



Kevin Lynch on Adobe's AIR: Extending the Web beyond the Browser

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On February 25, 2008, Adobe Systems launched version 1.0 of the Adobe Integrated Runtime, or "AIR," which allows software programmers to use web-development tools to create desktop software applications that run on all the major operating systems: Windows, Mac and -- coming soon -- Linux.

For Adobe, AIR is a big bet. At the launch event, CEO Shantanu Narayan described AIR as Adobe's "fourth platform," positioning it as the next link in the chain that includes PostScript, Acrobat's PDF (Portable Document Format) and Flash. The first three created disruptive paradigm shifts in their respective fields -- typesetting and document printing, electronic document interchange and web interactivity -- and all have generated significant revenue for Adobe. Adobe hopes AIR will follow suit

One company not sitting idly by on the sidelines is Microsoft. On March 5, the software giant released a beta (test) version of the next generation of its Silverlight technology. The first version of Silverlight was aimed at combating Adobe's success in establishing Flash as a popular method of delivering video over the web. The most recent release of Silverlight, version 2, is targeted at Flash's ability to create what Adobe terms "rich Internet applications" -- web-based software programs that provide many of the features associated with traditional desktop software.

While Microsoft's Silverlight competes with Adobe's Flash, Microsoft doesn't have a technology that directly compares to Adobe's AIR. When Knowledge@Wharton recently [spoke with Microsoft corporate vice president Scott Guthrie](#), he said he doesn't see a big opportunity for "a web-based model for applications" of the type AIR enables.

Thus the contest between Microsoft and Adobe over the next generation of software development tools is, to some extent, based on differing views of the future of computing. For Microsoft, the future lies in what it terms "software plus services" -- that is, using traditional desktop software (like the company's popular Office franchise) to connect to the web to access online services. Adobe believes the future rests on cross-platform software that allows developers to use web-based tools to build applications that run inside a web browser or, with AIR, can be installed as full-featured desktop software programs.

For example, the recently released the Adobe Media Player, built with AIR, can both access online video subscriptions and organize locally-stored Flash video files. In the works is an AIR version of Buzzword, a word processor with many of the basic text formatting features found in Microsoft Word and similar programs. A number of other companies including eBay, AOL and Salesforce.com have deployed AIR applications. Adobe hopes many more will follow.

Leading this drive to establish AIR as the next major platform for software development is 41-year-old Kevin Lynch. Lynch joined Adobe as Chief Software Architect when the company acquired Macromedia in 2005. On February 5, 2008, Lynch was made Adobe's Chief Technology Officer.

Knowledge@Wharton recently spoke with Lynch about his new role at the company and why he believes



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AIR is important to developers, consumers and business users. An edited version of that conversation follows.

Knowledge@Wharton: You were recently given the title of Chief Technology Officer at Adobe. How is that different from your previous role as Chief Software Architect?

Lynch: Some people now confuse me with the CIO [laughs]. We have a great CIO and it's not [me].

I'll be involved more with Adobe overall in terms of our technology direction and the problems we are trying to solve; working across the different business units at Adobe. To some degree, I was already doing this in my previous role with the platform technology [unit at Adobe] because it touches so many of the other things that we do. This is formalizing that more.

In terms of my day-to-day activities, I'm continuing to work with the platform [group] and I'll also be working with our design group called XD -- Experience Design -- to pull together our Experience Design and our platform efforts. They are obviously somewhat related -- you can see a lot of great design in the Flex framework and in the applications we produce -- but there's more opportunity to build usability and best practices into our frameworks that we are learning from the XD group.

Another [focus] is the core technology group, which works on developing software across almost all of Adobe's products -- like imaging, font management and text handling -- deep technology that is used in products like Photoshop, Illustrator and other areas. That will add more of a connection between the platform technology and the software that we're building across Adobe. It's an interesting new opportunity.

We recently brought our mobile technology group together with our desktop technology group, and I'm [also] leading [that] right now. And I will continue to be speaking outside of the company about our direction and our strategies.

Knowledge@Wharton: You recently launched release 1.0 of AIR. Can you explain what AIR is and the vision behind it?

Lynch: AIR grew out of our early thinking about rich Internet applications around 2001. We started to see web developers pushing the boundaries of what could be done inside the browser and taking advantage of Flash in ways that we hadn't expected.

The Broadmoor Hotel was one of the first to do this. They had a multi-page check-out experience for reserving a hotel room built with HTML. They changed that to what they called "a one screen interface" using Flash and saw a dramatic increase in the number of reservations booked online.

We looked at that as an early sign of what was to come. But those applications were far too hard to build. At the time, there weren't even components in Flash to do things like scroll bars; everything had to be built from scratch. We started thinking: How are we going to make this happen in a more mainstream way?

We introduced Flex, which is a high level framework for building applications; we made the virtual machine in Flash about 10 times faster; and we support modern scripting languages to build these applications.

AIR came out of that thinking. We started looking at: Okay, if these applications become very popular over the next few years, what problems are we going to see?

Some of the challenges could be solved within the browser. When we [moved] from the desktop to web application development we gained a lot in terms of distribution, working across operating systems and ease of updating applications. But we lost things like access to the local file system, drag and drop, the ability to notify the user if something changes. So we thought: How can we get those things back?

AIR was born from thinking about how rich Internet applications would play out over time and what new pieces of technology would be in demand for these to go to their next generation. AIR is basically enabling these web apps to come to the desktop.

Knowledge@Wharton: At the launch event, Adobe CEO Shantanu Narayen characterized AIR as the fourth platform in Adobe's history -- following PostScript, PDF and Flash. How big a gamble is this for the company?

Lynch: We think there's a big shift of software development to the web and that this is going to affect software companies in general. Just like the Internet has transformed the media industry or the e-commerce industry, the software industry is also being affected dramatically by the Internet.

If you look at a company like Adobe, the majority of our business is still software that's built by teams, put on CDs and shipped in boxes. But we think the trend is towards hosted applications, software as a service, applications built with web technology. AIR is a way for us to enable this new generation of applications ... so you're not limited by what you can do inside the browser.

The soul of our company is building software that enables people to communicate, that works across whatever [computers or devices] you have. The more diversity there is, the better off Adobe is.

We solved the cross printer problem with Postscript; we solved the cross word-processing program problem with PDF. And with Flash, we solved the [problems of] multimedia and video incompatibility across the web.

The next frontier is the cross operating system application runtime. In some ways, it's the biggest one. I'm excited about it.

Knowledge@Wharton: Aside from the benefit that AIR brings to software developers, what impact will this technology have on consumers or business customers?

Lynch: Applications are becoming increasingly web-based. Rather than relying on software written for a particular operating system, people are relying more and more on web technology for getting information, doing business transactions, expressing themselves creatively. The digital revolution that's happening now is with web technology.

But the technologies within the browser today aren't enabling consumers to have a lot of the capabilities that they used to have [with traditional desktop software].

If you like keeping in touch with other people on your social networks, like Facebook or Twitter, a lot of those applications are in the browser. But if, for example, you want to be notified when someone Twitters about you or wants to chat from Facebook, you can't do that very well inside the browser. That's just a simple example, but that's driving the popularity of some [of what] we are starting to see [happen].

A lot of applications inside enterprises used to be created with Visual Basic, for example, or were deployed to particular OSs. We've seen a revolution within companies where people are building web applications, which has a lot of benefits from an IT perspective. These applications are easier to monitor because you just update them on the server and everyone gets [the updated version]. They don't have to worry about having a particular configuration on the desktop. You can have Mac, Windows, Linux, whatever you like, and your internal applications will work. And they are easier to develop. You can have web developers creating these applications in conjunction with traditional IT architecture on the server side.

While enterprises gained a lot when they went to the web, they also lost the ability to use information while they're on the road. For example, companies have directories for everyone who works there. You can usually look up information on those directories while you are inside the firewall, but while you are traveling, either you don't have a network connection or you have to [connect through a] VPN to get that information.

At Adobe, we have a directory application built on AIR that enables you to look up anyone's information on your local computer. People carry around the 7000 entries of everyone at Adobe on their computers and it synchronizes the directory when they are connected inside the company. AIR supports local encryption of files, so other applications can't look at that [data]. That enables us to have an internal IT application that has some of the benefits of traditional desktop application, but it's built with web technology.

Knowledge@Wharton: Despite all the features you mention, when we spoke with Microsoft's Scott Guthrie, he said that he didn't see a "big opportunity" for this type of software. How big is the market for AIR and how will you assess its success in, say, a year?

Lynch: If you look at what's happening with computing, there are increasing layers of abstraction. There was a time when we didn't have operating systems. You [set switches to] toggle programs [directly onto the hardware]. Then there was a kernel and [device] drivers. Then there was an OS and APIs [application programming interfaces]. I see AIR as another layer of abstraction that sits above the operating system.

If you're working in an operating system company, you might say, "Hey, I don't really see a need for that because we already have an operating system." That's missing the point of what the web is. The web is a technology that works *across* operating systems. The web has done that for pages [of content]. With AIR, we're bringing that capability to applications.

From the success perspective, AIR will be similar to what we have done before with Flash Player and Reader and other technologies. We will focus on getting the runtime distributed so developers can take advantage of it. We'll also make it possible for that runtime to be auto-installed, so if the user wants [an AIR] application and they don't have AIR, they will automatically get AIR, too.

That creates a virtuous cycle, where we start pushing the runtime out, developers start adopting it and the applications that use AIR continue to make that flywheel spin faster and faster.

We're looking for ways we can help get AIR out into the marketplace ourselves -- the push part of it -- by setting up distribution channels with things like Reader. Then the pull part will kick in when people start building popular applications -- whether that's Pounce or Twitter or eBay or NASDAQ.

Knowledge@Wharton: There also seems to be a philosophical difference between Adobe and Microsoft in how you view web-enabled software. Microsoft sees a sharp dividing line between what you do inside a browser and the applications you run on your desktop -- while AIR spans that gap in some ways. Is there a concern that AIR blurs a critical security distinction between a protected browser app and a desktop app with full access to the operating system?

Lynch: I think that's a bit of a red herring. AIR is enabling applications to be built with web technologies -- using things like HTML, Flash and Flex -- and it brings those applications to the desktop with the rights of a desktop application. Otherwise, there's not much point in bringing them to the desktop.

The installation process for AIR lets the user know that this application was signed [with a digital certificate] by a particular vendor. You can approve or disapprove it. If you approve it, then it does have capabilities like other applications you install on your computer. It's very much following the desktop application model in enabling these applications to be more functional and act like desktop applications, but run across operating systems.

If you think about how an OS vendor might look at this, certainly there is motivation to help distinguish the OS from the web and try to talk about how the OS can do things that the web can't.

We're focused on enabling the web to extend to the desktop. That is, I think, a disruptive move and will be revolutionary for people who are building these applications and want to distribute them across operating systems, rather than having this big chasm between the web and the desktop which some would say needs to be there.

We see a revolution in how people are building software now, and that revolution is the web. We are betting on that movement and enabling those applications to live up to their full potential as desktop applications.

Knowledge@Wharton: The AIR run time is available as a free download. The AIR Software Development Kit is available for free. How does Adobe make any money from this technology?

Lynch: That's a great question. It's the same strategy we've pursued in other areas with Reader, which is free. Adobe initially tried to sell Reader, but we learned from that experience. The dynamic now in the

industry is that you give away portions of your technology and you hope that other portions will drive revenue. We give away Reader, Flash Player, the Flex development framework and now AIR. The revenue comes, we hope, from several areas.

One is tooling -- we build some of the best tools in the world. The more people build things that work on Flash or AIR, the more interest we hope to drive to our tools: Photoshop, Creative Suite, Dreamweaver and new tools like Flex Builder. You don't have to use our tools for any of these things, but we try to make the best tools in the world, so people do [use them].

The second is our server technologies. Again, you can use any server technology that you want with our clients. But we make servers like LiveCycle to manage business process workflow, document production and reliable document sharing; Flash Media Server for streaming of video; and ColdFusion, of course, which is a rapid application development framework.

Those server technologies are well connected to our client technologies. LiveCycle is well connected to PDF, so that you can create applications that feed data back into LiveCycle and then produce a PDF. And it is now well connected to Flex and AIR. We are gluing these together in ways that make it super productive for developers.

A new area where we have several projects underway is hosted services. One is code named "Share," which is a way to store documents in the "cloud" [on remote servers] and share them with other people. It is a "freemium" [free/premium] service: You can use it to a certain degree for free and then pay a premium if you want to have more space to store documents, for example. Right now, it's in beta. Other technologies will be coming out over the coming year or two.

Buzzword is an online word processor and again uses a "freemium" model -- you'll be able to use it to a certain extent for free and then there will be a subscription associated with it.

On top of the platform are applications. Most applications will be built by people out on the Internet, but we'll build some ourselves. One of those, for example, is Adobe Media Player. With all of the popularity of Flash video, we didn't have our own standalone media player. We now have one built on AIR, and it also is free to end users. The way this generates revenue is: You can either watch free video streams or, if the content providers want to monetize their content, they can associate advertising with it, and then we share in the advertising revenue.

There are a number of ways that we're looking to generate revenue around these technologies. Strategically, we feel like the more we can help innovate and move the expressiveness of the web forward, the better off Adobe is in terms of enabling people to produce that expressive content with our tools and our servers.

Knowledge@Wharton: Where might an abstraction layer like AIR take us in the future?

Lynch: AIR is not only going to be on desktop PCs and laptops, but also on a range of devices. We are embarking on this with a number of partners. We don't have a lot of announcements to make because it's still early. But we are attempting to bring AIR to [multiple] devices so you will be able to use an application, for example, on a mobile phone and use that very same application on your PC.

This has long been a goal of many technologies. There are a lot of challenges in making it work, but those are the same challenges we faced in making our other technologies work across disparate environments. That is going to be a huge boon for people developing [software] across all these different computing environments.

That's a big focus for AIR that's going to change things a lot.

Knowledge@Wharton: More broadly, whether talking about a desktop app, a browser app or an AIR app, the notion of storage and computing in the cloud is becoming popular. How important is that trend and what are the greatest impediments to its success?

Lynch: The cloud computing model is central to building web software. But there needs to be a balance between local client computing and cloud computing. The best applications will have an architecture that

leverages both -- they're not totally in the cloud and not totally on the client.

AIR, in particular, is designed for that model. You can take advantage of the local computing environment in a way that is functional across OSs. You can do local processing, even when you are offline. But you can also take advantage of services in the cloud and even integrate the best data from multiple sources across the cloud into one application. The blended model of cloud and client is one that takes the best advantage of the computing landscape.

One could say, "Hey, it's all going to be cloud computing," but that is ignoring all the processing power that we have in front of us on our computers. Or you can say, "Hey, it's really still about the desktop," but that's ignoring the revolution of the Internet and all of these services available in the cloud. You want a solution that helps you balance across both. That's hopefully the architecture we're building.

Knowledge@Wharton: Doesn't this cloud/client hybrid environment demand services that don't exist yet -- like convenient sync between local storage and cloud storage, and identity management across these various platforms? There's a lot of infrastructure needed to make this happen. Is this a space Adobe will move into?

Lynch: There are lots of opportunities to create technologies to help people build apps in this world, some of which we already are working on and have talked about, some of which we haven't yet.

If you look at synchronization, for example, we already have a framework for synchronizing data between multiple clients and the server. I think you'll see more progress from us in those areas.

Look at what we're doing with the project that's code named "Share," [which provides] a cloud storage service that people can use to integrate with their applications. We have a collaboration framework code named "CoCoMo" if you want to build an application that isn't just about synching data, but helps people [synchronously] collaborate with each other -- having them be present in the same application at the same time.

It's not just a solo experience with data. It is people connected on the Internet and working together to collaborate live.

Some of these are underway already, some are new and some we're just thinking about. But you'll see a lot of innovations from us and other people -- even some new things that we haven't done before.

Knowledge@Wharton: Much of your platform strategy -- whether it's Flash, Flex or, to a large extent, AIR -- is based upon Flash's SWF file format as a core technology.

Lynch: That's right.

Knowledge@Wharton: Microsoft recently launched a beta of Silverlight 2.0, which moves Silverlight into this rich Internet application space. What's your assessment of Silverlight as a competitive threat to Flash?

Lynch: Silverlight is clearly working to compete with Flash Player. Their initial move was to work to provide higher quality video than Flash had at the time. We responded very quickly and updated Flash Player to add both HD [high-definition] video and H.264 [video format] support.

We see H.264 as becoming the industry standard for video. H.264 is an ISO [International Organization for Standardization] standard. It's been built into consumer electronics -- television sets, settop boxes, cell phones, camcorders and hardware accelerated encoders. The quality of video in Flash is back on par with anything else out there. And it's widely distributed -- 99% of computers on the web have Flash Player.

The update rates of Flash continue to accelerate. When we come out with a new version of the Flash Player, we get over 90% of the web [using the updated version] in less than a year. That means that the rate of innovation can go much more quickly than [with other technologies].

The reach of Flash is greater than any other technology on the web -- including any operating system. It's got more reach than Windows, for example.

I think that we're in a great position with Flash. It took us a decade and a lot of focus and investment to get where we are now.

Flash is only successful because people around the world find it productive to build content in the Flash format. It's not just an Adobe story; it's a story of the Internet and the web choosing to use Flash as a reliable delivery mechanism for their content.

Silverlight is working to compete with that. It's good to have competition -- it keeps everybody on their toes. But we're certainly not resting on our laurels.

Knowledge@Wharton: What would you say is the biggest threat to Adobe's continued success in the future?

Lynch: There are fundamental changes happening in the industry that all software companies need to embrace or they will [face] a long-term threat. These types of disruptions have happened before in technology. Western Union was a leader in the telegraph, [but when] Bell invented the telephone, Western Union couldn't see the value of that shift. And they're not as successful today as they were in the heyday of the telegraph.

The same is true with these disruptions today. They include the move from native, OS-specific applications to web applications. We're a leader in enabling that transition to happen with things like AIR. We're focused on taking advantage of that shift, not only with our enabling technologies, but also our applications like [our online services] Premiere Express, Photoshop Express and BuzzWord.

Another thing happening is that the world of computing is not just PCs -- it's also mobile devices. We talk about them and we carry them around, but software companies are still primarily using personal computers to make software for other people to use on personal computers.

Already there are more mobile devices connected to the Internet than there are PCs. In some countries, the culture has completely skipped the PC era and gone [directly] to mobile. Even here in the U.S., that shift is happening. And yet, as software developers, people are still designing web pages or applications for big screens.

We're unifying those efforts so that we have a cohesive view across these devices.

The third thing is that the Internet has enabled this incredible social network of people, and that is changing software in a number of ways. In the early days of making software, we would get feedback from customers who would write us letters. And I still get letters [laughs].

But the bulk of that communication has moved to electronic communication, whether that's email or discussion groups communicating with us about what we should do and asking how to solve problems. That conversation has evolved over time [to become] a rich dynamic between the teams building software and the people using the software.

Macromedia and Adobe have embraced the social dynamic in how to build software that's responsive to people. Look at [Adobe] Labs, for example, [where] people could participate in the development of things like LightRoom, Flex Builder and Photoshop Express.

That has evolved to where people not only want to make suggestions about software, they want to contribute to the software itself. This social network around software is actually the underlying pressure to move to open source. It's not just for the philosophical goodness of being open -- [although] there are a lot of benefits to being open -- but it's moving the software forward by involving your customers.

These are not solo experiences. They're network-connected social experiences, and so software has to change in that way, too.

Those are the three major transformations that are happening simultaneously right now. As a software company, it's critical to be on top of those changes, contributing to them and making sure you change with them.

At Adobe, we're really focused on making that transformation. We've gone through several of these before -- we just celebrated our 25th anniversary as a software company, which is rare in the software industry.

That's due to our ability to change with the times and establish ourselves as a leader in each of these different revolutions, whether desktop publishing or multimedia or CD-ROM production or web publishing. And now, rich Internet applications. We actually coined the term, "rich Internet applications." We're a leader on these trends and that will carry us forward as technology continues to evolve.

I'm sure, in the next five or six years, there will be another revolution, and we'll need to be on top of that. That's part of the fun -- being in the thick of it. As much as you think you might have solved the problems that are in front of you, there's a whole raft of new problems to solve.

That keeps me and everybody here engaged. That's the fun of this industry.

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