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Macromedia’s Flash Platform

Bringing Rich Experiences to the Masses

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Patricia Seybold Group / Perspective

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INTRODUCTION

On June 6, 2005, Macromedia unveiled its Flash Platform for delivering rich user experiences (content, applications, and communications) across browsers, operating systems and devices. The Flash Platform is a cohesive product roadmap, demonstrating how the various Macromedia offerings fit together, and provides some previews of future plans. Macromedia’s announcement signifies that the time for rich interfaces (and interactions) on the Web, on mobile phones, and in the enterprise is upon us.

We are interested in Macromedia’s plans because user experience is a significant aspect of delivery a high-quality customer experience. Our most innovative clients (Pioneers and Visionaries) have been pushing the user experience envelope using early releases of Flash, as well as retreating to the desktop with thin Java Swing implementations.

Reviewing Macromedia’s roadmap, it is apparent that the company is ready to make a concerted push into the enterprise, with an enterprise-developer-friendly (and infrastructure-friendly) offering. At the same time, Macromedia continues make advances important to its loyal design community. In many ways, Macromedia’s push to the enterprise provides a new opportunity for those designers to use their skills on new initiatives and to develop rich enterprise-class applications as part of larger development teams.

In this report, we describe the Flash Platform at a high level, paying particular attention to the components enabling rich Internet applications (RIAs)[1] in the enterprise. As always, we share our perspective—what we like, Macromedia’s challenges, and its strengths.

FLASH PLATFORM

Illustration 1 shows the Flash Platform architecture. The architecture supports the delivery of content, rich applications, and communications to a user interacting through a variety of touchpoints (browser, mobile device, desktop client, set-top box, etc.) that represent a wide range of operating systems, form factors, and providers.

As shown in the architecture drawing, the Flash Platform is not just a client-side plug-in, but a comprehensive system with dedicated server-side technology, back-end integration capability, a programming model, development tooling, prebuilt solutions, and, of course, the universal runtime.

Client Runtime: Flash Player

At the heart of the Flash Platform architecture is the client runtime. Most of us are familiar with the Flash Player that runs as a plug-in to our browsers. In our daily Internet experiences,[2] Flash brings us news clips, sports highlights, movie previews and shorts, real-time baseball, advertisements, product

[1] A rich Internet application combines a rich interface that is useful, usable, and desirable with the performance, scalability, and reach of an enterprise-class Web application built on an n-tier architecture and/or service-oriented architecture. RIA combines the best of both worlds: rich interface and distributed Web application.

[2] For some Flash-enabled experiences, try product configurators for the Mini Cooper (http://www.mini.com/mini_worldwide/mini_worldwide.html) and NikeId (http://nikeid.nike.com/nikeid/index.jhtml), see a short movie (www.amazon.com/screeningroom), and view live—in season—baseball (http://mlb.mlb.com/NASApp/mlb/mlb/video/mlb_tv.jsp).

Flash Platform Architecture

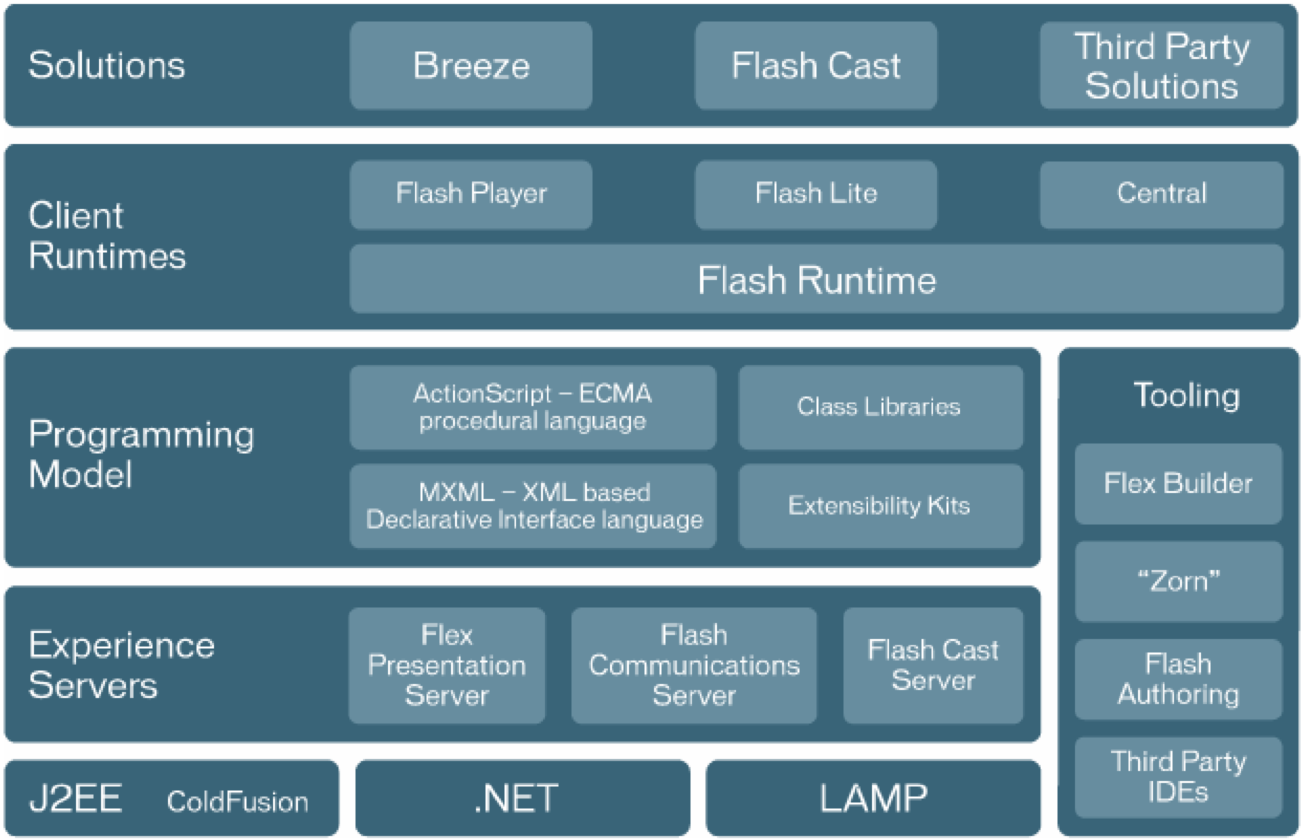

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Illustration 1. Macromedia's Flash Platform architecture supports the delivery of content, rich applications, and communications to a user interacting through a variety of touchpoints (browser, mobile device, desktop client, set-top box, etc.) that represent a wide range of operating systems, form factors, and providers.

configurators, and streamlined check-out processes. Now that we have bandwidth, it is hard to imagine the Internet without Flash-enabled content.

NOT JUST FOR BROWSERS. In addition to the browser-destined Flash Player,[3] there are runtime versions for mobile phones (Flash Lite) and for the desktop (Central). Flash Lite is a lightweight version of Flash Player. Flash Lite delivers content and applications to the phone and sometimes serves as the actual phone interface.

Central supports an occasionally connected work model. Its features include local cache, data synchronization, and presence detection.[4] Central is currently a developer release offering only, billed as a next-generation solution.

NOT JUST MEDIA. In addition to media capability, the Flash runtime has a variety of data service capabilities, including Web Service (SOAP/HTTP) and XML/HTTP (REST) requests and XML parsing. For a detailed feature list for each platform layer, please refer to Table A.

[3] Flash Player has also been embedded into set-top boxes, home control systems, PDAs, and educational toys.

[4] For more information on Central, see http://www.macromedia.com/software/central.

Flash Platform Capabilities

Platform Component	Aspect	Capabilities		
Client Runtimes	Media	• Vector graphics	• JPEG/GIF/PNG	• Two-way MP3 audio
		• Two-way video	• Text rendering	
	Data Services	• HTTP/S	• XML/SOAP	• AMF
		• RTMP	• Sockets	• Local persistence
		• Data sync	• Local connection	• External API
		• Security sandbox		
	System Services	• Accessibility	• Printing	• Debugging
		• Auto update	• Presence	
Programming Model	Language	• ECMAScript 262 Edition 4	• E4X	• Declarative XML abstraction
		• CSS		
	Class Library	• UI controls	• Navigators/layout managers	• Data components
		• Skinning/styling	• Extensibility	
Experience Servers	Develop/Deploy	• Compilation	• Caching	• Shared library management
		• Client detection	• Versioning	• Search integration
		• Administration	• History management	• Analytics integration
	Data Services	• Data sync/page/push	• Enterprise connectors	• SOAP proxy
		• AMF gateway	• RTMP gateway	• HTTP services
		• Security	• LDAP integration	
	Collaboration	• SMS	• MMS	• XMPP
		• SIP/SIMPLE	• Video chat	• Text chat
		• Screen sharing	• Application sharing	• Permissioning
	Media Delivery	• Video on demand	• Live A/V broadcast	• SVG transcoding
		• A/V transcoding	• CDN/edge services	

Table A. This table lists Flash Platform capabilities in the Maelstrom release of Flash Player, the Deuce release of Flash Lite, the Mistral release of Flex Server, and the Edison release of Flash Video.

ASYNCHRONOUS AND EVENT DRIVEN. The Flash runtime follows a common interaction model of asynchronous server interaction coupled with event processing. This allows the user to continue interacting with the client application while the server fulfills the request. The client runtime receives the data as an event and then processes it appropriately.

PERVASIVE. The Flash client runtime has been enormously successful. Flash is installed in 98 percent of all Internet-connected PCs. The success can be attributed to the small footprint (less than 1 MB), the ease of deployment and updates, Macromedia's continued investment in performance, the security sandbox model,[5] the published SWF file format that allows third parties to output Flash format, and the quality of experience delivered.

MAELSTROM. The current version of the Flash client runtime is 7. The next version of Flash, code-named Maelstrom, has significant advances in performance (graphics rendering, text scrolling, component rendering, ActionScript execution, and memory management), graphical expressiveness (drop shadows, blurs, glows, beveled highlights, color transformation and convolution, and new blending modes), font readability, enhanced video, privacy controls, IME context switching for large character sets, and file upload/download capabilities.

Programming Models: Flash and Flex

Macromedia supports two programming models with common underpinnings. The first programming model is the traditional Flash client-side model, targeting designers and developers of content and small applications. The second is the newer Flex presentation-tier programming model, targeting designers and developers of enterprise-class, rich Internet applications. Underpinning both models is the ActionScript programming language and the compiled output format of SWF.

ACTIONSCRIPT. ActionScript is the scripting language used to control Flash movies and applications. There are two ActionScript versions. The first, ActionScript 1.0, is a simple scripting language targeting interactions, such as a user clicking a button. The second, ActionScript 2.0, is an object-oriented programming language developed for complex programming tasks, such as content and data manipulation.

ActionScript is an ECMAScript[6] language; it is therefore a close relative of JavaScript, with many syntax similarities. However, the ActionScript client model is based on movie clips, text fields, and sounds; and the JavaScript client model is based on windows, documents, and forms. While the ActionScript client model is natural for designers, it is foreign to enterprise developers.

ActionScript Integration with JavaScript. Macromedia has released a Flash/JavaScript Integration kit[7] that allows seamless communication between Flash and JavaScript. With the kit, you can now call JavaScript functions from Flash and ActionScript functions from JavaScript. This mixed client-side model is becoming more popular. An often-cited example implementer of Flash and JavaScript is Flickr.[8]

FLASH CLIENT-SIDE MODEL. Designers and developers can use Macromedia Flash MX 2004, as well as third-party tools, to develop content and applications for the Flash runtime. As mentioned above, the programming language is ActionScript, using the movie client metaphor, and the executable is a SWF.

FLEX. Flex is Macromedia's solution to bring rich clients to enterprise-class applications and to the enterprise development community. Flex addresses specific user experience challenges: multistep proc-

[5] In a security sandbox 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 and other sandboxes is controlled. This is similar to the model used for Java and JavaScript. For more information, please see http://www.macromedia.com/devnet/flashplayer/articles/client_security.html.

[6] For more information, see http://www.ecma-international.org/publications/standards/Ecma-262.htm.

[7] http://weblogs.macromedia.com/flashjavascript/

[8] http://www.flickr.com/

Flex Architecture

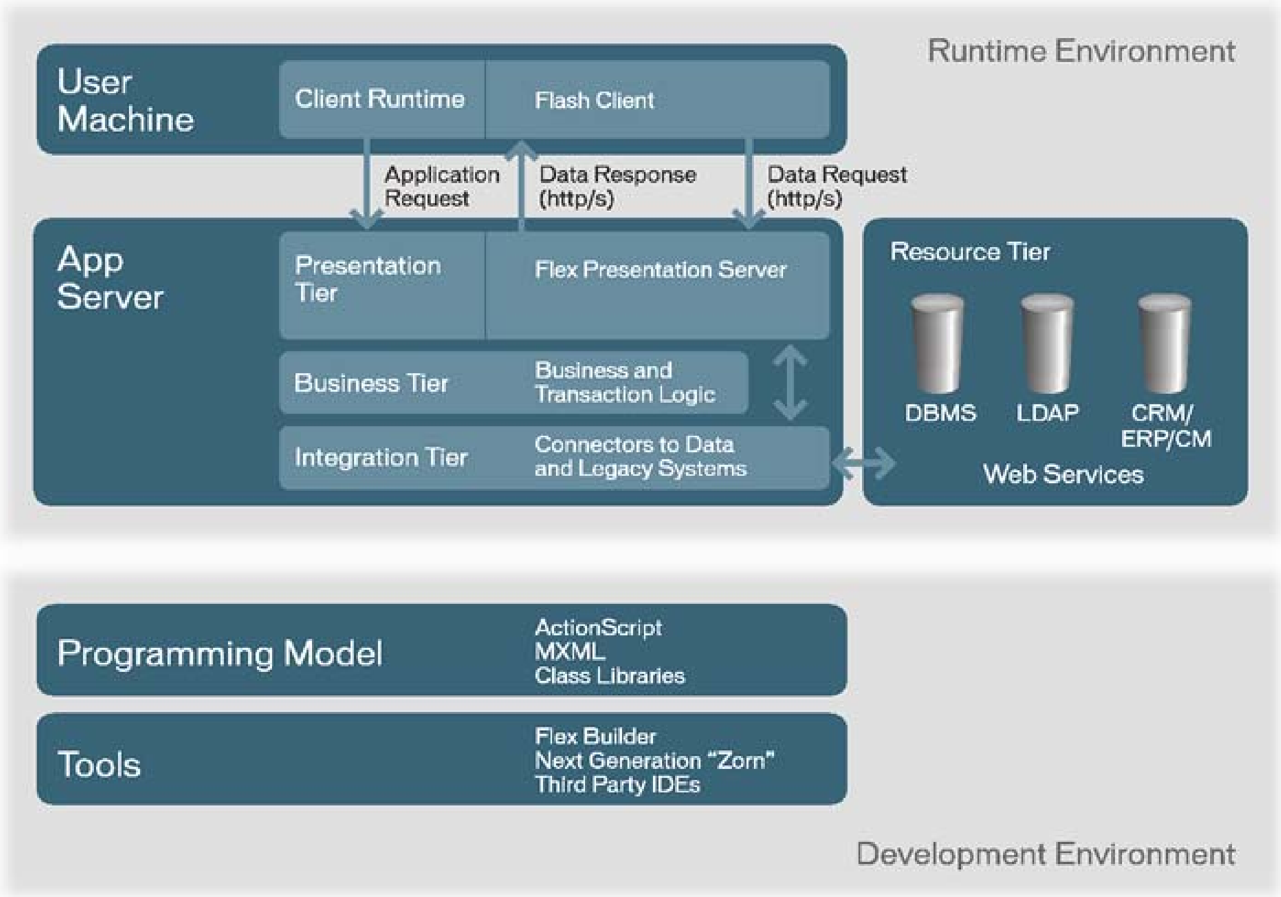

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Illustration 2. Flex brings the power of rich interfaces to enterprise-scale applications, thus providing an infrastructure for rich Internet applications (RIAs).

esses, client-side validation, direct manipulation, and data visualization.

Macromedia sees these challenges appear consistently in applications for guided selling (product configurators, comparison engines, product selectors, shopping carts/check-out, etc.), self-service (hotel reservations, order entry, online banking, etc.), and dashboards (business intelligence applications such as sales reporting, requiring sorts, filters, and drill down). Macromedia (rightly) contends that providing rich client experiences improves user focus, speed, and absorption, which lead to business benefit.

Macromedia shares that after T.J. Maxx[9] replaced its HTML-based check-out process with one based on Flash, the company increased its conversion rate (buying after placing items in cart) by 50 percent.

Flex is comprised of a programming model, presentation server (Flex Server), development tooling, and (of course) the Flash client runtime. See Illustration 2 for Macromedia's depiction of Flex.

[9] http://www.tjmaxx.com/

Macromedia designed Flex to fit into existing development practices and enterprise infrastructures. Development practices include:

- **Programming Model.** The Flex programming model adds the MXML interface language and a Flex class library to the ActionScript scripting language. MXML is an XML-based markup language that allows the developer to lay out the user interface and perform data binding and manipulation. The Flex class library has prebuilt components for UI and data binding (SOAP, XML/HTTP, J2EE).

- **Deployment.** Similar to Java Server Pages (JSP) development, Flex code assets deploy as files to the presentation server, and the code compiles into an application upon the first user request. The difference in Flex is that the code compiles into an executable (SWF) to run on the Flash client runtime.

- **Enterprise Application Practices.** Flex is designed for shops that use n-tier or service-oriented approaches to application architecture, specifically using the Model/View/Controller design pattern, separating presentation logic from business logic. In the Flex model, there is essentially a client-side view controller and a server-side business-logic controller.

- **Development Tooling.** Currently, Macromedia offers Flex Builder for tooling. As well, MXML is schema based, so developers can use other XML-schema-aware editors. To meet the enterprise developer's experience expectations, Macromedia has joined the Eclipse Foundation[10] and will develop tooling based on Eclipse (code-named Zorn), which will allow developers to work in an environment and development metaphor (projects) that they are familiar with.

Enterprise infrastructures include:

- **Flex Presentation Server.** The Flex server is the presentation tier in an enterprise application. The Flex server compiles and caches the interface, serves it to the client runtime, responds to data requests, and integrates with back-end components (the model layer) to fulfill those requests. In addition to standard data requests, Flex embeds Flash Platform capabilities, such as Flash Remoting gateway and a media transcoder, to serve content requests as SWF.

- **Flex Server Is a Java Application.** Since the Flex presentation server runs as a Java application in a standard application server, it can exploit existing application logic (Java, Web Services, XML/HTTP) and J2EE services (authentication, session management) using Java constructs.

- **Mistral.** The next release of the Flex Presentation Server, code-named Mistral, adds transparent data persistence across tiers to support occasionally connected clients, data synchronization, a data-push infrastructure, and large data set paging.

For more information on Flex, see Macromedia's Flex Technology white paper.[11]

Communications and Flash Cast Experience Servers

In addition to the Flex presentation server, the Flash Platform includes a server for collaboration (Flash Communication Server) and a server for wireless operators to deliver rich content to mobile devices (FlashCast). Accompanying both servers are client solutions: Breeze for collaboration and FlashCast for mobile devices.

FLASH COMMUNICATION SERVER. The Flash Communication Server integrates streaming audio, video, and data into a collaborative multiuser Flash application. Application examples are chat, shared whiteboards, Webcasts, and Web conferencing. These applications are client/server applications, with a Flash client interacting with the communication server using real-time message protocol

[10] http://www.macromedia.com/macromedia/proom/pr/2005/eclipse_flashplatform.html

[11] http://www.macromedia.com/software/flex/whitepapers/pdf/flex15_tech_wp.pdf.

(RTMP), which enables a persistent connection between client and server.

The communication server provides two communication models: streams and shared objects. Streams enable two-way audio/video communication. Shared objects allow multiple users to view data, make updates, and receive all other changes to the object in real time. An example of a shared object is a text field that is used for a multiuser chat display. All users can chat in the text field and see the chat of all other users.

Breeze Is a Communications Server Application. Macromedia Breeze, the collaborative meeting, presentation, and training solution, is built using the Flash Communication Server. We reviewed Breeze 4.0 in May 2004[12] and were impressed with the quality of online meeting experience for collaboration and presentation. Since our review, Macromedia has released Breeze 5.0, which has new features for teleconferencing and improved capabilities for meeting convocation.

Edison. The next major release of Flash Communication Server, code-named Edison, will support new high-fidelity video capabilities and provide integration with the Flex programming model. The Flex integration will facilitate adding communication elements to rich Internet applications; this will be particularly powerful for contact center applications and corporate intranet environments.

MOBILE STRATEGY. Macromedia's mobile strategy targets three audiences: content providers, handset/device manufacturers, and wireless operators. The content providers and handset/device manufacturers use the Flash Lite client runtime and Flash Authoring tools to develop rich applications for the device and, in some cases, the handset/device interface.

FlashCast. For wireless operators, Macromedia offers FlashCast, an end-to-end solution comprised of a client, a server, and a programming content framework. The FlashCast server is a carrier-grade J2EE application that manages subscriber accounts, aggregates and delivers channel content, and logs usage for billing. The FlashCast client is a device-resident application that manages local channel content and user preferences. The FlashCast client runs on Flash Lite and communicates with the FlashCast server.

PATRICIA SEYBOLD GROUP TAKE

What We Like

Macromedia and its Flash Platform impress us for the following reasons:

- With the Flash Platform announcement, Macromedia shows a cohesive strategy for delivering rich experiences (content, communication, applications) across touchpoints. The strategy is based on a common architecture (Flash Runtime, Programming Model, J2EE), and the Macromedia end-user solutions (Breeze, FlashCast) leverage the infrastructure offerings.

- Macromedia continues to invest in performance improvements. Performance, or lack thereof, is a top reason why end users abandon transactions and/or sites.

- Macromedia is bringing rich Internet applications to the enterprise in a way that makes sense for enterprise IT. The Flex model fits into existing runtime architectures, leverages back-end resources, and can provide a rich front end for n-tier applications and service-oriented solutions.

- Macromedia recognizes that its way isn't the only way. Macromedia allows for development in other tool sets (publishing SWF, XML schema for MXML) and integrates Flash ActionScript with JavaScript.

- Macromedia gets how people work and live. The Flash Platform enables intuitive interactions, mobility, occasional connectedness, and collaboration.

[12] See "Macromedia Breeze Live" by David S. Marshak, May 27, 2004, http://dx.doi.org/10.1571/pr5-27-04cc.

Macromedia's Challenges

We see several challenges for Macromedia, including:

- There are competing, standards-based, technologies to solve the RIA problem:
  - **AJAX.**[13] AJAX is the acronym recently applied to the combined use of XHTML and CSS for presentation, document object model for dynamic display and interaction, XML and XSLT for data interchange and manipulation, XMLHttpRequest for asynchronous data retrieval, and JavaScript to bind everything together. Google Maps[14] is an example of a rich client application developed using AJAX. While AJAX does leverage existing industry standards and is gaining popularity (and/or press), it is a complex endeavor and bumps up against browser compatibility issues.
  - **Java.**[15] Java offers Java Swing (an easier-to-use Swing abstraction), Java Desktop Network Components (JDNCs), and Java Server Faces. Java Swing targets the desktop but can be deployed in a browser. Java Server Faces is a server-side, browser-intended interface technology.
  - **XAML.** [16] Extensible application markup language (XAML) is the new interface definition language in Microsoft's Longhorn release. While Longhorn is not available, organizations and communities have been developing tools and XAML applications using the early release information from Microsoft.
- While opening up the SWF format is smart to gain community and browser penetration, it opens up competition in tooling (design/developer) and in the presentation tier. OpenLaszlo and XAMLON offer solutions for creating SWF files using tools and scripting languages (JavaScript, .Net) that are in the enterprise developer's wheelhouse. Since Macromedia's revenue stream is from tooling, not the Flash Player, this could become an issue over time.
- An initial reaction in the Flash designer and development community is that Flex has a high price tag. While this group is not the intended audience of Flex, this community contains influencers who would love to bring Flash into the enterprise.

Macromedia's Strengths

Macromedia's strengths include:

- Flash Player has widespread penetration (98 percent of Internet-connected PCs) and has a quick upgrade period. (A new release of Flash Player achieves an 80 percent reach in about 12 months.)
- More than 1 million designers and developers are working with the Flash Platform today. As the demand for rich Internet applications increases, this group will be tapped to provide user interface design and development in the enterprise. This group will be able to influence the choices made by enterprise IT.
- Macromedia has strong partnerships with such companies as SAP, HP, NTT Docomo, Yahoo!, AOL, Comcast, Samsung, NEC, and Nokia. SAP has adopted Flex to provide the user inter-

[13] The term "AJAX" (for asynchronous JavaScript and XML) was coined by Jesse James Garrett of Adaptive Path. See http://www.adaptivepath.com/publications/essays/archives/000385.php for Jesse's essay on AJAX.

[14] http://maps.google.com

[15] Java Swing: http://java.sun.com/products/jfc/index.jsp, JDNC: https://jdnc.dev.java.net/, Java Server Faces: http://www.jcp.org/en/jsr/detail?id=252.

[16] http://winfx.msdn.microsoft.com/library/default.asp?url=/library/en-us/wcp_conceptual/winfx/core/overviews/about%20xaml.asp

face framework for its next release of SAP NetWeaver Visual Composer.[17]

- There are 300 Flex customers in its first year of availability, in a variety of industries (platform vendors, telecommunications, government and defense, education, financial services, retail, software, and pharmaceutical).

- The resulting experiences, delivered using Macromedia's solutions and design guidance, are truly powerful.

SUMMARY

With the Flash Platform announcement, Macromedia demonstrates a cohesive strategy—built around proven, highly penetrated products—to continue on its mission to "provide the solutions that make great digital experiences possible."

To be successful, Macromedia needs to keep performance and the experience of its different designer and developer communities in the forefront. With the release of its roadmap, it appears Macromedia is heading in the right direction.

We can't wait to see the next wave of rich applications that our customers come up with!

[17] http://www.sap.com/company/press/press.epx?PressID=4519.