Introducing the French RNRT MARVEL project

Marc Lacoste[1]

CNET DTL/ASR (France Telecom),
28, Chemin du Vieux-Chêne, BP 98, 38243 Meylan Cedex, FRANCE,
marc.lacoste@cnet.francetelecom.fr

Abstract. This paper presents the MARVEL project which aims to define a computational model and to implement a minimal software infrastructure for distributed mobile object computing that should be scalable, secure, and fault tolerant.

The main aim of the French National Telecommunications Research network (RNRT) project MARVEL is to define and construct a minimal software infrastructure for distributed mobile object computing that is scalable (both up and down) to operate in heterogeneous environments. It seeks to go beyond current distributed object platforms, such as those based on the OMG CORBA standard and on Java RMI, and beyond existing ad-hoc approaches to software mobility, such as those encountered in today's mobile agent platforms, to provide uniform support for mobility on a large scale. In particular, it will address the mobility of executing programs, transferred with their computation and communications context from one site to another with differing resource availability.

MARVEL (translated from French) stands for "Distributed Virtual Machine and Language for Mobile Objects". The project's vision is that a sound and effective infrastructure for distributed mobile object computing can be constructed from a distributed virtual machine executing a programming language that implements a formal calculus of mobile object computing. The expected results of the project are:

- a formal calculus of mobile object computing, with well-defined mathematical semantics and accompanying formal proof techniques, that takes into account in a formal way:
  - higher-order characteristics of mobile objects and their computation
  - access to and management of distributed computation and communication resources
  - aspects related to security and fault-tolerance in distributed systems
- a distributed virtual machine implementation, that implements in an efficient and provably correct way, the execution semantics of the formal calculus
- a higher-order, strongly-typed, distributed object-oriented programming language for programming applications that will execute on the virtual machine.

The motivation behind MARVEL is that today's distributed object technologies, especially those based on CORBA and Java, have reached a certain degree of maturity but that there is little or no formal semantics associated with these technologies, and even less so with the various ad-hoc extensions of them that have been proposed to handle mobility. MARVEL seeks to counter this by starting with formal mathematical foundations that are applicable uniformly to all kinds of distributed and mobile computing, and building a language and virtual machine support based on these formal foundations. Scalability and adaptability are important aspects of mobile code that have to execute in varying (and potentially unknown) environments with different computing and communication capacities. MARVEL will seek to address this through the use of formal reflexive techniques thereby providing a basis for developing and executing flexible applications, capable of adapting automatically to changing conditions in their environment. Examples of potential target applications include network management applications, large-scale widely distributed games and chat services, and active network type applications.

The project draws its inspiration from, and combines the energies of, two communities working on distributed systems support (operating systems, middleware), and formal mathematical models and calculi of programming, notably process calculi. MARVEL started mid November 1998 and will run for three years. It involves teams from three (French) partners: INRIA (Meije and Para projects), France Telecom CNET (Distributed Systems Architecture dept), and ENST (Network and Computing dept).