

barriers between application, runtime, and compiler views of the system. In the next sections we look at Jikes RVM, a runtime that puts these principles together.

A Brief History of Jikes RVM

Jikes RVM stems from an IBM project called Jalapeño. The Jalapeño project was started in November of 1997 with the goal of developing a flexible research infrastructure to explore ideas in high-performance virtual machine design. By early 1998, an initial functional prototype was bootstrapped and capable of running small Java programs. In the spring of 1998, work was begun on the optimizing compiler, and the project rapidly grew in size. By early 2000, project members had published several academic papers describing aspects of Jalapeño, and university researchers began to express interest in getting access to the system to use as the basis for their own research efforts.

By the time the system went open source in October of 2001, there were already 16 universities using Jikes RVM under license from IBM. This community rapidly expanded and now includes hundreds of researchers at well over 100 institutions. Jikes RVM has been the basis for over 188 papers that have appeared in peer-reviewed publications, and it has formed a foundation for at least 36 university dissertations.

Version 2 was the original open source Jikes RVM and had support for both the Intel and PowerPC architectures. A range of different garbage collection algorithms were available, including reference counting, mark-sweep, and semi-space. A year later, version 2.2 of Jikes RVM was released. One of the main enhancements was a completely new implementation of the memory management subsystem, called the *Memory Management Toolkit* (MMTk). MMTk has become a very widely used framework in the garbage collection research community, and has been ported to other runtimes besides Jikes RVM. We discuss MMTk and garbage collection techniques further in “Garbage Collection.” The optimizing compiler and adaptive optimization system also had significant improvements, and the development of the runtime was simplified by a switch to the open source GNU Classpath standard class libraries. In April 2003, Jikes RVM 2.2.1 was one of the first open source Java runtimes capable of running significant portions of the Eclipse IDE.

In the almost four years between versions 2.2 and 2.4.6, a number of significant improvements in both functionality and performance were made, but with a source structure and architecture that were mostly unchanged.

Jikes RVM 3.0 was released in August 2008 and represents almost two years of concerted community effort to modernize and improve the system. Java 5.0 language features were adopted across the codebase, the build system switched to using Apache Ant, and a greatly improved testing infrastructure was developed to increase system stability and performance. In addition, a number of functional and performance improvements were made, resulting in performance for many programs that is competitive with that achieved by modern production JVMs (implemented in traditional runtime system languages such as C/C++).