

ArcGIS 开发资源

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Developing Applications with ArcGIS Engine

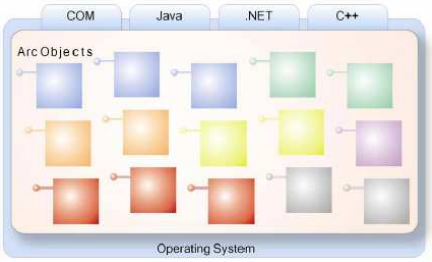
回顾

- ArcGIS APIs
- 软件和开发组件
- ArcGIS 桌面开发包
- 安装

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ArcGIS ArcObjects APIs

- ArcObjects 可以访问四个APIs
  - COM
  - Java
  - .NET
  - C++



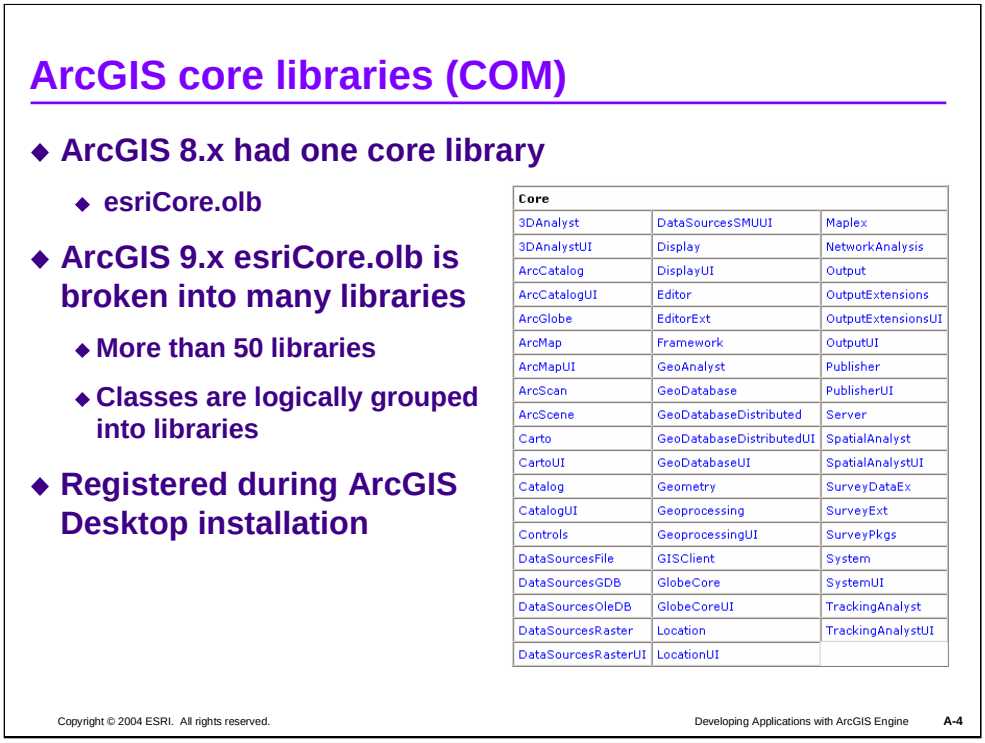
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Desktop API support

The ArcGIS desktop applications are COM clients. Therefore to extend the ArcGIS framework with your own customizations, your components need to be COM compliant. Any development environment that can adhere to the COM specification can be used: Visual Basic, Visual C++, Delphi™. In addition, the .NET API may be used as it offers backward COM compatibility.

The native COM type libraries are packaged as .OLB files. Therefore if you use an API other than COM, such as .NET, object proxies are used to communicate with the native ArcObjects components. In .NET, the object proxies can be created using wrapper classes, contained with interop assemblies. ESRI has supplied these interop assemblies for you.

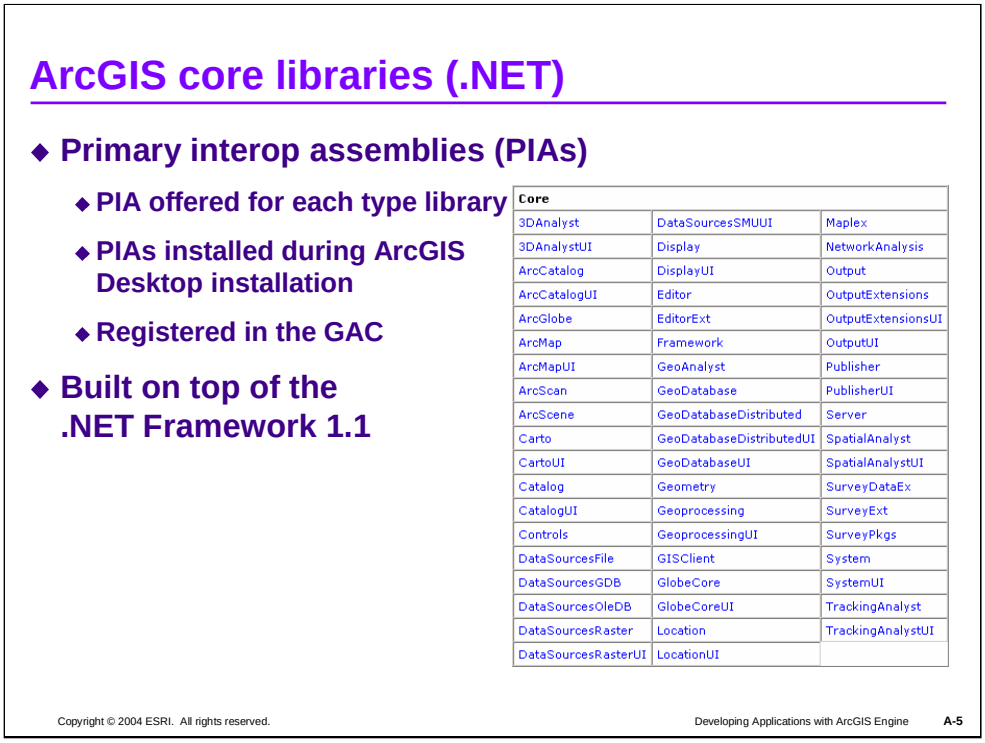
When choosing an development environment, many factors may influence your decision. The predominant factor may be experience and skill level with the language. Other factors may include performance, security and application requirements.



ArcGIS Desktop libraries

With ArcGIS 8.x there was one core library called esriCore.olb where the ArcObjects type information was held. With ArcGIS 9.x, esriCore.olb has been split into smaller, more manageable and modular libraries. Classes of similar functionality are grouped inside a particular library. For example, geometry classes such as points, lines, polygons have been placed inside a type library called Geometry. Map and Layer classes are located inside the Carto library. The Library Locator utility is one of many resources that can be used to locate the desired library.

The libraries have been split between UI and non-UI components. The UI prefixed libraries pertain to application framework components, such as the MxDocument, and COMPropertySheet. Objects contained in non-UI prefixed libraries offer the GIS functionality, and can be accessed by ArcGIS Engine and ArcGIS Desktop applications.



ESRI interop assemblies

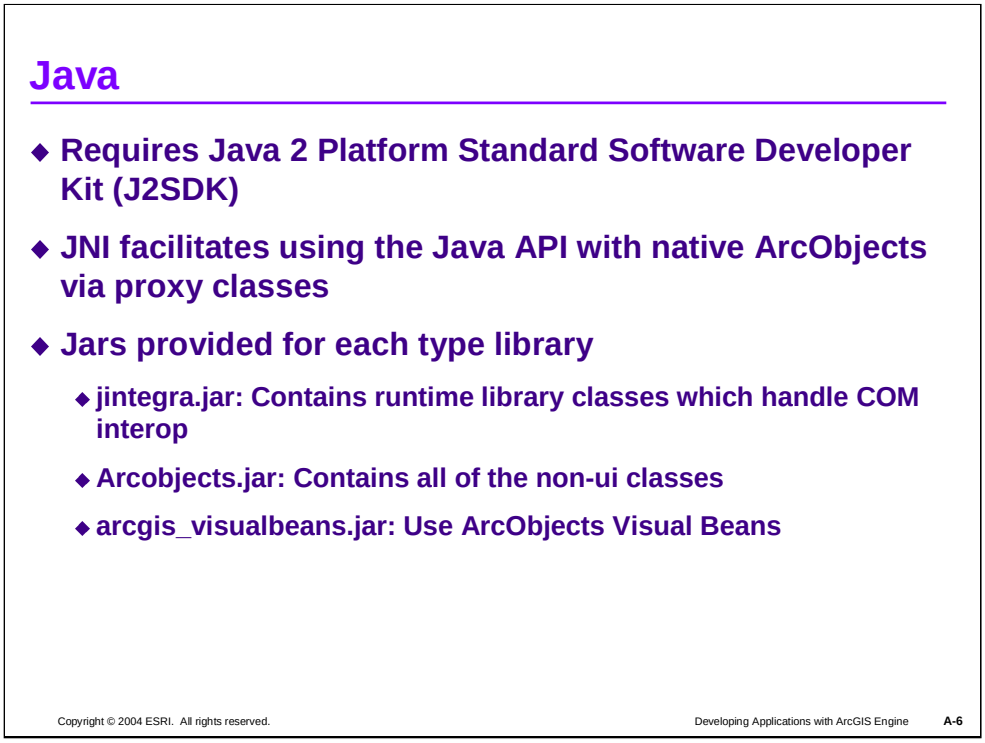
Each ArcGIS type library has an equivalent .NET interop assembly, to allow development with the .NET API. It is important to note that these ESRI-provided assemblies are marked as Primary Interop Assemblies (PIA). PIA indicates that an Interop assembly has been provided by the publisher of COM types. PIAs are always strongly named; they are digitally signed to guarantee unique identity semantics.

It is mandatory that you use the ESRI's interop assemblies. Creating your own assemblies is possible but risky, as you may experience undesirable behavior.

If the .NET Framework 1.1 is installed on the machine, all ESRI interop assemblies will be registered in the Global Assembly Cache (GAC) during the ArcGIS installation. By placing the interop assemblies inside the GAC prevents you from having to import the assemblies yourself and also prevents the assemblies from being copied to your local directory each time they are referenced by another project.

Further information

If you are new to .NET and COM interop and would like further information regarding ArcGIS development using the .NET API, the ArcGIS Developer Help offers detailed documentation. Within the ArcGIS Developer Help, go to *Development Environments* > *.NET* for a listing of articles.

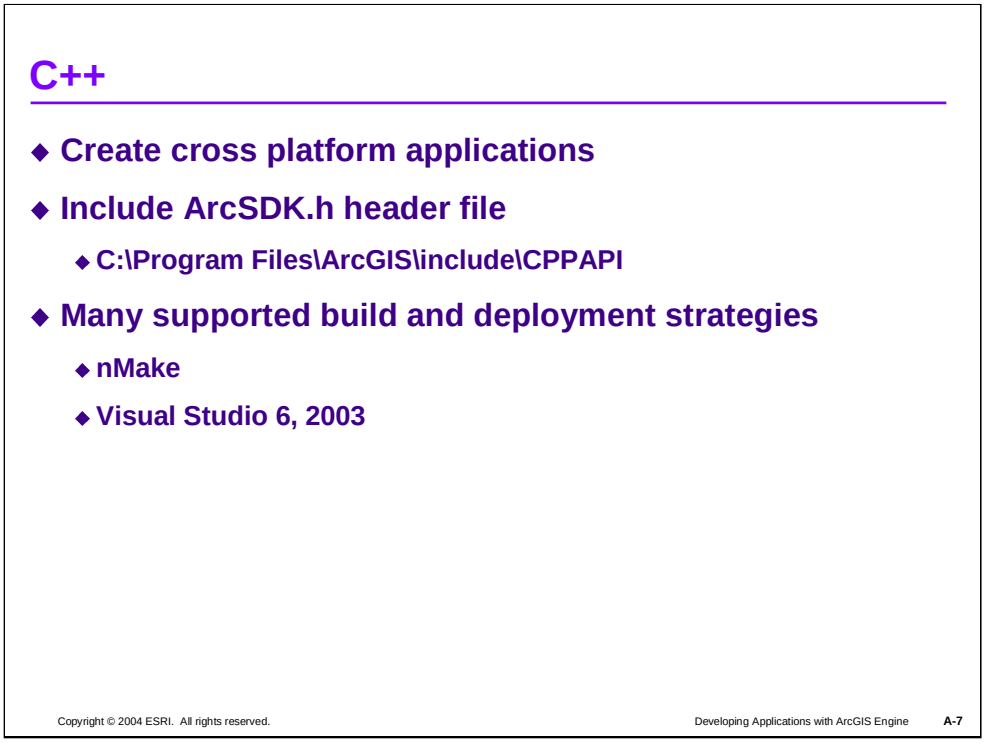


Java API

The ArcGIS 9.0 Java API provides interoperability with ArcObjects, allowing developers to access ArcObjects as though they were Java objects. The API is not limited to any specific Java Virtual Machine (JVM) or platform, and uses standard Java Native Interface (JNI) to access ArcObjects. The API exposes the complete functionality of ArcObjects via Java classes and interfaces. The Java API provides proxy classes that are generated from ArcObjects component type libraries (TLB) which allow interoperability with all of the underlying components. These proxy classes expose ArcObjects properties, methods, and events via their Java equivalents. The Java API is used in two ESRI developer products, ArcGIS Engine and ArcGIS Server. In order to develop with the ArcGIS SDK for Java you must have the Java 2 Software Development Kit (J2SDK) installed. All of your J2SDK tools are located in the J2SDK install directory.

Java Native Interfaces (JNI)

Even though Java programs are designed to run on multiple platforms, there may be times where the standard Java class library doesn't support platform-dependent features needed by a particular application or a Java program needs to implement a lower-level program and have the Java program call it. JNI is a standard cross-platform programming interface provided by the Java language. It enables you to write Java programs that can operate with applications and libraries written in other programming languages, such as C or C++. This is the technology used to bridge native ArcObjects with the Java API in ArcGIS.



C++ API

Developers may consider using the C++ API, as opposed to one of the other APIs, for the following reasons:

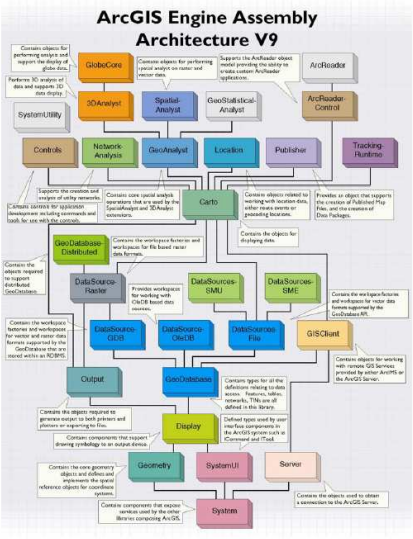
•Execution speed--C++ code typically executes faster than the equivalent Java, Visual Basic, and C# code.

•Cross-platform compatibility--Visual Basic and C# are currently used primarily on the Windows platform. C++ and Java are inherently more cross-platform.

•Prior familiarity--If the developers in your organization already have a good deal of experience using the language, then C++ is a logical choice.

Organization of the ArcGIS libraries

- Libraries are broken down into logical sets of functionality
- Libraries have dependencies
- Carto is central
  - Map --> Layers
  - Layers --> Symbol
  - Layers --> GeoDatabase
  - GeoDatabase --> Geometry
  - Geometry --> Display



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Core libraries

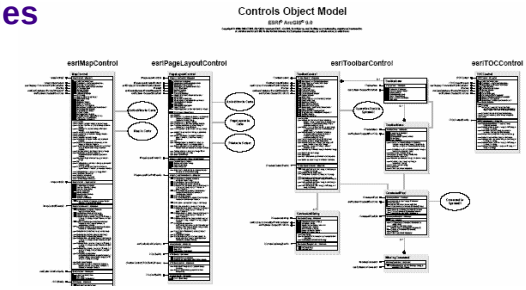
A number of ArcObjects libraries are provided for all products. For example, esriSystem is a low level library that provides objects to manage extensions, perform license checking, and persist objects in binary format or serialize them to XML. Other core libraries provide geometry, symbology, display feedback, output, and data source access capabilities.

Carto

The esriCarto library contains important types that existing ArcObjects developers will be familiar with such as Map, PageLayout and FeatureLayer. The Map and PageLayout objects provide hooks that allow access to other related objects such as Layers and Featureclasses. esriCarto provides interfaces to enumerate through layer and map collections, assign rendering to data layers, perform selections, and interact with the Graphics Container to control graphic elements. It also contains new objects such as the MxdServer and MapServer objects used with the ArcGIS Server product, and additional rendering options via a new interface called IViewRefresh.

ArcGIS Controls Library

- Desktop product provides
  - MapControl
  - PageLayoutControl
- Engine product also provides
  - SceneControl
  - GlobeControl
  - ArcReaderControl
  - ToolbarControl
  - TOCControl



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ArcGIS Desktop controls

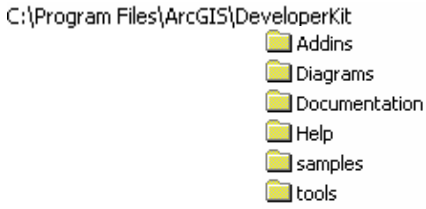
There are two controls available to ArcGIS Desktop developers to create stand-alone applications: MapControl and PageLayoutControl. These controls, included with the Desktop product, can be used in a development environments that supports ActiveX or .NET Windows Controls. They encapsulate much of the functionality found in the Map and PageLayout objects. In addition, new capabilities have been added at the 9.0 release to facilitate saving MxDocuments, which overcomes a previous limitation of creating stand-alone applications. Property pages for each control simplify the process of setting control properties without writing code, allowing the selection of data layers or MXD documents that will be used with the Map and PageLayout Controls. If you are interested in developing with these controls, consider using the ArcGIS Engine Developer Kit, which provides access to more controls and ArcObjects functionality.

New controls for 9.0 Engine

The MapControl and PageLayoutControl, along with the ArcReader, Toolbar, TOC, Scene and Globe controls are provided with the ArcGIS Engine Developer Kit. These Engine Controls are available as ActiveX OCX's, Visual JavaBeans, .NET Windows Forms Controls, and Motif Widgets. The Scene and Globe controls provide new opportunities for developers to create sophisticated visualization applications that can incorporate 3 dimensional and surface data. Data can now be analyzed and displayed in 3D at global and local scales; a user may write stand-alone applications that allow draping imagery and vectors over DEMs and DTD's.

ArcGIS Developer Kit

- Provides tools necessary to build ArcGIS applications
  - ArcGIS Developer Help
  - Developer tools and utilities
  - Add-Ins
  - Samples
- ArcGIS Developer Help is your main resource



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What's in the Developer Kit?

The ArcGIS Desktop Developer Kit includes all of the required developer resources to support extending the ArcGIS desktop applications using ArcObjects. Core libraries with COM and .NET API's may be used with object model diagrams and code samples to help write components that plug into the ArcGIS framework. The ArcGIS Desktop Developer Kit is included with your installation package of ArcGIS. The main resource for ArcGIS Desktop developers is the developer help, but a software engineer can also supplement his knowledge of ArcGIS Desktop development by reading the *ArcGIS Desktop Developer's Guide*.

Overview of the ArcGIS Developer Help

- Topics include:
  - Developing with ArcGIS
  - ArcGIS Desktop
  - Development Environments
  - Technical Documents
    - Migrating from 8.3 to 9.0
  - Add-Ins
  - Developer Tools
  - Library Reference
  - Samples
  - What's New at 9.0



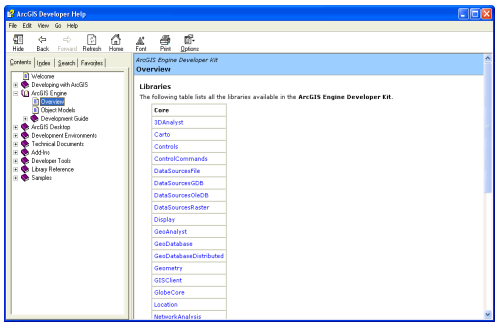
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ArcGIS Developer Help

The developer help has been overhauled at 9.0; all of the code samples and documentation has been updated to support the new modular architecture and multiple API support for the ArcObjects. For existing ArcObjects developers familiar with extending the ArcGIS Framework, a new Technical Document called *Migrating from 8.3 to 9.0* details important changes to the ArcObjects libraries between 8.X and 9.X. and provides step-wise instructions to convert existing ArcObjects code from 8.x to 9.x.

Getting started with the developer help

- ArcGIS Desktop contains key product and development information
- Overview
  - Core libraries
  - Extension libraries
- System Requirements
- Object Models
  - Shows all OMDs
- Developer Guide
  - Details of product
  - Development
  - Deployment



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Overview

The overview section of the help provides links to both core libraries and extension libraries.

System requirements

Platform, OS, and minimum CPU memory requirements are detailed here, as well as special installation requirements. For example, Internet Explorer 6 is a prerequisite to installing the ArcGIS Desktop 9.0.

Object Models

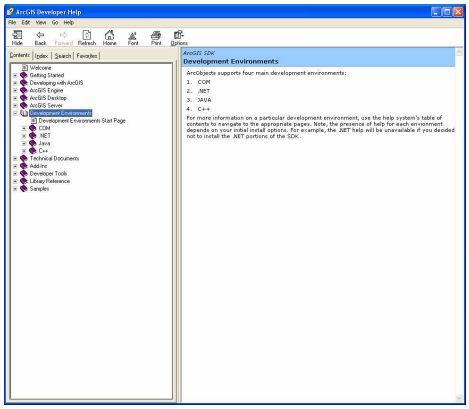
The Object Models link is a shortcut to access the entire collection of OMD's for the ArcGIS Desktop developer. This is a convenient resource when searching all of the libraries for classes, interfaces, enumerations, or structures. It is also useful when a developer needs to examine related objects on several diagrams.

Developer Guide

The Developer Guide provides a full discussion of the ArcGIS Desktop architecture, application development scenarios, and licensing and deployment options.

Learning about the APIs

- Specific information for
  - COM
  - .NET
  - Java
  - C++
- Support info
- Walkthroughs



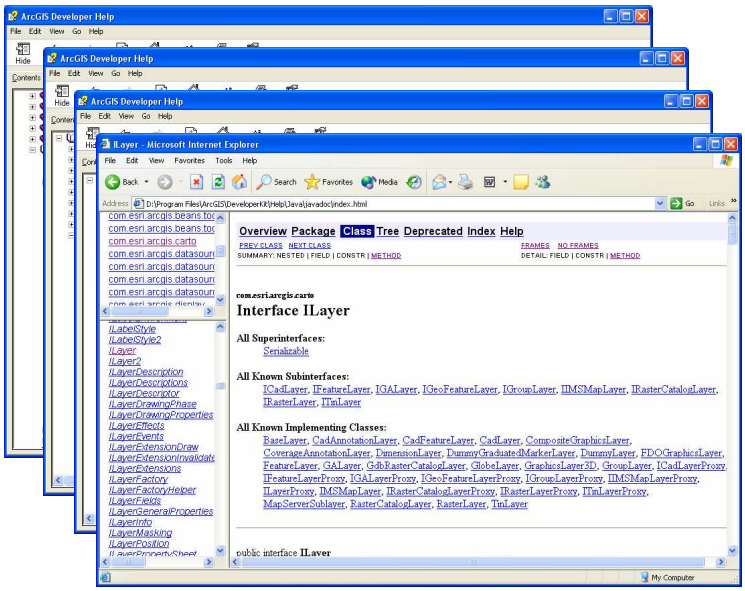
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API Help

The Development Environments section of the help system provides API specific information for the four supported environments. ArcGIS Desktop development is supported by COM and .NET environments. Each section has an introduction that supplies basic information as well as articles discussing important programming techniques and other issues such as error handling, performance, resource management, and platform configuration. There are language specific walkthroughs for each environment that detail the process of implementing ArcObjects components in ArcGIS applications.

Getting language-specific help

- VB 6 Help
- .NET Help
- Java Help
- C++ Help



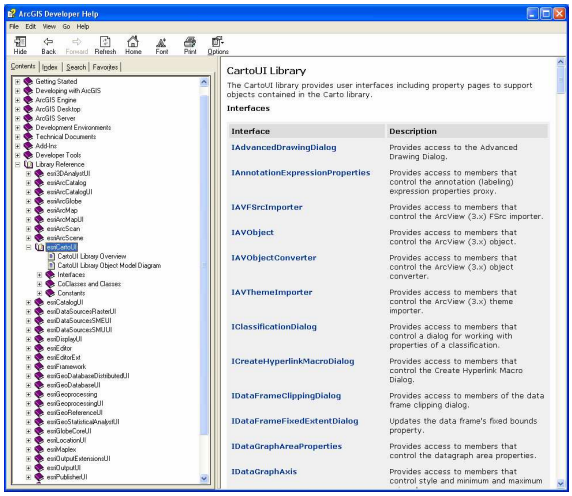
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Help system is modular

There are now separate help systems for each ArcObjects API that a developer may choose from. The help files may be accessed from *Start > All Programs > ArcGIS > Developer Help.*

Learning about the libraries

- **Detailed description of each library**
  - **Library Overview**
  - **Library OMD**
  - **Interfaces**
  - **CoClasses and Classes**
  - **Constants**



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Library reference

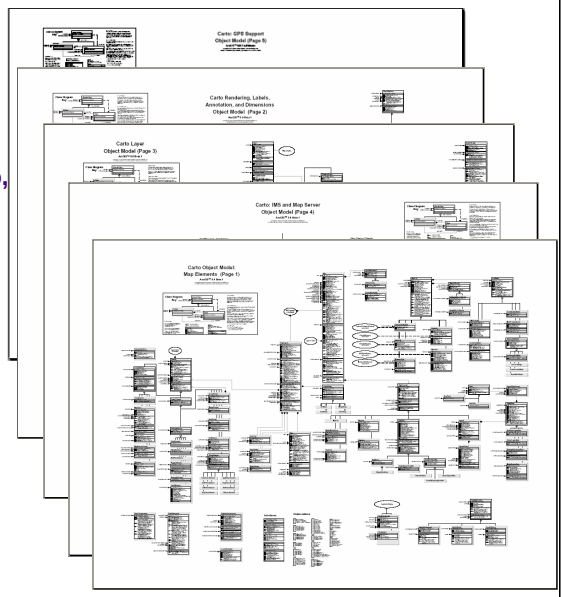
Each Library overview provides three important pieces of information:

1. Product support for each library and license requirements
2. Library dependencies
3. Links to library content and Object Model Diagrams

In addition to a high level discussion of the library contents, a developer will find usage notes indicating whether the library or its contents is extensible.

Explore the Object Model Diagrams

- One model per library
  - Carto Object Model
    1. Map Elements
    2. Rendering, Labels, Anno, Dimensions
    3. Layer
    4. IMS, Map Server
    5. GPS
- Wormholes
  - Points to other OMDs



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Object Model Diagrams

At version 8.3, type information for the ArcObjects components was defined in one file, esricore.olb. The Object Model Diagrams were organized into logical “units” of objects.

At version 9.0, type information for the ArcObjects is stored in separate libraries to support the new modular and multiple API nature of the ArcObjects system. Each diagram in the help represents either an entire library or a set of components that are part of a specific library. The Carto Object Model uses five diagrams to describe the ArcObjects types found in this library.

All the Object Model Diagrams provided for ArcGIS Desktop development are referenced within the AllDesktopOMDs.pdf. The pdf can be found under the director:

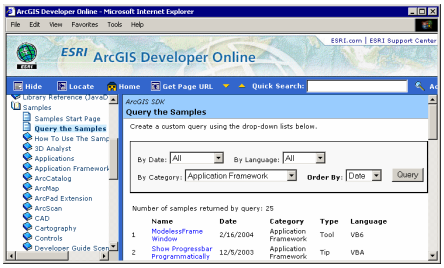
<ArcGIS Install>\ArcGIS\DeveloperKit\Diagrams\Desktop

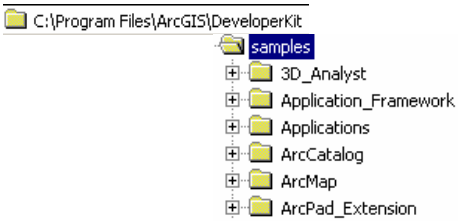
Wormholes

The ArcObjects components are part of a large system of objects. Wormholes are visual indicators that a class on one diagram has a relationship to a class found in another library. Inside the wormhole itself the first value represents the related class, and the second value specifies the library in which it is found.

Use the samples and walkthroughs

- Sample code is located in the developer kit
  - Over 600 samples
  - Multiple languages
  - Organized by functionality
  - Can 'Query the Samples'
- Try the walkthroughs
  - Step by step instructions
  - VB6, .NET, C++





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How to use the samples

These resources are included to help developers prepare their respective development environments to make use of samples. Accordingly, there are instructions for how to begin testing sample code for each of the 4 developer API's.

Code converter

This add-in is supplied with both VB6 and .NET, and is an essential tool for updating 8.3 code to make it compatible with 9.0. The Code Converter works with either the active project/solution or may be used in batch mode to convert many projects at a time.

Walkthroughs

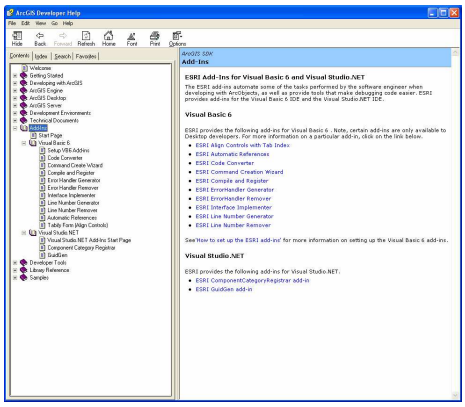
The developer help provides language specific walkthroughs as a jumpstart to understanding the process of writing new components for the ArcObjects framework. The walkthroughs are good beginning points if you need to become familiar with key aspects of writing COM objects using ESRI's .NET assemblies.

Developer guides

Developer guides are available for ArcGIS Engine, Desktop, and Server developers. The new Extending ArcObjects resource has been integrated into the help system, and gives details about writing extensible components for the ArcObjects Desktop clients.

Add-ins

- Simplify routine tasks in VB6 and .NET
  - Interface Implementer
  - Compile and Register
  - Error Handler
  - Line Number Generator
  - Code Converter
- Help describes each in detail



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ESRI add-ins

The ESRI add-ins are utilities provided in both Visual Basic 6 and .NET IDE to automate simple tasks such as stubbing out the members of an interface, registering a component in the appropriate Component Category, writing a registration script that may be used in setup package for deployment, and write error handling code. Note that certain add-ins are environment specific; for example, the GUIDgen utility produces a GUID that is formatted for C# components. The ESRI ComponentCategoryRegistrar add-in works for both VB.NET and C#.

Registering the ESRI add-ins for Visual Basic 6

A developer may register all of the Add-ins for VB6 at once, or choose to register them individually. To register all of the ESRI add-ins at once, you can simply run RegisterVBAddIns.exe in the '\ArcGIS\DeveloperKit\Addins' folder. You can unregister all the ESRI add-ins with UnRegisterVBAddIns.exe. To register the DLL for one specific add-in, you can use regsvr32.exe.

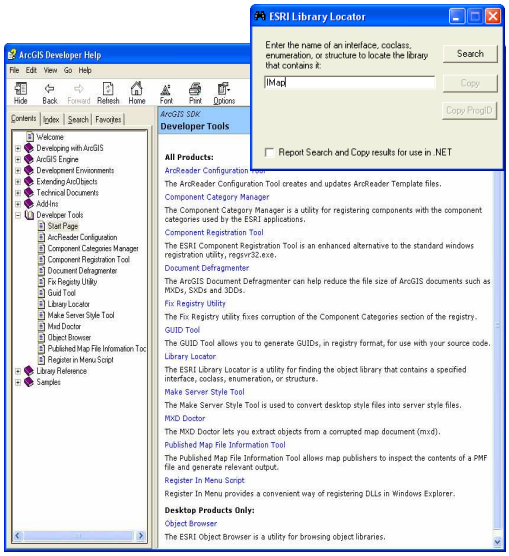
Registering the ESRI add-ins for Visual Studio .NET

The add-ins are installed to the <ArcGIS install>/DeveloperKit/Addins folder. To register the .NET addins, run the 'RegisterDotNetAddin.bat' file also in this folder. To unregister the add-ins run 'UnregisterDotNetAddin.bat'. To enable an add-in in Visual Studio .NET, do the following:

1. Click Tools > Add-in Manager.
2. In the Available Add-ins list, check the add-in you want to enable. If the add-in has a command, a corresponding menu item will appear near the top of the Tools menu.
3. If you want this add-in to be enabled every time you start Visual Studio .NET, check the Startup checkbox for this add-in.
4. Click OK to dismiss the Add-in Manager dialog.

Developer tools

- **Utility applications for specific developer tasks**
  - **ArcReader Configuration**
  - **Component Registration**
  - **ESRI Object Browser**
  - **Published Map Info**
  - **Make Server Style**
  - **Library Locator**
- **Help provides descriptions and usage**



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Developer tools

Most of the developer tools are accessible from the ArcGIS Program Group under *Start* > *All Programs* > *ArcGIS* > *Developer Tools*. If you wish you may also navigate on the file system to C:\Program Files\ArcGIS\DeveloperKit\tools to begin using these utilities.

The Component Registration Utility, which provides an alternative to using Rgsrvr32.exe is located in the <ArcGIS Install>\bin directory.

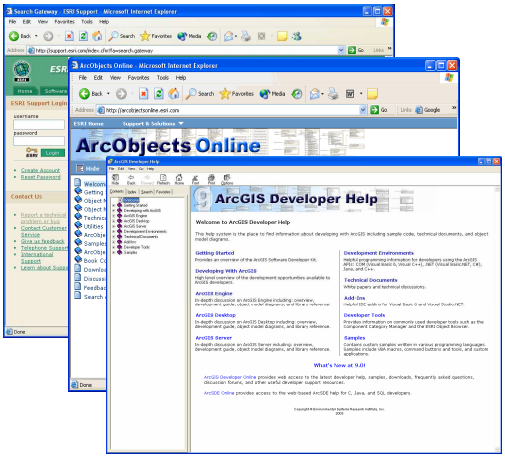
Note that the ESRI Object browser is only available when the Desktop products are installed.

ESRI Library Locator

The ESRI Library Locator is a new utility that is designed to help developers who were familiar with ArcObjects interfaces, coclasses, enumerations, or structures. After typing in a search string, the Locator displays the name of the library that contains a type or object. A developer may also choose to copy the library name or a fully qualified ProgID to the Windows Clipboard for later use.

Other developer resources

- Support center
  - KB docs
  - Forums
- ArcObjects Online
- Desktop help
- Samples
- Extending ArcObjects
- *New Developer Site



http://arcgisdeveloperonline.esri.com/ArcGISDeveloper/default.asp

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ESRI Support Center

The ESRI support center has been centralized at http://support.esri.com. A developer may find invaluable knowledge base and technical documentation here and can take advantage of user forums to gather code samples and practical insight during the development process.

ArcObjects Online

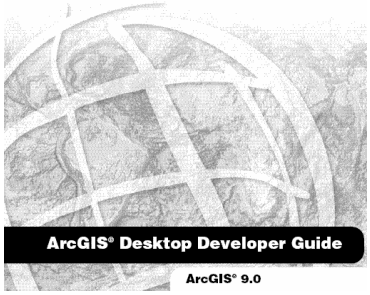
This is a web based resource that houses the same information as the desktop help. It is periodically updated with new samples, corrections, and technical documents, and is the best location to obtain up to date information online. At version 8.3 this resource was located at http://arcobjectsonline.esri.com. There is a new resource for 9.0 developers at http://arcgisdeveloperonline.esri.com.

Other Documentation

There are a series of new developer resources available at version 9.0 including Exploring ArcObjects, Extending ArcObjects, and Developer Guides for ArcGIS Engine, ArcGIS Desktop and ArcGIS Server Developers.

ArcGIS developer guides

- **Must-read before starting development**
- **Contents**
  - **What is ArcGIS Desktop?**
  - **Features and Capabilities**
  - **Utilize Tools and Libraries**
  - **Deployment Scenarios**
  - **Programming with the APIs**



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ArcGIS Desktop Developer Guide

This new resource is part of the the ArcGIS Developer Series of ArcObjects documentation that is new with the 9.0 release. The series includes guides for Engine, Desktop and Server developers, as well as *Extending ArcObjects*, a resource geared to developers wishing to write components to extend the ArcGIS framework.