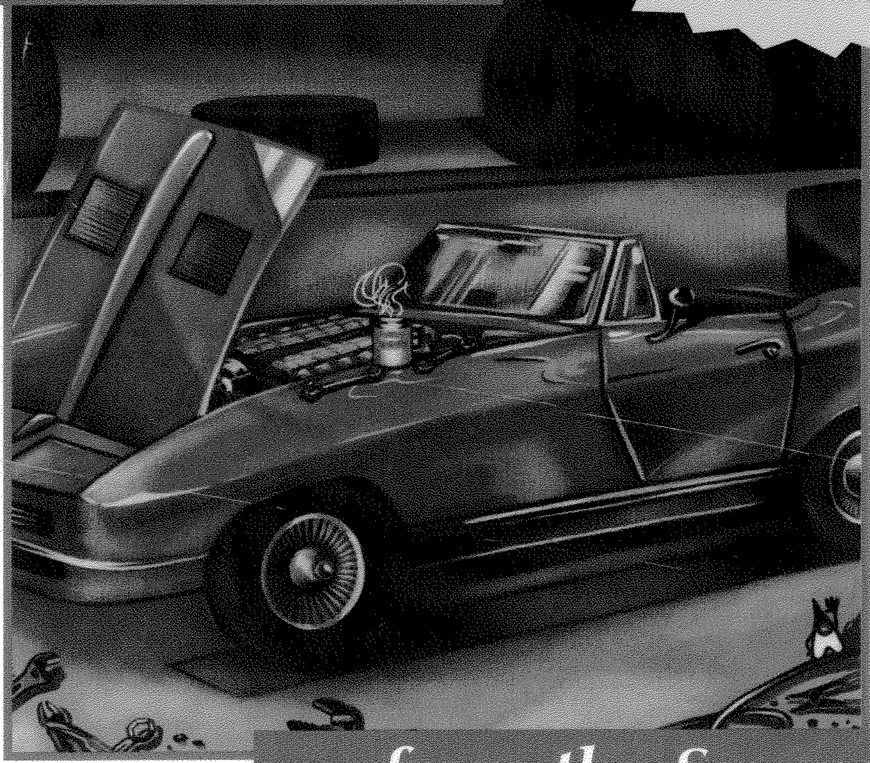
Tim Lindholm • Frank Yellin

The Java™ Virtual Machine Specification Second Edition

The Java Series

Java™ 2 Platform



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The Java™ Virtual Machine Specification

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Tim Lindholm
Frank Yellin

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The element type of an array may be any type, whether primitive or reference. In particular, arrays with an interface type as the component type are supported; the elements of such an array may have as their value a null reference or instances of any class type that implements the interface. Arrays with an `abstract` class type as the component type are supported; the elements of such an array may have as their value a null reference or instances of any subclass of this `abstract` class that is not itself `abstract`.

2.15.2 Array Variables

A variable of array type holds a reference to an object. Declaring a variable of array type does not create an array object or allocate any space for array components. It creates only the variable itself, which can contain a reference to an array.

Because an array's length is not part of its type, a single variable of array type may contain references to arrays of different lengths. Once an array object is created, its length never changes. To make an array variable refer to an array of different length, a reference to a different array must be assigned to the variable.

If an array variable *v* has type *A*`[]`, where *A* is a reference type, then *v* can hold a reference to any array type *B*`[]`, provided *B* can be assigned to *A* (§2.6.7).

2.15.3 Array Creation

An array is created by an *array creation expression* or an *array initializer*.

2.15.4 Array Access

A component of an array is accessed using an *array access expression*. Arrays may be indexed by `int` values; `short`, `byte`, or `char` values may also be used as they are subjected to unary numeric promotion (§2.6.10) and become `int` values.

All arrays are 0-origin. An array with length *n* can be indexed by the integers 0 through *n* – 1. All array accesses are checked at run time; an attempt to use an index that is less than zero or greater than or equal to the length of the array causes an `ArrayIndexOutOfBoundsException` to be thrown.

2.16 Exceptions

When a program violates the semantic constraints of the Java programming language, the Java virtual machine signals this error to the program as an *exception*. An example of such a violation is an attempt to index outside the bounds of an array. The Java programming language specifies that an exception will be thrown when semantic constraints are violated and will cause a nonlocal transfer of control from the point where the exception occurred to a point that can be specified by the programmer. An exception is said to be *thrown* from the point where it occurred and is said to be *caught* at the point to which control is transferred. A method invocation that completes because an exception causes transfer of control to a point outside the method is said to *complete abruptly*.

Programs can also throw exceptions explicitly, using `throw` statements. This provides an alternative to the old-fashioned style of handling error conditions by returning distinguished error values, such as the integer value `-1`, where a negative value would not normally be expected.

Every exception is represented by an instance of the class `Throwable` or one of its subclasses; such an object can be used to carry information from the point at which an exception occurs to the handler that catches it. Handlers are established by `catch` clauses of `try` statements. During the process of throwing an exception, the Java virtual machine abruptly completes, one by one, any expressions, statements, method and constructor invocations, static initializers, and field initialization expressions that have begun but not completed execution in the current thread. This process continues until a handler is found that indicates that it handles the thrown exception by naming the class of the exception or a superclass of the class of the exception. If no such handler is found, then the method `uncaughtException` is invoked for the `ThreadGroup` that is the parent of the current thread.

In the Java programming language the exception mechanism is integrated with the synchronization model (§2.19) so that locks are properly released as `synchronized` statements and so that invocations of `synchronized` methods complete abruptly.

The specific exceptions covered in this section are that subset of the predefined exceptions that can be thrown directly by the operation of the Java virtual machine. Additional exceptions can be thrown by class library or user code; these exceptions are not covered here. See *The Java*™ *Language Specification* for information on all predefined exceptions.

2.16.1 The Causes of Exceptions

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