Using Geographic Information System Technology With Linux

An ESRI® White Paper • June 2002

ESRI 380 New York St., Redlands, CA 92373-8100, USA • TEL 909-793-2853 • FAX 909-793-5953 • E-MAIL info@esri.com • WEB www.esri.com

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Using Geographic Information System Technology With Linux

Introduction

Building on a long history of cross-platform support including UNIX releases of industry-leading geographic information system (GIS) technology, ESRI is currently releasing components of its ArcGIS™ product line for Linux users. This white paper explains what components ESRI is making available in the Linux environment, provides a brief description of these components, and provides additional information about the technology used to accomplish the port to Linux.

ESRI UNIX Support

UNIX is not a new platform for ESRI; in fact, it has been a primary platform for ESRI software users for many years. ESRI released its first UNIX product in the early 1980s, when ArcInfo™ was originally ported from the Prime minicomputer environment to UNIX.

Over the years, in response to both user needs and changes in the marketplace, ESRI has supported a number of different "flavors" of UNIX including

- Red Hat Linux—Intel
- Sun Solaris
- HP-UX
- IBM AIX
- Compaq TRU64
- Silicon Graphics IRIX

Our goal is to deliver ESRI® products on multiple platforms. ESRI's software products will be supported on the set of computing platforms that are most appropriate for each (i.e., high-end desktops, servers, and devices).

- ArcGIS Desktop applications: primarily Windows, with some UNIX support
- ArcGIS servers: Windows and UNIX support
- ArcGIS clients: HTML (browsers), Java applications, Pocket PC (Windows CE), and Windows platforms

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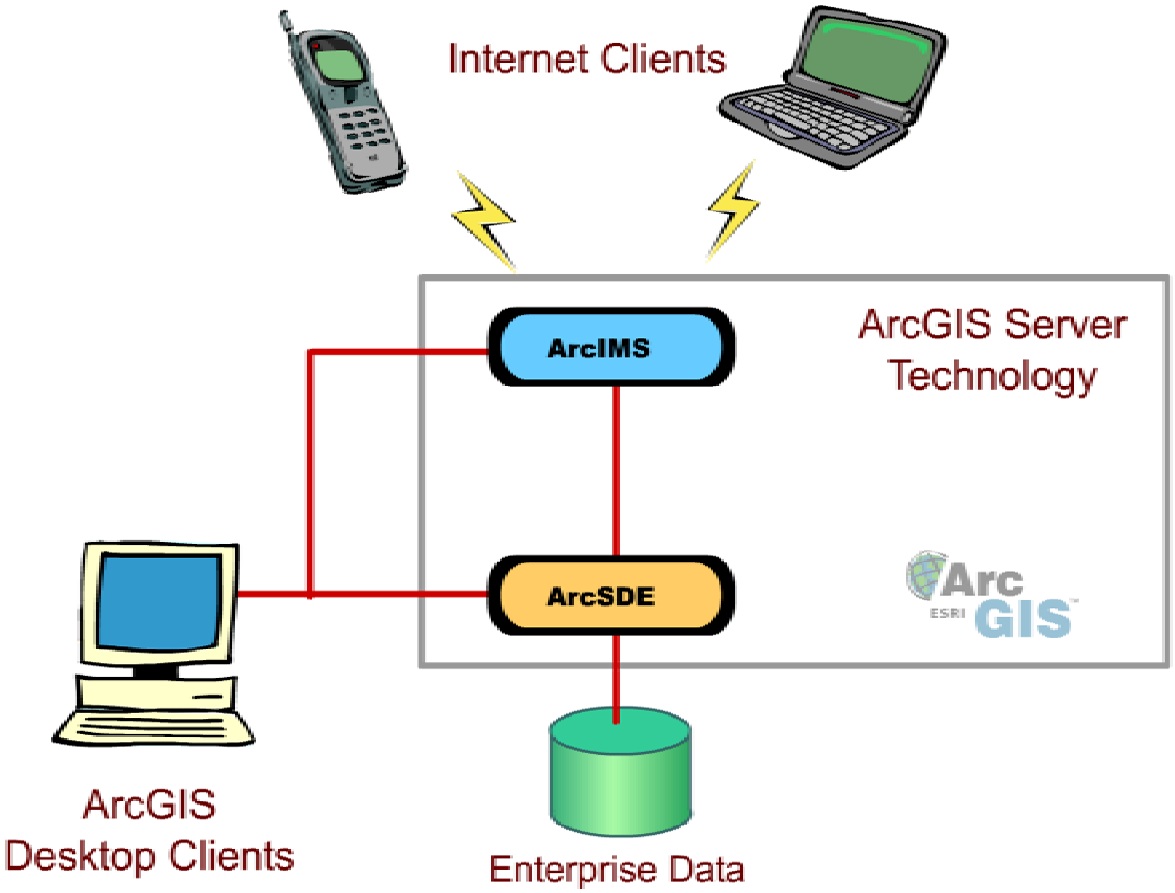


ESRI Linux Support

ESRI has a large user base with strong interest in a wide range of computing platforms. ESRI's goal is to provide strong, *open* platform support. While ESRI has focused on the release of ArcGIS Desktop for Windows, we are not solely focused on the Windows computing architecture. ESRI has also been building a strong cross-platform code base for the deployment of ArcSDE™ and ArcIMS® on server-based platforms for UNIX and Windows. ESRI's open platform Java product is called MapObjects®—Java Standard Edition and is available for Linux. ESRI plans to deploy the ArcObjects™ component architecture under Linux.

ArcSDE 8: The Geodatabase

ArcSDE 8 is the GIS gateway for managing spatial data in a commercial database management system (DBMS). ArcSDE serves spatial data to a wide variety of clients and is the key component in managing a multiuser spatial database.

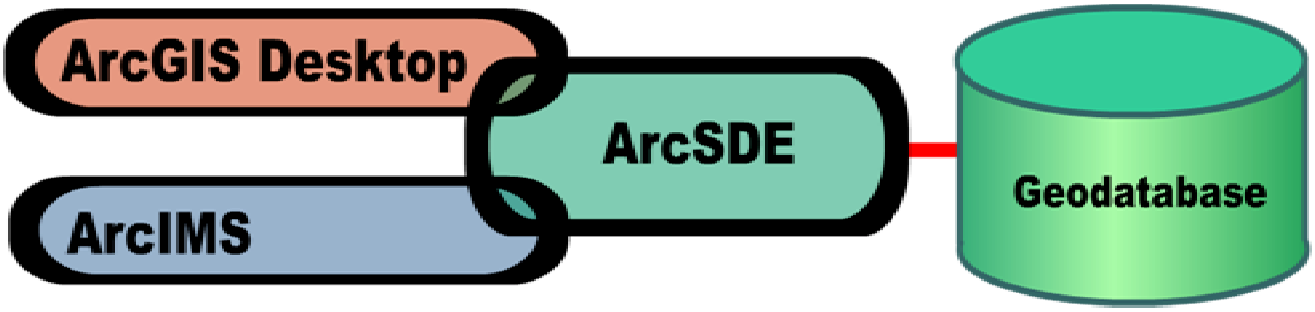
ArcSDE 8 Capabilities

- Provides the infrastructure required to manage multiple users editing the same spatial database with long transactions, alternate versions, and history
- Provides not only the business logic software for creating simple geometric data but also technology for supporting advanced GIS data types such as images, networks,

features with integrated topology and shared geometry, and associating these with rules, behavior, and other object properties

- Allows GIS data to be directly maintained in the format of "spatial types" supported by the DBMS vendors (building on their parallel efforts to develop spatial extensions)

- Integrates the spatial (geometric) search capability provided by the DBMS vendors within the ArcGIS client software applications



System Requirements for ArcSDE 8.2 Under Linux

Platform	Linux–Intel
Operating System	Red Hat 7.1 (Seawolf) Kernel 2.4.2-2 on an i686
DBMS	Oracle 9*i* Enterprise Edition (32 bit)
Kernel/Version	Release 9.0.1.2.0
Disk Space Requirements	ArcSDE 57 MB Oracle 2.5 GB minimum

ArcIMS: Web Mapping and More

ArcIMS is ESRI's solution for distributing mapping and GIS data and services on the Web. It is a powerful, scalable, standards-based tool that lets you quickly design and manage Internet mapping services.

ArcIMS Capabilities

ESRI ArcIMS is Internet Map Server (IMS) software for authoring, designing, publishing, and administering Internet mapping applications. ArcIMS allows Web clients, map servers, data servers, and the Web server to communicate with one another. ArcIMS is ESRI's solution for distributing mapping and GIS data and services on the Web. Key capabilities include the following:

- Ability to use and integrate data from multiple sources. ArcIMS provides support for a variety of data types and image formats.

- Wide range of GIS capabilities. ArcIMS lets you incorporate a variety of GIS capabilities into your Web site including image rendering, feature streaming, data extraction, geocoding, data querying, and much more.

- Highly scalable architecture. Specifically designed to grow with an organization, ArcIMS is a completely scalable solution for publishing GIS data, maps, and applications.

- Standards-based communication. ArcIMS clients and servers communicate using ArcXML, which is a GIS extension to standard Extensible Markup Language (XML).

- Support for a wide range of clients. ArcIMS allows you to select the client that best suits your needs from wireless appliances, such as cellular phones and personal digital assistants, to lightweight browser-based clients or a full-featured GIS desktop client.

Metadata Capability

One of the most significant features included in ArcIMS 4 is the ability to create a central repository for publishing and browsing metadata over the Internet using ArcIMS in conjunction with ESRI's ArcSDE and ArcGIS Desktop. Metadata can easily be authored using the ArcGIS ArcCatalog™ application, published to a metadata server, and then quickly searched by others. Along with ArcIMS software's metadata services, users also receive the Metadata Explorer, which is a JavaServer Pages (JSP) application that can be used to build a customized, browser-based means of searching for data.

Java Capability

As part of ESRI's strategy of offering more GIS capabilities for the Java developer, ArcIMS now comes with a Java Connector, which allows developers to program Java clients and applications that use a set of JavaBeans. A new object model, JSP tag libraries based on the new object model, and a full range of samples are included.

ArcIMS 4 also includes new JSP-based administration tools along with the standard HTML-based tools for greater flexibility and cross-platform support.

ArcMap Compatibility

The ArcIMS ArcMap™ Server ties ESRI's ArcGIS family of products and ArcIMS more closely together. The ArcIMS ArcMap Server allows files created in the ArcGIS ArcMap application or ArcGIS Publisher to be shared over the Internet using ArcIMS. With the ArcIMS ArcMap Server, users can leverage all the data access and cartographic capabilities of ArcMap.

ArcIMS Route Server

ArcIMS 4 also supports the optional ArcIMS Route Server extension.

The ArcIMS Route Server offers the ability to incorporate fast, accurate routing and point-to-point driving directions into Web sites built with ArcIMS. It is compatible with both ArcIMS 3.1 and ArcIMS 4.

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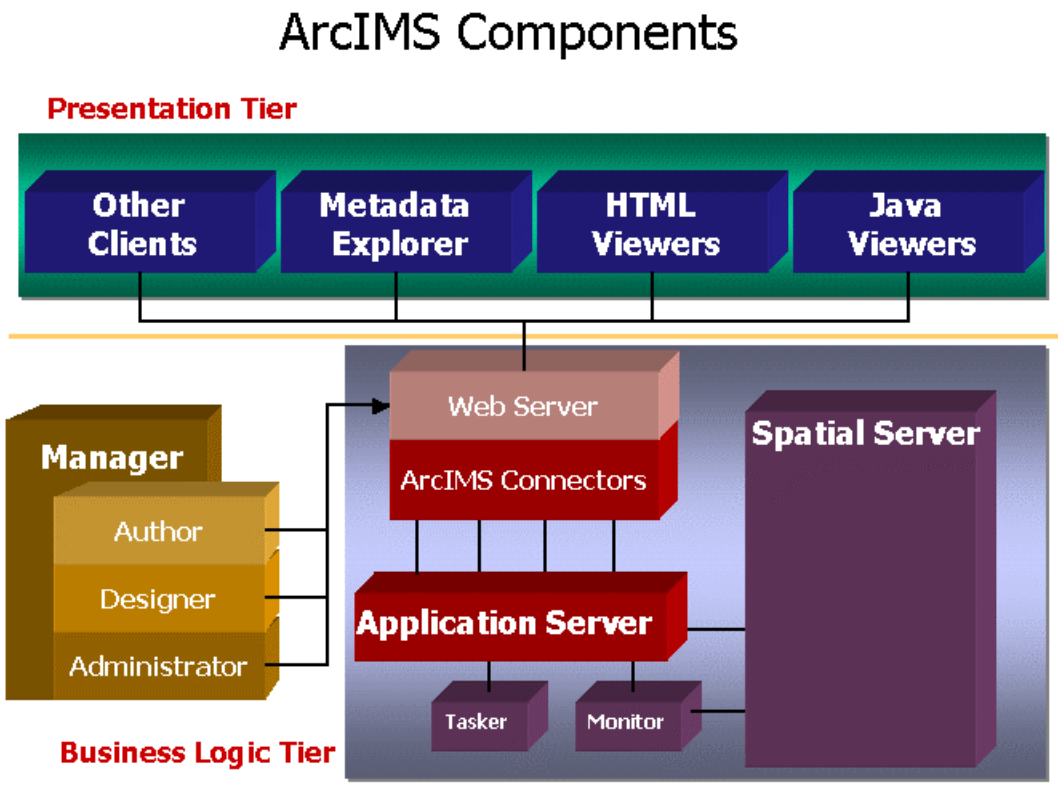

System Requirements for ArcIMS 4 Under Linux

Operating System	Red Hat 7.1 (Seawolf) Kernel 2.4.2-2 on an i686
Web Servers	■ Apache 1.3.20 (Tomcat 3.2.x and ServletExec for Apache servlet engines) ■ IPlanet 6.0 (native servlet support) ■ IBM HTTP 1.1.19 (WebSphere 4.0.2 servlet engine) ■ WebLogic 6.1 (native servlet support) ■ Oracle Application Server 9*i* (native servlet support)

MapObjects—Java Standard Edition: Clientside Tools

MapObjects—Java Standard Edition is a suite of more than 900 Java-based GIS and mapping developer components that can be used to build custom, cross-platform GIS applications or applets. Because it is pure Java, MapObjects—Java Standard Edition can be used with Linux, Windows, and a variety of UNIX operating systems.

MapObjects—Java Standard Edition includes prebuilt JavaBeans that are easily used in the integrated development environment of your choice such as Sun's Forte for Java or Borland's JBuilder software.

Key Features of MapObjects—Java Standard Edition

- The ability to combine multiple data sources (local and Internet or Intranet) to create customized maps
- Connectivity with ArcIMS (ESRI's GIS for the Internet)
- A wide range of GIS capabilities and compatibility with many data sources including industry-standard shapefiles, ArcSDE layers, and a variety of image formats such as BMP, TIFF, PNG, JPG, and GIF
- Ability to create feature layers from custom data sources

For more information, download *Geographic Information Systems for Java*—an ESRI white paper.

System Requirements for MapObjects—Java Standard Edition

Operating System	Red Hat 7.1 (Seawolf) Kernel 2.4.2-2 on an i686

ArcExplorer: Free Geodata Viewer

ArcExplorer™ 4—Java Edition is the newest version of ESRI's free GIS data viewer. Because it is built with Java, ArcExplorer 4 allows users to enjoy cross-platform support including compatibility with Linux, Windows, and a number of UNIX operating systems.

ArcExplorer is a lightweight GIS data viewer developed by ESRI. This freely available software offers an easy way to perform basic GIS functions. ArcExplorer is used for a variety of display, query, and data retrieval applications and supports a wide variety of standard data sources. It can be used on its own with local data sets or as a client to Internet data and map servers.

Among its many uses, ArcExplorer is an excellent vehicle for publishing your data. You can distribute the ArcExplorer setup and your data on CDs. You can then use the CD to install ArcExplorer on their machines and view your data easily and effectively. And best of all, ESRI does not charge any fees for you to distribute ArcExplorer with your data.

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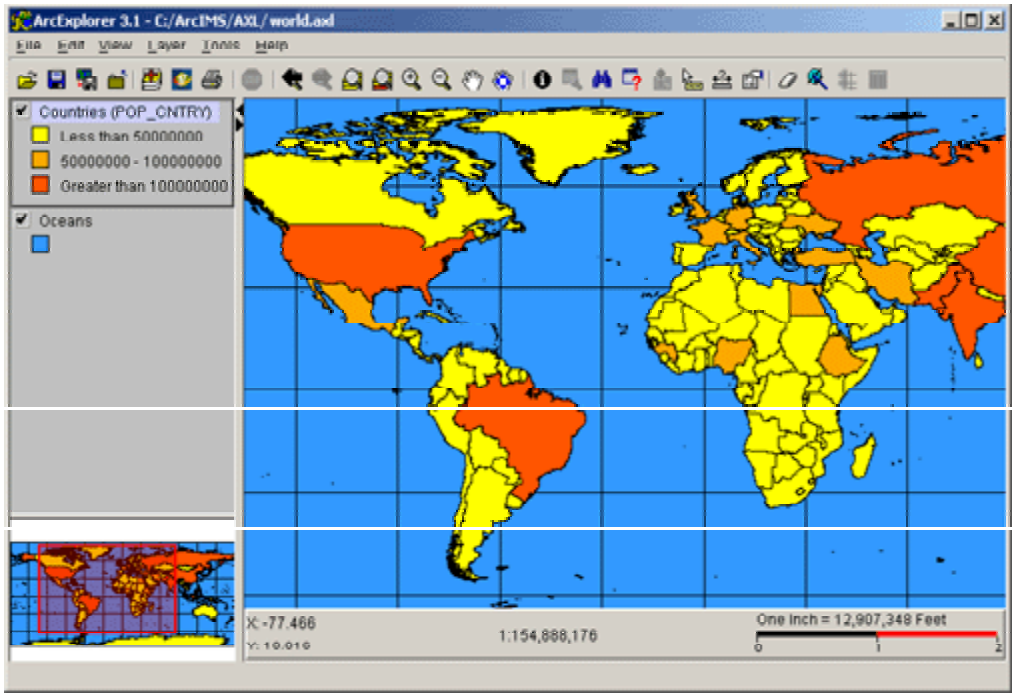

ArcObjects: Developer Solutions

In the mid-1990s, ESRI made a strategic decision to develop an entirely new product line—now known as ArcGIS. ArcGIS is a scalable system of software for geographic data creation, management, integration, analysis, and dissemination for every organization from an individual to a globally distributed network of people.

In a future release, ArcObjects will be available as a Software Development Kit for several operating systems including Linux.

The software architecture for ArcGIS is based on the use of a common set of software components that can be deployed in desktop applications and servers (e.g., Internet Web Services) and embedded in custom, lightweight applications. These ArcObjects components are built using C++ and have the following characteristics:

- High performance
- Cross platform (Windows and UNIX)
- Multithreaded
- Scalable
- Extensible
- Customizable using industry-standard development tools (e.g., Visual Basic, .Net, Java, C++)

ArcObjects components provide GIS services to developers. The services provided range from low-level functionality (such as geometry manipulation and data access) to high-level map display, query, printing, and so forth.

Developers can access the GIS services ArcObjects offers by using the Component Object Model (COM) application program interface (API) and supporting infrastructure. COM provides services, such as the Service Control Manager (SCM), which is in effect the COM run-time environment, and makes use of the registry, which holds a database of installed components. Developers interact with the SCM using a clearly defined API.

MainWin Technology

The COM component architecture is used to build these C++ objects. Microsoft Windows operating systems supply the COM infrastructure for their platforms, but UNIX does not; therefore, the COM API and supporting infrastructure are provided by Mainsoft's MainWin product. The MainWin run-time deployment ESRI uses in the UNIX port of ArcGIS Desktop functionality (ArcObjects) implements the COM API and provides the necessary infrastructure to allow COM components to execute on UNIX platforms.

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ArcObjects for UNIX: Summary

The UNIX version of ArcObjects affirms ESRI's long-standing commitment to the UNIX community to provide them with robust, professional GIS tools comparable to the tools ESRI provides in the Windows environment. In summary

- ESRI has many years of experience in successfully porting and supporting cross-platform GIS tools applications.
- ESRI has a long history of supporting UNIX applications and is fully committed to supporting the UNIX version of ArcObjects.
- ESRI's UNIX version of ArcObjects is robust, offering capabilities and performance comparable to the Windows version.
- ESRI uses the MainWin software from Mainsoft because it is the best technology available for porting ArcObjects technology to work in the UNIX environment.
- MainWin development software is needed only if a developer wishes to extend the COM classes of ArcObjects or create new COM components.
- MainWin development software is not needed if a developer only wishes to create, use, and manage the COM classes of ArcObjects components.

Standard UNIX developer tools, such as Java and C++, can be used under Linux for customizing applications.