Pro Silverlight for the Enterprise

Ashish Ghoda

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I dedicate this book to my grandparents (Nayansukhray and Kumud Ghoda, Mahavir and Sarla Majmudar), parents (Jitendra and Varsha Ghoda), sister (Kruti Vaishnav), and lovely family (Pratixa, Gyan, and Anand Ghoda) whose blessings, sacrifice, continuous support, and encouragement enabled me to achieve this dream.

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ASHISH GHODA is a customer-focused and business values–driven senior IT executive with more than 12 years of IT leadership, technical and financial management, and enterprise architect experience. He is founder and president of Technology Opinion LLC, a unique collaborative venture striving for strategic excellence by providing partnerships with different organizations and the IT community. He is also associate director at a Big Four accounting firm.

Ashish Ghoda actively contributes to the IT community in the following ways:

- Provides strategic advice to achieve IT goals and define the product and the technology roadmaps of organizations
- Provides training and speaks on IT leadership areas and Microsoft technologies
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About the Technical Reviewer

A prolific writer on cutting-edge technologies, **FABIO CLAUDIO FERRACCHIATI** has contributed to more than a dozen books on .NET, C#, Visual Basic, and ASP.NET. He is a .NET MCSD and lives in Milan, Italy.

Acknowledgments

It has been a nice journey and a pleasant experience writing my first book.

First of all, I would like to thank the chief .NET editor of Apress—Ewan Buckingham—for keeping trust in me and giving me an opportunity to write this unique book on Silverlight. Special thanks to Kylie Johnston for keeping this aggressive project on track; to Matthew Moodie and Fabio Claudio Ferracchiati for their thorough technical review, technical editing, and valuable guidance; to Ami Knox for copyediting; to Kelly Gunther for shepherding the project through production; and to the other Apress team members who worked on my book. Without positive support from the Apress team, I could never have achieved this goal.

I would also like to thank Jay Nanavaty, an independent senior consultant and my brother-in-law. Without his significant contribution and dedicated support in the development of the Silverlight Rich Internet Applications (RIAs) for Chapters 2 and 5, it would be very challenging for me to finish the book in the given timeframe.

With blessings from God and encouragement from my grandparents, parents, and in-laws, I was able to accomplish this task successfully. My wife, Pratixa, and two little sons, Gyan (5 years old) and Anand (8 months old), have positively supported my long hours of work (including most of the weekends). I thank my family for their unbelievable cooperation and encouragement and for keeping their faith in me during this challenging time.

Introduction

Microsoft Silverlight is a cross-browser, cross-platform, and cross-device plug-in for delivering the next generation of .NET-based media experiences and Rich Internet Applications (RIAs) for the Web.

If you want to learn how Silverlight can fulfill an organization's need for an enterprise-level technology platform for RIAs, you need to understand how Silverlight can be applied in today's business environment rather than simply delving into the syntax and grammar of Silverlight in isolation.

This book is a one-stop guide to understanding Service-Oriented Architecture (SOA), Web 2.0, Enterprise 2.0, and enterprise mobility concepts. You will learn how you can adopt Silverlight in your organization and remain ahead of the competition by developing Silverlight-based simplified, rich, interactive, and loosely coupled RIAs and deploying them as Software as a Service (SaaS) in a secured environment.

I will demonstrate the enterprise capabilities of Silverlight for developing service-oriented RIAs. You will get hands-on experience by developing a Silverlight-based enterprise training portal integrated with WCF, LINQ, and external data sources. The developed RIA also demonstrates how you can utilize advanced features of Silverlight such as Deep Zoom, custom controls, and externalized dynamic user interface definitions. We will explore different deployment options (same-domain vs. cross-domain) to deploy Silverlight-based RIA in a secured, supportable, and maintainable environment.

Finally, I will discuss the future of Silverlight for Mobile and how to plan for its release. You will learn the basics of developing for mobile applications, including coverage of common pitfalls and traps you may encounter, and you will explore the key architectural considerations for developing mobile applications.

Who This Book Is For

This book is for enterprise architects, IT executives, IT professionals, the developer community, technical and project managers, and anyone who wants to start using Silverlight in a corporate environment as well as understand SOA, Web 2.0, Enterprise 2.0, and enterprise mobility concepts.

This book assumes that you are familiar with Silverlight and its syntax, .NET Framework 3.5 components (WPF, XAML, and WCF), C#, ASP.NET, and development tools such as Visual Studio and Expression Blend.

How This Book Is Structured

This book is mainly divided into four parts. Part 1, "Exploring Silverlight," details how Silverlight is capable of supporting the Web 2.0 concept through rich, interactive RIAs and builds the foundation for the rest of the chapters by showing you how to develop an example RIA, named My Album. This part contains the following two chapters:

- Chapter 1 defines the Web 2.0 concept and discusses the architecture and available technologies for developing advanced RIAs. It also provides a detailed overview on Microsoft's Silverlight technology architecture and the components of Silverlight that allow organizations to develop advanced enterprise RIAs.
- Chapter 2 serves as a foundation for the rest of the book. In this chapter, I show you how to develop a quick but sound and attractive Silverlight RIA, the My Album application. In Chapter 5, you see how to extend the architecture of the My Album RIA to develop an enterprise-level training portal RIA.

Part 2, "Enterprise Application Development with Silverlight," is the heart of this book. This part defines Enterprise 2.0 and SOA in the context of Silverlight capabilities and provides hands-on experience by walking you through the development of an enterprise-level, service-oriented, Silverlight-based RIA, the Enterprise Training Portal. This part contains the following four chapters:

- Chapter 3 defines the Enterprise 2.0 concept and the key objectives of an enterprise-ready technology platform. Here I also explain what makes Silverlight an enterprise-ready technology platform.
- Chapter 4 focuses on defining the SOA concept in detail, which involves the seven key principles—usability, flexibility, simplicity, reusability, scalability, maintainability, and security—of the SOA concept. This chapter also covers Silverlight's enterprise capabilities for integrating with WCF/Web Services and LINQ by developing a sample Silverlight application with dynamic UI creation and dynamic content population.
- Chapter 5 provides hands-on experience by showing you how to transform the My Album RIA developed in Chapter 2 into an enterprise-level RIA, the Enterprise Training Portal, utilizing Silverlight and its service-oriented features and capabilities.
- Chapter 6 defines the deployment process in general. Here you explore Silverlight deployment features and Silverlight application deployment options/approaches such as Silverlight in-package and on-demand deployment, and same-domain and cross-domain deployment. The chapter also discusses embedding the Silverlight plug-in into a web page, custom error handling, and Silverlight support for globalization and localization features.

Part 3, "Silverlight for Mobile," takes a look at the future of Silverlight for Mobile with the following chapter:

- Chapter 7 explains enterprise mobility and its key components so you can understand the role of mobile applications in Enterprise 2.0. Here I outline the basics of developing enterprise-level mobile applications, main architecture components, key design considerations, and different data synchronization models for mobile applications. This chapter also provides the latest updates on Silverlight for Mobile and potential capabilities of Silverlight for developing RIAs for the mobile platform.

Part 4, "Final Words," wraps up the book with one last chapter, which provides practical advice on how to adopt Silverlight in your organization.

- Chapter 8 discusses current challenges posed by Silverlight and key considerations and practical advice for organizations deciding whether to adopt Silverlight as part of their technology and product roadmaps.

Prerequisites

The design theory and Silverlight enterprise capabilities I discuss apply to Silverlight 2 and future versions (Silverlight 3 is planned for release later in 2009).

I developed the example Silverlight RIAs in this book with the following tools, which you may want to use as you follow along:

- Microsoft .NET Framework 3.5 SP1
- Microsoft Silverlight 2
- Microsoft Visual Studio 2008 SP1
- Microsoft Silverlight Tools for Visual Studio 2008 SP1
- Microsoft Expression Blend 2 SP1
- Microsoft Expression Encoder 2 SP1
- Microsoft Deep Zoom Composer

Downloading the Code

The source code for this book is available to readers at `www.apress.com` by clicking the Source Code link on this book's details page. Please feel free to visit the Apress web site and download all the code there. You can also check for errata and find related titles from Apress.

Contacting the Author

I really enjoyed writing this book and actually learned a lot. I am sure you will feel the same when you read about the enterprise-level design concepts for Silverlight RIAs presented herein and how to develop enterprise RIAs using Silverlight.

I appreciate your continuous comments and feedback. You can send them to me, as well as any questions, via e-mail at `AskAshish@TechnologyOpinion.com`.

You can also visit my web site, `http://www.TechnologyOpinion.com` (an enhanced version of the Enterprise Training Portal developed in this book), to access my latest articles, instructor-led onsite training information, and news on different IT areas including Silverlight.

PART 1

Exploring Silverlight

CHAPTER 1

Understanding Silverlight

The Web 2.0 concept drives enterprises to develop browser-based Rich Internet Applications (RIAs) that support different market needs, such as platform (operating system, browser, and device) independence, information collaboration, social-networking, rich user interfaces, high performance, and high security. Silverlight 2 is a Microsoft .NET Framework–based technology platform enabling us to develop loosely coupled plug-ins and RIAs at the enterprise level. Silverlight helps enterprises to achieve the Web 2.0 concept by implementing RIAs in a very agile and cost-effective way that can provide maximum customer satisfaction and thus can drive enterprises to transform information system centers from cost centers to profit-making centers.

This chapter is divided into two major sections. It starts by explaining concepts of Web 2.0 and RIAs. I will discuss the architecture and available technologies in the market that basically drive the development of advanced RIAs. The latter part of the chapter focuses on introducing and understanding Microsoft's Silverlight technology and its components that allow organizations to develop advanced enterprise RIAs.

Web 2.0 and RIAs

Today users' expectations are increased in terms of collaboration, usability, performance, flexibility, user-level customization, and security for two reasons. The first reason is the use of the Internet and web-based applications have become part of users' day-to-day life. The second reason is the use of IT to execute and integrate business processes within and across organizations is extensive. Additionally, in today's digital economy era, the increased use of digital media makes all types of information available in digital format and can easily lead to information overload if organizations don't manage that information properly. Organizations also need to implement governance policies for data retention and government compliance. Innovative Web 2.0 and RIA concepts drive organizations to develop and deploy second-generation cross-platform and cross-device web applications meeting many of today's market needs.

Figure 1-1 presents a view of the Microsoft Surface home page (`http://www.microsoft.com/surface`), which basically demonstrates the different opportunities of Web 2.0 and RIAs by providing a rich, interactive user interface to explain how the new Microsoft Surface platform can deliver rich services.

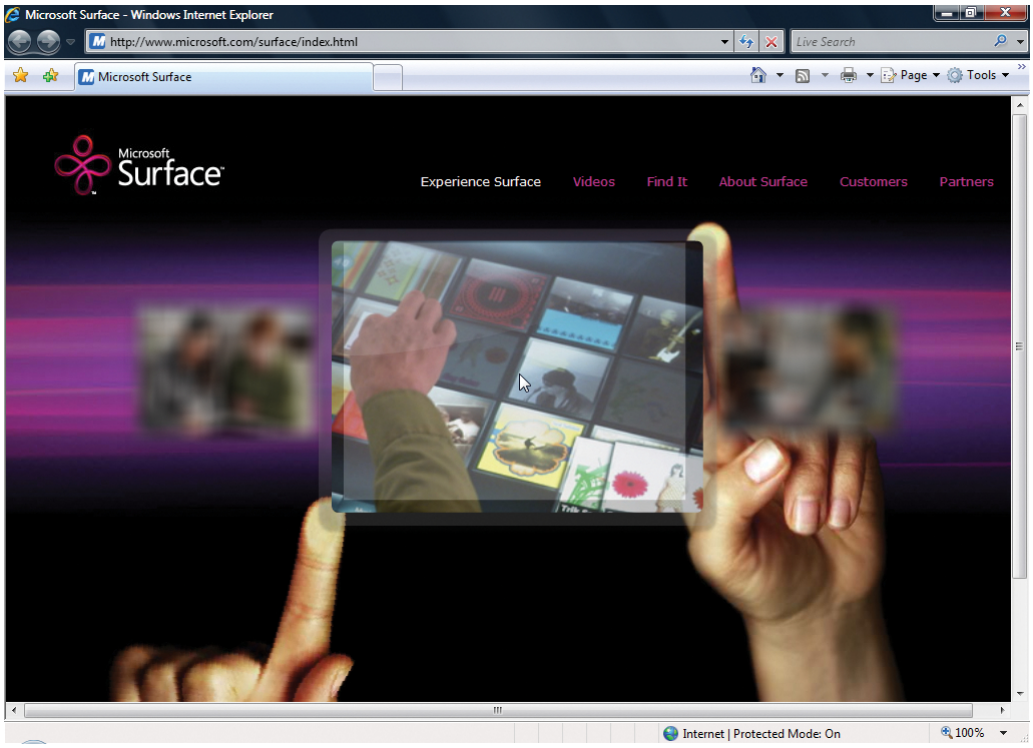

Figure 1-1. *Microsoft Surface home page: an example of an RIA*

Key Attributes of Web 2.0

Although there is no specific definition for Web 2.0, one of the most accepted definitions is by Tim O'Reilly:[1]

> *Web 2.0 is the business revolution in the computer industry caused by the move to the Internet as platform, and an attempt to understand the rules for success on that new platform.*

As shown in Figure 1-2, the following are key attributes of Web 2.0:

- Improved usability via *rich and creative user interface* that provides an interactive rich experience, which is very similar to desktop rich client applications. Web 2.0 applications *process audio and video seamlessly*.
- *Modular* and loosely coupled web-based application architecture that supports flexibility, user-level customization, and seamless content and process integration.
- *High-performing* rich and interactive web-based applications due to the following capabilities:
  - Separation between the *loosely coupled presentation layer and the data access layer*. This enables client-side processing and reduces overall server-side processing by avoiding round-trips.

1. Tim O'Reilly, `http://radar.oreilly.com/2006/12/web-20-compact-definition-tryi.html`, 2006

  - *Asynchronous communication* in the background to process different data process–related requests between client and server.
  - *Metadata management and data indexing* capabilities to structure and organize data that help to overcome information overload by providing the right information at the right time.
- *Collaboration platform* to share information among diverse and geographically separate groups.
- *Simplified and standard distribution protocols* and *metadata management* enables secured social-networking.
- *Platform-independent* technology that is cross-platform (i.e., available on different operating systems—Microsoft Windows, Apple Mac, Linux), cross-browser (i.e., available on different Internet browsers—Microsoft Internet Explorer, Mozilla Firefox, Apple Safari, Google Chrome), and cross-device (i.e., available on computers, mobile devices).

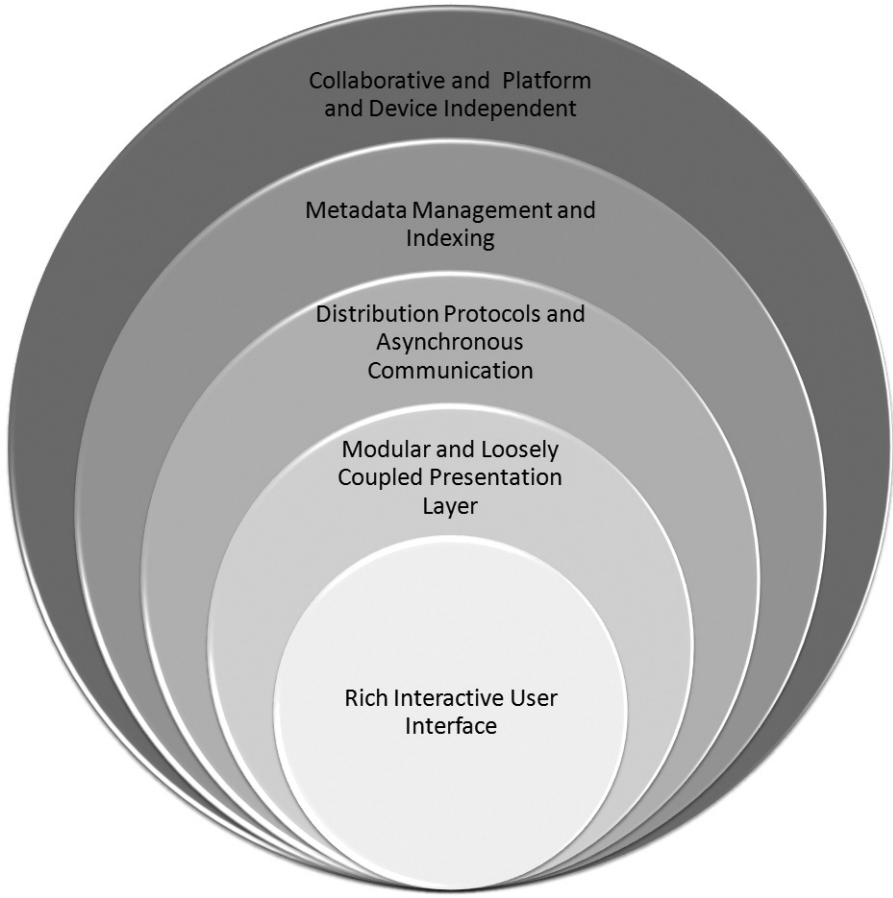

Figure 1-2. *Key attributes of Web 2.0*

Rich Internet Applications

RIAs are web-based applications incorporating the previously described key attributes of the Web 2.0 concept. Following is a simplified definition of RIA:[2]

> *Rich Internet applications (RIAs) are web applications that have the features and functionality of traditional desktop applications.*

From the end users' perspective, RIAs enable end users to collaborate information (content and media) securely and provide effective data search and social-networking capabilities with rich user interface. RIAs' user interfaces are usually high performing, interactive, and intuitive, and as such deliver rich user experiences.

As defined in a white paper published by Macromedia in 2002,[3] RIAs from a technology perspective should have the following capabilities:

- Provide an efficient, high-performance runtime for executing code, content, and communications.
- Integrate content, communications, and application interfaces into a common environment.
- Provide powerful and extensible object models for interactivity.
- Enable rapid application development through components and reuse.
- Enable the use of web and data services provided by application servers.
- Embrace connected and disconnected clients.
- Enable easy deployment on multiple platforms and devices. If designed correctly, RIAs can support the concept of development and distribution of service-oriented software applications as software as a service (SaaS).

■ **Note** SaaS is a software deployment approach for software providers to deploy software as a service for public consumption. The deployed software as a service can be consumed by different consumers based on the subscription policies defined by providers.

RIA Architecture

It is essential to understand the architecture of traditional web-based applications before you understand the architecture of Web 2.0 and RIAs.

Figure 1-3 shows a traditional web application's architecture. As shown in the figure, these traditional client applications follow the client-server model to perform all the user requests and actions on the server side mostly in synchronous mode.

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2. Wikipedia, `http://en.wikipedia.org/wiki/Rich_Internet_application`
3. Jeremy Allaire, "Macromedia Flash MX—A Next-Generation Rich Client," `http://www.adobe.com/devnet/flash/whitepapers/richclient.pdf`

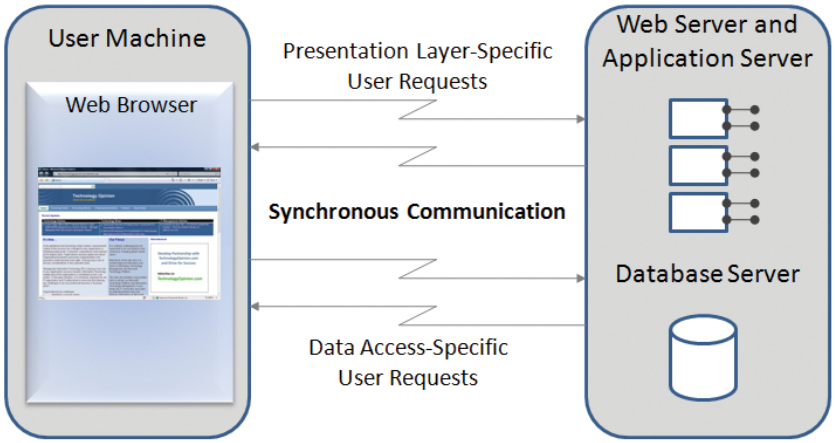

Figure 1-3. *Traditional (thin client) web-based application architecture*

Due to the sequential execution model and limitations of the rendered HTML user interface, traditional web applications lack the rich, creative, and interactive user interfaces of desktop applications. They lack the high-performing and modular application design that allows asynchronous communication between client and server in the background.

Figure 1-4 shows the typical RIA architecture. RIAs follow a hybrid approach to process user requests and actions. The presentation layer–related user requests and actions are performed at the web client side, and the data process–related user requests and actions are mainly performed at the server side asynchronously.

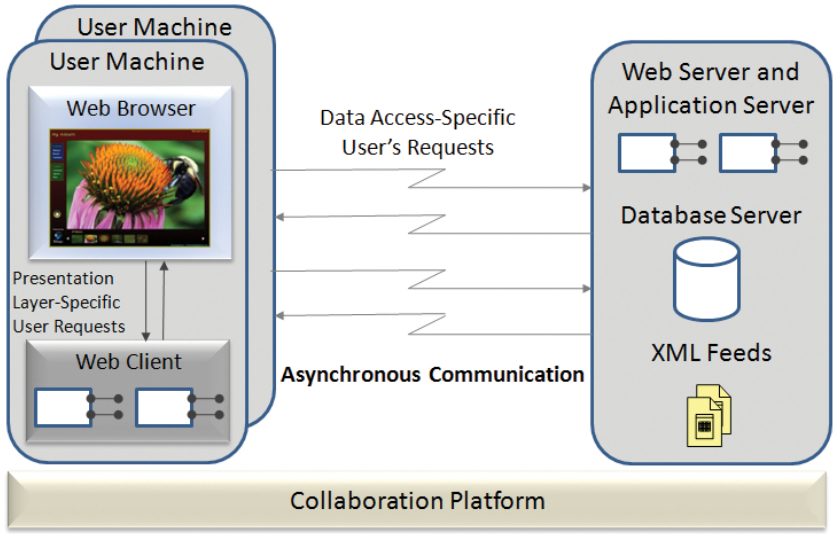

Figure 1-4. *RIA architecture*

The key difference between traditional web-based applications and RIAs is the presence of the web client layer, which is also often called the *client engine*. The web client layer helps to process the RIA's presentation layer–related requests and actions on the user machine and leverages the resources of the end user device in a sandbox environment. It also enables the asynchronous communication between the client and server to fetch and cache data before it is needed.

■ **Note** The *sandbox environment* is a mechanism to provide a restricted, isolated, and secured environment on the client machine to download and execute untrusted RIA components and code securely without accessing and having an impact on key client machine resources.

The Five Usability Dimensions for RIAs

Before developing any application, it is critical to understand the vision and scope of the application. In addition, especially for RIAs, it is important to choose the right technology platform and set of technology components because RIA technology is evolving all the time.

A paper published by Keynote Systems[4] defines four key dimensions of application usability that are essential for measuring the success of a web application—*availability*, *responsiveness, clarity*, and *utility*. I would add *safety* as a fifth usability dimension. Figure 1-5 shows the five dimensions of application usability.

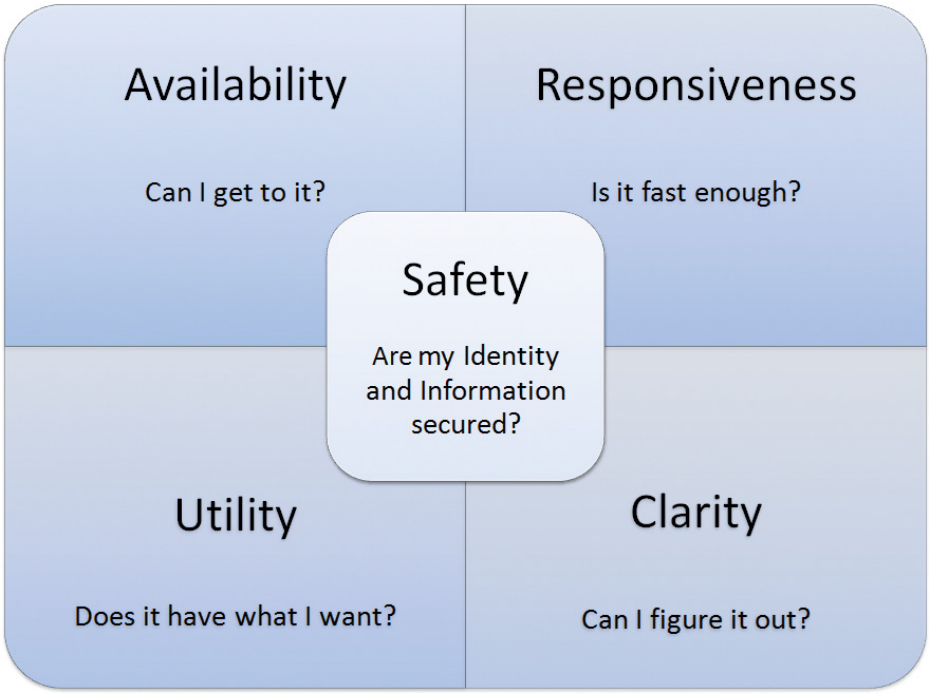

Figure 1-5. *The five dimensions of application usability*

4. Chris Loosely, "Application usability dimensions—Rich Internet Applications: Design, Measurement, and Management Challenges," `http://www.keynote.com/docs/whitepapers/RichInternet_5.pdf`, 2006

I will cover the five dimensions of application usability in Chapter 4 in more detail. However, I wanted to mention them in this first chapter because I think it is important to know and keep in mind these usability dimensions before you really start exploring the Silverlight technology platform.

Technologies That Support RIAs

So far we have discussed the high-level vision and key attributes of Web 2.0 and the key features of RIAs. Unfortunately, there is no single technology available in today's market to develop RIAs fulfilling the Web 2.0 vision. This section of the book provides a high-level overview of the available technologies supporting the development of rich, interactive RIAs.

Microsoft ASP.NET AJAX

As described on the Microsoft ASP.NET web site:[5]

> *ASP.NET AJAX is a free scripting framework for quickly creating efficient and interactive Web applications that works across all popular browsers.*

Microsoft ASP.NET AJAX is an enhanced version of JavaScript. Its client- and server-side libraries are tightly integrated with Visual Studio 2008 and is included as part of the Microsoft .NET Framework 3.5 SDK. The client-side library allows you to implement client-level processing such as end-user-entered information processing and validation, refreshing a portion of the web page and developing rich, interactive user interfaces. You can also efficiently integrate the client-side library components with the server-side ASP.NET controls library in asynchronous mode.

However, ASP.NET AJAX is not an ideal solution for developing enterprise-level RIAs. The key technology driver of ASP.NET AJAX is scripting. In general, script-based web applications face several challenges due to different browser settings (e.g., JavaScript is not enabled by default) on PCs and mobile devices. ASP.NET AJAX supports only limited features of RIAs and does not support effective multimedia integration, managed code-behind integration, or metadata and information management.

ASP.NET AJAX does have asynchronous communication capabilities. However, due to the nature of the implementation, the web application must continuously pull data from the server to get the latest updates, which ultimately slows down overall application performance.

In conclusion, ASP.NET AJAX is a good place to start to transform your traditional web-based applications to RIAs. Often scripting is not always the best strategy for enterprises to develop secured and scalable RIAs. ASP.NET AJAX's script-based approach and the previously mentioned limitations raise many concerns about the security, compatibility, and maintainability of ASP.NET AJAX web applications. Thus many enterprises may hesitate to develop enterprise-level RIAs using only ASP.NET AJAX technology.

The PageFlakes web site (`http://www.pageflakes.com/Default.asp`) is a very good example demonstrating the use of ASP.NET AJAX. This page demonstrates key RIA features like modular design, asynchronous communication, and user customization with the use of ASP.NET AJAX.

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5. Microsoft ASP.NET AJAX Definition, `http://www.asp.net/ajax/default.aspx?wwwaspnetrdirset=1`

Java Applets

As described on the Java Sun web site:[6]

> *[A Java] applet is a special kind of Java program that a browser enabled with Java technology can download from the Internet and run. An applet is typically embedded inside a web page and runs in the context of the browser.*

A Java applet is a browser plug-in that is cross-browser and cross-platform. Java applets use the Java Virtual Machine (JVM) incorporated within the end user browser to execute and run in a sandbox environment on the end user machine.

Using the Java platform, it is possible to develop interactive and heavy graphical RIAs with offline capabilities. With the use of Java server-side component libraries, they can perform asynchronous communication.

Java applets have limitations similar to the ASP.NET AJAX technology. Users' browsers should be Java enabled, and the Java Runtime Environment (JRE) needs to be installed on users' machines to run Java applets successfully. Java applets support only limited features of RIAs. It would be challenging to develop a rich, interactive user interface with the media streaming and metadata management capabilities of RIAs in rapid application development (RAD) mode using the Java applets and supporting Java technology components.

Adobe Flash, Adobe Flex, and Adobe AIR

As described on the Adobe Flash product site:[7]

> *[Adobe Flash] software is an advanced authoring environment for creating rich, interactive content for digital, web, and mobile platforms.*

Adobe Flash is one of the most popular web browser plug-ins for displaying animation and audio and video streaming on web sites. Adobe Flash provides ActionScript—a scripting language—for developing animation and multimedia streaming.

Adobe Flash does not provide an efficient development platform to build interactive and complex RIAs, but it is the most suitable tool for creating interactive plug-ins for web applications.

To meet the need for an efficient development platform for enterprise-level RIAs, Adobe has developed Adobe Flex, which basically is an enhancement to Adobe Flash. As described on the Adobe Flex product site:[8]

> *[Adobe Flex] is a . . . free open source framework for building and maintaining expressive web applications that deploy consistently on all major browsers, desktops, and operating systems.*

The Adobe Flex development platform provides a rich UI component library and uses MXML, a declarative XML-based language to develop rich, interactive user interfaces. The ActionScript programming language is used to implement the business service layer.

Adobe is making some serious moves to enhance its platform so you can use it not just for developing rich, interactive user interfaces and integrating multimedia elements, but also for

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6. Java Applet Definition, `http://java.sun.com/docs/books/tutorial/deployment/applet/index.html`
7. Adobe Flash Definition, `http://www.adobe.com/products/flash/`
8. Adobe Flex Definition, `http://www.adobe.com/products/flex/`

developing desktop applications that can seamlessly integrate with RIAs. In addition to Adobe Flash and Adobe Flex, in February 2008 Adobe introduced Adobe AIR for developing desktop applications that we can extend as RIAs. As described on the Adobe AIR product site:[9]

> *[Adobe AIR] lets developers use proven web technologies to build rich Internet applications that deploy to the desktop and run across operating systems.*

Figure 1-6 shows the eBay desktop application developed utilizing Adobe AIR and Adobe Flex. The eBay application demonstrates the power of the offline capabilities of the RIA.

Figure 1-6. *eBay desktop application developed using Adobe Flex and Adobe AIR*

Microsoft Silverlight

As described on the Microsoft Silverlight web site:[10]

> *Microsoft Silverlight is a cross-browser, cross-platform, and cross-device plug-in for delivering the next generation of .NET-based media experiences and rich interactive applications for the Web.*

Microsoft Silverlight is a subset of Windows Presentation Foundation (WPF), which is part of .NET Framework 3.5. Silverlight is integrated with the broad range of Microsoft tools and services

9. Adobe AIR Definition, `http://www.adobe.com/products/air/`
10. Microsoft Silverlight Definition, `http://silverlight.net/`

like Microsoft Visual Studio 2008, Microsoft Expression Blend, Microsoft Deep Zoom Composer, and Microsoft Silverlight Streaming by Windows Live for the easy development and deployment of Silverlight-based multimedia RIAs.

Microsoft partnered with NBC Universal for the Beijing 2008 Olympic Games[11] and successfully demonstrated the capabilities and power of the Microsoft Silverlight technology in the commercial RIA market. NBC's Olympics web site (`http://www.nbcolympics.com`) featured more than 2,000 hours of live content and 3,000 hours of on-demand video for Olympics lovers. The Silverlight technology enabled NBC to develop the Control Room feature, presenting video picture-in-picture capability that let viewers watch up to four events at the same time.

Figure 1-7 presents a page from the NBC Olympics web site featuring Silverlight-based video streaming.

Figure 1-7. *Beijing 2008 Olympics game videos on NBC's Olympics web site featuring Microsoft Silverlight*

11. Ina Fried, "What It Takes to Bring the Olympics to the PC," `http://news.cnet.com/8301-13860_3-10003752-56.html?tag=nefd.lede`, 2008

Figure 1-8 shows the Silverlight Olympic 2008 plug-in on the MSN web site (`http://www.msn.com`) during the Beijing 2008 Olympics.

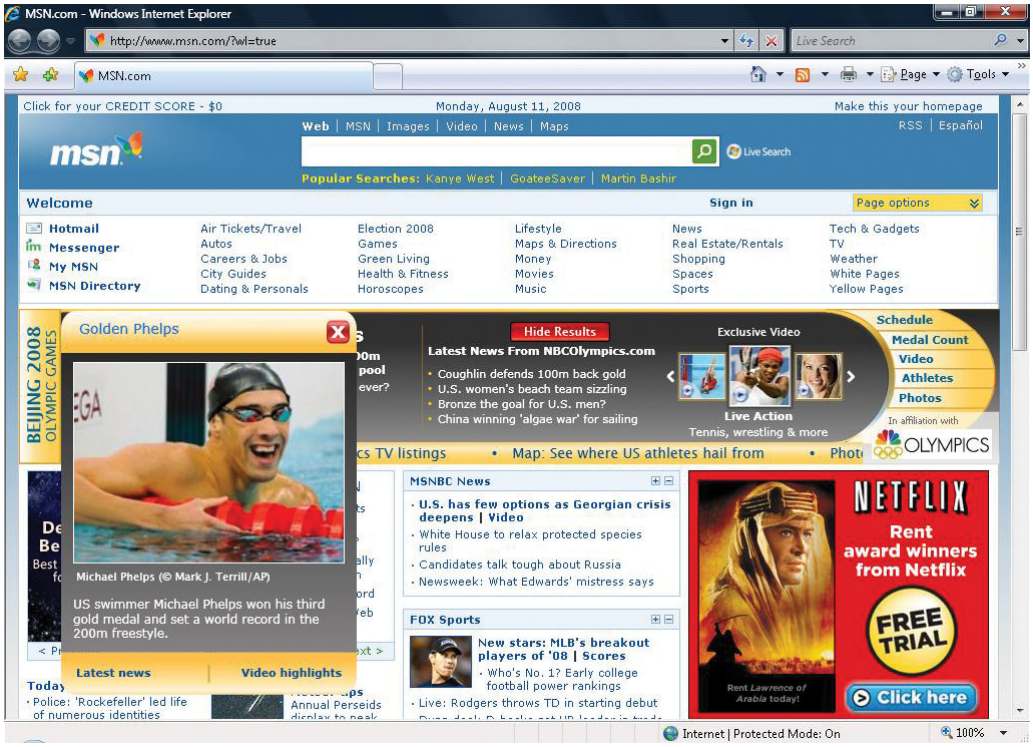

Figure 1-8. *Olympics Silverlight plug-in on the MSN web site*

Applying a Balancing Act When Selecting Technology Components

It is very clear from the discussion in the preceding sections that one technology is not enough to develop intuitive RIAs. Although I will cover this in more detail in the later part of the book (in Chapters 3 and 4), in summary it is recommended you apply a balancing act (see Figure 1-9) in the selection of the right set of technology components to develop and deploy RIAs successfully. The selection of technology components must align with your organization's strategic vision, your customers' requirements, the product roadmap, and the technology roadmap for long-term success and to gain maximum ROI.

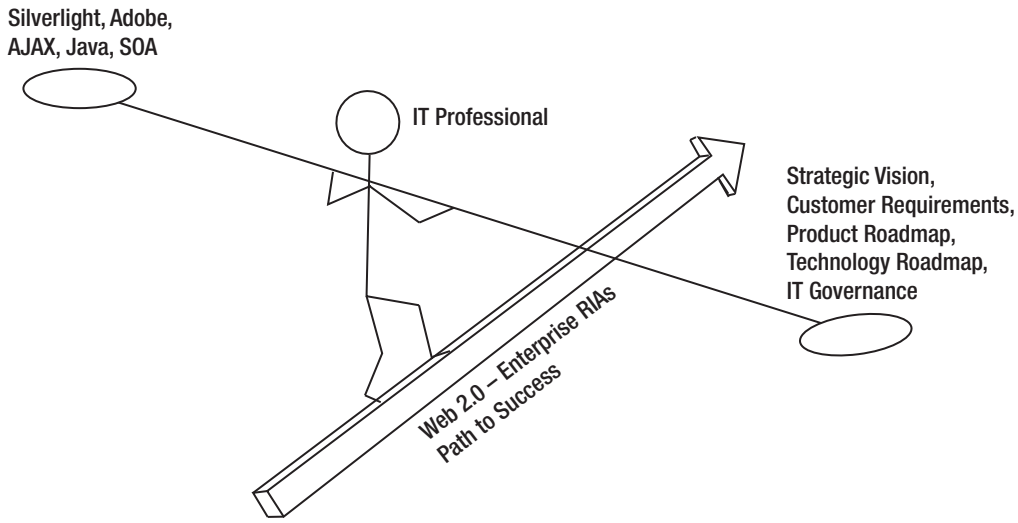

Figure 1-9. *Applying a "balancing act" in the selection of the right Web 2.0 technologies to develop Enterprise RIAs*

Examining the Silverlight Platform

This book is mainly focused on the Microsoft Silverlight technology. You will see how Silverlight can be utilized to develop service-oriented enterprise RIAs that fulfill the Web 2.0 vision. Before we dive into the details of Silverlight for the enterprise, let's take a high-level look at Silverlight and its available versions and key components. This book assumes that you are already aware of the Silverlight technology and how to build basic applications using Silverlight 2. If you are a newcomer to Silverlight and the following section is not sufficient to get started with Silverlight 2, please read the online materials and books mentioned in the "Additional References" section of this chapter.

As described earlier, Microsoft Silverlight provides a platform to develop cross-browser, cross-platform, and cross-device RIAs. All versions of Silverlight are a subset of WPF and use XAML (Extensible Application Markup Language), an XML-based language that facilitates externalized and loosely coupled definitions of the user interface and related style sheets.

Different Versions of Silverlight

At present, two versions of Microsoft Silverlight—Silverlight 1 and Silverlight 2—are available.

Silverlight 1

After having a great showcase at Mix 2007 in May 2007, Microsoft Silverlight 1 (earlier known by the code name WPF/E—Windows Presentation Foundation/Everywhere), along with Microsoft Expression Encoder 1.0, was released in September 2007 as the first version of Silverlight. Silverlight 1 is a very rudimentary release of the product and mainly focuses on the development of Rich Media Internet Applications (RMIAs). It contains rich media presentation framework–related core components like UI controls handling the rendering of 2D vector graphics, media, animation, and simplified user input management. The Silverlight Media Player controls support the WMA, WMV, and MP3 formats of media files. Silverlight 1 is also capable of using JavaScript with Document Object Model (DOM) integration to manipulate the UI.

■ **Note** The RMIA is a type of RIA containing a subset of RIA attributes. RMIA-type applications/plug-ins are mainly focused on media (audio and video) streaming features.

Even though Silverlight 1 has limited features and limited support for development, when it was released, it was highly respected in the commercial market and created a buzz. Along with the Major League Baseball web site (`http://www.mlb.com`), many major commercial sites adopted Silverlight 1 to provide rich media experiences. Microsoft also provided some great sample sites like the Tafiti search front end (`http://www.tafiti.com/`), powered by the MSN search engine to explain the Silverlight technology and RIA concepts.

Silverlight 2

The next landmark version of Silverlight was released as Silverlight 2 in October 2008. It is a big leap from the first basic version to version 2. Silverlight 2 is enhanced in the following areas:

- Enhanced support for the Microsoft .NET Framework 3.5 with the Common Language Runtime (CLR). The support for the CLR enables the integration of Microsoft .NET managed code-behind using default Microsoft .NET class libraries in Silverlight 2 projects.
- Enhanced Base Class Library (BCL) and Language-Integrated Query (LINQ) integration to develop complex enterprise RIAs.
- Additional UI components to support the development of RIAs featuring rich multimedia functionalities.
- Enhanced media management supporting secured multimedia streaming.
- Enhanced networking support including policy-based cross-domain networking to support different types of application deployment.
- Support for the open source and cross-platform Eclipse development platform via Eclipse Tools for Microsoft Silverlight: eclipse4SL (`http://www.eclipse4SL.org`).
- Improvement of the interoperability features of Silverlight due to the Silverlight XAML schema vocabulary specification (MS-SLXV) released under the Open Specification Promise (OSP) (`http://msdn.microsoft.com/en-us/library/dd361850(PROT.10).aspx`).