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WHITE PAPER

Delivering Enterprise Applications, Content, and Communications with the Flash® Platform

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Contents

Meeting the Demand for Rich Enterprise-Class Solutions

Enterprise CIOs and technology architects face a range of complex business challenges related to their organizations' use of information technology assets. Although immense back-office investments have been made in enterprise applications and industry-specific solutions, problems related to data accessibility and usability resulting from poor interface design and unwieldy navigation abound. As a direct result, businesses suffer from reduced productivity, poor communication and collaboration, inaccurate data, and missed sales opportunities, all of which diminish profits. Although enterprise portals ideally can aggregate and simplify access to data and business processes, most simply provide a single point of entry to the same complex, difficult-to-access applications. Unfortunately, the problems of poor interface design and unwieldy navigation are not limited to internal corporate applications, as research suggests that both customer- and partner-facing websites are equally frustrating for users. In fact, IDC research indicates that 61% of Internet shoppers in Western Europe agreed that it is difficult to navigate and find desired products on the Internet. The problem of poor usability and navigation is further compounded by the proliferation of non-PC devices through which users increasingly access information.

To meet growing demands for more usable internal and external applications, businesses will benefit from an integrated technology platform that can deliver a range of rich user experiences. Through these applications, organizations can offer employees meaningful access to enterprise data and processes, support interactive communication and collaboration within and beyond enterprise walls, and deliver engaging interactive experiences to their customers. Examples of these new applications include the following:

- **Guided selling:** Online guided selling, which provides potential customers with context-sensitive, easy-to-understand information to help them purchase the right products for their needs, provides a more engaging and satisfying customer experience than the typical "click-heavy" online product-configuration and shopping-cart model prevalent today. For example, single-screen, highly interactive product configurators that allow users to create and inspect complex products visually before purchase generally result in more purchases and fewer returns.
- **Guided services:** In an online guided service, users receive step-by-step assistance for a complex process, and receive immediate, context-sensitive feedback for their actions. Whether deployed within a company (for example, to improve processes such as time reporting and expense management) or to customers (for example, to simplify submitting insurance claims or to book hotel reservations), guided services improve usability, save administrative time, reduce errors, and increase user satisfaction.
- **Business process integration:** By integrating data and business logic from a range of different sources into a single online interface, and controlling access to and the appearance of the information based on specific user roles and activities, enterprises can reduce errors and improve the flow of information within and beyond the enterprise. For example, enabling access to a customer's order history (stored in a customer relationship management solution) and current inventory and manufacturing information (stored in an enterprise resource planning solution) through a single user interface makes it easier for customer service representatives to better serve a customer without needing to search multiple systems for relevant information.
- **Rich content:** While rich, interactive content is frequently the most effective way to engage an audience, customers who experience lengthy delays waiting for the content to download and play will simply go to another website. Businesses are challenged to create meaningful content that plays seamlessly, is easy to interact with, and creates deep impressions.

- **Visual analysis:** To support enhanced decision making, enterprise personnel will benefit from online visual methods of analyzing and interacting with data from a range of disparate sources. For example, a single intranet-based application such as an "online dashboards" that displays aggregate sales figures can make it possible to understand at a glance whether revenues are approaching sales goals, while drill-down capabilities enable personnel to view different subsets of the data. With different ways to view and manipulate data over the Internet, businesses can more easily recognize and exploit new opportunities as well as identify and address existing liabilities.
- **Enhanced communications and collaboration:** In today's global marketplace, companies are challenged to work with employees, partners, and customers around the globe, while reducing the costs and inefficiencies of physical travel. Business units throughout the enterprise will benefit from easy-to-use communication and collaboration applications that support both live and on-demand multimedia for Web conferencing, sales, training, and customer service purposes.

Most organizations have the internal skill sets to identify and describe the kinds of engaging customer experiences and business process improvements that will help them improve their competitive position. However, identification is only the first step; enterprises must find efficient, cost-effective ways to develop, deploy, and deliver these new applications and experiences that meet the divergent needs of business users, IT personnel, and end users.

Evaluating Architectures for Enterprise-Class Solutions

The challenge of identifying and implementing a solution that aligns IT with corporate objectives typically falls into the hands of the enterprise architect. Architects are faced with implementing technologies that will keep the overall IT development and maintenance costs to a minimum, while finding new ways of driving top-line revenue growth. Architects therefore have to evaluate and identify solutions that enable them to do the following without affecting existing systems or adding personnel:

- Unlock new value from existing systems through:
    - Dramatically improved usability of existing applications or systems
    - Nonintrusive application, data, and process integration
- Deliver new solutions that have the widest reach and the most effective experiences for users
- Deliver real-time communication solutions that improve productivity and reduce communication costs within and across organizations

It is generally well-understood within the architect and developer community that the solution to the objectives listed above is in the presentation tier of a platform's infrastructure, which enables the creation of applications that leverage data from a variety of sources without requiring changes to the underlying infrastructure. Unfortunately, developing effective presentation-tier solutions with legacy enterprise technologies can be challenging due to the following reasons:

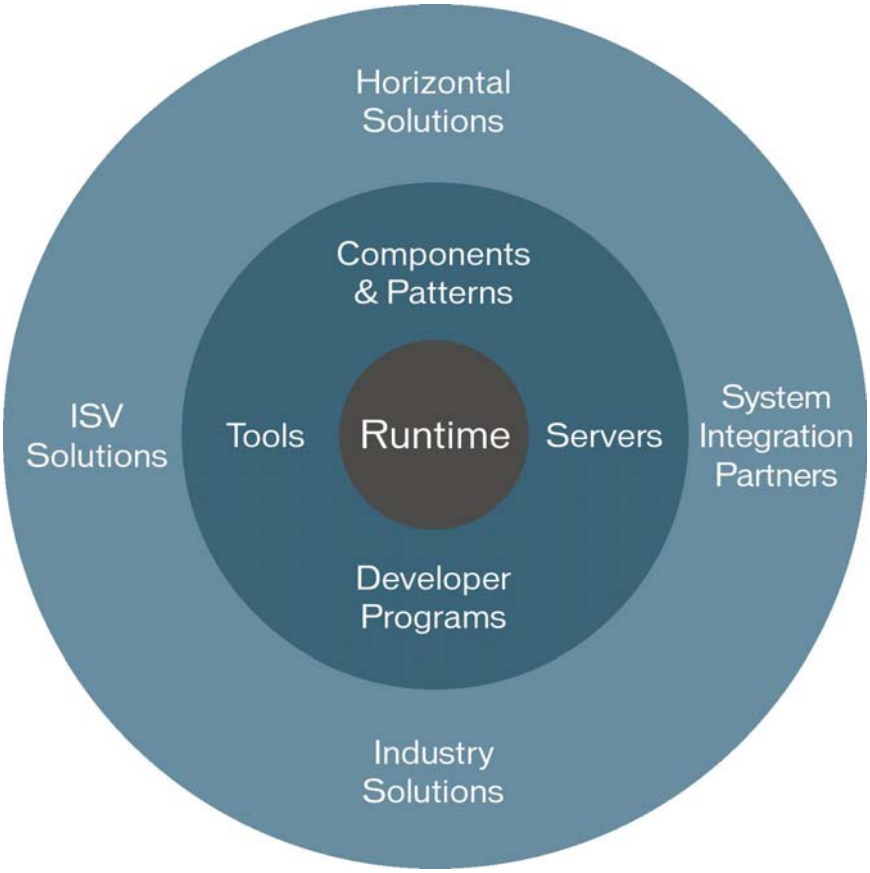
- Poorly designed or non–user-centric architectures of underlying tier solutions
- Lack of effective presentation-tier development tools, programming model, and class libraries
- Lack of an enterprise-class infrastructure to deploy and manage these solutions
- Lack of business solutions and developer focus on the presentation-tier part of the solution

To help identify an effective solution for their organizations, CIOs and enterprise technology architects will benefit from a holistic, platform-centric model of presentation-tier solutions that addresses key business and technology needs. An effective presentation-tier solution platform contains the following elements:

- **Servers and data services:** An effective enterprise-class presentation-tier solution platform will offer high-performance application, content, and data servers and services that integrate seamlessly into existing environments and smoothly interact with the client runtime to deliver an exceptional user experience.
- **Tools and programming model:** To support enterprise-class application development, the platform should offer a mature, standards-based programming model that includes fully documented programming and interface development languages, and a comprehensive set of class libraries and objects. In addition, to enable greater interactivity and reduce time-consuming server interactions and page refreshes, the programming model should go beyond the traditional page-based model to extend the server-based object model to end users. To support team development efforts and enhance productivity, the solution should offer a full-featured developer toolset and integrated development environment (IDE). To leverage existing investments in development tools, third-party tools and IDEs should be supported as well.
- **Applications, components, and patterns:** To ensure that enterprises can focus on developing solutions that meet their unique requirements without "reinventing the wheel," an enterprise platform should deliver robust prepackaged applications that satisfy general enterprise requirements for key functions such as communication and collaboration. The architecture should offer packaged applications and solutions that can be customized and extended to support the organization's business model. In addition, reusable libraries of components and patterns should be provided to speed development efforts.
- **Client runtime:** To ensure that content and applications will have the widest reach while placing the smallest possible burden on the end user, the client runtime should support as many platforms, operating systems, and devices as possible. Ideally, the runtime should already be widely deployed so that users can enjoy a seamless experience without the inconvenience of installing new software. In addition, the client runtime must meet performance and security requirements to maintain the privacy of confidential business and corporate data. Finally, a client runtime that provides an open file format will ensure that developers can use the most appropriate tools to develop applications and content for the runtime.
- **Development community:** A key indicator of a platform's long-term viability is the presence of a large, vibrant community of developers. To ensure the platform's continued success, the community must use the architecture to support their own business requirements and technical needs, as well as actively extend the model with new applications, reusable components, and libraries.
- **Support for solutions:** To ensure that the architecture will support the widest range of applications and be accepted throughout the industry, the model should be standards-based and offer comprehensive opportunities for the development of both horizontal and industry-specific solutions. The vendor should also offer outreach programs to both independent software vendors (ISVs) and system integration (SI) partners to provide businesses with a range of deployment, maintenance, and development options.

Figure 1 shows elements of a comprehensive enterprise class presentation-tier solution.

Figure 1: Elements of comprehensive enterprise-class presentation-tier solution.



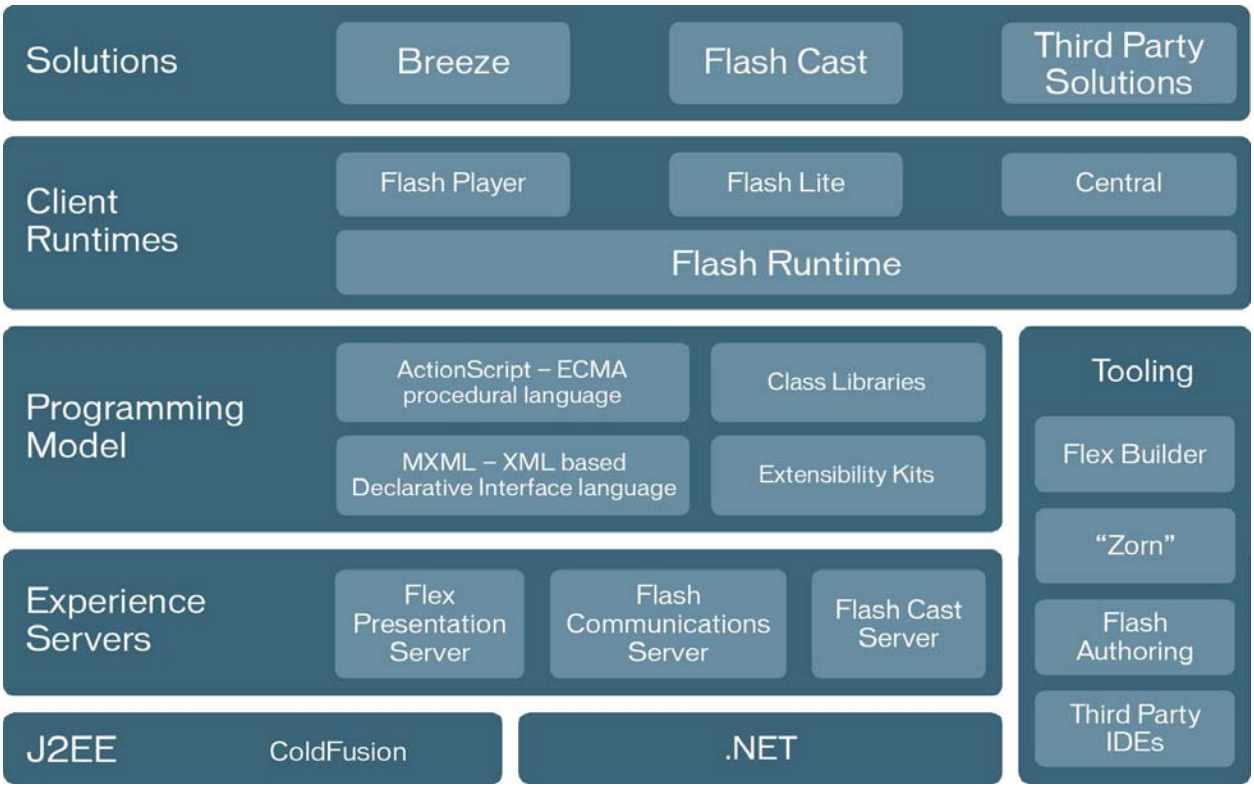
In addition, the architecture should meet the following overall criteria:

- **Security and privacy:** An enterprise-class architecture must provide for the confidentiality of user and corporate data. Organizations that fail to meet this requirement may face penalties for noncompliance, and risk diminished marketplace reputation and customer goodwill.
- **Ease of deployment and maintenance:** Evaluators should ensure that the architecture is easy to deploy, manage, and maintain without requiring additional resources.
- **Interoperability with existing systems:** New technologies should seamlessly integrate with existing systems to enhance and extend their capabilities without negatively impacting their performance.
- **Long-term viability:** So that organizations can be confident that their investments will support future requirements as well as current short-term needs, architects should evaluate whether the platform is poised for long-term stability and growth.

The Flash Platform Architecture

For more than a decade, Macromedia has been the industry leader in empowering business users, developers, and designers to create and deliver effective and compelling user experiences. As shown in Figure 2, the Flash Platform provides a robust, end-to-end architecture for delivering Rich Internet Applications (RIAs), content, and communications across multiple platforms and devices.

Figure 2: The Flash Platform architecture supports the delivery of RIAs, content, and communications.



The elements of the Flash Platform architecture include the following:

- High-performance servers and data services that operate seamlessly in existing J2EE and .NET environments to efficiently deliver Flash based applications, content, and communications without increasing administrative burden or infrastructure requirements
- A robust, standards-based programming model grounded in industry best practices
- Comprehensive development tools that support a team approach, provided by Macromedia as well as a variety of third-party ISVs
- A client runtime that delivers a consistent user experience across the widest range of platforms and devices
- A flexible communication and collaboration solution that addresses the increasingly complex communications issues of today's organizations
- An innovative, tested method of delivering applications, content and on-demand data services to mobile devices

The following sections contain more information about these elements.

High-Performance Servers and Data Services

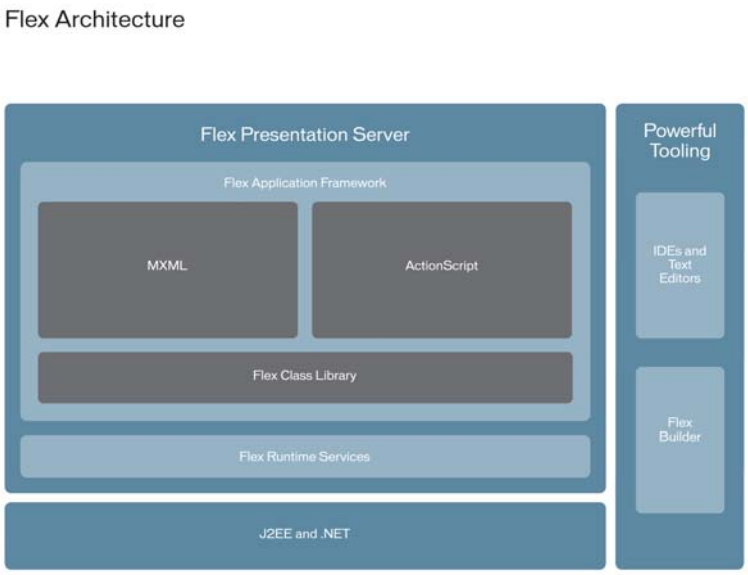
The Macromedia high-performance content and application servers include the Macromedia® Flex™ Presentation Server for RIAs and the Macromedia® Flash® Communication Server for streaming media.

Presentation-tier Solution for Existing Application Servers

The Flex Presentation Server – part of the Macromedia® Flex™ presentation-tier solution for developing and deploying RIAs – makes it possible to extend the power of the Flash client runtime and persistent client-side local processing to enterprise-class business applications and RIAs. Without affecting underlying systems, the Flex Presentation Server supports the development of presentation-tier applications that integrate data and business logic from a variety of sources.

Complementing existing enterprise technologies, the Flex Presentation Server is a native Java application that operates on industry-standard Java application servers, including IBM® WebSphere®, BEA WebLogic, Oracle® 10g, SAP® Netweaver, Macromedia® JRun™, and the Apache Tomcat servlet container. Because the Flex Presentation Server operates like any other application on the application server, it fits seamlessly into an existing Java environment. Figure 3 illustrates how the Flex Presentation Server integrates within an existing J2EE or .NET environment.

Figure 3: The Flex Presentation Server architecture fits seamlessly into an existing Java environment.



The following suite of services offered by the Flex Presentation Server is designed to ease the development and delivery of Rich Internet Applications:

- **Application compilation, caching, and deployment:** Flex applications compile in a just-in-time model, without disrupting the user experience. An application is compiled when it is first invoked, cached for subsequent invocations, and deployed to the appropriate client runtime when invoked.
- **Performance:** The Flex Presentation Server relies on the Action Message Format (AMF), an asynchronous binary protocol that enables rapid data transfer between client-side Flex applications and the Flex Presentation Server. AMF increases application responsiveness to user input. Asynchronous client-side communication also delivers seamless user experiences by supporting screen and data updates without requiring intrusive and time-consuming page refreshes on user systems.
- **Back-end integration:** With support for accessing any web services exposed by back-end systems, the Flex Presentation Server makes it possible to integrate data and processes between user client applications and back-end business applications.
- **Application-server resource integration:** Because the Flex Presentation Server operates as a Flex application running on the enterprise application server, it can fully exploit existing application-server capabilities such as server-side application logic, application objects, authentication, session management, and security.
- **Seamless user experiences:** Flex supports Flash client runtime detection and updating services to ensure that the appropriate runtime is installed, reducing the burden on users. To reduce startup times for individual Flex applications, support for deferred instantiation makes it possible to load elements on demand or as designated by the developer.

Communication Server

The Flash Communication Server is a comprehensive platform for creating and deploying compelling high-quality video over the Internet. With a range of advanced audio and video options and support for interactivity, the Flash Communication Server is ideally suited for the following:

- **On-demand video:** The Flash Communication Server enables businesses to deliver on-demand video with advanced capabilities, including instant-on, playlist support, and rich interactive features.
- **Webcasts:** With live audio and video capture, real-time stream control, and text-chat capabilities, the Flash Communication Server supports live webcasts with compelling interactive capabilities.
- **Live communication and collaboration:** With real-time digital video capture, live audio and video streaming among multiple participants, and a range of control features, the Flash Communication Server supports adding video chat and messaging to a website or designing custom collaboration applications.

For businesses that want to deploy streaming services without investing in a streaming server, Flash Video Streaming Service offers a load-balanced, redundant deployment of the Flash Communication Server over leading content delivery networks. More information about these options can be found in "Deploying and Maintaining the Flash Platform Architecture within an Enterprise," later in this document.

Mobile Content Delivery Server

The Macromedia® FlashCast™ Server presents an ideal solution for mobile operators, who want to offer rich data services such as channel or "push-based" services to subscribers. The server manages subscriber accounts, aggregates and delivers channel updates to subscribers, and generates billing transactions for fulfillment. To optimize network performance, reduce costs, and support increased users and content, the server sends only differential updates of channels used in the service for each subscriber. FlashCast leverages existing mobile value-added services based on WAP, SMS, MMS, J2ME, HTTP, UDP and other technologies. FlashCast enables mobile operators to leverage existing services and investments to create ways for subscribers to consume existing content and services while providing a solid platform for operators to launch completely new services based on Flash technology without replacing the existing infrastructure. As a result, with minimal changes to the infrastructure, operators can improve end-user experiences and usability, increase usage of data services, improve both top- and bottom-line revenues, and reduce customer churn.

By decoupling the communications between content feeds and consumer devices, mobile operators gain significant flexibility and management capabilities for the service. More information about the complete FlashCast solution for creating, delivering, and using rich data services over mobile devices appears in the section titled "Delivering Rich Experiences to Mobile Users Using the Flash Platform."

Robust, Standards-Based Programming Model

To ensure that enterprise developers can leverage their existing skill sets and expertise, the Flash Platform architecture relies on Macromedia® Flex™, a robust standards-based programming model designed for developers familiar with object-oriented languages such as Java and C# who are accustomed to building server-side enterprise-level applications. With a development model that is similar to JSP, ASP, .NET, and others, the programming model extends the server-based object model directly to client systems, enabling users to interact with applications and content without requiring inefficient page refreshes to update information on the screen. Flex makes it possible to deliver the benefits of the rich Flash runtime experience to a business audience. Key elements of the programming model include the following:

- **ActionScript programming language:** Based on the ECMA-262 standard, ActionScript is a strongly typed object-oriented language similar to JavaScript. Among other functions, ActionScript is used to define event listeners and handlers, set or retrieve values of component properties, and handle callback functions.
- **MXML interface language:** MXML is an XML-based markup language used to lay out an application's user interface that includes advanced components to manipulate structured data and large data sets. MXML provides declarative abstractions for presentation-tier logic and bindings between the user interface and server-side data. By cleanly separating presentation issues from business logic, MXML helps maximize developer productivity and application reusability.
- **Flex Class library:** The Macromedia Flex class library offers extensible set of pre built components (such as containers and controls), data binding, behaviors, and other features. As the industry leader in visual design for complex information and processes, Macromedia provides developers with a consistent set of visual cues, interaction patterns, and application navigation conventions to aid in creating consistent behaviors and visual elements across applications. This allows developers to focus on an application's business logic, content, and data and benefit from built-in support for usability, navigation, and user experience within Flex.

Comprehensive Development Tools

Macromedia offers two powerful tools to provide developers with a range of options for developing rich content and RIAs. The Macromedia® Flash™ authoring tool is ideal for developing highly visual interactive content and applications, while Macromedia® Flex™ Builder™ offers a powerful IDE for developing RIAs in a team environment.

In addition, applications for the Flash Platform architecture can also be developed using any desired editor or IDE, including Eclipse, Borland® JBuilder®, JetBrains IntelliJ IDEA™, Microsoft® Visual Studio®, and others. As a result, developers can use the tools that they're most familiar with, enabling enterprises to leverage their investments in tools and training.

Macromedia® Flash® Authoring Tool

The Macromedia Flash authoring tool offers comprehensive features for creating sophisticated interactive content, professional quality video, and RIAs with custom interfaces for desktop computers as well as a wide range of mobile phones and devices. The Macromedia Flash authoring tool accelerates development with productivity enhancements that simplify the creation and incorporation of animation, interactivity, and rich-media assets.

An extensive library of templates for common mobile phone and PDA device interfaces reduces development time, while device player emulators make it easy to identify compatibility issues and runtime conflicts without deploying to a mobile device.

To deliver ultimate flexibility to the Flash development community, the Flash authoring tool exposes a built-in JavaScript API that allows third-party developers to control, automate, and extend the product's core tools, effects, behaviors, and commands.

Macromedia® Flex™ Builder

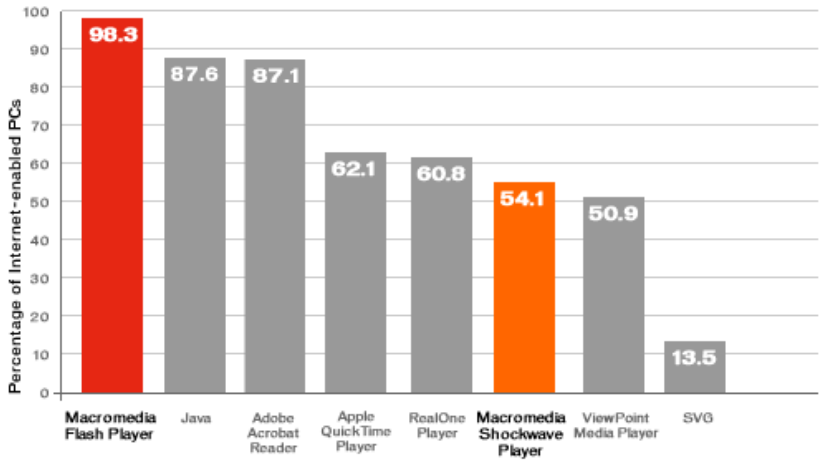
Macromedia Flex Builder, the Macromedia IDE for Flex application development, enables designers and developers to collaborate on the creation of RIAs with Flex in a team environment. This IDE makes it possible for designers to build application interfaces quickly and connect them to back-end data sources without coding; the IDE supports the following functions:

- **Layout and prototyping:** The Flex Builder visual design interface speeds application prototyping and layout. MXML code is generated automatically by arranging application containers and components. Developers can see an application's code and layout by switching between design and code views or viewing both at the same time, while synchronization ensures that changes to either the design or code are reflected automatically in each view. Additional features include a tag inspector, styling and CSS support, data connectivity, data binding, and custom components.
- **Coding:** The Flex Builder code editor speeds developer learning and productivity with a code editor, code hinting, tag completion, validation, and context-sensitive help.
- **Debugging:** To help developers identify, isolate, and resolve bugs to produce the best possible applications, Flex Builder offers robust debugging tools, including an ActionScript debugger. Flex Builder also includes a network traffic–monitoring feature that traces communications between the server and the Flex client application to help ensure the most efficient use of resources.
- **Deployment:** Flex Builder makes it easy to manage file sets for development, testing, staging, and production so developers can be confident that all required code – including dependent files, custom components, and MXML components – are correctly copied to the target server.

Client Runtime

The Flash® Player client runtime is a lightweight, full-featured, self-contained runtime that is easily downloaded to or deployed on end-user machines. Installed on more than 98% of all Internet-enabled PCs, more than 50 models lines, and a wide variety of other electronic devices, Flash Player client runtime is the most widely deployed client runtime (see Figure 4).

Figure 4: The Flash Player client runtime is the most widely deployed client runtime in the world. *(NPD Quarterly Flash Player Penetration Survey, March 2005)*



The Flash Player client runtime can be obtained and installed in a variety of ways:

- **Browser-mediated inline installation:** An organization's website can ensure automatically that the correct version of the Flash client runtime is installed on visitors' computers without requiring them to leave the site or the content they were viewing.
- **Flash Player-mediated inline installation:** This mechanism enables the Flash client runtime to update itself automatically if the content requires a later version of the runtime.
- **Flash Player Download Center:** To eliminate the need for platform and browser detection and custom installation code, organizations can direct visitors to the Macromedia Flash Player Download Center, where the latest version of the Flash client runtime is installed by Macromedia.

More information about the variety of options that are available to support Flash client runtime deployment within an enterprise appears in the section titled, "Deploying and Maintaining the Flash Platform Architecture Within an Enterprise."

Consistent User Experience

The Flash client runtime is controlled, plug-in client-side code that provides a fully functional set of rich client capabilities that operate consistently across browsers, desktop applications, application servers, underlying operating systems, and hardware platforms. Businesses can therefore deliver consistent user experiences through their Flash runtime-based RIAs and content.

Unlike other media players, Flash client runtime installation and updates are automated and easy, with small bandwidth-friendly files that do not require additional installers.

Exceptional Performance

To ensure that the Flash client runtime provides exceptional support for increasingly complex content and applications, Macromedia is committed to delivering continuous performance improvements. The latest improvements – including faster graphics rendering and display, enhanced video playback, rapid component initialization, better memory usage, caching improvements, and improved XML parsing – deliver significant improvements in the following key areas:

- Application startup time and loading of reusable components
- Rendering and display of text, images, audio, and video as well as large data sets
- Application speed and responsiveness to user input
- Consistent responsiveness when handling large data sets

Performance is also enhanced through improved communication between the Flash client runtime and the server, including support for asynchronous bidirectional communication. By supporting both server-push and client-pull models for retrieving components such as vector graphics and video from the server, the runtime enables users to enjoy more consistent viewing and interaction as elements are updated in the background without requiring the screen to be refreshed. Network delivery improvements such as bitpacking techniques help maintain quality over networks with limited or unpredictable bandwidth.

Security and Privacy

The Flash client runtime is designed to protect against unauthorized access to host system resources and data as well as private or confidential user information such as personal and financial data. All content runs inside a virtual machine (VM) that implements a "security sandbox" model. This means that all resources – including applications, data, URLs, and others – known to the Flash client runtime are associated with a specific sandbox. Applications may interact freely with resources within the same sandbox, but access to all other resources is controlled. Interaction among sandboxes is allowed in accordance with specific security rules, and only after the parties overseeing the domains provide permission for the interaction. By default, only 10K of persistent client-side storage is allocated per sandbox.

Sandboxes that allow access to local system resources and files do not allow network access, and sandboxes that allow network access do not allow access to system resources and files. As a result, the Flash client runtime cannot be used to create an application that transmits any local information across a network.

Other security features of the Flash client runtime VM disallow native or operating system executable byte code instructions and ensure no direct access to system memory or processors. The runtime also supports domain-based security configurations, configurable file system and network access controls, and secure network protocols such as HTTPS.

Users can modify security and privacy settings through an easy-to-understand graphical user interface, while enterprise administrators can implement security throughout an organization with configuration files. More information about configuring security within an enterprise appears in the section titled "Deploying and Maintaining the Flash Platform Architecture Within an Enterprise."

Expressive Capabilities

For developers, the Macromedia Flash authoring tool, Flex and the ActionScript programming language provide access to APIs that deliver ultimate control over the breadth and depth of the user's interactive experience. Features that deliver expressive capabilities include the following:

- Powerful rendering engine for efficient delivery of multiple media types (text, vector graphics, audio, and video)
- Advanced compositing capabilities for integrating multiple media types
- Enhanced text-rendering engine that renders text crisply and clearly at all font sizes on all platforms
- Advanced video codecs (including support for select H.263 and VP6 streams) that enable the creation of high-quality video with efficient bandwidth requirements
- Dynamic filter support for delivering real-time graphic effects
- Precise display control of runtime graphics for the widest range of creative possibilities

Simplified Development

The Flash client runtime is designed so that businesses can confidently develop content that will run seamlessly on the designated target systems. Development time is reduced because developers no longer need to write code to detect the operating system and browsers. In addition, programmers can create RIAs without being limited by browser or .NET- and Java-specific virtual-machine constraints.

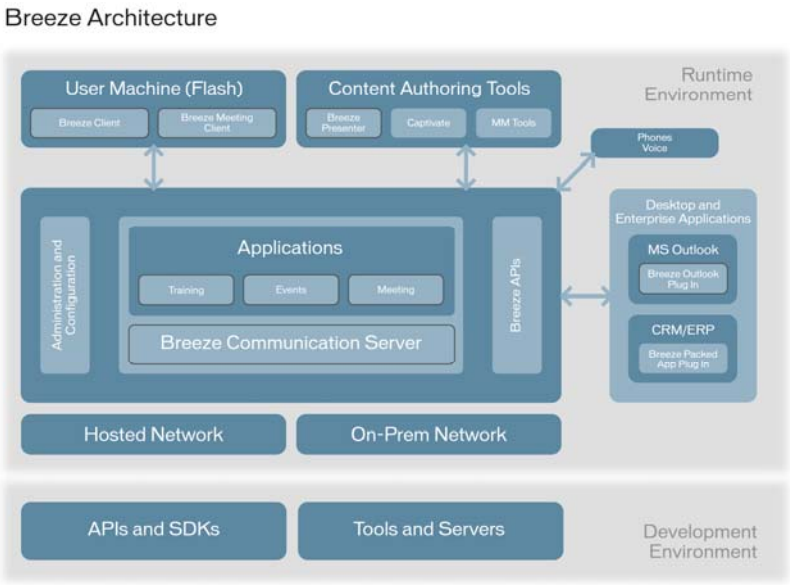
Developers who rely on the Flash client runtime to play video content no longer need to duplicate efforts encoding video for multiple formats such as RealPlayer, Windows Media Player, and QuickTime. This results in faster development and testing time, while eliminating the expense of purchasing and maintaining multiple encoding workstations.

Because Flash content is delivered in an open, standards-based file format, developers can create content using Macromedia tools, third-party tools, or tools they create themselves to meet their specific requirements.

Communication Solution

Macromedia® Breeze™ 5 is a rich web communication and collaboration system that supports the delivery of high-impact online meetings, training, and presentations through the widely deployed Flash client runtime. Enterprises benefit from the scalability, flexibility, and extensibility of Breeze, while meeting attendees and training participants benefit from seamless access to engaging content without downloading additional software. The Breeze architecture is illustrated in Figure 5.

Figure 5: Breeze offers a comprehensive enterprise-class communication and collaboration solution.



The Breeze Communication Server offers real-time and on-demand communications and provides user administration, tracking, and reporting, as well as integrated content management for Breeze applications. To meet the demands of large organizations, the Breeze Communication Server delivers enterprise-class scalability, with support for single-server or clustered environments that can handle thousands of concurrent users. Breeze applications include the following:

- **Breeze Training:** An ideal solution for managing, delivering, and tracking online training initiatives, Breeze Training supports the design and delivery of both live and self-paced courses and curriculums, including courses created with other authoring tools. User completion and course results can be tracked using convenient dashboard reports or at a more detailed learner-by-learner and question-by-question level.
- **Breeze Presenter:** With support for Microsoft® PowerPoint® authoring, a drag-and-drop audio editor and wizard-based quiz and survey creation, Breeze Presenter makes it easy for content experts to create engaging multimedia e-learning courses and on-demand presentations. Breeze courses can also be delivered and tracked by SCORM 1.2, SCORM 2004, and AICC-compatible learning management systems.
- **Breeze Meeting:** With features that include multipoint video conferencing and rich-content sharing, Breeze Meeting delivers real-time meetings and seminars that are easy to attend as well as manage and deploy. Reusable settings and content simplify the creation and administration of recurring and follow-up meetings.
- **Breeze Events:** To simplify the administration of large online seminars and presentations, Breeze Events offers an end-to-end event management solution that supports user registration, qualification, notification, automatic e-mail reminders, and participant tracking. Customization and reporting features are also available.

The Breeze architecture is designed to integrate with existing enterprise systems; for example, Breeze Directory Services supports out-of-the-box integration with user management systems. Plug-ins and integration modules for Microsoft® Outlook®, Microsoft PowerPoint, and common enterprise applications, along with available APIs and SDKs, support integration with existing applications. This integration enables activities such as initiating a meeting directly from Outlook, spawning an ad hoc meeting from within a customer relationship management (CRM) system, or launching an enterprise resource planning (ERP) application from within an existing meeting so that all participants can view the data. In addition, the Breeze solution is offered as a hosted service or as licensed software for behind-the-firewall implementations.

Developing and Delivering Rich Internet Solutions with the Flash Platform Architecture

The Flash Platform architecture presents an ideal solution for building and deploying enterprise-class solutions including RIAs, content, and communications. In addition, the Flash Platform architecture enables the delivery of rich application, content, and data services to a range of mobile devices.

Rich Internet Content

The possible enterprise-level uses for rich Internet content are boundless and include multimedia information delivery, three-dimensional product views, interactive games and simulations, video-on-demand applications, and more. The Flash Platform architecture presents an exceptional model for deploying rich visual content regardless of the platform, operating system, or browser, for the following reasons:

- **A ubiquitous rich runtime environment:** Deployed on more than 98% of all computers worldwide as well as on a majority of mobile and electronic devices, the Flash client runtime makes it easy for businesses to make content globally available.
- **Widespread availability of development tools:** A range of tools for developing Flash content are available from Macromedia and third-party vendors. As a result, developers and content designers benefit from access to tools that meet their budget requirements and content development needs.
- **A large, experienced developer community:** The availability of a considerable community of Flash developers ensures that enterprises can easily find the right personnel to develop Flash content.

One of the Flash Platform architecture's superior capabilities is its support for deploying video, which includes support for the following range of delivery options:

- **Embedded video:** In this model, the video is fully embedded in the Flash file. This model is the easiest to deploy and is generally acceptable for short video clips. Disadvantages include lengthy delays before playback while the Flash Video is downloaded, as well as the inability to modify the video component without recreating the entire Flash file.
- **Progressive download:** In a progressive download, video is stored separately from the Flash file. The video file is downloaded when the Flash content references the video, and playback begins before the file has completely downloaded. Benefits of progressive download include immediate video playback, smaller Flash files, and improved video performance. However, because the video is downloaded and temporarily stored on the user's system, progressive download may not offer sufficient protection for proprietary materials.

- **Streaming video:** In streaming video, each user opens a persistent connection to the Flash Communication Server, which immediately streams the video that the content requests. As soon as the bits are played, they are discarded. Ideal for delivering long video files and delivering video to many simultaneous users, streaming video offers a range of benefits, including immediate playback, bandwidth detection, efficient use of network resources, tracking and reporting capabilities, and security of media assets.

This flexibility in delivery models enables organizations to deploy online video in a method most appropriate for their unique requirements.

Rich Internet Applications

The Flash Platform architecture is designed to support the development and delivery of RIAs that combine the reach of the Internet with the processing power of desktop computers and mobile devices. This combination enables the delivery of more complex interactions than are currently supported by the browser model. Flex applications extend the server-based object model to client systems, improving interactivity by eliminating the constant page refreshes and context switches that users frequently experience. . As a result, Flex applications enable organizations to provide users with a dramatically improved experience that supports the manipulation of data and information in ways that are inconceivable in a traditional browser-based environment.

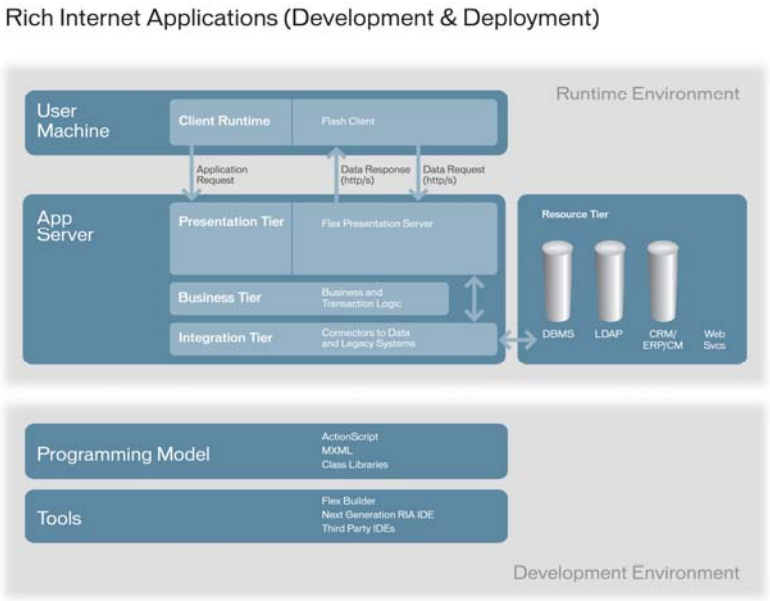
Sample uses of Flex applications include the following:

- **Guided selling:** The Flash Platform aids the design and development of numerous product-oriented applications, such as configurators, selectors, comparison engines, and shopping carts, providing customers with an integrated experience from initial inquiry to final purchase. By reducing customer search time and leading customers directly to the items they want, guided selling can increase conversion rates, drive larger sales, and reduce shopping cart abandonment.
- **Data dashboards:** The Flash Platform architecture provides charting, graphing, and drill-down capabilities that make it easy to consolidate data from disparate systems without slow page refreshes. Businesses benefit from faster decision cycles and improved access to information.
- **Process and data integration:** With the Flash Platform architecture, businesses can consolidate data and information and align processes to meet the unique needs of internal and external users. Automated process and data integration increases accuracy, improves efficiency, and enhances customer service through faster response times.

The following elements, shown in Figure 6, are required to deliver enterprise-class RIAs:

- **Flex Presentation Server:** The Flex Presentation Server is an application that acts as the application and services intermediary between Flex applications and the existing enterprise environment. The Flex Presentation Server easily integrates and executes with existing enterprise application servers, without touching or affecting existing business, transaction, or integration logic in any way. As a "good citizen" of the application server environment, the Flex Presentation Server leverages existing resources and policies for functions such as deployment, session management, and security.
- **Industry-standard IDE:** Flex applications can be built and tested using Macromedia Flex Builder or a third-party IDE such as Borland® JBuilder®, JetBrains IntelliJ IDEA™, Microsoft® Visual Studio®, and others.
- **Flash client runtime:** The Flash client runtime, which is already present on more than 98% of computers, provides the user interface to Flex applications.

Figure 6: The Flash Platform architecture provides all the elements required to deliver enterprise-class RIAs.



Businesses that develop and deploy Flex applications report reducing development cycles by more than 50% and reducing personnel requirements by as much as 66%. In addition, a retailer who implemented a single-screen checkout Flex application realized a 50% increase in conversion rates. For detailed information about how businesses are benefiting from Flex, visit the Macromedia Showcase at http://www.macromedia.com/go/showcase and follow the link for Flex.

Rich Communication and Collaboration

Through Breeze, the Flash Platform architecture delivers a comprehensive easy-to-use communication and collaboration solution that can integrate into any existing enterprise environment. Rated "Excellent" in an InfoWorld review of real-time collaboration solutions, Breeze can be used to support the following:

- **Training and education:** With robust content creation and management tools, integration with third-party systems, comprehensive testing, tracking, and pacing features, and support for industry standards such as SCORM and AICC, Breeze offers an end-to-end learning solution ideal for businesses, higher education, and government.
- **Marketing:** Breeze helps shorten sales cycles by improving communications throughout the sales process, such as easing sales kickoff meetings, keeping the sales team updated through regular meetings, delivering relevant presentations to potential customers at their convenience, and supporting real-time communication with prospects, including the delivery of personalized proposals.

- **Web conferencing:** Breeze improves internal and external collaboration by making it easy to create ad hoc or scheduled meetings with multiple participants. Support for directory services simplifies the process of inviting or adding meeting participants. Meeting administrators can easily configure live meeting room layouts to suit their presentation and interaction style, and save the meeting rooms, including all content, to reduce preparation time for recurring meetings. For added flexibility, Breeze is available as a hosted service or as licensed software for behind the firewall enterprise implementations.

Organizations that have implemented Breeze have realized benefits such as investment recovery within three months; a 10% increase in user adoption each month; greater ease documenting training compliance; and significant cost savings compared to previous training solutions. For detailed information about how organizations are benefiting from Breeze, visit the Macromedia Showcase at http://www.macromedia.com/go/showcase and follow the link for Breeze.

Rich Experiences for Mobile Devices

The Flash Platform architecture offers an end-to-end solution for designing, delivering, and viewing rich content, applications, and data on mobile devices.

For Businesses

For businesses that wish to deliver their content to mobile devices, the Flash Platform architecture provides two key elements:

- **Flash client runtime:** The Flash client runtime for mobile devices – a compact, expressive runtime optimized for mobile phones – is already available on more than 50 mobile phone product lines of the largest mobile handset manufacturers in the world.
- **Development tools:** The Flash authoring tool offers a range of device templates and emulators that ease content development for mobile devices.

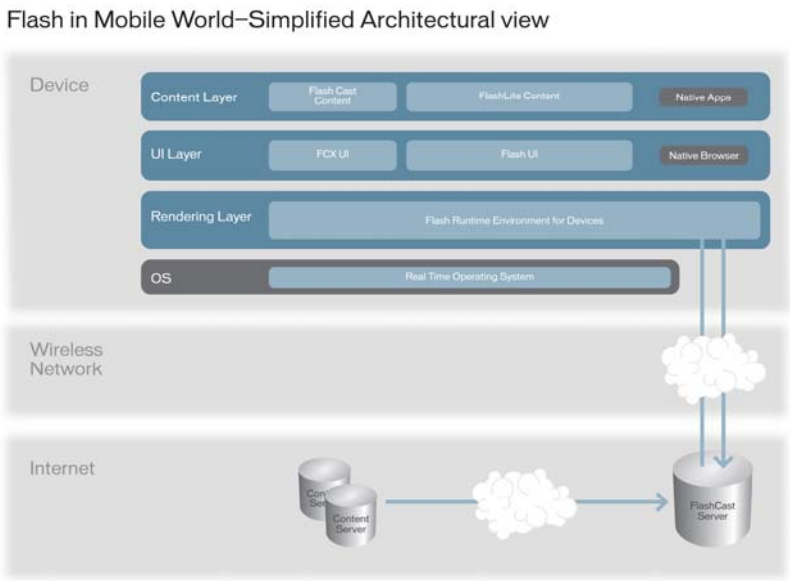
For Operators

As illustrated in Figure 7, the Flash Platform and Macromedia® FlashCast™ offer an end-to-end solution for wireless operators to create exceptional interactive experiences for their subscribers through key enabling technologies at the following three levels:

- **The mobile-device rendering level:** The Flash client runtime – available on most major mobile handsets around the world – delivers a compact, high-performance runtime that renders rich content, applications, and custom user interfaces and supports on-demand and pull-based services.
- **The mobile-device user-interface level:** The FlashCast client makes it possible for operators to provide custom and on-demand content to users through the user interface, and enables operators to develop custom user interfaces for the mobile device itself.
- **The mobile-device content and application level:** Operators can deliver Flash content and applications directly to mobile devices as standalone items or as elements of rich data subscription services through operator-owned networks.

Within the operator's infrastructure, the FlashCast server – a J2EE-compliant server that uses available network protocols for FlashCast data – delivers rich content to subscribers. By decoupling the communications between content feeds and consumer devices, mobile operators gain significant flexibility and management capabilities for the service.

Figure 7 The Flash Platform architecture offers an end-to-end solution for creating and delivering interactive services to mobile devices.



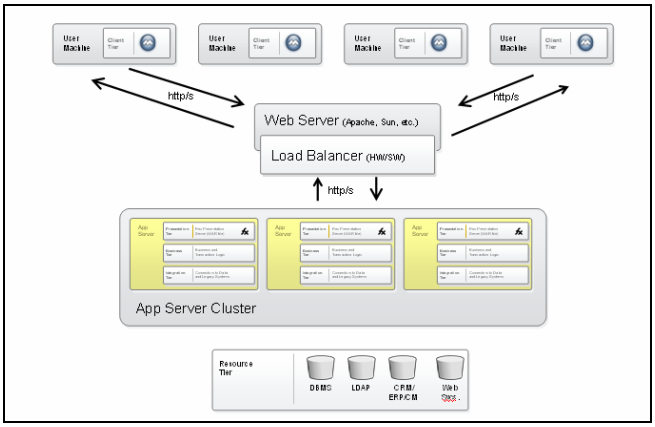
Deploying and Maintaining the Flash Platform Architecture Within an Enterprise

The Flash Platform architecture is designed for easy deployment and maintenance within any standards-based enterprise infrastructure.

Flex Deployment and Administration

Because the Flex Presentation Server is a native Java application, deployment and maintenance are as straightforward as managing any other application. Figure 8 illustrates a sample deployment of the Flex Presentation Server within a clustered environment. The deployment of individual Flex applications on the J2EE platform is handled with Java web archive (WAR) files. For administrators, the Flex XML schema and file-based application model mean that individual Flex applications can be incorporated easily into existing administration and application lifecycle tools. While executing in the Flash client runtime, the Flex application can interact with any existing server-side functionality, such as Java objects, SOAP web services, and others.

Figure 8: The Flex Presentation Server deployed in a clustered environment



Streaming Video Deployment and Administration

Flash Communication Server can be deployed in a variety of ways to meet an organization's unique requirements:

- **Standalone:** This solution is best suited for organizations that only need to serve a relatively small number of simultaneous connections.
- **Clustered:** The Flash Communication Server is designed to scale to support the needs of organizations of any size, and operates seamlessly in a networked server environment. An organization may deploy the Flash Communication Server with a single content origin server and multiple edge servers, replicating content and automatically delivering it based on the requirements of the load-balancing system.
- **Content delivery networks (CDNs):** For organizations that want to deliver streaming video to the largest possible audience without the expense or burden of maintaining a video delivery infrastructure, Macromedia has partnered with industry-leading CDNs to offer Flash Video Streaming Service (FVSS), a hosted service for delivering Flash Video across reliable, high-performance networks. FVSS customers benefit from built-in load balancing and failover to ensure that video is delivered efficiently despite network traffic. Bandwidth and storage are flexibly allocated based on an organization's unique requirements, and sophisticated tracking and reporting mechanisms help businesses identify trends in video access.

Flash Client Runtime Deployment and Administration

To provide enterprise administrators with flexibility in deploying the Flash client runtime within a managed networked computing environment or intranet, Macromedia supports a range of common installation methods, including disk images and remote software management systems. Supported deployment methods include a "silent installer" for Windows platforms as well as an installer and associated merge module that enables the incorporation of the Flash client runtime into compound install packages for deployment with technologies such as Microsoft MSI.

To improve security, administrators can customize individual installations with a configuration file that establishes defaults for a range of settings.

An Architecture for the Future

Macromedia is committed to continually enhance and improve elements of the Flash Platform architecture. Planned enhancements include the following:

- **Flash client runtime:** With each successive release, Macromedia has significantly improved the performance and memory efficiency of the Flash client runtime. Future improvements to the runtime will further reduce application startup time, and improve overall application responsiveness and graphics rendering capability. Developers will be able to exploit file upload and download capabilities, new graphics effects, high-quality font rendering, and a higher quality video codec to support new kinds of interactive applications and experiences. Administrators and users will gain increased local control of the Flash client runtime for enhanced privacy protection and control of the user experience. Additional enhancements are also being made to improve client installation and automatic updates for users.
- **Programming model:** The Flash Platform programming model will incorporate enhancements to the core ActionScript programming language to further align with the ECMAScript standard. Additional enhancements include more powerful data connectivity options, including binary sockets and expanded web services support. In addition, the Flex framework will include a host of new user interface components and enhanced support for applying custom skins and styles.
- **Development tools:** To further support RIA development using the Flex framework, Macromedia has joined the Eclipse Foundation and is building a new development tool, code-named Zorn, based on Eclipse. Zorn will unify the design, development, and debugging of RIAs and provide a more robust, extensible environment that supports the full range of Flex development needs.
- **Flex Presentation Server:** The next release of the Flex Presentation Server, code-named Mistral, will introduce transparent data persistence across tiers to support occasionally-connected clients, data synchronization, a robust data-push infrastructure, and paging for large data sets. Support for real-time collaboration within RIAs is also planned.
- **Flash Communication Server:** The next major release of the Flash Communication Server, code-named Edison, will support new high-fidelity video capabilities and provide integration with the Flex programming model for quickly blending communication elements in RIAs.
- **Breeze:** Future enhancements to Breeze will include support for advanced video features; delivering on-demand content and live communications to mobile devices; extending collaboration and communication capabilities through integration with telecommunications systems and enterprise applications; improving both live and asynchronous communications through enhanced awareness of presence; and enhancing multicast support for webcasts and other large online events.

As demonstrated by the comprehensive roadmap outlined above, the Flash Platform will continue to offer the most robust set of capabilities for delivering effective experiences across devices.

Benefits of the Flash Platform Architecture

The Macromedia Flash Platform architecture offers an enterprise-class solution for building and delivering RIAs, content, and communications. With robust servers, a mature programming model, comprehensive development tools, an active community of more than one million Flash developers, and a suite of powerful rich-communication solutions, organizations can easily develop and deliver RIAs, content, and communications solutions that meet their unique business needs. Extensible packaged rich-communication solutions and a wide range of ISV and SI partners enable greater flexibility for the deployment of business solutions build with Flash technology. The ubiquitous Flash client runtime ensures a seamless user experience while working with the organization's content and applications – anytime, anywhere.

In summary, the Flash Platform architecture delivers exceptional return on investment by leveraging existing technology to drive new efficiencies, improve revenue streams, and identify and exploit previously hidden opportunities. Built-in scalability, extensibility, and flexibility, support for industry standards, runtime ubiquity and support from ISV and SI partners, and a robust development community ensure that the architecture provides a viable platform for organizations to deliver enterprise-class solutions reliably, now and in the future.

For More Information

For more information about the Flash Platform Architecture in general, call a sales representative at 1-888-649-2990 (US and Canada) or find an international sales line at http://www.macromedia.com/international/buy/numbers.html. To purchase online, visit http://www.macromedia.com/store. Or, use any of the following links:

- For more information about the Flash Player, visit www.macromedia.com/software/flashplayer/.
- For more information about the Flash authoring tool, visit http://www.macromedia.com/software/flash/.
- For more information about Flex Builder, visit www.macromedia.com/software/flex/flexbuilder/.
- For more information about the Flex Presentation Server, visit www.macromedia.com/software/flex/.
- For more information about Flash Communication Server, visit www.macromedia.com/software/flashcom/.
- For more information about Flash Video Streaming Services, visit www.macromedia.com/software/flashcom/fvss/.
- For more information about Breeze, visit www.macromedia.com/software/breeze/.

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