Geographic Information Systems for Java™

An ESRI® White Paper • April 2002

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Geographic Information Systems for Java

In its role as the language for the Internet, Java™ is increasingly adopted by developers and information technology professionals as the preferred software development/deployment platform for Internet applications. There are many benefits to using Java including

- Simple yet robust; small footprint, ideal for rapid prototyping and development
- Platform independent ("write once, run anywhere")
- High performance, multithreaded
- Object oriented, producing reusable object-oriented components
- Network oriented, easily dealing with protocols such as HTTP and FTP

The Java platform is a universal Internet/Intranet software development and deployment platform. It is also a core technology for the Internet Computing Model for Distributed Geoprocessing.

Java is ideally suited for use in smart devices, the telecommunications industry (specifically the location-based services market), and the data services market.

ESRI offers a variety of mapping and geographic information system (GIS) solutions for the Java developer. Through the openness of Java, developers can enjoy cross-platform support for their GIS applications, providing end users with a wide range of interactive mapping capabilities.

ESRI's Java solutions cover a wide range of needs for both developers and end users including lightweight desktop applications, Java application programming interfaces (APIs) for accessing spatial databases, components for creating new Java-based applications or embedding GIS capabilities into existing Java applications, and Java technology to implement Web mapping and GIS solutions. Whether you are creating Web, stand-alone, or enterprise solutions, ESRI's Java technology provides a solution to meet your needs.

This paper briefly describes the various ways that ESRI® technology provides opportunities for Java development and integration. The relationship among these components of ESRI's Java strategy is summarized in the diagram on the following page.

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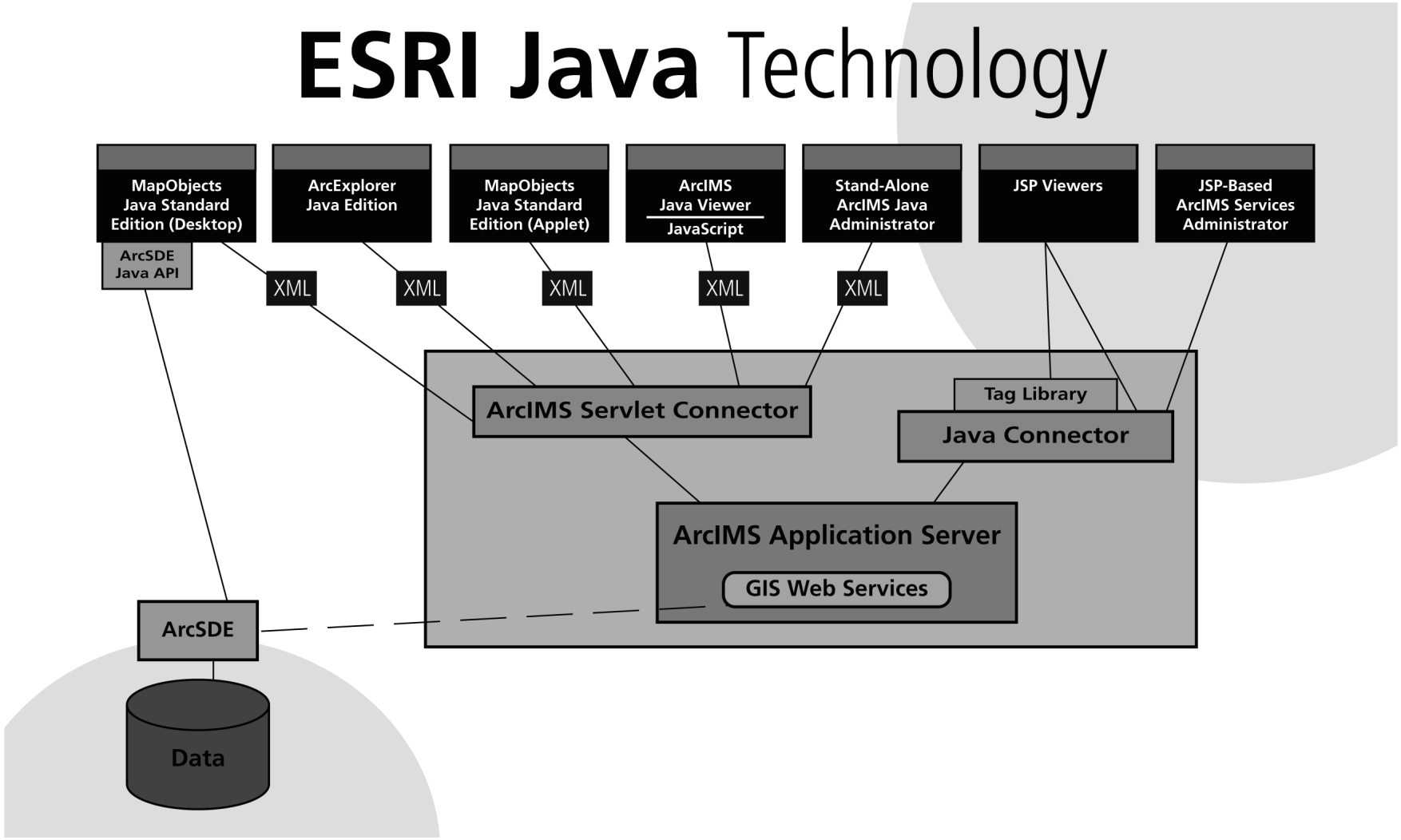
ESRI Java Technology
MapObjects Java Standard Edition (Desktop)
ArcExplorer Java Edition
MapObjects Java Standard Edition (Applet)
ArcIMS Java Viewer
JavaScript
Stand-Alone ArcIMS Java Administrator
JSP Viewers
JSP-Based ArcIMS Services Administrator
ArcSDE Java API
XML
XML
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XML
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ArcIMS Servlet Connector
Tag Library
Java Connector
ArcIMS Application Server
GIS Web Services
ArcSDE
Data

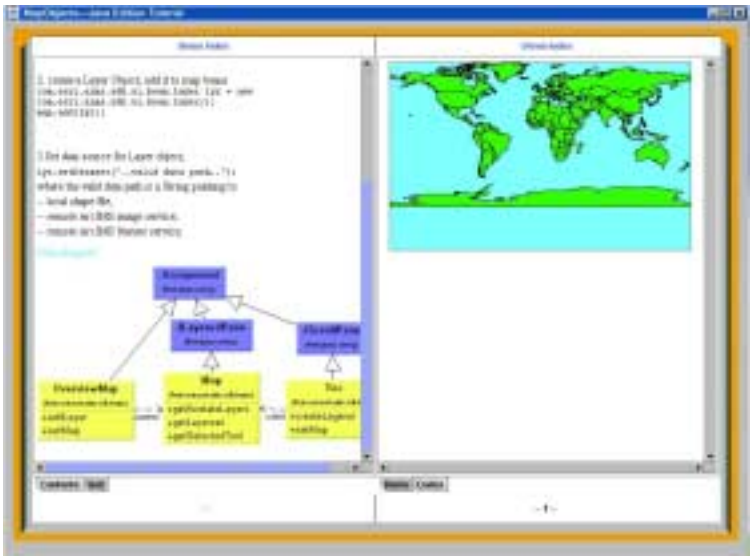
MapObjects—Java Standard Edition

ESRI's clientside Java solution is MapObjects®—Java Standard Edition. This pure Java API allows developers to build cross-platform custom clients or easily integrate mapping and GIS into existing Java applications. MapObjects—Java Standard Edition is built entirely on the Java 2 platform. It consists of a set of Java Archive (JAR) files containing pure Java components that can be referenced and used to develop custom Java-based client stand-alone applications or applets. With MapObjects—Java Standard Edition, users can view maps and perform a wide variety of geographic-based display, query, spatial analysis, and data retrieval activities.

The suite of visual JavaBeans™ contained in MapObjects—Java Standard Edition can be referenced in an integrated development environment (IDE) such as JBuilder™ and Forte™ for Java. These Beans can be used in a drag-and-drop environment for building graphical user interfaces.

All of the visual components in MapObjects—Java Standard Edition extend from the Java Swing components. Using these components, developers can build applications that include functional toolbars, overview maps, and map legends that make custom applications easy to use.

The software comes with Javadoc (standard interface and class descriptions), a programmer's reference, a guide to building applications, more than 20 sample applications (including source code), quick-start tutorials, and a comprehensive object model diagram.

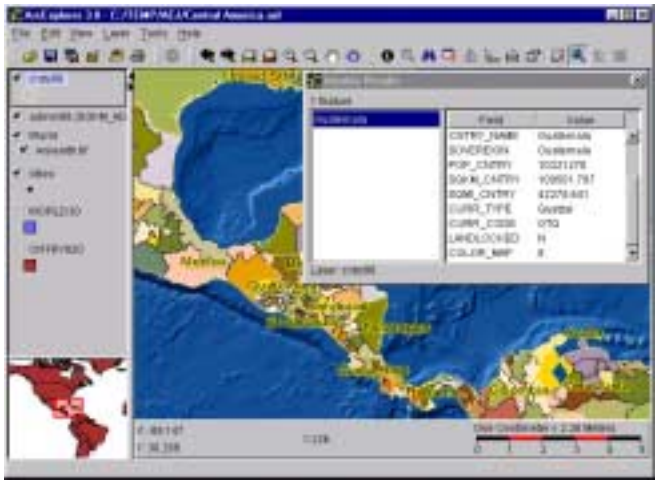


MapObjects—Java Standard Edition tutorials offer a quick way of getting applications up and running.

ArcExplorer—Java Edition

An example of a client application that can be built with MapObjects—Java Standard Edition is ESRI's ArcExplorer™—Java Edition software, which is a desktop GIS data viewer distributed free of charge. It can be used on its own with local data sets or as a client to Internet data and map servers. One of the unique features of ArcExplorer—Java Edition is that users display a MapService built with ArcIMS® (ESRI's GIS for the

Internet) and perform GIS functions directly online—without having to download data from the Web.



ArcExplorer—Java Edition provides a ready-to-use application for accessing local and Internet or Intranet data sets.

ArcIMS

ArcIMS provides the foundation for distributing high-end mapping, GIS, and services over the Internet. It enables users to integrate local data sources with Internet data sources for display, query, and analysis in an easy-to-use Web browser. ArcIMS uses Java-based components that communicate with and access ArcIMS services.

The ArcIMS Application Server Connectors connect the Web server to the ArcIMS Application Server. The ArcIMS Servlet Connector is the standard connector used with ArcIMS. It supports the Open GIS Consortium (OGC) WMS 1.1 implementation specification.

ArcIMS also comes with a Java Connector, which allows developers to program Java clients and Java applications that use a set of JavaBeans. The Java Connector communicates with the ArcIMS Application Server via a JavaServer Pages (JSP) client or a stand-alone Java application. It is a reusable software component suite that includes a JavaBeans Object Model Library and a rich set of custom JSP tags supported in the form of a Tag Library. These JavaBeans and JSP tags allow developers to programmatically establish communication with an ArcIMS Application Server—via an HTTP, HTTPS, or TCP/IP connection—and begin sending requests to it. Once the Application Server receives the request, it processes it and returns the appropriate response. With that response, the application can react accordingly.

On the client side, ArcIMS comes with a Java Viewer, which is a browser that uses a Java 2 applet for user interface components such as the map display, scale bar, and legend. It also uses Java to send requests to the ArcIMS Spatial Server. The ArcIMS Java Viewer allows clientside drawing and editing and requires a Java plug-in. Java Viewers can be used with Feature or Image MapServices.

The ArcIMS Java Viewer can be customized using JavaScript to access methods and properties in the Java Viewer Object Model. The look and feel of the ArcIMS Java Viewer can be customized using HTML and JavaScript to alter tags and parameters.

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ArcIMS Java Viewers are highly customizable, allowing for a great deal of control over clientside capabilities.

Other Java technology that is part of the ArcIMS framework includes

- ArcIMS Administration—ArcIMS Web sites can be administered through the stand-alone Java Administrator or an administrator using a JSP implementation. The stand-alone Java Administrator is a desktop application that communicates using HTTP to administer an ArcIMS site. It administers the site using the Servlet Connector. The JSP Administrator is a Web application that administers an ArcIMS site using the Java Connector.

- JSP Viewer—A customizable and extensible Web application that uses the Java Connector.

ArcSDE—Java API

ArcSDE™ is ESRI's Spatial Database Engine™. It is the GIS gateway that facilitates managing spatial data in a database management system. ArcSDE allows you to manage geographic information in one of four commercial databases: IBM® DB2®, Informix®, Microsoft® SQL Server™, and Oracle®. Clients can connect to ArcSDE data sets via the ArcSDE—Java API.

GIS Web Services

GIS Web Services are self-contained, modular components and applications that can be published and accessed over the Web. They typically perform a specific GIS function that can be integrated as part of a larger application. ESRI's GIS Web Services let developers quickly integrate functionality into their applications without having to build or host the functionality locally, often resulting in a significant savings of time, money, and disk space.

GIS Web Services can be accessed from any Web-enabled application. This includes desktop applications, as well as Web applications, that are commonly built with Java or Active Server Pages (ASP). If the application can connect to the Web, a developer can integrate GIS Web Services from ESRI.

ESRI's GIS Web Services are deployed through standard Web protocols including HTTP and XML. They use the XML-based Simple Object Access Protocol (SOAP) to communicate, and therefore, they are compatible with the majority of Web service frameworks available today.