



Java Card™ Technology

Providing a Secure and Ubiquitous Java Platform for Smart Cards

Highlights

Java Card™ technology is the leading open, interoperable platform for smart cards and memory-constrained devices, and includes:

- The Java Card Platform Specification (Java Card Virtual Machine Specification, Java Card Runtime Environment Specification, and API for the Java Card Platform) — provides the basis for cross-platform and cross-vendor applet interoperability
- The Java Card Development Kit — offers a complete, standalone development environment in which applets written for the Java Card platform can be developed and tested



Java Card™ technology enables smart cards and other devices with very limited memory to run small applications, called applets, that employ Java™ technology. Java Card technology provides smart card manufacturers with a secure and interoperable execution platform that can store and update multiple applications on a single device and is compatible with existing smart card standards.

Java Card technology enables developers to build, test, and deploy applications and services rapidly and securely. This accelerated process reduces development costs, increases product differentiation, and enhances value to customers. Java Card technology makes it easy to integrate security tokens into a complete Java software solution.

Industries

Almost any type of smart card can benefit from Java Card technology:

- Subscriber Identity Module (SIM) cards used in cell phones on most wireless networks
- Financial cards supporting both online and offline transactions
- Government and healthcare identity cards
- Cards that provide logical access and physical access to enterprise resources
- Smart tickets for mass transit

On the majority of cellular telephone networks, a subscriber uses a smart card commonly called a SIM card to activate the telephone. The card authenticates the user and provides encryption keys for digital voice transmission. When fitted with Java Card technology, SIM cards can also provide transactional services such as remote banking and ticketing. Several billion SIM cards based on Java Card technology are already powering innovative services in cell phones.

In the banking industry, smart cards give users secure access to a wide array of networked financial services, including cash machines, bill paying, and bridge tolls. Java Card technology enables a single smart card to host multiple financial applications and to deliver third-party services such as mileage programs or secure online banking.

A wide variety of other applications are available, wherever security and authenticated identity are important, such as in controlling access to secure facilities and to medical records.

Benefits

Smart card vendors and issuers benefit from several unique features of Java Card technology, specifically:

- **Interoperability:** Applets developed with Java Card technology will run on any Java Card technology-enabled smart card, independently of the card vendor and underlying hardware.
- **Security:** Java Card technology relies on the inherent security of the Java programming language to provide a secure execution environment. An open design process, proven industry deployments and high-level security evaluations guarantee that the Java Card platform is the most capable and secure technology available today.

- Multi-application capability: Java Card technology enables multiple applications to coexist securely on a single smart card.
- Dynamic nature: New applications can be installed securely after a card has been issued, enabling card issuers to dynamically respond to their customer's changing needs.
- Compatibility with existing standards: The Java Card API is compatible with international standards for smart cards such as ISO 7816 or Europay, MasterCard, Visa (EMV). Major industry-specific standards such as the Global Platform and European Telecommunications Standards Institute (ETSI) refer to it.

Developers creating applications using Java Card technology enjoy all the advantages of working in the Java programming language:

- Object-oriented programming yields greater code modularity and reusability, leading to higher programmer productivity.
- Protection features characteristic of the Java programming language apply to Java Card applets, enforcing strong typing and protection attributes.
- Powerful off-the-shelf development tools are readily available.

Components

Sun Microsystems publishes the Java Card Platform Specification and the Java Card Development Kit. Providing the basis for cross-platform and cross-vendor applet interoperability, version 2.2.2 includes:

- The Java Card Virtual Machine Specification defines the features, services, and behavior that an implementation of Java Card technology must support. It includes the instruction

set of a Java Card Virtual Machine (VM), the supported subset of the Java language, and the file formats used to install applets and libraries into smart cards and other devices that host Java Card technology.

- The Java Card Runtime Environment Specification defines the necessary behavior of the runtime environment (RE) in any implementation of the Java Card technology. The RE includes implementations of the Java Card Virtual Machine, the Java Card API classes, and runtime support services such as the selection and deselection of applets.
- API for the Java Card Platform complements the Java Card Runtime Environment Specification and describes the application programming interface (API) of the Java Card technology. The API is compatible with formal international standards and industry-specific standards, and contains the class definitions required to support the Java Card VM and the Java Card RE.

The Java Card Development Kit is a suite of tools for designing implementations of Java Card technology and developing applets based on the Java Card API Specification:

- C-JCRE is a reference implementation of the Java Card Runtime Environment written in the C programming language. It also includes the Java Card Virtual Machine interpreter.
- Off-card platform components such as the Java Card Converter and the Java Card Verifier complement C-JCRE to provide a complete development chain.
- Additional design and testing tools enable developers to prototype and test applications.

Java Card “S”

The Java Card “S” program enables Java Card licensees to derive fixed-function smart cards from existing Java Card technology-based products. Java Card “S” products have all the functionality and security of standard Java Card smart cards except the dynamic download capability: applications cannot be added or removed after the device has been issued.

Licensing

Java Card technology is licensed to companies that now represent more than 90 percent of the world's smart card manufacturing capacity. Additionally, it provides a range of new opportunities for original equipment manufacturers (OEMs) and their partners across several industries. In particular, the applet interoperability provided by Java Card technology allows card issuers to mix and match third-party applications, including standard payment, stored value, computer authorization, data management, and more. Java Card technology licensees can also acquire a license to the Java Card Technology Compatibility Kit (TCK), which can be used to certify a Java Card implementation on a particular platform.