JAVA CARD TECHNOLOGY PROVIDING A SECURE AND UBIQUITOUS PLATFORM FOR SMART CARDS

Java Card™ technology enables smart cards and other devices with very limited memory to run small applications, called applets, which 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 IS THE LEADING OPEN, INTEROPERABLE PLATFORM FOR SMART CARDS AND MEMORY-CONSTRAINED DEVICE

HIGHLIGHTS

- 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

Overview

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

Java Card technology is used in all industries that rely on smart cards:

- **Telecom**. Billions of SIM cards have been issued including Java Card technology, which mobile operators use to provide value-added services to their customers. Java Card is also central to NFC deployments, whether based on SIM cards or on embedded secure elements.

- **Finance**. Java Card technology is often at the base of payment cards, in particular since the emergence of contactless protocols in addition to contact protocols. Java Card technology also allows banks to provide additional services such as two-factor authentication to their customers.

- **Government and Identity**. Many governments are including Java Card technology in their requirements for electronic identity documents. Java Card technology provides them strong guarantees of interoperability and security, as required by these sensitive deployments.

- **Other markets**. Java Card technology is also used in other markets such as public transportation, pay-TV, or private access control. In such markets, the use of Java Card technology helps actors to reduce their costs while preparing for convergence with other technologies (like with NFC, which dematerializes some public transportation cards).

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 mobile communication standards issued by ETSI/3GPP. Major industry-specific standards such as EMVCo, GlobalPlatform 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

Oracle publishes the Java Card Platform Specification and the Java Card Development Kit. Since version 3.0, the Java Card specification includes two distinct editions: Classic and Connected. The Classic Edition focuses on existing product ranges, while the Connected Edition focuses on more advanced products.

Providing the basis for cross-platform and cross-vendor applet interoperability, the Java Card Classic specification 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 Classic 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.

The Connected edition has been added in order to support more powerful chips and more demanding use cases, in particular related to secure Web services. The Java Card Connected specification, version 3.0.1 also defines an extended virtual machine, runtime environment,

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and API, as well as a servlet environment. The associated Connected Development Kit includes all tools required to develop and test Java Card Connected applications, and it has been fully integrated in the NetBeans environment for a better develop experience.

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.

Licensees are provided with a specific Trimming tool, which allows them to determine precisely the subset of Java Card features required by an application or group of applications. This tool simplifies the generation of Java Card "S" products by licensees.

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.

Contact Us

For more information about Java Card, visit oracle.com or call +1.800.ORACLE1 to speak to an Oracle representative.

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