 * %W% %E% Firstname Lastname
 *
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 *
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 */
package java.blah;

import java.blah.blahdy.BlahBlah;

/**
 * Class description goes here.
 *
 * @version      1.10 04 Oct 1996
 * @author       Firstname Lastname
 */
public class Blah extends SomeClass {
    /* A class implementation comment can go here. */

    /** classVar1 documentation comment */
    public static int classVar1;

    /**
     * classVar2 documentation comment that happens to be
     * more than one line long
     */
    private static Object classVar2;

    /** instanceVar1 documentation comment */
    public Object instanceVar1;

    /** instanceVar2 documentation comment */
    protected int instanceVar2;

    /** instanceVar3 documentation comment */
    private Object[] instanceVar3;


      /**
       * ...method Blah documentation comment...
       */
      public Blah() {
          // ...implementation goes here...
      }

      /**
       * ...method doSomething documentation comment...
       */
      public void doSomething() {
          // ...implementation goes here...
      }

      /**
       * ...method doSomethingElse documentation comment...
       * @param someParam description
       */
      public void doSomethingElse(Object someParam) {
          // ...implementation goes here...
      }
  }
```