



macromedia® white paper

Developing Rich Internet Applications with Macromedia MX

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Macromedia, Inc.
600 Townsend Street
San Francisco, CA 94103
415-252-2000

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Introduction

Summary

The Internet's potential as a platform for commerce, communications, and business automation is being constrained by the limitations of today's user experience. To address this challenge, a new class of applications—Rich Internet Applications—is emerging, promising to change Internet application development. This white paper outlines the need for a new generation of applications, provides a technical overview of Rich Internet Applications, and describes how the new Macromedia MX product family lets you develop these applications.

Evolution of the Internet

During the last six years, the web has seen explosive growth. With more than 4 billion static pages and 400 million users, it has affected the conduct of business, education, and government worldwide.

Despite the growth and success of the web, however, the Internet's potential as a platform for commerce, communications, and business automation remains untapped, constrained by the limitations of today's user experience.

While the web provides an excellent user experience for browsing content, the experience for applications makes even simple activities like online shopping too difficult, and more complex interactions like those in traditional client/server and desktop applications almost impossible.

The key to tapping the Internet's potential is twofold: to deliver more effective user experiences through the browser; and to extend the capabilities of the web to deliver richer, more interactive, and more responsive user interfaces that can be deployed not just to personal computers, but across many devices.

In response to the opportunity for a more effective Internet, a new generation of Internet applications is emerging: Rich Internet Applications.

Defining Rich Internet Applications

Overview

Rich Internet Applications take advantage of interactive, or rich, client technology to offer more intuitive, responsive, and effective user experiences on the web. They combine the interactive user experiences of desktop applications with the deployment flexibility and cost profile of traditional web applications to create a single, integrated user experience.

Rich client technology makes it possible to build Rich Internet Applications by providing a runtime environment that can host compiled client-side applications that are delivered as files via HTTP. The client-side applications connect to existing application server back-ends using an asynchronous client/server architecture that's secure, scalable, and well-suited to the new service-oriented model being driven by the adoption of web services.

The growing adoption of rich client technology is an evolutionary step that will not replace HTML; rather, it will extend browsers and devices for more effective and responsive user interfaces. Most Rich Internet Applications run within the browser, and many run within a web page along with HTML content. HTML will continue to play a critical role in delivering content, user interfaces, and navigation.

Because rich client technology can run in both browsers and devices, it promises the ability to create applications that are deployed consistently across a broad array of Internet-connected platforms. Moreover, because rich client technology can support motion graphics, video, audio, two-way communications, and complex forms, it provides a significantly more robust environment for creating application user interfaces.

Examples of Rich Internet Applications

The best way to understand how Rich Internet Applications can advance Internet application development is to look at a few examples.

- **Broadmoor Hotel:** The Broadmoor uses a Rich Internet Application to deliver a better user experience for online reservations. While the original reservation system used five HTML pages, the new system provides a single, intuitive screen. By moving the reservation form from HTML to a rich client technology, the Broadmoor reduced the average time to complete a reservation from more than three minutes to less than a minute, and increased the number of online reservations (www.broadmoor.com).

- **Etrade:** ETrade used a Rich Internet Application to create a control that was embedded into an HTML page to look up stock quotes. The quote widget eliminated the need to do a full page refresh every time a user searched for a new quote. This reduced the time for the lookup, improved the user experience, and lowered costs by reducing the amount of pages delivered and the bandwidth used on the site (www.etrade.com).

Although relatively simple, these two examples show how Rich Internet Applications can enable a whole new class of Internet solutions with intuitive, responsive, and effective user interfaces that incorporate content and application functionality into a single, integrated user experience.

Requirements for Rich Internet Applications

Delivering Rich Internet Applications requires three elements: rich client technology, server technology, and development tools.

- **Rich Client Technology:** Rich client technology provides the client-side capabilities that make Rich Internet Applications possible by taking advantage of local processing power on personal computers and devices. The two key factors in choosing a rich client technology are the adoption of the technology and its capabilities.
- **Server Technology:** Server technology provides the mechanism to connect rich clients to application logic and data. The server technology for Rich Internet Applications should extend existing infrastructure to offer a rapid scripting environment, enterprise integration, client connectivity, and support for key standards. In addition to enabling traditional database applications, Rich Internet Applications promise to integrate two-way communications and real-time data into applications, so they also need a new generation of communication server capabilities.
- **Development Tools:** Having the client and server technology is meaningless without a set of easy and powerful development tools that let you get started quickly and deliver advanced solutions. Because of their client/server architecture, Rich Internet Applications require a range of development tools that work together.

The new Macromedia MX product family is specifically designed to address these requirements, making it possible to build the next generation of Internet solutions quickly and easily.

Building Rich Internet Applications

Overview

Macromedia MX is the first complete family of products and technologies designed to work together to deliver Rich Internet Applications. The Macromedia MX product family includes major new releases of existing Macromedia products, as well as new technologies and products. It includes solutions for each of the three key elements required to create Rich Internet Applications: rich client technology, server technology, and development tools.

- **Rich Client Technology:** Macromedia MX takes advantage of the new capabilities of Macromedia Flash Player 6. Macromedia Flash Player 6 builds on the success of Macromedia Flash with powerful new capabilities specifically designed for enabling Rich Internet Applications.
- **Server Technology:** Macromedia MX includes a major new release of the ColdFusion server-scripting environment, ColdFusion MX. ColdFusion MX offers a completely new architecture that runs on Java servers and Windows .NET. In addition, the Macromedia MX product family will include an entirely new server technology for two-way communications and real-time data exchange.
- **Development Tools:** Macromedia MX offers a complete suite of development tools for building rich applications in the new Macromedia Studio MX release. Macromedia Studio MX includes Macromedia Flash MX, Dreamweaver MX, Fireworks MX, and FreeHand 10.

The Macromedia MX products are designed to work together seamlessly, while also flexibly supporting a wide range of other technologies and industry standards.

Rich Client Technology

The first key element to delivering Rich Internet Applications is rich client technology. This technology provides the runtime environment for deploying rich user interfaces.

Macromedia Flash Player

Although a variety of rich client technologies are available, the most widely adopted is Macromedia Flash Player. Through broad and free distribution, wide industry acceptance, and the availability of a published file format standard (SWF), it has become the de facto standard rich client technology on the Internet.

With more than 2 billion downloads since 1997, Macromedia Flash Player is the most ubiquitous rich client and the most widely distributed software on the Internet. Macromedia Flash Player is currently available to over 98 percent of web users, reaching more users than any other rich client technology. It runs in every major browser and on Windows, Macintosh, Linux, Solaris, and other operating systems.

Macromedia Flash Player also has broad distribution on Internet-connected devices. Through agreements with leading personal computer and device vendors including AOL Time Warner, Apple, Casio, Ericsson, Microsoft, Nokia, OpenTV, Samsung, and Sony, Macromedia Flash Player is on everything from Pocket PCs to mobile communicators to game stations.

The player supports a runtime environment for applications that are delivered in the SWF file format. These files are created in an authoring environment such as Macromedia Flash MX. The player itself is less than 500k, and through compression and the ability to load components on demand, even complex SWF files remain small and easy to deploy on the Internet.

Rich Internet Application Capabilities

The new Macromedia Flash Player 6 is the cornerstone of the rich client technology in the Macromedia MX product family, building on the success of previous player releases and adding significant new functionality for Rich Internet Applications. It offers a wide range of key capabilities that are not available in any other rich client:

- **Client-Side Scripting:** Macromedia Flash Player provides a robust client-side scripting environment that uses ActionScript, a scripting language based on the industry-standard ECMAScript. Version 6 of the player includes a powerful new object and event model, as well as new APIs for client/server application development.
- **High-Performance Server Connectivity:** Macromedia Flash Player supports a new technology called Macromedia Flash Remoting that enables high-performance connectivity with ColdFusion MX and other server technologies. It uses a binary message format, called Action Message Format (AMF), which lets you invoke server-side objects with a single line of code. The result is transparent client/server connectivity for applications.
- **Real-Time Server Communication:** Macromedia Flash Player supports real-time communication including two-way audio and video, and real-time data exchange. These capabilities let you build applications that natively incorporate communication functionalities traditionally found only in instant messaging and video chat clients, as well as open new types of collaborative applications by sharing application data in real time.
- **Offline Data Persistence:** With the new Shared Object technology, Macromedia Flash Player can persist data locally. As a result, you can build mobile Rich Internet Applications that run in both online and offline modes, seamlessly synching data when connected.

- **Accessibility:** Macromedia Flash Player supports assistive technologies, such as screen readers, which let you build applications that are accessible to all users.
- **Localization Support:** Macromedia Flash Player is localized in a wide range of languages including English, French, German, Italian, Portuguese, Spanish, Swedish, Japanese, Korean, and Simplified and Traditional Chinese. This makes it an effective solution for global applications.
- **Vector Graphic Display:** Because graphics, user interfaces, and rich content created with Macromedia Flash and displayed by the Macromedia Flash Player are based on vector graphics, they download quickly and display cleanly.

While all of these features are critical to building effective Rich Internet Applications, the most important characteristic of Macromedia Flash Player is its wide distribution.

More than 2 million downloads of Macromedia Flash Player occur each day; at this rate, it will be deployed to approximately 80 percent of web users in about a year. However, because the player downloads and installs quickly and seamlessly, developers can begin using the new Macromedia Flash Player 6 capabilities immediately with the knowledge that users will be able to easily access it.

Rich Internet Application Delivery

Using Macromedia Flash Player to deliver Rich Internet Applications is straightforward. The client-side of an application is sent to the Macromedia Flash Player as a SWF file, much like HTML content is delivered to a browser. The client application can then communicate with the server as needed using AMF over HTTP and Macromedia Flash Remoting without requiring the browser page to reload. On the server, application logic is provided in ColdFusion MX pages or components.



Figure 1: *A Rich Internet Application delivered with ColdFusion.*

The same model works with applications built using Microsoft .NET or Java application servers. ColdFusion MX runs on Windows .NET servers and Java application servers. In addition, Macromedia Flash Remoting is available separately for applications built natively with ASP.NET, C#, or Java.

(For more information about Macromedia Flash Player, see the new Macromedia white paper, [Macromedia Flash MX — A Next-Generation Rich Client](#)).

Server Technology

The second key element to delivering Rich Internet Applications is server technology. This technology lets you connect to the rich client technology and rapidly develop on Java and Windows .NET servers.

Macromedia ColdFusion MX

On the server, the Macromedia MX product family introduces ColdFusion MX, the next generation of ColdFusion server-side scripting technology.

ColdFusion MX provides a server-side scripting environment for application logic created with ColdFusion Markup Language (CFML) and now, server-side ActionScript. CFML uses an intuitive tag-based syntax that's easy to use yet offers powerful capabilities. Server-side ActionScript provides a scripting environment that uses the same scripting language found in Macromedia Flash Player.

In addition to the scripting environment, ColdFusion MX offers a number of advanced application services including full-text searching and indexing, dynamic charting, security, state management, and language extensibility with Java, C++, COM, EJB, and CORBA.

ColdFusion, one of the first commercial application server technologies on the market, defined the page-based model for web application development. More than 10,000 companies have adopted it as the foundation for rapid Internet application development.

Rich Internet Application Capabilities

ColdFusion MX delivers an entirely new runtime architecture and a number of powerful new features for Rich Internet Applications:

- **ColdFusion Components:** A powerful new component model—ColdFusion Components, or CFCs—makes it easy to build reusable components in CFML. CFCs can be accessed as web services, Macromedia Flash Remoting services, custom tags, and functions. They're self-describing, so it's easy to share them on teams and generate Web Service Description Layer (WSDL) files automatically for consumption by web services clients.
- **XML:** ColdFusion MX has deep support for XML. XML is treated as a native data type, easily manipulated, and handled with a variety of standard processing functionality including XPath and XSLT.

- **Web Services:** Publishing and consuming web services with ColdFusion is straightforward and easy. ColdFusion components can be automatically deployed as web services, providing one of the easiest mechanisms on the market for creating a web service. For consumption, ColdFusion MX makes it possible to invoke a web service with a single line of code, and then automatically generate custom tags to interface with the methods provided by the service.
- **Server-Side ActionScript:** The ColdFusion server-scripting environment now supports server-side ActionScript, which, like the client-side ActionScript used in Macromedia Flash Player, is based on the industry-standard ECMAScript. This lets Macromedia Flash developers create server-side scripts with a language they are already familiar with.
- **Native Macromedia Flash Remoting Services:** For connecting with client applications running in Macromedia Flash Player, ColdFusion MX offers native support for Macromedia Flash Remoting. CFCs can be used to automatically deploy services for Macromedia Flash applications, and server-side ActionScript can be used to script services.
- **Java Technology Architecture:** ColdFusion MX has been entirely rebuilt on a Java technology architecture. As a result, it can now run stand-alone or be deployed natively on leading Java application servers including IBM WebSphere and Sun iPlanet. In addition, the environment has strong interoperability with Java and support for deploying JavaServer Pages (JSP) and Java Servlets.
- **Microsoft .NET Support:** ColdFusion MX is built to run on Microsoft Windows .NET servers. It delivers strong integration with the .NET Framework through support for Microsoft .NET web services as well as COM.

These are just some of the new features in ColdFusion MX, all of which build on the legendary ease of use and productivity of the ColdFusion scripting environment. This ease of use is furthered enhanced through strong integration with the Macromedia Flash MX and Dreamweaver MX development environments.

Communication Server Technology

In addition to ColdFusion MX, Macromedia is planning to release a new communication server technology that will let you deliver two-way communications and real-time data with Macromedia Flash Player.

This new technology will support multi-way, real-time audio and video, as well as one-to-many, broadcast-style streaming audio and video. It will allow real-time data transfer for applications that monitor live information, and other advanced capabilities for communication and collaboration oriented applications.

The new technology will interoperate with other server technologies, such as ColdFusion MX, through Macromedia Flash Remoting, using the same services-oriented architecture that Macromedia Flash Player employs.

Development Tools

The third key element to delivering rich applications is the set of development tools that lets you create the various pieces of an application—from graphics to web pages to rich user interfaces to server-side application logic.

Macromedia Studio MX

The Macromedia MX product family offers a complete suite of development tools for creating Rich Internet Applications: Macromedia Studio MX.

Macromedia Studio MX includes Macromedia Flash MX, Dreamweaver MX, Fireworks MX, and FreeHand 10. Each new Macromedia MX tool is a major release in its own right, with powerful new functionality. Together, they comprise the first complete set of integrated tools for Rich Internet Application development.

Macromedia Studio MX also includes ColdFusion MX Server Developer Edition, a fully functional, single-user version of ColdFusion MX that developers can use to easily develop and test Rich Internet Applications at their workstations.

With more than 2.4 million designers and developers already using the products in Macromedia Studio MX, the software suite builds on the momentum that Dreamweaver and Macromedia Flash have in the market today.

Macromedia User Interface

Designed to work together, the Macromedia MX development tools share a new standard Macromedia user interface. As a result, they deliver significantly better productivity for both design- and code-oriented tasks:

- **Workspace Organization:** The powerful new Macromedia user interface supports collapsible and dockable floating panels, which you can customize for a variety of different work modes.
- **Property Inspection:** The Property Inspector offers common conventions and a consistent organization across the programs. This reduces the number of panels you need to work with and lets you build complex applications faster.
- **Design and Coding:** Dreamweaver MX and Macromedia Flash MX both offer powerful visual design and code editing tools in a single environment, which significantly increases productivity by eliminating the need to switch environments. Dreamweaver MX includes visual HTML design tools and new hand-coding tools for HTML, XHTML, XML, and scripting languages including JavaScript, ActionScript, CFML, ASP, ASP.NET, JSP, and PHP. Macromedia Flash MX includes visual design tools for rich user interfaces and robust ActionScript editing and debugging tools.
- **Server Integration:** Consistent integration with ColdFusion MX and other server technologies lets you easily access server-side data and rapidly develop applications.
- **Productivity Enhancements:** Common design tools, keyboard shortcuts, and menu structures let you effortlessly switch between tools.

Rich Internet Application Capabilities

Each of the tools in Macromedia Studio MX has a broad range of new features and capabilities that support development across the spectrum of Internet solutions. Among these are a number of specific capabilities for developing Rich Internet Applications:

- Dreamweaver MX provides the development environment for constructing the dynamic pages that contain Rich Internet Applications and server-side application logic.
- For developing server-side application logic, Dreamweaver MX has strong support for working with CFCs, web services, and server-side ActionScript.
- For developing the client-side application logic and user interfaces, Macromedia Flash MX provides a robust development environment that works with Dreamweaver MX.
- Macromedia Flash MX adds a powerful editing environment for coding client-side ActionScript, visual tools for working with Macromedia Flash components, and support for integrated ActionScript debugging. Macromedia Flash MX also supports distributed debugging for applications built with Macromedia Flash Remoting on the server.
- Macromedia Flash MX supports a flexible model for building components. Macromedia Flash components can encapsulate functionality for reuse, and can be customized visually and functionally at design time and runtime. The Macromedia Flash MX authoring environment ships with a set of pre-built components for common form controls. Third-party components are also available.
- Fireworks MX is an ideal environment for developing graphics for interface elements and content in Rich Internet Applications. It exports to Macromedia Flash MX and offers powerful new tools such as bitmap-editing support.

These products support a seamless workflow for building websites and applications. Rich user interface elements built in Macromedia Flash MX can be dropped into pages created with Dreamweaver MX. Dreamweaver MX can be used to code server-side logic with tools that integrate with ColdFusion. Graphic assets built in Fireworks MX and FreeHand 10 can be easily imported into Macromedia Flash MX or Dreamweaver MX, and modified via launch and edit. Applications and dynamic pages can display live dynamic data from ColdFusion MX.

Overall, Macromedia Studio MX is the only integrated suite of products that gives developers all the tools they need to build Rich Internet Applications.

Websites and Web Applications

While the entire Macromedia MX family is uniquely suited to build Rich Internet Applications, the individual Macromedia MX products also let you create effective user experiences across the spectrum of Internet solutions:

- **Websites:** Dreamweaver MX and Fireworks MX work together to enable visual page design; handle advanced coding requirements for HTML, XHTML, and XML; and create professional web graphics.

- **Web Applications:** Dreamweaver MX can be used with ColdFusion MX to create everything from simple database applications to advanced e-commerce solutions. In addition, Dreamweaver MX has strong support for developing applications with ASP, ASP.NET, JSP, and PHP.
- **Rich Content:** Macromedia Flash MX provides the premier authoring environment for creating rich content and operates with Fireworks MX and FreeHand to create professional bitmap and vector graphics.

Macromedia MX in the Enterprise

Macromedia MX was designed to adhere to established IT best practices, and make it possible to deliver Rich Internet Applications that leverage existing infrastructure, support the development of maintainable solutions, use XML and web services, and implement strong security standards.

Leveraging Existing Infrastructure

The Macromedia MX runtime technologies on the client and server extend existing infrastructure and support key interoperability standards within the enterprise.

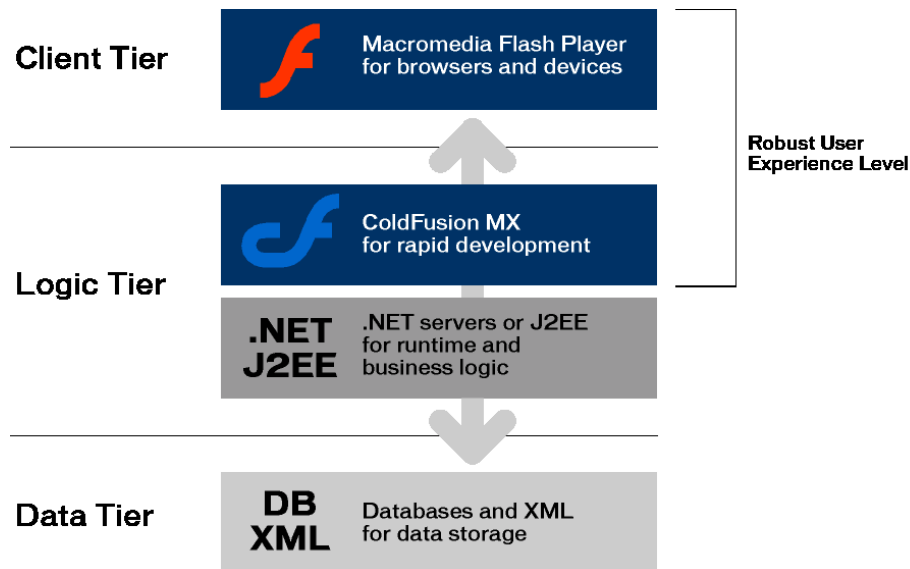


Figure 2: *Macromedia MX extends existing infrastructure.*

Macromedia Flash Player runs as an extension of the browser, desktop, or device operating environment, and already has very broad adoption. Distribution of the player is straightforward. Once installed, it offers significant benefits for subsequent deployment of Rich Internet Applications.

On the server, ColdFusion MX can run on all major operating systems including Windows, Solaris, and Linux. It can also run on Windows .NET Server, or be deployed within a standard Java application server such as IBM WebSphere and Sun iPlanet. As a result, ColdFusion MX can be used to increase productivity and lower costs in an enterprise environment.

The ColdFusion MX server environment interoperates with the key IT infrastructure—from mail servers to databases to distributed object middleware—through support for industry standards including LDAP, SMTP, POP, HTTP, JDBC, ODBC, COM, EJB, CORBA, XML, and web services.

Macromedia tools and players also work with other server-scripting environments including ASP, ASP.NET, JSP, and PHP.

Working with the Microsoft .NET Platform

The Microsoft .NET platform includes a broad range of products and technologies aimed at delivering distributed applications. Macromedia MX is designed to integrate with .NET to enable the creation of Rich Internet Applications.

Macromedia MX features a variety of integration points with .NET technologies:

- Macromedia Flash Player is available as an ActiveX control for Microsoft Internet Explorer; it is included with Microsoft Windows XP and is available for Microsoft Pocket PC. The player offer a rich user interface for applications using .NET through either ColdFusion MX on the server, or directly to ASP.NET and C# with Macromedia Flash Remoting for .NET. Using these connections, Macromedia Flash Player can remotely call CLR code as if it were a local ActionScript object.
- ColdFusion MX runs on Microsoft Windows .NET servers; integrates with Microsoft servers such as SQL Server, IIS, and Exchange; and supports integration with the .NET Framework through .NET web services, and with .NET objects through COM APIs.
- Dreamweaver MX offers strong support for building applications with ASP.NET including authoring tools, behaviors, and support for standard ASP.NET controls. In addition, Dreamweaver MX supports authoring and using Microsoft .NET web services, making it an ideal rapid development environment for ASP.NET applications.

Overall, Macromedia MX provides a powerful way to get more out of IT investments in .NET technologies by expanding the range of developers who can use .NET, accelerating .NET web development, and enabling the use of .NET for building Rich Internet Applications.

Working with the Sun Java Platform

The Sun Microsystems Java technology platform has become an industry standard for enterprise applications. Macromedia MX delivers exceptional support for the Java technology platform.

Macromedia MX features a variety of integration points with the Java technology platform and Java application servers based on the Java 2, Enterprise Edition (J2EE) specification:

- Macromedia Flash Player provides a rich user interface for applications built on J2EE through either ColdFusion MX on the server or directly to Java with Macromedia Flash Remoting for J2EE. Using these connections, the Macromedia Flash Player can remotely call any Java class or package, JavaBean, Enterprise JavaBean (EJB), or Java Management Extension (JMX) as if it were a local ActionScript object. The player can also integrate with session management and security frameworks.
- The ColdFusion MX runtime is built on Java, and CFML and ActionScript files dynamically compile directly to Java code.
- ColdFusion MX can be easily installed on popular J2EE application servers including Macromedia JRun, IBM WebSphere, and Sun iPlanet.
- ColdFusion MX includes a built-in JSP and servlet container based on JRun. Developers can import and use JSP tag libraries in CFML as native ColdFusion tags.
- ColdFusion scripts can directly invoke and use any Java class or API from within pages or components. ColdFusion MX can publish web services for Java technology-based web services engines, and consume web services published by Java engines.
- Dreamweaver MX has strong support for building applications with JSP using JSP authoring tools. Dreamweaver MX supports authoring and using web services that work with Java servers, making it an ideal rapid development environment for JSP applications.

Overall, Macromedia MX provides a powerful way to get more out IT investments in Java technologies by expanding the range of developers who can use Java servers, accelerating Java web application development, and enabling the use of Java servers for building Rich Internet Applications.

Because Macromedia MX supports both the Microsoft .NET and Sun Microsystems Java platforms, IT organizations don't have to choose between them, and can even use both platforms together.

Supporting Modularity and Reuse

One of the key requirements for both rapid development and application maintenance is support for modularity and reuse. The Macromedia Flash components and CFCs make it simple to rapidly develop maintainable applications with Macromedia MX.

The Macromedia Flash component model lets developers easily pick from pre-built user interface components or build their own components. This encourages a consistent design across applications and supports reuse.

On the server, CFCs provide a straightforward mechanism to create reusable code that's accessible through custom tags or function calls. CFCs can be automatically deployed as web services or Macromedia Flash Remoting services.

Macromedia MX supports building applications that use an n-tier application architecture with clear separation between client-side user interface, server-side presentation-tier logic, business logic in distributed objects, and data stored in relational databases. Macromedia MX applications can work with distributed objects deployed using COM and EJB.

Macromedia MX also supports building applications that take advantage of the service-oriented architectures enabled by web services. Rich Internet Applications are ideally suited to deployment in a services-oriented context because their support for asynchronous user interface updates makes it possible to provide an effective user experience during the consumption of web services.

Using XML and Web Services

XML and web services are becoming increasingly important to the delivery of enterprise solutions. Macromedia MX makes working with them easy and productive.

Rich Internet Applications are ideally suited to delivering effective user experiences for applications that are built by assembling web services and using XML for data exchange.

Macromedia MX offers a variety of ways to work with XML and web services:

- Macromedia Flash Player 6 has enhanced support for XML that makes parsing XML on the client significantly faster than in Macromedia Flash Player 5. As a result, it's now easy to use XML to exchange data between Macromedia Flash clients and application servers over HTTP or sockets.
- ColdFusion MX has new XML scripting features that help developers easily load XML into ColdFusion objects and translate ColdFusion objects into XML, all without needing to directly work with the complexities of parsing and traversing XML documents and nodes.
- ColdFusion MX supports advanced XML capabilities, such as XML searching using XPath notation and XML transformation using XSLT, that let developers easily transform XML documents into HTML or other XML formats.
- Using CFCs, developers can easily author and deploy web services with a built-in web services engine that supports Standard Object Access Protocol (SOAP) and WSDL.
- Web services client support in ColdFusion MX makes it possible to import and use any remote web services as a custom tag or object, or through a declarative invocation mechanism.
- Macromedia Flash Remoting, included with ColdFusion MX, lets you access web services directly from Macromedia Flash clients. Web services are visible to developers as if they were local ActionScript objects on the client.
- Dreamweaver MX fully supports XML authoring and editing with color coding, XML validation, and the ability to import XML Schema and Document Type Definition (DTD) to define new tag libraries for the editor.

- Dreamweaver MX offers web services tools for browsing remote web services and dynamically generates client proxies for those web services using ColdFusion, ASP.NET, or JSP. From the web services browser, developers can drag and drop web service methods into Code view for rapid development, and then view the live data from the web services directly in the page.

Overall, deep support for XML and web services makes Macromedia MX an ideal solution for working with these technologies in the enterprise.

Delivering Secure Solutions

Because they're built on existing Internet and enterprise standards and infrastructure, Rich Internet Applications can take advantage of an existing security infrastructure:

- Applications deployed to Macromedia Flash Player that use Macromedia Flash Remoting to talk with application servers can use Secure Sockets Layer (SSL) for client/server data exchange.
- Macromedia Flash Player provides a secure runtime sandbox on the client. Applications running in the player in a browser do not have access to client machines, and can only make server requests to the domain they originated from.
- ColdFusion MX fully supports integration with existing security infrastructure for user authentication through standard mechanisms including LDAP and databases.
- ColdFusion MX provides a robust role-based application security framework and enables server sandboxing for securing resources hosted on a shared server.

Macromedia works closely with industry groups to continue the advancement of security in new technology areas. As with all security, it's crucial that developers and server administrations configure, design, and maintain Rich Internet Applications with security in mind.

Getting Started with Macromedia MX

Getting started with Macromedia MX is easy. You can download 30-day evaluation versions of the Macromedia MX products from the Macromedia website:

www.macromedia.com/downloads

Once you've downloaded Macromedia Flash MX, Dreamweaver MX, and ColdFusion MX, take advantage of the wide range of technical, training, and tutorial information in the Macromedia Designer and Developer Center:

www.macromedia.com/desdev

For advanced online and classroom training as well as formal certification, look to the Macromedia training team:

www.macromedia.com/training