

Force.com Platform Fundamentals

An Introduction to Custom Application Development in the Cloud

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Force.com Platform Fundamentals

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Force.com Fundamentals is an introduction to the native functionality of the Force.com platform. This book walks the reader through the creation of a standard recruiting application, including designing and creating Force.com objects, modifying the appearance of the standard Force.com interface, the Force.com security scheme, collaborating with Chatter, reporting on your data, and using workflows and approvals. This book also introduces the use of Visualforce pages integrate external functionality.

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Preface

As users of the Internet, we're all familiar with the fascinating, innovative, creative, and sometimes silly ways in which it has changed how we work and play. From social networking sites to wikis to blogs, and more, it's exciting to watch the innovations taking place that are changing the ways we communicate and collaborate.

While these changes have certainly impacted how we work with content, a similar set of Internet-driven ideas and technologies is changing how we build and work with business applications. While yesterday's business applications required thousands, if not millions, of dollars and sometimes years of professional services help to set up and customize, the technologies offered by the Internet today make it much easier to create, configure, and use business applications of all kinds. Indeed, the power of the Internet has given us the ability to solve new kinds of business problems that, because of complexity or cost, had previously remained out of reach.

Just as the changes that moved publishing technology from paper to bits made it possible for us to have information about anything in the whole world right at our fingertips, the changes in application technology make it similarly possible to imagine a robust, enterprise-class application for almost any business need. Sound pretty good? Then you're probably wondering: "What's the magic that makes this possible?"

Welcome to the Cloud!

These new ways of building and running applications are enabled by the world of *cloud computing*, where you access applications, or *apps*, over the Internet as utilities, rather than as pieces of software running on your desktop or in the server room. This model is already quite common for consumer apps like email and photo sharing, and for certain business applications, like customer relationship management (CRM).

Because almost all apps these days are delivered via a Web browser, it's increasingly hard to tell which applications are "traditional software," and which are run in the cloud. As with the Internet, applications that run in the cloud have grown so ubiquitous that almost every business user interacts with at least one, whether it's an email service, a Web conferencing application, or a sales system.

Platforms for Cloud Computing

A new twist, the *platform in the cloud*, is making the delivery of application functionality even more interesting. Increasingly, applications that run in the cloud are starting to look less like websites and more like platforms, meaning they are starting to sprout Application Programming Interfaces (APIs), code libraries, and even programming models. Collectively, these new kinds of development technologies can be thought of as platforms to run apps in the cloud.

Similar to traditional platforms, cloud computing platforms provide tools that allow developers to leverage existing functionality to create something new; however, because these platform tools are accessed freely over the Internet rather than through an operating system or package that was installed on a local machine, developers don't need to worry about the logistics of putting together an executable that will be installed on a user's machine. Anyone with a Web browser can access the app!

The possibilities presented by this new type of platform have emerged quickly, spurred on by the popularity of *mash-ups*—a website or application that combines tools from multiple cloud computing platforms to create new functionality. Some of the cloud computing platform tools used in today's mash-ups include innovations like Google's search API, which allows developers to use the power of that search engine in their applications, eBay's APIs for auctions and listings, or Amazon.com's system for creating entirely new storefronts. For example, almost any real estate website or application these days uses Google or Yahoo! maps under the hood, illustrating how these new APIs are now commonly running alongside the more traditional database, app server, or operating system platforms.

About This Book

This book introduces you to the Force.com platform, salesforce.com's platform for building and running business applications in the cloud.

To illustrate the technologies available on the Force.com platform, and to show you just how easy it is to create your own business application with the platform, this book walks you through the process of creating a new recruiting application that runs in the cloud. To follow along you won't need to learn any programming languages or hack your way through cryptic configuration

documents—instead, you'll just need to point-and-click your way through a Web interface, following the easy step-by-step instructions in the book.



Note: Want an online version of this book? Go to

https://developer.salesforce.com/page/Force_Platform_Fundamentals.

Intended Audience

This book can be easily understood by anyone from a business user to a professional developer. However, to get the most out of the book, it helps to be familiar with basic Internet and database concepts, such as tables and fields.

While the book focuses primarily on using the declarative, point-and-click functionality of the Force.com platform, [Moving Beyond Point-and-Click App Development](#) on page 333 introduces you to the platform's user interface programming tools. To fully understand that chapter, you should be familiar with HTML and JavaScript. However, all the code you need is provided, so even if you're not an experienced developer, you can still follow along to gain a deeper understanding of what can be done with the Force.com platform.

Chapter Contents

If you're already familiar with the Force.com platform, you can skip around to the chapters in which you're most interested:

Chapter	Description
Introducing the Force.com Platform	Learn about the technologies behind the Force.com platform, including the AppExchange directory.
About the Sample Recruiting App	Learn about the recruiting application that we'll be building in this book and the fictitious company for whom we'll be building it.
Reviewing Database Concepts	Review database concepts such as tables, records, fields, keys, and relationships.
Building a Simple App	Create the first custom object in our recruiting app, and add several basic fields.
Enhancing the Simple App with Advanced Fields, Data Validation, and Page Layouts	Add picklists, dependent picklists, validation rules, and formula fields to the custom object,

Chapter	Description
	and then edit the layout of the object's detail page.
Expanding the Simple App Using Relationships	Add five more custom objects to our recruiting app, and associate them with one another using relationships.
Securing and Sharing Data	Set up rules for who can read, create, edit, and delete records in the app.
Collaborating with Chatter	Enable Chatter for your organization so users can keep up with the information they care about.
Using Custom Workflow and Approval Processes	Define workflow rules and approval processes that assign tasks, update fields, and send emails when certain criteria are met.
Analyzing Data with Reports and Dashboards	Create custom reports, charts, and dashboards that give users a bird's-eye view of recruiting data.
Moving Beyond Point-and-Click App Development	Learn how to use Visualforce to extend the functionality of the platform by creating a mash-up with Yahoo! maps and adding a tool for mass updating records.
Learning More	Find out where you can get more information about developing on the platform.
Glossary	Look up the definition of any term you find unfamiliar.



Note: This book contains lots of screenshots. Because the Force.com platform is a rapidly developing platform, the screenshots might vary slightly from what you see on the screen, but don't worry! These differences should be minor and won't affect your understanding of the system.

Choosing Your Development Environment

To follow along with the exercises in this book, you'll need a Salesforce account. If you're already a Salesforce customer, you can use a Force.com *sandbox*. A sandbox is a copy of your

organization that you can use for testing configurations and training users without compromising the data in your production organization. Salesforce Enterprise, Unlimited, and Performance Editions come with one free sandbox; users of other editions can use Developer Edition to do the exercises.

If you're new to Salesforce or if you don't want to use a sandbox, go to developer.salesforce.com and sign up for a free Developer Edition account. Developer Edition is a fully-functional version of Salesforce that you can use to develop Salesforce apps. Since it's free, there are limits on the amount of users, bandwidth, and storage you're allowed, but it includes all of the features in Salesforce. When you sign up, you'll also automatically become part of the growing community of Force.com platform developers around the world.

Sending Feedback

Questions or comments about anything you see in this book? Suggestions for topics that you'd like to see covered in future versions? Go to the Developer Force discussion boards at community.salesforce.com/sforce?category.id=developers and let us know what you think! Or email us directly at developerforce@salesforce.com.

About Developer Force

Developer Force is a community of developers who customize and build applications that run in the cloud and are built with the Force.com platform. Developer Force members have access to a full range of resources, including sample code, toolkits, an online developer community, and the test environments necessary for building apps. The Developer Force website includes an online version of this book and has information about the Dreamforce event that we hold every year for Force.com platform developers. If you need more info, have a question to ask, are seeking a toolkit or sample, or just want to dig a little deeper into Force.com platform development, Developer Force is where it all comes together.

To find out more about the resources available on the Developer Force website, see developer.salesforce.com, and review the [Learning More](#) chapter.

Salesforce.com Training & Certification

A number of examples in this book have been provided by salesforce.com Training & Certification and are drawn from the expert-led training courses available around the world. Salesforce.com Training & Certification courses provide an opportunity to get hands-on

experience with the Force.com platform and Salesforce applications, and prepare you to become Salesforce certified. Register for courses at www.salesforce.com/training.

INTRODUCING THE FORCE.COM PLATFORM

Chapter 1

Introducing the Force.com Platform

In this chapter ...

- The Basics of an App's User Interface
- The Benefits of a Force.com Platform App
- The Technologies Behind a Force.com Platform App

Force.com is a platform for creating and deploying next-generation cloud apps. Because there are no servers or software to buy or manage, you can focus solely on building apps that include built-in social and mobile functionality, business processes, reporting, and search. Your apps run on a secure, proven service that scales, tunes, and backs up data automatically.

Why use Force.com:

- **Proven** — More than 100,000+ companies trust Force.com, including many industry leaders. They've built 220,000+ apps that run in accredited, world-class data centers with backup, failover, disaster-recovery, and an uptime record exceeding 99.9%. You can see real-time system performance data at trust.salesforce.com.
- **Agile** — Force.com requires minimal coding. Assemble your apps in building-block fashion using our visual tools and library of components. Streamline development with sandbox environments, and integrate your apps using open APIs.
- **Social** — Work more effectively with your colleagues using your own secure social network. Force.com includes pre-built components for feeds, profiles, conversations, updates, and file sharing. All

components are available through REST APIs that can be easily integrated into any custom app.

- **Mobile** — Build native mobile apps powered by a secure cloud database, with rock-solid APIs. Or build mobile-optimized browser apps, using our UI framework and HTML5 to support any device with one code base. Or mix native and HTML in a hybrid cocktail that gives you the best of both worlds. Force.com has what you need to securely deliver apps on mobile devices.

The Basics of an App's User Interface

You and your users may access Salesforce through two interfaces: the full Salesforce site, as accessed from your desktop computer, and the mobile app. Throughout this guide, we'll walk through tasks and see the impact of those customizations in both environments. If you haven't used Salesforce before, you'll find it worthwhile to log in and spend a bit of time clicking around both the full site and the mobile app. Most Salesforce editions (including Developer Edition) have a basic Salesforce Sales app, so we'll start by looking at that. The interface for these tasks has a lot in common with the interface of the app we're planning to build.



Note: Haven't signed up for Developer Edition yet? Go to
<https://developer.salesforce.com/signup>.

The screenshot shows the Salesforce Account detail page for 'Grand Hotels & Resorts Ltd.'. The top navigation bar includes tabs for Home, Leads, Accounts (highlighted in red), Contacts, Opportunities, Reports, Dashboards, Documents, Products, and Forecasts. Below the tabs is a search bar with 'Search All' and a 'Go!' button. To the left is a sidebar with 'Create New...' and 'Recent Items' sections, and a green 'Recycle Bin' button. The main content area displays account details: Account Owner (Dave Carroll), Account Name (Grand Hotels & Resorts Ltd.), Parent Account, and a 'Notes & Attachments' section with links. A 'Hyperlinks' callout points to these links. The 'Form' callout points to the 'Account Detail' section where fields like Type (Customer), Industry (Hospitality), Employees (5,600), Annual Revenue (\$500,000,000), and Description are shown. The 'Address Information' section at the bottom lists Billing and Shipping addresses.

Figure 1: Force.com Platform Apps Include Tabs, Forms, and Links

As you can see when you start clicking around, there are a few key elements that form the foundation of the Sales app and of most applications created with the platform.

Tabs

Across the top of the app is a set of *tabs* that segment the app into different parts. Each tab corresponds to a type of object, such as an account or contact, and within a tab you can perform actions on particular records of that tab's type. For example, when you click on the Accounts tab, you can create a new record for the "Acme" account. You can also edit existing accounts, or use a *list view* to filter lists of accounts by certain criteria. Most

app development work revolves around creating tabs and defining the data and behaviors that support them.

Fields

Displayed within each record is a selection of *fields*, which is how the Force.com platform houses and organizes information. For example, a contact record includes fields such as Last Name, Home Phone, Mailing City, Title, Birthdate, Reports To, and Account. When developing a new app, you can customize which fields appear for a given type of record—such as for contact records—as well as how they are organized. In a Force.com platform app, users enter information with writable fields on an *edit page* and view that information with read-only fields on a *detail page*.

Links

Finally, because Force.com platform apps are delivered in a Web browser, they use *links* to provide navigation to related data. For example, on an account detail page, there are links to related records, such as the contacts who belong to the account and the sales user who manages the account. Other links take you to recently visited records and to areas of the app where users can set personal preferences. Links provide navigation within an app and to external Web sites.

Now let's look at how these elements appear in a mobile context, like Salesforce1. We still see collections of fields, and tapping links navigates us to the indicated record or external website. That said, tabs don't exist in the mobile app.

Menu Items

Instead of tabs, mobile users access objects from items in the *navigation menu*. Like a tab, each menu item in the Recent section corresponds to a type of object, such as an account or contact. Objects are surfaced based on which objects you've viewed or worked with recently. Tapping **Show More** displays all the objects available based on your profile and permissions. When you tap one of these items, such as Accounts, you can create a new record or look your recently visited records. To edit an existing record, you first need to tap the record to open it.

Menu items also include things like Tasks, Dashboards, and the Feed, most of which we'll talk about later in this guide.

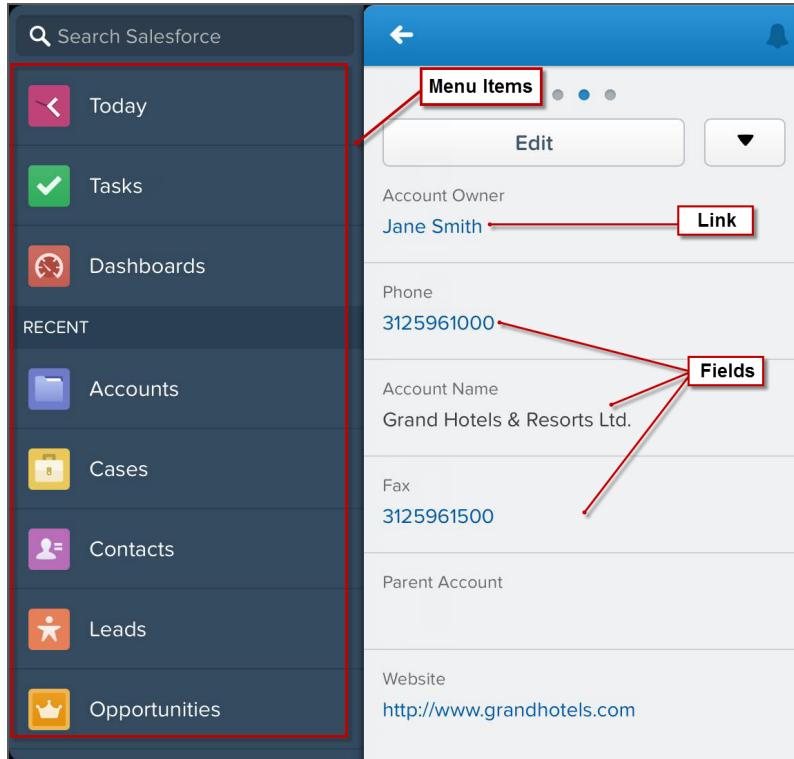


Figure 2: Force.com Platform Apps in Mobile Include Menu Items, Forms, and Links

The Benefits of a Force.com Platform App

To better understand what the platform is best suited for, let's look beyond the core elements of tabs, fields, and links, and into the types of applications they enable. Two huge benefits start to come into focus when you look at Force.com platform apps: they're data-centric and collaborative.

Data-Centric Apps

Because the platform is centered around a database, it allows you to write apps that are *data-centric*. A data-centric app is an application that is based on structured, consistent information such as you find in a database or XML file. We can find these data-centric apps everywhere, in small desktop databases like Microsoft Access or FileMaker, all the way to the huge systems running on database management systems like Oracle or MySQL. Unlike

applications that are built around unstructured data, like plain text documents or HTML files, data-centric apps make it easy to control, access, and manage data.

For example, consider an exercise such as trying to determine the total sales for a month from a set of Microsoft Word-based contracts versus a set of contracts in a simple database. Whereas it takes a lot of effort to open each Word document, find the contract total, and then add them all together, if this data is stored in the database of a data-centric app, we can more efficiently get the same result by issuing a single query.

While most people don't need a data-centric application to keep track of anything other than contacts, photos, or music, companies of all sizes constantly need to query and aggregate their large amounts of data to make fast business decisions. As a result, the data-centric nature of the Force.com platform makes it the perfect platform to build and host business applications.

Collaborative Apps

Because the platform can be accessed by multiple users at the same time, it allows you to write apps that are *collaborative*. A collaborative app is an application with data and services that are shared by multiple users in different locations. Unlike more traditional forms of software that are installed on a single machine and are hard to access from a distance, collaborative apps on the platform can be accessed from anywhere in the world with only a Web browser. This makes it easy for teams to work together on activities like selling a product, managing a project, or hiring an employee.

In addition to easy access over a Web browser, a number of built-in platform features also facilitate productive group collaboration:

- Use the platform's **security and sharing model** to finely control a user's access to different data.
- Use **workflow rules** to automatically assign tasks, update data, or send e-mail alerts when certain business events occur, such as the creation of a new record or a change in the value of a record field.
- Use **approval processes** to set up a sequence of steps necessary for a record to be approved, including who must approve it at each step.

Collectively, these features provide a framework for sharing apps across groups, divisions, and entire corporations without relinquishing administrative control over sensitive data.

The Technologies Behind a Force.com Platform App

Now that we've talked about the kinds of apps the platform can build, let's review some of the technologies behind the platform. These technologies have a big impact on what the platform supports and what it's like to develop on it.

Table 1: Key Technologies Behind the Platform

Technology	Description
Multitenant architecture	An application model in which all users and apps share a single, common infrastructure and code base.
Metadata-driven development model	An app development model that allows apps to be defined as declarative "blueprints," with no code required. Data models, objects, forms, workflows, and more are defined by metadata.
API Access	<p>Several application programming interfaces (APIs) provide direct access to all data stored in Force.com from virtually any programming language and platform.</p> <ul style="list-style-type: none"> • The SOAP API and REST API integrate your organization's data with other applications • The RESTful Bulk API (also available using Data Loader) loads or deletes large numbers of records • The Metadata API manages customizations in your organization (also available using the Force.com Migration Tool) • The Chatter REST API accesses Chatter feeds and social data • The Streaming API provides notifications reflecting data changes in your organization
Apex	The world's first on-demand programming language, which runs in the cloud on the Force.com platform servers.
Visualforce	A framework for creating feature-rich user interfaces for apps in the cloud.
Mobile Access	With Salesforce mobile apps, you can access custom apps built using the Force.com platform's point-and-click development tools. Your users can access those apps on their mobile devices—and you don't have to learn any mobile programming languages.

Technology	Description
AppExchange directory	A Web directory where hundreds of Force.com apps are available to Salesforce customers to review, demo, comment upon, and/or install. Developers can submit their apps for listing on the AppExchange directory if they want to share them with the community.

A Multitenant Architecture

In a *multitenant architecture*, all users share the same infrastructure and the same version of the Force.com platform. In contrast to their single-tenant counterparts, such as client-server enterprise applications or email servers, multitenant architectures release upgrades automatically and simultaneously for all users. Consequently, no one has to worry about buying and maintaining their own physical stack of hardware and software, or making sure that their applications always have the latest patch installed.

Besides the Force.com platform, several popular, consumer-based applications also use a multitenant architecture, including eBay, My Yahoo!, and Google Gmail. Multitenant architecture allows these applications to be low-cost, quick to deploy, and open to rapid innovation—exactly the qualities for which salesforce.com has also become known.

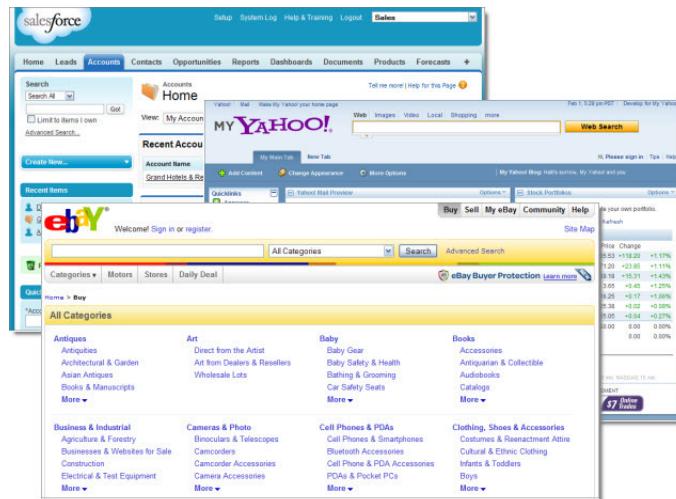


Figure 3: On-Demand, Multitenant Applications that Run in the Cloud

The platform's multitenant architecture also impacts how developers use the platform to create new applications. Specifically, it defines a clear boundary between the platform and the applications that run on it. A boundary is important because it allows applications to define

their own components without jeopardizing the functionality of the core platform or the data stored by other users.

A Metadata-Driven Development Model

The Force.com platform uses a *metadata-driven development model* to help app developers become more productive in putting together apps. It means that the basic functionality of an app—that is, the tabs, forms, and links—are defined as metadata in a database rather than being hard-coded in a programming language. When a user accesses an app through the Force.com platform, it renders the app's metadata into the interface the user experiences.

As a result of metadata-driven development, the Force.com platform app developers work at a much higher level of abstraction than if they developed applications using Java or C#, and are shielded from having to worry about low-level system details that the platform handles automatically. At the same time, Force.com platform developers can also leverage advanced features that the platform provides by default.

Customizing your app's metadata might sound intimidating, but as you'll see in this book, the platform's user interface makes it easy. Anyone who is familiar with using a Web browser can quickly get up to speed, even if he or she doesn't know any programming languages.



Tip: Developers can use the *Force.com Metadata API* to programmatically manage their app's setup. The Force.com Metadata API provides an alternative to the platform's user interface by allowing developers to directly modify the XML files that control their organization's metadata. Developers can also use the Metadata API to migrate configuration changes between organizations, and create their own tools for managing organization and application metadata. For more information, see [Force.com Metadata API Developer's Guide](#).

Although at first glance metadata-driven development may seem somewhat esoteric, it's exactly the same model for how Web browsers work. Instead of hard coding the definition of a Web page in a free-form programming language, a Web page author first defines the page as HTML, which is itself a kind of metadata. When a user requests a page, the Web browser renders the page using the metadata provided in the HTML tags. Even though the HTML/browser combination does not allow authors as much formatting power as they might get in a regular publishing tool, it simplifies the work of publishing content to a wide audience and increases the Web page author's overall productivity.

Likewise, the Force.com platform vastly simplifies the work of building an app and increases a developer's overall productivity. And, like Web pages that use JavaScript or Flash to add functionality to HTML pages, the Force.com platform also provides ways for more advanced developers to add custom functionality to the apps you build.

APIs

The platform's metadata-driven development model allows app developers to quickly build a lot of functionality with tools provided by the platform; however, sometimes app developers want to modify the actual data in an app and use third-party services to create more customized app behaviors. To do this, they can use a number of APIs to integrate with the platform. The core set of APIs include Force.com SOAP API and REST API, the Bulk API, Streaming API, and Metadata API. You can call these APIs from a wide variety of client-side languages - and toolkits are also available to ease the integration. For more information, see "Which API Should I Use?" in the Salesforce Help.

Our APIs provide straightforward, powerful, and open ways to programmatically access the data and capabilities of any app running on the platform. They allow programmers to access and manipulate apps from any server location, using any programming language that supports Web services, like Java, PHP, C#, or .NET. For more information, see
<https://developer.salesforce.com/page/Integration>.

Apex

As you might expect from the company that delivered the world's first cloud computing platform, salesforce.com also introduced the world's first cloud computing programming language, Apex. Apex, whose syntax is similar to Java, the most popular programming language for Web apps, runs on the Force.com platform servers. Apex is specifically designed for building business applications to manage data and processes within the larger context of the Force.com platform. The language provides a uniquely powerful and productive approach to creating functionality and logic, allowing developers to focus just on the elements specific to their application, while leaving the rest of the "plumbing" to the Force.com platform.

The majority of this book is intended for readers who don't necessarily code, so Apex is beyond the scope of what we'll discuss here; however, you can learn everything there is to know at
developer.salesforce.com/page/Apex.

Visualforce

At the front of any great business application is a great user interface that's easy to use, powerful, and suited exactly for the tasks, users, and devices the application serves. Visualforce is a complete framework for creating such user interfaces, enabling any kind of interface design and interaction to be built and delivered entirely in the cloud. The user interfaces you build with Visualforce can extend the standard Force.com platform look and feel, or replace it with

a completely unique style and set of sophisticated interactions. Because Visualforce markup is ultimately rendered into HTML, designers can use Visualforce tags alongside standard HTML, JavaScript, Flash, or any other code that can execute within an HTML page on the platform. And that's only the beginning: you can also use Visualforce pages to combine data from multiple Force.com platform objects, or blend data from Web services into your applications, as we discuss in [Moving Beyond Point-and-Click App Development](#) on page 333.

Mobile Access

As the primary points of Internet access shift from desktops and laptops to smartphones and tablets, apps that don't provide mobile access to critical data will quickly become obsolete. Don't let your app get trampled by the mobile stampede! Instead, use the Salesforce1 app or Salesforce Classic to deliver your Force.com customizations to your mobile users.

So how do you decide which mobile app to use? Salesforce1 and Salesforce Classic are each apps themselves. Downloadable versions of these apps install on mobile devices and use the native functionality of the device. When users log in on a mobile device, they can access and update their data via an interface specially designed for mobile device screens. Both apps allow you to work with most standard Sales objects, some standard Service objects, and all custom objects.

Salesforce1

Administrators don't have to create special configurations for mobile users to access their organization's data. What users see is controlled by their profile and user permissions, and the app respects any customizations made in the full Salesforce site. In addition, this app includes Chatter, so your users can keep collaborating while on the go.

Salesforce1 is supported on Apple® iPhones® and iPads®, as well as Android™ phones. If your organization prohibits installing the downloadable app to corporate-issued devices, Salesforce1 is also available from a mobile web browser.

Salesforce Classic

Administrators create mobile configurations to determine the Salesforce data, Visualforce pages, and other elements their mobile users can access. In addition, Salesforce Classic stores a subset of data on the device to provide users with offline access when a wireless connection is unavailable, and synchronizes that data with Force.com when connectivity is reestablished.

Salesforce Classic is supported on the Apple iPhone and iPod touch®, BlackBerry® smartphones, and Android tablets and smartphones.

When you're ready to take your app mobile, see the *Salesforce1 App Admin Guide* or the [Salesforce Classic Implementation Guide](#).

The AppExchange Directory

The final piece of technology that differentiates the Force.com platform from other platforms is the *AppExchange*. The AppExchange is a Web directory where apps built on the Force.com platform are available to salesforce.com customers to browse, demo, review, and install.

Developers can submit their apps for listing on the AppExchange directory if they want to share them with the community.

To fully appreciate the benefits of the AppExchange, take a quick tour at <http://sites.force.com/appexchange>. There you'll see the hundreds of innovative and exciting apps that exist today, including everything from payroll management to telephony integration, service and support surveys, adoption dashboards, and beyond. Some of these apps have been created inhouse at salesforce.com, but most are built by partners and individual developers who have chosen to take advantage of the Force.com platform.

Chapter 2

About the Sample Recruiting App

In this chapter ...

- About Universal Containers
- Considerations for the Recruiting App
- Building the App: Our Design

The goal of this book is to show you how easy it is to create powerful, multifaceted applications that solve common business problems. To do so, let's walk through the steps of creating a simple application for a make-believe company called Universal Containers.

Like many companies that have grown rapidly, Universal Containers has been experiencing a few growing pains, especially in its Human Resources department. In this book, we're going to build a Recruiting app for the company that allows it to move away from the Microsoft Word documents and Microsoft Excel spreadsheets that it has traditionally used to an application that's available on demand.

By the time we finish building the Recruiting app in this book, you should feel confident enough to build a custom application in the cloud that suits your own company's needs. So let's get started!

About Universal Containers

First, let's learn a little more about our fictional company, Universal Containers.

Universal Containers is a rapidly growing international supplier of container products. The company produces every kind of container from simple overnight letter mailers to custom equipment packaging to large cargo shipping containers. In addition, Universal Containers develops and maintains its own proprietary software to facilitate the design of its various types of containers. As such, Universal Containers has a very diverse group of employees, including facilities and operations professionals, software and design engineers, financial accountants, and legal and human resources personnel.

Historically, the Human Resources department has used Microsoft Word documents and Microsoft Excel spreadsheets to manage the recruiting and hiring process for new employees. However, over the last two quarters it's become evident that unless this process is replaced by one that is more collaborative, reliable, and scalable, the department won't be able to meet its hiring goals for this fiscal year. Universal Containers needs a centralized application that can bring all of its recruiting and hiring processes together, and the company has hired us to solve this problem. Our approach will be to leverage their Salesforce account and build a recruiting application on the Force.com platform. We're going to introduce Universal Containers to the world of cloud computing!

Considerations for the Recruiting App

After meeting with Megan Smith, Universal Containers' vice president of Human Resources, we've drawn up a few requirements for the new Recruiting app. The app needs to:

- Track positions in all stages of the process, from those that are open to those that have been filled or canceled.
- Track all of the candidates who apply for a particular position, including the status of their application (whether they've had a phone screen, are scheduled for interviews, have been rejected or hired, or have passed on an offer that was presented).
- Track the posting of jobs on external employment websites, such as Monster.com.
- Allow employees to post reviews for candidates whom they've interviewed.
- Provide security for the recruiting data so that it's not mistakenly viewed, edited, or deleted by employees who shouldn't have access.
- Automatically inform the relevant recruiter about the next steps that should be taken when a decision has been made about an applicant.
- Automatically inform all employees of new positions that have been posted.

- Make sure that a new job opening has executive approval before it becomes active.
- Include reports that give users an overview of recruiting status.
- Allow recruiters to map the locations of all candidates who are applying for a position, to better understand relocation expenses.
- Make it easy to perform several similar tasks at once, like rejecting multiple job applications.
- Automatically post open positions on Universal Containers' public website.

An app that meets these requirements is going to greatly increase the efficiency of Universal Containers' recruiting and hiring processes.

Building the App: Our Design

Let's take a look at the different parts of the Force.com platform that we'll use to implement Universal Containers' Recruiting app. We'll learn about all of these things in a lot more detail in later chapters, but for now, this quick preview will give you an idea about what's in store.

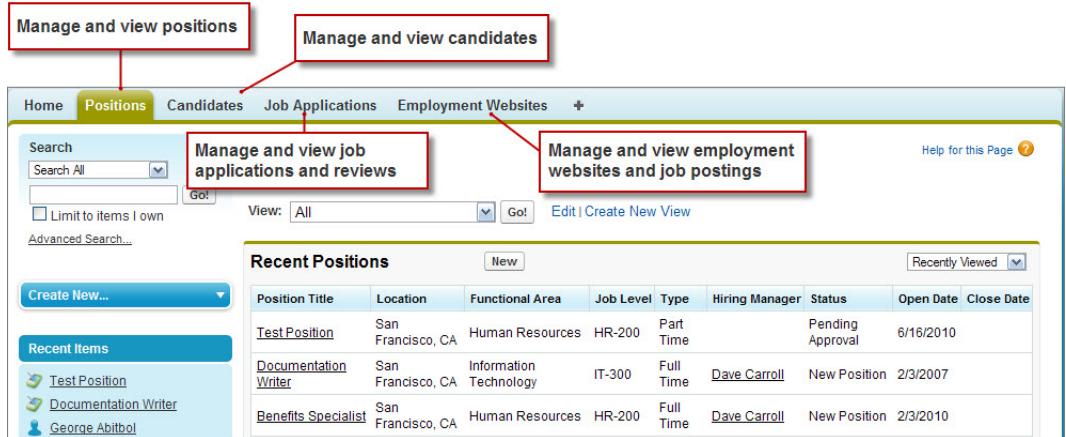
Custom Objects

Custom objects are the native components that model the data we need to store in our Recruiting app. Similar to a database table, a custom object is composed of several fields that store information such as a job applicant's name, or the maximum salary for a particular position. However, unlike traditional database tables, we don't need to write any SQL in order to create custom objects. We can simply point and click in the platform to create as many objects as we need.

For our Recruiting app, we'll be creating six custom objects to track recruiting-related data:

- Position
- Candidate
- Job Application
- Review
- Job Posting
- Employment Website

Most of these objects will be displayed as tabs in our application and menu items in Salesforce1. When a user clicks one of the tabs, he or she will have access to individual instances of that particular object, as shown in the following screenshot.

**Figure 4: Recruiting App Tabs**

One of the powerful features of a custom object is the fact that it can have relationships with other objects in the system. For example, for every review written by an interviewer and entered into the system, we'll want to associate it with the job application of the candidate who was being interviewed. Again, we won't need to write any SQL to make this happen—thanks to the platform, defining a relationship will be as simple as a few clicks of the mouse.

Security and Sharing Rules

Another important function that we'll need to build into our app is the ability to restrict access to data that particular users shouldn't see, without preventing other users from performing their jobs effectively. We're going to implement this requirement with a group of components that we've grouped under a single term: *security and sharing rules*.

With security and sharing rules, we'll first specify which custom objects a particular user should be allowed to create, view, or edit (for example, Candidate and Position), and then which instances of those objects should be accessible (for example, the records for candidate John Smith or the Senior Sales Manager position). Controlling our data either with the wide brush of object-level security or with the more detailed brush of record-level security will give us a lot of power and flexibility in controlling what users can and can't see.

Workflow and Approval Processes

Three of our requirements involve automating business processes, such as triggering an alert email to a recruiter whenever a job application's status has changed, and submitting new job

openings for executive approval. Once again, the Force.com platform makes these requirements easy for us to implement natively with the built-in *workflow* and *approval process* components.

Workflow and approval processes allow us to create business logic based on rules:

- Workflow rules can assign tasks to users, update fields, or send email alerts.
- Approval processes allow users to submit sensitive records like new contracts or purchase orders to other users for approval.

For example, in our Recruiting app, we can create a workflow rule that triggers an event whenever the status of a job application has changed to Reject or Extend an Offer, as illustrated below.

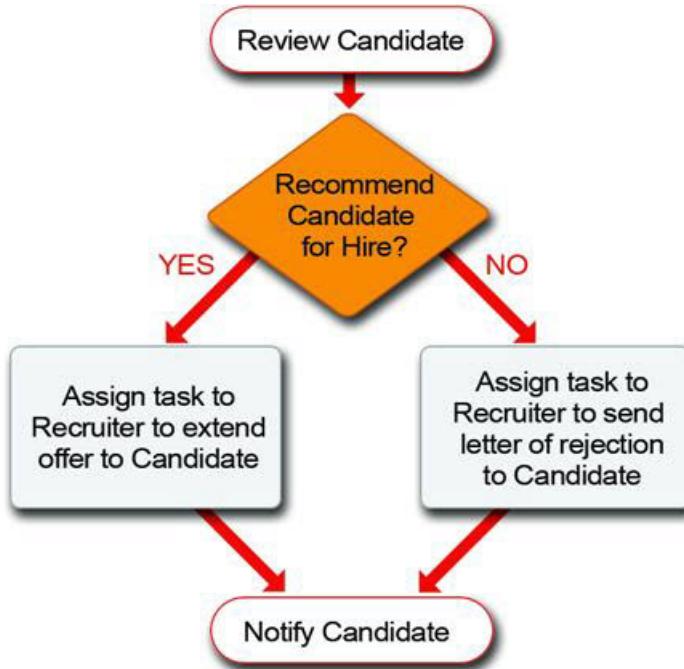


Figure 5: Workflow When a Job Application's Status Has Changed

When a hiring manager makes a decision to either extend an offer to or reject the candidate, changing the status of the application triggers the appropriate task to be assigned to the recruiter for that position. Based upon the hiring manager's decision, the recruiter performs the appropriate follow-up task.

Similarly, we can define an automatic approval process that sends all new positions to the appropriate management for approval. If the position is approved, its status automatically changes to Open - Approved and recruiters can start the hiring process. If the position is

rejected, its status automatically changes to Closed - Not Approved and the position won't be filled.

Custom Reports and Dashboards

Finally, we need to give users a way to inspect the status of all positions and job applicants in the Universal Containers recruiting program. Managers need to delve into the intricate details of how each recruiter is performing, while executives just want a high-level overview of how departments are doing with staffing goals.

We can meet these requirements using reports and dashboards. Using report builder, we can create detailed reports with filters, conditional highlighting, subtotals, and charts. With dashboard builder, we can quickly create a dashboard of up to 20 different components on a single page.

Visualforce

We'll be able to use point-and-click tools to satisfy nearly all of our Recruiting app use cases; however, there are a few use cases, such as the mapping of candidate locations and the posting of positions on Universal Containers' public jobs site, that will require us to use Visualforce, the Force.com platform's tag-based markup language that allows you to build sophisticated, custom user interfaces for apps. We won't address these use cases until the very last chapter, and when we do, this book will provide all the code you need.

Although we haven't yet gone into detail about how any of this stuff is going to work, you can probably see now just how flexible and powerful the Force.com platform can be when you're creating a custom app.

In the next chapter, we'll start out by building our first custom object. We'll swiftly get a feel for how the platform interface works, and it won't be any time at all before you're building app components easily and quickly. When it's this easy, you can't help but become an expert!

Chapter 3

Reviewing Database Concepts

In this chapter ...

- [What's a Database?](#)
- [What's in a Database?](#)
- [What's a Relational Database?](#)
- [Summary of Database Concepts](#)

Now that we've introduced the power of the Force.com platform and learned about the requirements of the Recruiting app that we're going to build, let's take a moment to talk about databases and why a simple understanding of database concepts can help you realize the full potential of the platform and make your app development a whole lot easier.

As you know, the underlying architecture of the platform includes a database where your data is stored. This means that all of the information you enter is stored in that database and then retrieved from the database whenever you view it within your app.

Historically, companies were required to buy, build, and maintain their own databases and IT infrastructures in order to distribute and run their applications. Cloud computing on the Force.com platform provides an alternative and makes it easy for you, as a company or as a sole developer, to build and deliver your app. Part of the simplicity of the cloud computing model is that the technical responsibilities of maintaining and running all of the database hardware and software is handled by the hosting company (in this case, salesforce.com), so you can focus on developing your app.

It's worth pointing out that although your data is stored in a database and a simple understanding of database concepts is helpful, you don't need to be a database

developer to build an app on the platform. We won't be doing any traditional database programming in the course of developing our app.

What's a Database?

In simple terms, a *database* is an organized collection of information. Common examples include a phone book, a library catalog, an employee directory, a catalog of the MP3s you own, or in the case of our Recruiting app, information about the open positions at a company, the people who are applying for those positions, and the managers at our company who are in charge of hiring each position.

Typically, you use a database to collect information about people, things, or concepts that are important to you and whatever project you're working on. In standard database language, the category of a person, thing, or concept you want to store information about is referred to as an *entity*, although in standard Force.com platform terminology, we refer to this as an *object*.

In a database, each entity is represented by a *table*. A database table is simply a list of information, presented with rows and columns, about the category of person, thing, or concept you want to track. So in a phone book, you might have a table to store information about residences and another table to store information about businesses; or in a library catalog, you might have one table to store information about books and another to store information about authors.

In our Recruiting app, we'll have one table to store information about open positions, another table to store information about the candidates applying for the positions, and a table to store information about hiring managers. (Our Recruiting app will have more than just this, but we'll get to that later.)

In very simplistic terms, a Force.com platform object is similar to a database table in that you'll have a separate object for each person, thing, or concept about which you want to collect information. In reality, a Force.com platform object is much more than this because the full functionality of the platform is behind each object. Each object automatically has built-in features like a user interface, a security and sharing model, workflow processes, and much more that you'll learn about in the rest of this book.



Note: As we introduce database concepts, “object” and “table” will be used interchangeably because they are similar. Just remember that a Force.com platform object is much more than just a database table.

It's important to understand that a single database table, or Force.com platform object, should contain only one type of information. You don't want to lump all of your information into one table, so you wouldn't store positions, candidates, and hiring managers all in the same place. Not only is this not good database design, but it doesn't allow you to relate objects to one another. For example, if all of our data were in one table, how would we ever know which

candidates were applying for which positions, or which managers were in charge of hiring for which positions?

As we define our app, it's important for us to keep this in mind and ask ourselves questions like, "What kind of information do we want to store? Can we separate our information into distinct categories so that each object holds only one type of person, thing, or concept?" The answers to these questions will guide us as we design the structure of our application.

What's in a Database?

As we mentioned, a database table presents your information in rows and columns. Let's take a look at how a table of positions might look:

The diagram illustrates the components of a database table. It features a table with five columns: Position Title, Education Requirements, Functional Area, Max Pay, and Min Pay. The first row contains the column headers. The second row shows 'Executive Assistant' in the Position Title column, 'Associate degree' in Education Requirements, 'Human Resources' in Functional Area, '60,000' in Max Pay, and '40,000' in Min Pay. The third row shows 'Recruiter' in Position Title, 'Bachelor's degree' in Education Requirements, 'Human Resources' in Functional Area, '110,000' in Max Pay, and '85,000' in Min Pay. The fourth row shows 'SW Engineer' in Position Title, 'Bachelor's degree' in Education Requirements, 'Engineering' in Functional Area, '140,000' in Max Pay, and '110,000' in Min Pay. The fifth row shows 'SQA Engineer' in Position Title, 'Bachelor's degree' in Education Requirements, 'Engineering' in Functional Area, '140,000' in Max Pay, and '110,000' in Min Pay. Red arrows point from labels to specific parts of the table: 'Row (record)' points to the first row; 'Column (field)' points to the 'Education Requirements' header; 'Data Value' points to the '140,000' in the Max Pay column of the fourth row; and 'Table (object)' points to the entire table structure.

Position Title	Education Requirements	Functional Area	Max Pay	Min Pay
Executive Assistant	Associate degree	Human Resources	60,000	40,000
Recruiter	Bachelor's degree	Human Resources	110,000	85,000
SW Engineer	Bachelor's degree	Engineering	140,000	110,000
SQA Engineer	Bachelor's degree	Engineering	140,000	110,000

Figure 6: Position Information in a Table

Each row in the table represents the information about a specific instance of the object, for example, the Recruiter position or the SW Engineer position. In standard Force.com platform terminology, we call this a *record*. For every object you want to track in your app, you'll have multiple records to represent each individual item about which you're storing information. It's common for users who are new to the platform to confuse the meanings of object and record. It'll make your development a lot easier if you remember that an object is a category of information, such as a position or candidate, and the record is a single instance of an object, such as a SW Engineer.



Note: As a side note here, we'll mention that the platform includes a set of built-in objects when you first start using it; we call these *standard objects*. One example of a

standard object is the User object, which stores information about each person who is a user of the app, like our hiring managers. You can also build your own objects to store information that's unique to your app; we call these *custom objects*. Both standard objects and custom objects are not really all that different—one kind is prebuilt for you, and the other you build yourself. We'll talk more about these later as you start to build your app.

Now let's look at the columns in the table. Each column lists a particular piece of information such as the Position Title or Max Pay. We refer to these as *fields*. Every object has a set of fields that you use to enter the information about a particular record. For each field in the table, a single item of data that you enter, such as Human Resources in the Functional Area, is referred to as a *data value*.

Just like objects, fields come in two varieties: standard and custom. The standard fields are the ones that are built into the platform and automatically added for you. The custom fields are the ones you define to store specific pieces of information that are unique to your app. Fundamentally, there is no difference between standard and custom fields. Both are simply columns in the database table. We'll talk more about standard and custom fields later when you begin building your app.

What's a Relational Database?

Now you have some information stored in your database, but so what? You could easily make a list of positions using Microsoft Excel or some other spreadsheet software. For each position, you could even list the hiring manager in a field called Hiring Manager, like:

Position Title	Education Requirements	Functional Area	Max Pay	Min Pay	Hiring Manager
Executive Assistant	Associate degree	Human Resources	60,000	40,000	Phil Katz
Recruiter	Bachelor's degree	Human Resources	110,000	85,000	Megan Smith
SW Engineer	Bachelor's degree	Engineering	140,000	110,000	Andrew Goldberg
SQA Engineer	Bachelor's degree	Engineering	140,000	110,000	Ben Stuart

Figure 7: Position Information with Hiring Manager Field

But what if a hiring manager is responsible for hiring more than one position? You would need to have duplicate records for the same hiring manager so you could capture every position for which that hiring manager is responsible, like:

Hiring Managers duplicated for each of their positions

Position Title	Education Requirements	Functional Area	Max Pay	Min Pay	Hiring Manager
Executive Assistant	Associate degree	Human Resources	60,000	40,000	Phil Katz
Recruiter	Bachelor's degree	Human Resources	110,000	85,000	Megan Smith
Senior Recruiter	Bachelor's degree	Human Resources	115,000	95,000	Megan Smith
SW Engineer	Bachelor's degree	Engineering	140,000	110,000	Andrew Goldberg
Senior SW Engineer	Bachelor's degree	Engineering	140,000	110,000	Andrew Goldberg
SQA Engineer	Bachelor's degree	Engineering	140,000	110,000	Ben Stuart

Figure 8: Position Information with Duplicate Hiring Managers

This is not a good database design! Using this approach, data is repeated unnecessarily. In addition, there is really no way to capture additional information about our hiring managers, like their email addresses or phone numbers. And if we try to add information about which candidates are applying for each position, you can imagine that our simple table will quickly become extremely complex and unmanageable.

As we mentioned before, you want to create separate database tables, or objects, for each person, thing, or concept you want to track. A better way to model our scenario here would be to create one object for positions, one object for candidates, and one object for hiring managers. (Luckily, the platform has a standard object that we'll be able to use to represent our hiring managers—the User object.)

Once we have our data separated into discrete objects, we can easily relate objects to each other. This is what a relational database is all about! A *relationship* is an association between two or more tables. For example, we can relate positions to hiring managers so we know which positions each hiring manager is responsible for.

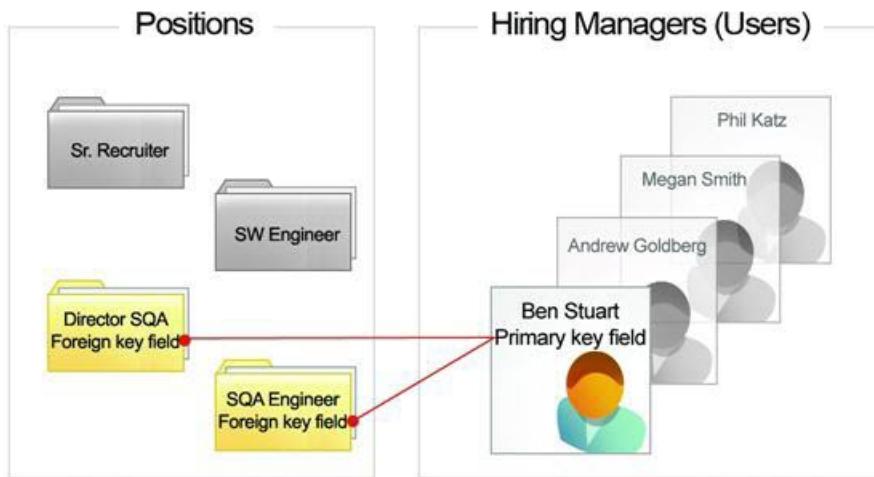


Figure 9: Positions Related to Hiring Managers

From a technical standpoint, each table in a relational database has a field in which the data value uniquely identifies the record. This field is called the *primary key*. The primary key is one part of what defines the relationship; the other part is the *foreign key*. A foreign key is a field whose value is the same as the primary key of another table. You can think of a foreign key as a copy of a primary key from another table. The relationship is made between two tables by matching the values of the foreign key in one table with the values of the primary key in another.

Primary and foreign keys are fundamental to the concept of relationships because they enable tables to be related to each other. As you begin building your app, you won't really need to think too much about primary keys and foreign keys. The important concept to understand here is that in a relational database, objects are related to each other through the use of common fields that define those relationships.

Summary of Database Concepts

At this point, we're ready to dive into the building of our Recruiting app. But first let's recap what we've learned about databases. Whether this was your first introduction to databases or whether you're already an experienced database developer who's new to the Force.com platform, the important things to remember are:

- A *database* is an organized collection of information.
- A database table stores information about a single type of person, thing, or concept—such as a job position. In the Force.com platform, we use the term *object* here (even though an object is much more than this, as you'll see).

- A database row, or *record* in Force.com platform terms, represents a single instance of an object—such as the SW Engineer position.
- A *field* stores a particular piece of information on a record.
- *Relationships* define the connection between two objects, and objects are related to each other through the use of common fields.

Now that we've got that all covered, let's get started building our first object!

Chapter 4

Building a Simple App

In this chapter ...

- [Becoming Familiar with the Setup Area](#)
- [Introducing Apps](#)
- [Introducing Objects](#)
- [Introducing Tabs](#)
- [Becoming Familiar with Setup Detail Pages and Related Lists](#)
- [Introducing Fields](#)
- [Look at What We've Done](#)
- [Taking Our Simple App Mobile](#)

Just as traditional programming books first teach you how to write a simple “Hello World” program before getting into more complicated things, in this chapter, we’re going to create a very simple version of the Recruiting app to show you just how easy it is to get started with the Force.com platform. Along the way we’ll orient ourselves to the platform’s user interface (where we’ll be doing most of our work), and we’ll learn how to create and configure our first custom object. Although easy and straightforward, the tasks we complete here will be the first step in developing a full-featured Recruiting app. So let’s dive right in!

Becoming Familiar with the Setup Area

Since we're going to spend most of our time working in the Setup area of the platform, let's first become familiar with what it is and how to navigate to it.

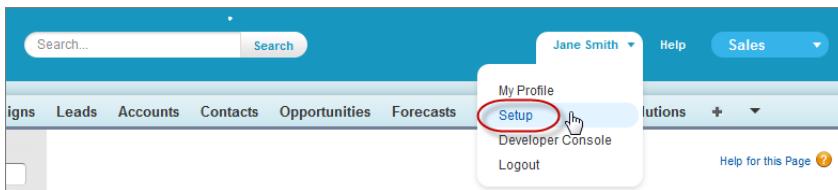
The Setup area is a place to build and customize applications and to administer and monitor organizations and users, all in one. We perform almost every task we need to create our app in the Setup area, so most of the "Try It Out" sections of the book are going to start with an instruction like "From Setup, click **Create > Apps**." This is a short way of saying:

1. Depending on your organization settings, you'll access the Setup area in one of two ways. Look at the header at the top of the page.

If you see **Setup** in the header, click it.



If you don't see **Setup** in the header, click your name, then select **Setup**.



2. Once you're in the Setup area, you'll see a menu on the left side of the page. From that menu, click **Create > Apps**.

The final link that you click (in this example, **Apps**) will change depending on the task you're performing, but you get the general idea.

The screenshot shows the Salesforce Setup area. At the top, there's a navigation bar with tabs like Home, Chatter, Campaigns, Leads, Accounts, Contacts, Opportunities, Forecasts, Contracts, Cases, Solutions, and a Sales tab. Below the navigation bar is a search bar and a user profile dropdown for Jane Smith.

The main content area is titled "Apps". It contains a sidebar with sections for Force.com Home, Administer (with Manage Users, Manage Apps, Company Profile, Security Controls, Domain Management, Communication Templates, Translation Workbench, Data Management, Mobile Administration, Desktop Administration, Email Administration, and Google Apps), Build (with Customize and Create options, and sub-options for Apps and Custom Labels), and a "Quick Find" search bar.

The main window displays a table titled "Apps" with columns for Action, App Label, Service Cloud Console, Custom, and Description. The table lists various apps: Call Center, Community, Content, Marketing, Platform, Sales, Salesforce Chatter, Sample Console, and Site.com. The "Sample Console" row has a checked checkbox in the "Custom" column.

Figure 10: The Setup Area

Similar to the other parts of the application, the Setup area consists of a tab bar, a navigational sidebar, and a main window.

- The tab bar is made up of the same tabs that appear in the regular application. Just click on any one of the tabs to exit the Setup area and go to that tab in the main application.
- The navigational sidebar includes expandable lists of all the tools that are available in the Setup area. The tools include options for setting up, maintaining, and customizing your organization, as well as building, extending, and managing apps.
- The main window is where the navigational links or a selected setup tool are actually displayed.



Tip: Since you'll be developing apps in Force.com, you might want to make the Setup area your default landing page when you log in. To do this:

1. At the top of the page, click the down arrow next to your name. From the menu under your name, select **My Settings** or **Setup**—whichever one appears.
2. From the left pane, select one of the following:
 - If you clicked **My Settings**, select **Display & Layout > Customize My Pages**.

- If you clicked **Setup**, select **My Personal Information > Personal Information**, then click **Edit**.
- 3. Select **Make Setup My Default Landing Page**.
- 4. Click **Save**.

Now that we know what we're looking at, let's start creating our simple app.

Introducing Apps

What should we do first? If we were writing a software application, the first thing we'd need to do is build a project where we could store all the code that we were going to write. With the Force.com platform, the first thing we need to do is create a new app.

Like a programming project, an *app* is little more than a container for all of the objects, tabs, and other functionality that we're going to build as part of our Recruiting application. It consists simply of a name, a logo, and an ordered set of tabs. The simplest app contains only one tab—the Home tab—and a default logo. As we define more tabs in the remainder of this book, we can add them to the app later.

Let's start clicking through the process of actually creating a simple app now. Log in to your Salesforce account so you can follow along!



Note: Because the platform is continually evolving, you might find that the screenshots you see in this book vary slightly from what you see on your screen. These changes should be minor and shouldn't affect your understanding.

Try It Out: Define an App

1. Open a browser and go to www.salesforce.com.
2. Click **Log in to Salesforce**.
3. Enter your username and password.
4. From Setup, click **Create > Apps**.
5. If you see an introductory splash page, simply click **Continue**.



Note: Many parts of the application have these splash pages to help you understand what you can do with the platform. If you never want to see a particular page again, just select **Don't show me this page again**.

Welcome to the Apps list page! Like many of the setup tools, the starting page for the Apps tool consists of a list of all the apps that are currently enabled for your organization. Depending on which edition you're using or have installed from the AppExchange, you'll probably already have some standard apps listed here.

Beyond the Basics

There are actually two ways to create an app. The **Quick Start** button creates an app with one custom object and associated tab. With the **New** button, you create an app with a logo, add existing tabs, and specify the app's visibility for your profiles. In this book we'll use the **New** button, but feel free to try out the **Quick Start** button later.

6. Click **New**. The New Custom App wizard appears.
7. In the **App Label** field, enter Recruiting.

The app label is the name that represents our app in the Force.com app menu that appears at the top right of all pages. Users can use this menu to switch back and forth between apps.

Notice that a vertical red bar appears just to the left of this **Label** field. This red bar indicates that you must provide a value for this field in order to save your work. If you don't enter a value here and try to proceed, an error message is displayed.

The screenshot shows the 'New Custom App' wizard. At the top, it says 'Step 2. Enter the Details' and 'Step 2 of 5'. Below that, a note says 'Fill in the fields below to define the custom app.' A red error message 'Error: Invalid Data. Review all error messages below to correct your data.' is displayed above the 'Custom App Information' section. In the 'Custom App Information' section, there is a field labeled 'App Label' with a red border around it. Below the field, an error message says 'Error: You must enter a value' and provides an example: 'Example: HRforce, Financeforce, Bugforce'. A small note at the bottom right of the section says '| = Required Information'.

Figure 11: Required Fields Highlighted in Red

8. Click your mouse inside the **App Name** field.

The app name is what developers use to identify an app when writing code for the Force.com platform. We won't do anything in this book that uses the app name, but the field is required, so it needs a value. Fortunately, when you enter a value in the **App Label** field, the same value should automatically appear in the **App Name** field. If it doesn't, enter Recruiting in the **App Name** field now.

9. In the Description field, enter Manage positions, candidates, and job applications, and track job postings on employment websites.
10. Click **Next**.

The next screen in the New Custom App wizard allows you to specify the image file to use for this app's logo. Whenever the app is selected in the Force.com app menu, this logo appears in the upper-left corner of all pages. Since we're just creating a simple app, let's accept the default logo that's already provided. We can always change it later.

11. Click **Next**.

As we said before, an app is a container for an ordered collection of tabs, and this step of the New Custom App wizard allows us to specify which tabs we want to include in our new app. The Available Tabs list shows us the standard and custom tabs that are available for us to choose, and the Selected Tabs list shows us which tabs are already included, listed in the order that they should be displayed. You'll notice that one tab, the Home tab, is already included in our app by default. This is because the Home tab is required in every app, and must always be in the first position; however, you can use the Default Landing Tab drop-down menu to select which tab is first displayed when the app opens.

Again, since we're just creating a simple app, let's accept the defaults and move on. We'll add more tabs later.

12. Click **Next**.

Now that we've defined some of the basic features of our app, you might be wondering what remains to be done in the New Custom App wizard—shouldn't we already be done? It turns out that one crucial step remains: we need to define the users who can access our app.

In this step of the New Custom App wizard, we can choose which user profiles should have access to the app. We'll learn more about profiles in [Securing and Sharing Data](#) on page 149. For now, just understand that every user is assigned to a profile, and profiles control which apps the users assigned to that profile can view.

13. Select the **Visible** checkbox next to the Standard User and System Administrator profiles.
14. Click **Save**.

That's it!

Look at What We've Done

Now that we've made it back to the Apps list page, let's see what we've just done. First of all, we've got a new entry in the Apps list—our Recruiting app! It shows up in the list in the same order it's going to appear in our Force.com app menu. In fact, let's go look at the Force.com app menu now.

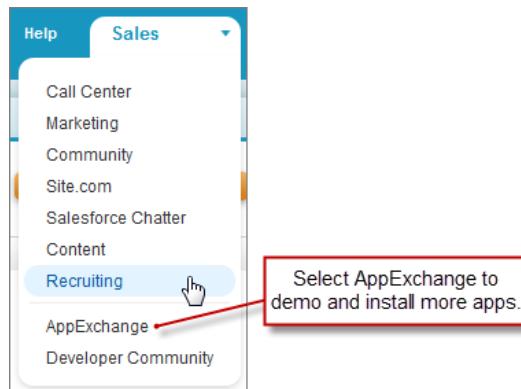


Figure 12: Force.com App Menu



Tip: If you want to change the position of our app in this menu, do so from the Apps list page by clicking **Reorder** and rearranging the available apps as you see fit.

Now select the Recruiting app from the menu and see what happens—our app is launched with a single Home tab! We've created the Recruiting app's Home tab, and we've added it to the Force.com app menu. That's how easy it is to get started.

You'll notice that the approach we're taking here is iterative: we'll build part of the app, look at what we've accomplished, and then add to it. This sequence not only reflects the fact that we're leading you through the steps of building an app in this book, but you'll also find that in building Force.com platform apps in general, this iterative process is common.

During the course of this book, you'll also notice that unlike with traditional coding projects, your app is always functional. There's no build or compile phase, and as a result, you'll almost never be chasing down syntax bugs or other typos. In fact, with this simple one-tab app, you can already utilize all of the built-in functionality that comes with the platform, including search, calendar events and tasks, user preferences, and a familiar user interface.

Introducing Objects

Now that our app is functional (but rather boring), let's make it a little more interesting by introducing our first object.

As you might remember from the last chapter, an *object* is very similar to a database table in the Force.com platform. The platform comes with a number of standard objects, like contacts, accounts, and cases, which support default apps like Salesforce Sales and Salesforce Call Center. We can also define custom objects that allow us to store information specific to our Recruiting app.

Whether they're standard or custom, Force.com platform objects not only provide a structure for storing data but they also power the interface elements that allow users to interact with the data, such as tabs, the layout of fields on a page, and lists of related records. Because any object can correspond to a tab, and an ordered collection of tabs makes up an app, objects make up the heart of any app that we create with the platform.

With custom objects being so important—they have lots to do with how our app will look, behave, and feel—what we do with custom objects and how we use them quickly becomes essential to creating a successful app. The design of the data model behind an app is typically the biggest factor in its success or failure.

That's enough talk about objects for now. Let's go define one!

The Position Custom Object

The first custom object that we'll create for our Recruiting app reflects a typical recruiting task: describing a position. Recruiters at Universal Containers need to keep track of all the positions they're hiring for, such as a Senior Developer, Sales Engineer, or Benefits Specialist. They'll need easy access to all positions in the system through a tab, and they'll need to include certain information for each position, such as its minimum and maximum salary range, the position's location, and its hiring manager. In Force.com platform terms, we'll create a custom object, create a custom tab for that object, and then define some custom fields.

Try It Out: Define the Position Custom Object

To create the Position custom object, we'll go back to the Setup area.

1. From Setup, click **Create > Objects**.

2. On the Custom Objects page, click **New Custom Object**.

Unlike defining a custom app, which we did through the New Custom App wizard, defining a custom object is confined to just one page. You'll find that the platform uses wizards or single pages depending on the amount of information that needs to be specified.

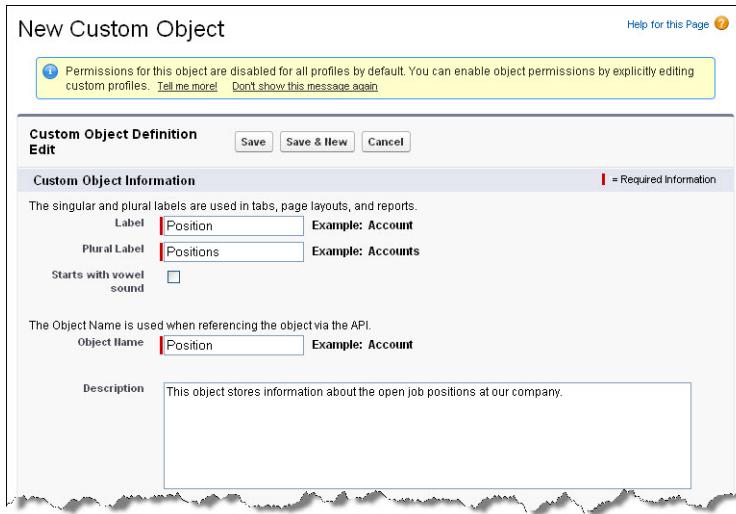


Figure 13: Custom Object Definition Page

- 3.** In the `Label` field, enter `Position`.
- 4.** In the `Plural Label` field, enter `Positions`.
- 5.** The `Object Name` field is defaulted to `Position`. Let's leave it as is.

The `Label` and `Plural Label` of a custom object are what users see in all of the object's related user interface elements, such as the object's tab or in search results headings. Object labels work best as nouns, and the plural label is always used to label a custom object's tab (if you create a tab for your object).

The value of a custom object's `Object Name` represents the unique name for the object when it's referenced in other areas of the platform, such as formulas and Visualforce pages. This value is helpfully auto-generated based on the value that you enter for the `Label`, except that all spaces and punctuation are replaced with underscore characters. We'll talk more about formulas and Visualforce later in this book. For now, keep in mind that the `Object Name` value must be unique across all objects defined in your organization.



Note: Within the platform, `Object Name` is actually stored with `_c` appended to the end as a suffix (for example, `Position__c`). This identifies it as a custom object.

6. In the Description field, enter This object stores information about the open job positions at our company.
7. For the Context-Sensitive Help Setting, accept the default. If you later want to provide customized help documentation for your users about this object, you can come back and choose the Open a window using a custom Visualforce option.
8. In the Record Name field, enter Position Title.

The Record Name is the label for the field that identifies individual position records in the system. A custom object cannot be saved without this identifying field.

9. In the Data Type drop-down list, select Text.

The Data Type drop-down list allows you to select the type of value used for this identifying field: either Text or Auto-Number. Some objects, like Positions or Accounts, can be identified with a text field because there will always be a name for a position or account available. Other objects, like a Case (used in the standard Call Center app) are harder to identify with a single text field, so we assign them auto-numbers instead.



Tip: Whenever possible, it's best to use text as the data type for an identifying field so that users can more easily identify a particular record when several of them appear together in a single list.

To illustrate how custom object and record name labels work together in the app, let's fast forward a bit to see where each label will appear once we've defined our Position custom object, its tab, and a single Sr. Developer position record.

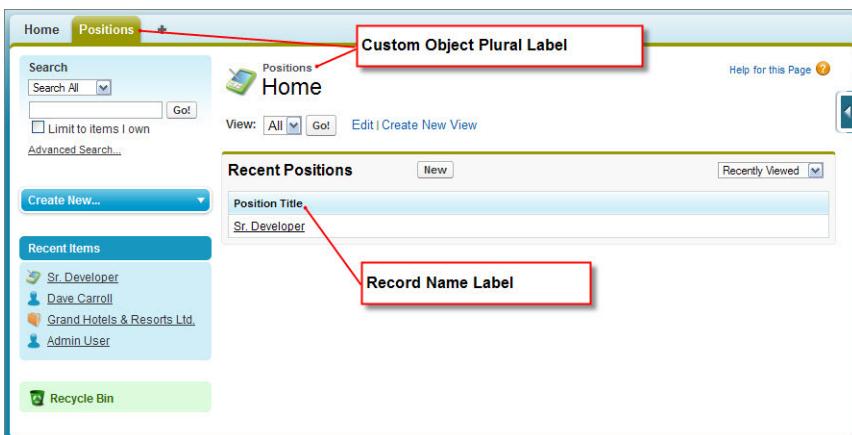


Figure 14: Custom Object and Record Name Labels

Let's move on.

- 10.** In the Optional Features area, select the Allow Reports, Allow Activities, and Track Field History checkboxes.

These three checkboxes actually enable some really robust functionality.

Allow Reports

Selecting this option makes the data in the position records available for reporting purposes. The platform comes with a large number of standard reports, and users can also create custom reports by using a simple yet powerful report builder. (To find out more about reports, see [Analyzing Data with Reports and Dashboards](#) on page 287.)

Allow Activities

Selecting this option allows users to associate tasks and scheduled calendar events with a particular position. For example, a user can create a task, such as “Update salary range for Sr. Developer position,” and specify attributes such as priority, due date, and status. The user can then handle the task or assign it to someone else. (To find out more about tasks, see “Activity Overview” in the Salesforce Help.)

Track Field History

Selecting this option allows the platform to automatically track edits to position records, such as who changed the value of a field, when it was changed, and what the value of the field was before and after the edit. History data is available for reporting, so users can easily create audit trail reports when this feature is enabled. (To find out how to select which data is tracked, see “Tracking Field History for Custom Objects” in the Salesforce Help.)

In general, select these options if there's any chance that they might be useful for whatever custom object you're defining.

- 11.** In the Deployment Status area, select Deployed.



Note: This step assumes that you're working in a development environment. If you're not, and if you don't want users to see the Position object after you click **Save**, select In Development. Setting the status to In Development hides position records from all users except those with the “Customize Application” user permission (that is, just about anyone who isn't a System Administrator).

- 12.** In the Object Creation Options area, select the Add Notes & Attachments related list to default page layout and Launch New Custom Tab Wizard after saving this custom object checkboxes.

These two options are available only when you're creating a new custom object. If you later decide to go back and edit some of the details about your custom object, you won't see them. But what do they do?

- Enabling notes and attachments for an object means you can attach external documents to any position record, in much the same way that you can add a PDF or photo as an attachment to an email. It's handy functionality, so select it.
- Launching the New Custom Tab wizard does exactly what it says—it's a shortcut to launching the tab wizard after we've saved our Position object, and will save us a few clicks if we know that we need a tab.

All set? Let's go ahead and save our Position custom object now.

That's all there is to it! As promised, the New Position Tab wizard is displayed instead of the list of custom objects that we'd normally see. Let's take a moment to talk about why we should even be defining a tab for our Position object in the first place. What's so great about tabs, anyway?

Introducing Tabs

If you're familiar with the Force.com platform, you know that clicking tabs is how you navigate around an app. Every tab serves as the starting point for viewing, editing, and entering information for a particular object. When you click a tab at the top of the page, the corresponding home page for that object appears. For example, if you click the Accounts tab, the Accounts tab home page appears, giving you access to all of the account records that are defined in your organization. Click the name of a particular account record and you'll view all of the record's information in its associated detail page.

What's really powerful about building an app with the platform is that you can create custom tabs that look and behave just like the tabs for standard objects that are already provided. From the perspective of your end users, any customizations that you make appear perfectly seamless, and as a developer, you don't have to do anything special to make it work that way! Let's see how quickly we can create a tab for our Position object.

Try It Out: Define the Positions Tab

To create a custom tab for our Position object, we're going to use the New Custom Object Tab wizard that was so helpfully launched for us when we clicked **Save** after defining the object. However, in case you forgot to select the **Launch New Custom Tab Wizard** after

saving this custom object option or if you're coming back to work that you previously saved, have no fear! There's another way to launch the wizard.

1. From Setup, click **Create > Tabs**.
2. In the Custom Object tabs area, click **New**.

Easy. Now that we're all on the same page, let's get started working through the wizard.

3. In the Object drop-down list, select Position.

If you launched the wizard directly after defining the custom object, the Position object is automatically selected for you.

4. Click the Tab Style  icon to launch the Tab Style Selector as shown in the following screenshot.

Every object that appears as a tab must have a unique color scheme and icon. This color scheme is what identifies the object, not only on its tab but also in different places in the user interface, such as in related lists and search results.

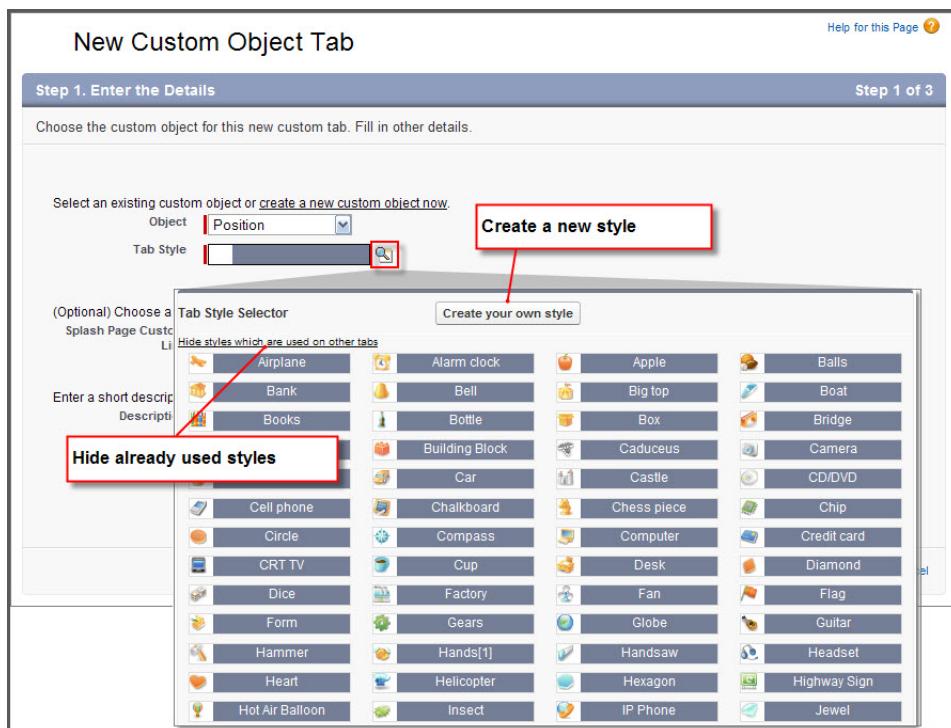


Figure 15: Custom Object Tab Setup Page and Tab Style Selector

In the Tab Style Selector, you can choose a predefined color and icon or you can create your own. To keep things simple, we're going to select an existing style.

5. Click the **Hide values which are used on other tabs** link to make sure you choose a unique style.
6. Click any colored box to choose a color scheme and icon.

Leave the Splash Page Custom Link drop-down list set to --None--. We'll learn more about custom links in [Moving Beyond Point-and-Click App Development](#) on page 333.

7. In the Description field, enter A tab and color scheme for the Position custom object.
8. Click **Next**.
9. Click **Next** again to accept the default user profile visibility.

Just as we controlled access to our Recruiting app by selecting user profiles in the New Custom App wizard, we can also control access to our Positions tab by selecting user profiles here. We'll learn more about user profiles and what they do in [Securing and Sharing Data](#) on page 149. For now, just know that accepting the defaults will make the tab visible to all users.

10. Deselect all of the `Include Tab` checkboxes except the one for our Recruiting app.

In performing this step, we're providing access to the Positions tab only when someone has access to our Recruiting app. Unless an employee is interested in recruiting, he or she probably doesn't need to see this tab.

11. Select the `Append tab to users' existing personal customizations` checkbox.

If you don't select this option, any users who have personalized their tab display will not immediately see the Positions tab. Also, if you've already created a new tab and didn't turn this option on, you have to first delete the existing tab and then recreate it with this option turned on to automatically push the tab to existing users. What a pain! Do yourself a favor and just always keep this option selected.

12. Click **Save**.

You'll notice when the page refreshes that the Positions tab has automatically been added next to the Home tab at the top of the page.

Look at What We've Done

To truly appreciate what we've just built with a few clicks, let's take a look at what we've done.

1. First, click the Positions tab to display the Positions tab home page, as shown in the following screenshot. Although the list is empty because we haven't yet created any records, you can see how this page will become the gateway to viewing, creating, editing, and deleting all of the positions that we create in our Recruiting app. It looks just like the tab home page of any other standard object.

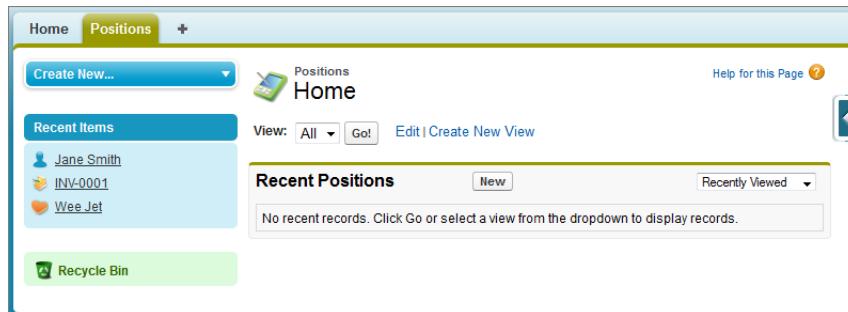


Figure 16: The Positions Tab Home Page

2. Now, check out the contents of the **Create New...** drop-down list in the left sidebar. As promised, our custom object has been seamlessly incorporated into the platform with the other standard objects like Event and Task. An end user need never know that the Positions tab was created with a custom object, because it shows up alongside the standard objects as well.
3. Select Position from the **Create New...** drop-down list, or click **New** in the Positions tab home page. Voilà—it's the Position edit page! Sadly, though, our position still doesn't have much room for data. At this point, all we have is a field for **Position Title** (the record identifier) and **Owner**, a default field that appears on every object to identify the user who created the object.
4. Click **Cancel**. It doesn't do much to create a position record with hardly any interesting data. We need more fields! And sure enough, that's what we'll get to next. First, though, we'll revisit our Position custom object and orient ourselves to what else is available through a custom object detail page in the Setup area.
5. Notice the arrow icon (1) on the right side of the page. Click it to open the Force.com quick access menu. When you're building apps, the quick access menu makes it easy to switch between object records and setup pages. This menu appears from the list pages and record detail page for any object, so you can easily jump to the setup pages for an object and its tabs, fields, and more. You'll get a chance to try out the quick access menu in a little while.

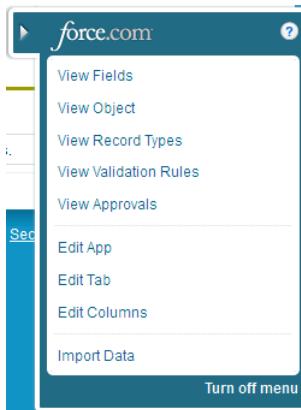


Figure 17: Force.com Quick Access Menu



Note: You can see this menu because you have the “Customize Application” permission, which allows you to create apps, objects, tabs, and fields. Users who don’t build apps, like those with the Standard User profile, won’t see this menu.

Becoming Familiar with Setup Detail Pages and Related Lists

You may recall when we first introduced the concept of objects that we learned: “Whether they’re standard or custom, Force.com platform objects not only provide a structure for storing data but they also power the interface elements that allow users to interact with the data, such as tabs, the layout of fields on a page, and lists of related records.” If you’ve been following along closely, you might have been wondering why we didn’t get to define any fields (other than the identifier field of Position Title) or user interface elements (other than the Positions tab) when we created our Position object. If fields and user interface elements are a part of the definition of what a custom object is all about, where do we get to define them?

It turns out that the Force.com platform differentiates between the initial creation of certain components and details related to those components. In other words, the information that we see when we define or edit a custom object is different from the information that we see when we view a custom object that’s already defined. Let’s go back to our custom object list page to see how this difference is reflected in the platform interface.

1. From Setup, click **Create > Objects**.

Here we are back in the custom object list page. You'll notice in the row for Position there are three links that we can click.

Edit

This link takes us back to the Custom Object edit page where we originally defined our Position object.

Del

This link deletes the custom object, including any records, tabs, reports, or other components associated with that object.

Position

This link takes us to the custom object detail page for our Position object.

Action	Label	Master Object	Deployed	Description
Edit Del	Position			<p>This object stores information about the open job positions at our company.</p> <p>View every detail about the object, including information that's not in the edit page.</p>

Figure 18: Custom Object List Page: Edit, Delete, and Detail Links

We're already familiar with the edit page from when we defined our Position object, and we certainly don't want to delete our object. Let's go ahead and open up the detail page to see what we can do there.

2. Click Position.

As you can see, the Custom Object edit page that we filled out when we defined our Position object was just the tip of the iceberg. The top two areas of the Position detail page include all of the information that we originally specified, plus a few standard fields that the platform includes with every object. Below those areas are several additional groupings of data that allow us to do more with our Position object.

In Force.com platform terms, those groupings of data are called *related lists*, and they're a big part of what makes the platform so powerful. A related list is a list of records or other components that are associated with whatever we're viewing. Related lists appear in both the

main application and in the Setup areas and represent a relationship between the items that appear in the related list and the object or record that we're viewing in the detail area. We'll learn a lot more about relationships in [Expanding the Simple App Using Relationships](#) on page 101, but for now, just understand that anything that appears in an object's related list is directly related to that object.

Now that we've found out where we can continue customizing our Position custom object, let's use the Custom Fields & Relationships related lists to create some more fields in our Position object.

Custom Object Definition Detail		Definition Details	
Singular Label	Position	Description	This object stores information about the open job positions at our company.
Plural Label	Positions	Enable Reports	<input checked="" type="checkbox"/>
Object Name	Position	Track Activities	<input checked="" type="checkbox"/>
API Name	Position__c	Track Field History	<input checked="" type="checkbox"/>
		Deployment Status	Deployed
		Help Settings	Standard salesforce.com Help Window
Created By	Admin User, 2/2/2010 2:07 PM	Modified By	Admin User, 2/2/2010 2:07 PM

Action	Field Label	Data Type	Track History
Edit	Created By	Lookup(User)	<input type="checkbox"/>
Edit	Last Modified By	Lookup(User)	<input type="checkbox"/>
Edit	Owner	Lookup(User, Queue)	<input type="checkbox"/>
Edit	Position Title	Text(80)	<input type="checkbox"/>

Custom Fields & Relationships		Custom Fields & Relationships Help
New Field Dependencies Set History Tracking		Custom Fields & Relationships Help
No custom fields defined		

Figure 19: Position Custom Object Detail Page

Introducing Fields

We're ready to add more fields to our Position custom object, but first, let's talk briefly about what a field is and how it fits into the world of the Force.com platform.

As you might remember from the last chapter, a *field* is like a database column. The primary characteristic of a field is its data type—some fields hold text values, while others hold currency values, percentages, phone numbers, email addresses, or dates. Some fields look like checkboxes, while still others are drop-down lists or record lookups from which a user makes a selection.

The data type of a field controls the way the field is ultimately displayed in the user interface and how data entered into the field is stored in the platform. To get a better feel for how the

fields will look, let's take a sneak peak at what the Position object is ultimately going to look like and the types of custom fields we're going to create for it:

The screenshot shows the 'Position Edit' screen for a 'New Position'. The interface is divided into sections: 'Information', 'Compensation', 'Description', and 'Required Languages'. Several fields are highlighted with red boxes and labeled:

- Text field:** Position Title (Benefits Specialist)
- Picklist field:** Status (New Position), Type (Full Time), Functional Area (Finance), Job Level (FN-300)
- Dependent picklist field:** Owner (Admin User)
- Standard owner field:** Location (San Francisco, CA)
- Date field:** Open Date (2/3/2010), Hire By (5/4/2010), Close Date (2/3/2010)
- Checkbox field:** Travel Required (checked)
- Currency field:** Min Pay (\$75,000.00), Max Pay (\$100,000.00)
- Long text area field:** Job Description (Play a leadership role in the development and implementation of Universal Containers' global employee benefits strategy, programs, policies, and processes.)

Figure 20: Position Custom Object Fields

There are a lot of fields here that we need to define, some more complicated than others. To keep things simple, let's go through and create the simple text, currency, checkbox, and date fields. We can tackle the more complicated picklist and custom formula fields in [Enhancing the Simple App with Advanced Fields, Data Validation, and Page Layouts](#) on page 59.

Try It Out: Add Text Fields

First let's define a few text fields. We already created a basic text field for Position Title when we defined our Position custom object. Looking at our screenshot, the only text fields that remain are the text fields under the Description heading. We'll start by defining the Job Description field.

1. From Setup, click **Create > Objects**.
2. Click **Position**.
3. In the Custom Fields & Relationships related list, click **New**.

Every time you create a custom field, you'll first choose a data type from the field type selection page.

The platform allows us to choose between different types of text fields.

- Basic text fields allow users to enter any combination of letters and numbers on a single line, up to as many as 255 characters.
- Text area fields also have a 255-character limit but also allow carriage returns so the text can be formatted on separate lines.
- Long text fields allow as many as 32,768 characters, on separate lines.
- Rich text fields allow user to enter as many as 32,768 characters of formatted text, including images and hyperlinks.
- Encrypted text fields allow users to enter any combination of letters and numbers that are stored in encrypted form, up to as many as 175 characters.

Since job descriptions can be lengthy, let's choose a long text area.

4. Choose the **Text Area (Long)** data type, and click **Next**.



Tip: Carefully consider the data type you choose for each of your custom fields, because once you set it, it isn't always the best idea to change it later. See “Notes on Changing Custom Field Types” in the Salesforce Help for details.

The second page of the custom field wizard allows us to enter details about our long text area field. The fields that appear in this step change depending on the data type that we selected in the previous page.

5. In the **Field Label** field, enter **Job Description**.

Like the other labels we've seen in the platform so far, **Field Label** specifies the text that appears when the field is rendered in the user interface. Notice that when we enter a value for **Field Label**, **Field Name** is automatically populated with the same text but with all spaces and punctuation replaced by underscores. The value for **Field Name** is a unique name that is used to refer to the field when writing a custom formula or using the API.



Note: Within the platform, **Field Name** is actually stored with **_c** appended to the end as a suffix (for example, **Job_Description__c**). This identifies it as a custom field.

The Length field allows us to restrict the maximum number of characters that are allowed. Since we don't get any benefit from this kind of restriction, leave this value set to 32,768.

6. In the Length field, enter 32,768.
7. In the # Visible Lines field, enter 3.

This field allows us to specify how large our text box will appear on the page.

8. In the Description and Help Text fields, enter High-level description of the job and its duties.

While the description is displayed only in the details for this custom field in Setup, this help text is displayed on record detail and edit pages when users hover over the field's label. Its purpose is to assist users in filling out the field correctly. It's optional to add help text for a field, but it's a good idea if you have fields that you think might confuse users.

There's no obvious default value for a text field, so just leave Default Value blank.

9. Click Next.

The third page of the Custom Field wizard allows us to restrict access to this field from certain user profiles. We'll learn more about profiles and field-level security in [Securing and Sharing Data](#) on page 149, so for now, just accept the defaults.

10. Click Next.

The last page of the wizard allows us to automatically place our field on the Position page layout. Again, we'll learn about page layouts in the next chapter, so for now, just accept the defaults.

11. Click Save & New.

Instead of clicking **Save** and returning to the Position object detail page, clicking **Save & New** saves a few clicks and allows us to finish up the other text area fields that we need. Here's what you need to know to define them.

Table 2: Position Object Long Text Area Fields

Data Type	Field Label	Length	# Visible Lines	Default Value
Text Area (Long)	Responsibilities	32,768	3	Leave unspecified
Text Area (Long)	Skills Required	32,768	3	Leave unspecified
Text Area (Long)	Educational Requirements	32,768	3	Leave unspecified

Now that we've wet our feet with text fields, let's quickly create a few more fields of other types. You'll find that with few exceptions, they're all very similar to one another.

Try It Out: Add Currency Fields

To keep track of a position's salary range, we need to add two currency fields: `Min Pay` and `Max Pay`. Note that unlike some fields, once we define these as currency fields, we won't be able to change them to any other type.

Defining a currency field is almost identical to defining a text field, with a few slight differences.

- The `Length` of a currency field actually corresponds to the number of digits to the left of the decimal point. An additional `Decimal Places` field handles the number of digits that should be displayed to the right.
- In the Details page of the wizard, a new checkbox called `Required` is displayed. We can select this option if we want to force our users to enter a value for this field when creating a new position.

Everything else should be familiar to you, so go ahead and use the custom field wizard to define the following fields:

Table 3: Position Object Currency Fields

Data Type	Field Label	Length	Decimal Places	Required	Default Value
Currency	Min Pay	7	2	Leave unchecked	Leave unspecified
Currency	Max Pay	7	2	Leave unchecked	Leave unspecified

Try It Out: Add Checkbox Fields

Here are some easy ones. The `Position` object requires a few checkbox fields: one to indicate if travel is required for the position, and four others to indicate which programming languages are required. By default, these values should be unchecked. (Note that similar to currency fields, once you define a field as a checkbox, you can't change it to any other type.)

Use the custom field wizard to define these fields.

Table 4: Position Object Checkbox Fields

Field Type	Field Label	Default Value
Checkbox	Travel Required	Unchecked
Checkbox	Java	Unchecked
Checkbox	JavaScript	Unchecked
Checkbox	C#	Unchecked
Checkbox	Apex	Unchecked

Try It Out: Add Date Fields

Finally, before we close out this chapter, let's add three date fields to our Recruiting app to track the date a position opens, the date it closes, and the date by which it should be filled. Date fields are great because they automatically include a popup calendar interface from which users can select a day without any typing—yet another built-in feature that we can leverage in our app without any extra work!

Once again we'll use the custom field wizard to define these three fields:

Table 5: Position Object Date Fields

Field Type	Field Label	Required	Default Value
Date	Open Date	Unchecked	Leave unspecified
Date	Hire By	Unchecked	Leave unspecified
Date	Close Date	Unchecked	Leave unspecified

Look at What We've Done

We've defined text, currency, checkbox, and date fields for our Position object. Let's take a look by going to the Positions tab and clicking **New**.

The screenshot shows the 'Position Edit' screen for creating a new position. At the top right is a 'Help for this Page' link. Below it is a toolbar with 'Save', 'Save & New', and 'Cancel' buttons. The main area is titled 'Information' and contains several input fields:

- Position Title:** A required field indicated by a red asterisk.
- Job Description:** A large text area.
- Responsibilities:** A large text area.
- Skills Required:** A large text area.
- Educational Requirements:** A large text area.
- Min Pay:** An input field.
- Max Pay:** An input field.
- Travel Required:** A checkbox.
- Language Checkboxes:** A group of four checkboxes labeled Java, JavaScript, C#, and Apex. These are highlighted with a red box and a callout bubble stating 'Optional language checkboxes'.
- Open Date:** An input field showing '2/2/2010'.
- Hire By:** An input field showing '2/2/2010'.
- Close Date:** An input field showing '2/2/2010'.

At the bottom are three buttons: 'Save', 'Save & New', and 'Cancel'.

Figure 21: Position Object Fields

Check out all the fields we've just made! Each field got added to the page in the order that we created it, and we may want to adjust the layout later, but it's definitely functional. Wasn't that easy?

Taking Our Simple App Mobile

Remember that mobile app we mentioned earlier? Salesforce1 hooks into your Salesforce organization and presents all your customizations and data in a mobile-friendly user interface. That means that anything you do in the full site will be reflected automatically in this mobile app, so your users will have access to the information they need, no matter where they are! This will be especially useful for our recruiters, who sometimes travel to find the best candidates for Universal Containers' open positions. Let's take a look at how the Positions tab and its fields appear in mobile.

Before we begin, make sure you have access to Salesforce1. You can do this with a downloadable app or the mobile browser app.

- To use the downloadable app, go to www.salesforce.com/mobile, and select the appropriate platform for your device to download Salesforce1 directly to your device.
- To use the mobile browser app, navigate to login.salesforce.com from your mobile browser. Salesforce will recognize that you're working from a mobile device and redirect you to the Salesforce1 mobile browser app.
 1. Open Salesforce1 from your mobile device.
 2. Enter your Salesforce credentials and tap **Log in to Salesforce**.

Notice that there isn't a home tab. With our current configuration, the first thing that appears for users is the first item in the *navigation menu*. We'll go over how to select which page appears when users first open Salesforce1 later in [Analyzing Data with Reports and Dashboards](#) on page 287.

3. Tap  to open the navigation menu.

Now is a good time to talk about how apps and tabs work in Salesforce1. Earlier, we learned that each tab is represented through a menu item in the Recent section of the Salesforce1 navigation menu. Salesforce apps, such as the Sales app or a custom app, don't appear in Salesforce1, because the mobile app figures out which records you look at most often. Rather than using the Force.com app menu to customize the tabs a user sees regularly, the smart search items under the Recent section reorder based on the user's history of recent objects. Since our organization is new and we haven't added any data yet, we see the default objects for now: accounts, cases, contacts, files, leads, and opportunities.

We don't see our custom object in this list, so let's look at the full list of smart search items.

4. Tap **Show More**.
5. Tap **Positions**.
6. Tap **New** to check out how our fields look in Salesforce1.

Just like in the full site, all the fields we made are here, and we can easily create a new position from our mobile device. That means we don't have to duplicate our effort to create a pleasant mobile experience for our users. It just works!

The screenshot shows a Salesforce1 interface for creating a new position. At the top, there are three buttons: 'Cancel', 'Create Position' (which is highlighted in blue), and 'Save'. Below this is a section titled 'INFORMATION'. Inside this section, there are five input fields:

- 'Position Title*' (marked with a red asterisk)
- 'Owner' (Jane Smith)
- 'Job Description'
- 'Responsibilities'
- 'Skills Required'

Figure 22: Create Position Page in Salesforce1

Once again, welcome to the power of the Force.com platform. First we created a new Recruiting app with a single Home tab, then we created a Position object and tab, and now we've just added a few fields, all in less than 15 minutes of clicking around. From start to finish we always had a fully functional app, and we never had to spend any time compiling or debugging our "code!"

In the next chapter, we'll enhance our simple Recruiting app even further by adding some additional fields that are more complex, defining validation rules to help our data stay clean, and then moving the fields around in a page layout so users can more easily find and enter the information they need. Let's keep going!

Chapter 5

Enhancing the Simple App with Advanced Fields, Data Validation, and Page Layouts

In this chapter ...

- Adding Advanced Fields
- Introducing Validation Rules
- Check It Out in Mobile
- Introducing Page Layouts
- Introducing Compact Layouts

In the last chapter, we got our Recruiting app off to a quick start by defining the Position custom object, tab, and several simple fields. This simple version of our app had the same look and feel as any other page on the Force.com platform, and we were able to whip it together in a matter of minutes.

In this chapter, we're going to enhance the Positions tab: first by defining a few more advanced fields, then by defining a couple of validation rules to make sure our data stays clean, and finally by moving our fields around within a page layout. These additions will help change the detail page of our Positions tab from a somewhat flat and inelegant user interface to something that users find powerful and intuitive to use. Let's get started!

Adding Advanced Fields

In this section, let's revisit the custom field wizard to help us create fields with more sophisticated functionality: picklists, dependent picklists, and fields that leverage custom formulas. We'll see how the platform's user interface helps guide us through the setup of these more complicated fields.

Introducing Picklists

When viewing the preview of what we wanted our Positions page to ultimately look like, there were several fields that were specified with drop-down lists. In Force.com platform terms, these fields are called *picklists*, and they consist of several predefined options from which a user can select.

Picklists come in two flavors: a standard picklist, in which a user can select only one option, and a multi-select picklist, in which a user can select multiple options at a time. For the purposes of our Position object, we need to define standard picklists for a position's location, status, type of job, functional area, and job level.

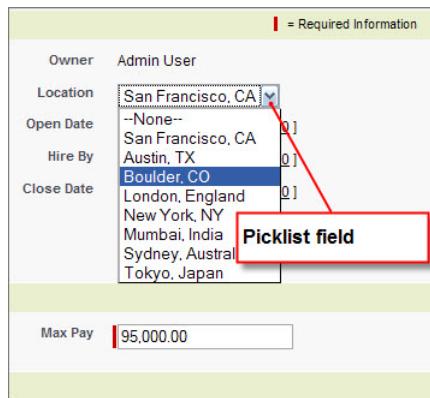


Figure 23: Location Picklist Field

Try It Out: Add Picklists

Let's walk through the creation of the Location picklist field. Then, as in the previous chapter, we'll give you the information that you need to create the others on your own.

1. From Setup, click **Create > Objects**.
2. Click **Position**.
3. In the Custom Fields & Relationships related list, click **New**.
4. Select the **Picklist** data type, and click **Next**.
5. In the **Field Label** text box, enter **Location**.
6. In the large text area box just below, enter the following picklist values, each on its own line:
 - San Francisco, CA
 - Austin, TX
 - Boulder, CO
 - London, England
 - New York, NY
 - Mumbai, India
 - Sydney, Australia
 - Tokyo, Japan
7. Select the **Use first value as default value** checkbox.

This option allows us to populate the field with a default value. If you select it, the field defaults to the first value that you specify in the list of possible picklist values. Otherwise, the field defaults to None on all new position records. Because most positions at Universal Containers are based at its headquarters in San Francisco, CA, this should be the default.

8. Accept all other default settings for field-level security and page layouts.
9. Click **Save & New**.

Easy! Now specify the remaining picklists according to the table below:

Table 6: Status, Type, Functional Area, and Job Level Picklist Values

Data Type	Field Label	Picklist Values	Sort Alphabetically?	Use First Value as Default?
Picklist	Status	New Position Pending Approval Open - Approved Closed - Filled Closed - Not Approved	No	Yes

Data Type	Field Label	Picklist Values	Sort Alphabetically?	Use First Value as Default?
Closed - Canceled				
Picklist	Type	Full Time Part Time Internship Contractor	No	No
Picklist	Functional Area	Finance Human Resources Information Technology Retail Operations Warehousing Miscellaneous	Yes	No
Picklist	Job Level	FN-100 FN-200 FN-300 FN-400 HR-100 HR-200 HR-300 HR-400 IT-100 IT-200 IT-300	Yes	No

Data Type	Field Label	Picklist Values	Sort Alphabetically?	Use First Value as Default?
		IT-400		
		RO-100		
		RO-200		
		RO-300		
		RO-400		
		WH-100		
		WH-200		
		WH-300		
		WH-400		
		MC-100		
		MC-200		
		MC-300		
		MC-400		

Introducing Field Dependencies

Now that we've made all those picklists, answer this question: How many times have you clicked on a drop-down list and found far too many values to choose from? For example, maybe you were selecting Uruguay from a list of countries, and every country in the world was on the list. That meant that you had to scroll all the way down to the countries that started with the letter U. What a pain!

Fortunately, the folks who built the Force.com platform have encountered that situation a few times themselves, and as a result, they've given us a tool to help us avoid this problem with our own picklist fields: *field dependencies*.

Field dependencies are filters that allow us to change the contents of a picklist based on the value of another field. For example, rather than displaying every value for Country in a single picklist, we can limit the values that are displayed based on a value for another field, like Continent. That way our users can find the appropriate country more quickly and easily.

Picklist fields can be either *controlling* or *dependent* fields. A controlling field controls the available values in one or more corresponding dependent fields. A dependent field displays values based on the value selected in its corresponding controlling field. In the previous example, the Continent picklist is the controlling field, while the Country picklist is the dependent field.

Try It Out: Create a Dependent Picklist

Looking at the picklists that we've created, it's quickly obvious that our users might get frustrated with the length of our Job Level picklist. Let's make our users happy by turning Job Level into a dependent field of the Functional Area picklist. Doing this will allow users to see only the four relevant job level values when a department is selected in the Functional Area picklist:

1. From Setup, click **Create > Objects**.
2. Click **Position**.
3. In the Custom Fields & Relationships related list, click **Field Dependencies**.
4. Click **New**.
5. For the **Controlling Field** drop-down list, choose Functional Area.
6. For the **Dependent Field** drop-down list, choose Job Level.
7. Click **Continue**.

A field dependency matrix displays with all the values in the controlling field across the top header row and the dependent field values listed in the columns below. For each possible value of the controlling field, we need to include the values that should be displayed in the dependent picklist when that controlling value is selected. In the field dependency matrix, yellow highlighting shows which dependent field values are included in the picklist for a particular controlling field value.

The screenshot shows a matrix-based interface for managing field dependencies. The columns are labeled by Functional Area (Finance, Human Resources, Information Technology, Miscellaneous, Retail Operations) and the rows are labeled by Job Level (e.g., FN-100, FN-200, FN-300, FN-400; HR-100, HR-200, HR-300, HR-400; IT-100, IT-200, IT-300, IT-400; MC-100, MC-200, MC-300, MC-400; RO-100, RO-200, RO-300, RO-400; WH-100, WH-200). A red box highlights the 'FN' column header. A red arrow points from the 'FN' header to the 'FN-100' cell in the first row. Another red arrow points from the 'FN' header to the 'Include Values' button at the top of the matrix. A callout box says: 'Highlighting shows the dependent field values selected for this controlling field value'. A red arrow points from the 'Next 5' button to a callout box: 'Click Next to see more columns of controlling field values.' A red box highlights the 'MC' column header. A red arrow points from the 'MC' header to the 'MC-100' cell in the first row. A callout box says: 'Blue highlighting indicates that you've selected these dependent field values for this controlling field value. Click the Include Values button to add them.' A red box highlights the 'MC' column header again. A red arrow points from the 'MC' header to the 'MC-100' cell in the second row. A callout box says: 'Column headings are repeated so they're visible when you scroll down the matrix.' At the top of the matrix, there are buttons for 'Exclude Values' and 'Include Values', and links for 'Showing Columns: 1 - 5 (of 6) < Previous' and 'View All'.

		Finance	Human Resources	Information Technology	Miscellaneous	Retail Operations	Manufacturing		
Functional Area:	Job Level:	FN-100	FN-200	FN-300	FN-400	FN-100	FN-200	FN-300	FN-400
	HR-100	HR-100	HR-200	HR-300	HR-400	HR-100	HR-200	HR-300	HR-400
	HR-200	HR-100	HR-200	HR-300	HR-400	HR-100	HR-200	HR-300	HR-400
	HR-300	HR-100	HR-200	HR-300	HR-400	HR-100	HR-200	HR-300	HR-400
	HR-400	HR-100	HR-200	HR-300	HR-400	HR-100	HR-200	HR-300	HR-400
	IT-100	IT-100	IT-200	IT-300	IT-400	IT-100	IT-200	IT-300	IT-400
	IT-200	IT-100	IT-200	IT-300	IT-400	IT-100	IT-200	IT-300	IT-400
	IT-300	IT-100	IT-200	IT-300	IT-400	IT-100	IT-200	IT-300	IT-400
	IT-400	IT-100	IT-200	IT-300	IT-400	IT-100	IT-200	IT-300	IT-400
	MC-100	MC-100	MC-200	MC-300	MC-400	MC-100	MC-200	MC-300	MC-400
	MC-200	MC-100	MC-200	MC-300	MC-400	MC-100	MC-200	MC-300	MC-400
	MC-300	MC-100	MC-200	MC-300	MC-400	MC-100	MC-200	MC-300	MC-400
	MC-400	MC-100	MC-200	MC-300	MC-400	MC-100	MC-200	MC-300	MC-400
	RO-100	RO-100	RO-200	RO-300	RO-400	RO-100	RO-200	RO-300	RO-400
	RO-200	RO-100	RO-200	RO-300	RO-400	RO-100	RO-200	RO-300	RO-400
	RO-300	RO-100	RO-200	RO-300	RO-400	RO-100	RO-200	RO-300	RO-400
	RO-400	RO-100	RO-200	RO-300	RO-400	RO-100	RO-200	RO-300	RO-400
	WH-100	WH-100	WH-200	WH-100	WH-200	WH-100	WH-200	WH-100	WH-200
	WH-200	WH-100	WH-200	WH-100	WH-200	WH-100	WH-200	WH-100	WH-200

Figure 24: Field Dependency Matrix

To include a dependent field value, you simply double-click it. To exclude a dependent value from the list, double-click it again.

For example, let's try it out by including the values that should be displayed in the Job Level picklist whenever Finance is selected in the Functional Area picklist:

8. In the column labeled Finance, double-click FN-100, FN-200, FN-300, and FN-400.

Those four fields should now be shaded yellow in the Finance column.

Instead of double-clicking every Job Level value, we can also use SHIFT+click to select a range of values or CTRL+click to select multiple values at once. Once those values are highlighted in blue, we can click **Include Values** to include them, or **Exclude Values** to remove them. Let's try it out.

9. In the column labeled Human Resources, single-click HR-100 and then press and hold the SHIFT key while clicking HR-400.
10. Click **Include Values**.

Now we have values selected for both the Finance and Human Resources columns!

11. Continue highlighting the appropriate values for all of the remaining columns, as described in the following table.



Tip: To get to all of the values that you need to modify for this step, you'll need to click **Previous** or **Next** to see additional columns.

Table 7: Functional Area and Job Level Field Dependency Matrix

Functional Area (Controlling picklist field)	Job Level (Dependent picklist field)
Finance	FN-100 FN-200 FN-300 FN-400
Human Resources	HR-100 HR-200 HR-300 HR-400
Information Technology	IT-100 IT-200 IT-300 IT-400
Retail Operations	RO-100 RO-200 RO-300 RO-400
Warehousing	WH-100 WH-200 WH-300

Functional Area (Controlling picklist field)	Job Level (Dependent picklist field)
	WH-400
Miscellaneous	MC-100
	MC-200
	MC-300
	MC-400

12. Click **Preview** to test the results in a small popup window.

13. Click **Save**.

Look at What We've Done

Now that we've created all those picklists, let's revisit the Positions tab to see what we have so far.

1. Go to the Positions tab.
2. Click **New**.
3. In the Functional Area picklist, select Finance.
4. Open the Job Level picklist.

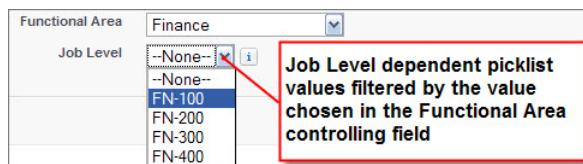


Figure 25: Dependent Picklist Fields

Our Recruiting app users are going to be very happy that they no longer have to deal with a long, onerous picklist. Now let's go add a field that's even more powerful and complex than a dependent picklist: a custom formula field.

Introducing Custom Formula Fields

Up to this point, the fields that we've defined have all had one thing in common—they each require a user to give them a value. Fields like that are very helpful for storing and retrieving data, but wouldn't it be great if we could somehow define a “smart” field? That is, what if we could define a field that looked at information that was already entered into the system and then told us something new about it?

Fortunately, *custom formula fields* give us the ability to do just that. Just as you can use a spreadsheet program like Microsoft Excel to define calculations and metrics specific to your business, we can use custom formula fields to define calculations and metrics that are specific to our Recruiting app.

For example, on our Position object, we've already created fields for minimum pay and maximum pay. If Universal Containers gives out yearly bonuses based on salary, we could create a custom formula field that automatically calculated the average bonus that someone hired to that position might receive.

How would we perform this calculation if we were using a spreadsheet? The columns in our spreadsheet would represent the fields that we defined on our Position object, and each row of the spreadsheet would represent a different position record. To create a calculation, we'd enter a formula in a new column that averages the values of `Min Pay` and `Max Pay` in a single row and then multiplies it by a standard bonus percentage. We could then determine the average bonus for every position record row in our spreadsheet.

Custom formulas work in a very similar way. Think of a custom formula like a spreadsheet formula that can reference other values in the same data record, perform calculations on them, and return a result. However, instead of using cell references, you use *merge fields*, which serve as placeholders for data that will be replaced with information from your records, user information, or company information. And, instead of typing fields, operators, and functions, you can click to select them.

The net result is that anyone can quickly and easily learn to create formula fields. And, as with all platform tools, the cloud computing delivery model makes it easy to experiment. You can create a formula, view the results, and change the formula again and again, as many times as you want! Your underlying data is never affected.



Tip: For more guidance on creating custom formulas, check out
<http://www.salesforce.com/us/developer/docs/usefulFormulaFields/>.

Calculating How Long a Position Has Been Open

Let's think about another custom formula field that we could create for our Position object—a custom formula field that calculates how many days a position has been open. To do this, let's first think about the logic that we should use to define the field, and then we can go through the process of creating it in our Recruiting app.

Let's think about the data that we need to make this calculation: we need to know the current date and the date the position was created. If we could somehow subtract these two, we'd have the number of days that the position has been open. Fortunately, it's easy to get both of these values.

- For the current date, we can use the platform's built-in `TODAY()` function. `TODAY()` returns today's date.
- For the date that the position was opened, we can use the `Open Date` field that we defined in the last chapter.

When using fields in formulas, you can't just refer to a field by its name. Instead, you need to refer to it by its merge field name, also called its API name. The format of the API name is typically the name of the field but with underscores instead of spaces. For custom fields, the API name is suffixed with two underscores and the letter “c,” like this: `Open_Date__c`. This naming convention in the platform helps distinguish between standard and custom fields.



Tip: You don't need to memorize the API names of fields you want to use in formulas. Simply use the field picker in the formula editor to insert fields and the platform automatically inserts the API name for you. If you ever want to know the API name of a specific field and you aren't using the formula editor, you can view the field's detail page.

Now that we have our two dates, we want to subtract them: `TODAY() - Open_Date__c`. Even if the two dates span different months or years, the platform is sophisticated enough to know how to handle all the intricacies of such a calculation behind the scenes. We just have to provide the dates, and the platform can do all the rest.

So far so good, but one problem still remains—what if the position has already closed? Our formula only works if we assume the position is still open. Once it closes, however, the value of our current formula will continue to increment every day as `TODAY()` gets farther and farther away from the original `Open Date`. If we can, we want to use the `Close Date` field in the formula instead of `TODAY()` after a position closes. How can we do this?

Once again, we can dip into the extensive library of platform functions. The `IF()` function allows us to perform a test and then return different values depending on whether the result of the test is true or false. The `IF()` function's syntax looks like:

```
IF(logical_test,  
    value_if_true,  
    value_if_false)
```

For the `logical_test` portion, we'll test whether the `Close Date` field has a value—if it does, the position obviously must be closed. We'll test for this with a third built-in function: `ISBLANK()`. `ISBLANK()` takes a single field and returns true if it does not contain a value and false if it does. So now our formula looks like:

```
IF( ISBLANK( Close_Date__c ) ,  
    value_if_true,  
    value_if_false)
```

By replacing `value_if_true` and `value_if_false` with the other formulas we talked about, we've now figured out our whole formula.

```
IF( ISBLANK( Close_Date__c ) ,  
    TODAY() - Open_Date__c ,  
    Close_Date__c - Open_Date__c )
```

Great! Our formula calculates the number of days a position has been open, regardless of whether it's currently open or closed. Now, let's go define a field for it on our Position object.

Try It Out: Define a “Days Open” Custom Formula Field

We'll begin building the formula field the same way we created our other custom fields.

1. From the Positions tab, click  to open the quick access menu (if it isn't open already).
2. Hover over **View Fields** and click **New**.



Figure 26: Opening the New Custom Field Wizard from the Quick Access Menu

3. Select the Formula data type, and click Next.

Step 2 of the New Custom Field wizard appears.

New Custom Field

Step 2. Choose output type Step 2 of 5

Field Label: Days Open Field Name: Days_Open

Indicates the formula's result is a number

Formula Return Type

Number Selected Select one of the data types below.

Currency Calculate a dollar or other currency amount and automatically format the field as a currency amount.
Example: Gross Margin = Amount - Cost__c

Date Calculate a date, for example, by adding or subtracting days to other dates.
Example: Reminder Date = CloseDate - 7

Date/Time Calculate a date/time, for example, by adding a number of hours or days to another date/time.
Example: Next = NOW() + 1

Number Calculate a numeric value.
Example: Fahrenheit = 1.8 * Celsius__c + 32

Percent Calculate a percent and automatically add the percent sign to the number.
Example: Discount = (Amount - Discounted_Amount__c) / Amount

Text Create a text string, for example, by concatenating other text fields.
Example: Full Name = LastName & ", " & FirstName

Options Decimal Places: 0 Example: 999

Figure 27: Custom Formula Field Wizard Step 2

4. In the Field Label field, enter Days Open.
5. Select the Number formula return type.

In this case, even though we're subtracting Date fields, we want to end up with just a regular numeric value.

6. Change the Decimal Places value to 0, and click Next.

Now it's time to enter the details of our formula.

7. Click the Advanced Formula tab, as shown in the following screenshot.

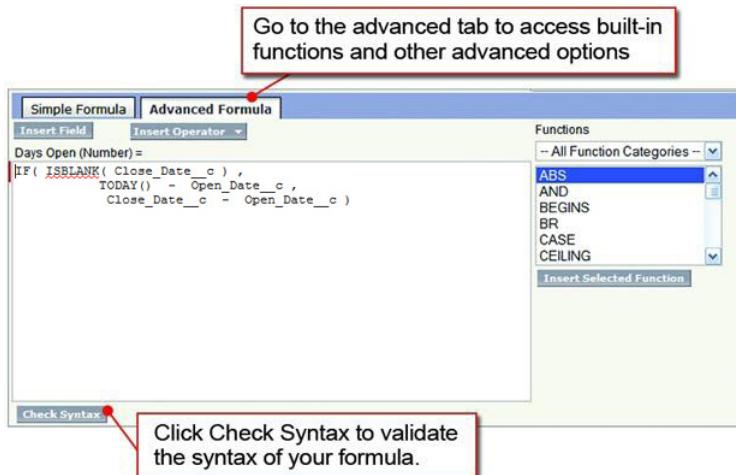


Figure 28: Custom Formula Field Editor

We want to use the Advanced Formula tab so we can access the platform's built-in functions through the Functions list on the right side.

8. From the Functions list, double-click IF.

Our formula now looks like this:

```
IF(logical_test, value_if_true, value_if_false)
```

Let's go ahead and define the logical test:

9. Delete *logical_test* from the formula, but leave your cursor there.
10. From the Functions list, double-click ISBLANK.
11. Delete *expression* from the ISBLANK function you just inserted, but leave your cursor there.
12. Click the **Insert Field** button. Two columns appear in an overlay.
13. In the left column, select Position.
14. In the right column, select Close Date.

15. Click Insert.

Did you notice that you didn't have to remember to use the API name of the `Close Date` field? The platform remembered for you when it inserted the value. Our formula now looks like this:

```
IF( ISBLANK( Close_Date__c ) , value_if_true, value_if_false)
```

Now, let's specify the value if our logical test evaluates to true:

- 16.** Delete `value_if_true` from the formula, but leave your cursor there.
- 17.** Press ENTER on your keyboard, and space over 10 spaces.

Adding the carriage return and spaces makes our formula more legible for others.

- 18.** From the Functions list, double-click `TODAY`.
- 19.** Click the **Insert Operator** button and choose Subtract.
- 20.** Click the **Insert Field** button.
- 21.** In the left column, select Position.
- 22.** In the right column, select `Open Date`.
- 23.** Click **Insert**.

We're getting closer—our formula now looks like this:

```
IF( ISBLANK( Close_Date__c ) ,
    TODAY() - Open_Date__c , value_if_false)
```

Finally, let's specify the value if our logical test evaluates to false:

- 24.** Delete `value_if_false` from the formula, but leave your cursor there.
- 25.** Press ENTER on your keyboard, and space over 10 spaces.
- 26.** Click the **Insert Field** button.
- 27.** In the left column, select Position.
- 28.** In the right column, select `Close Date` and click **Insert**.
- 29.** Click **Insert Operator** and choose Subtract.
- 30.** Click the **Insert Field** button.
- 31.** In the left column, select Position.
- 32.** In the right column, select `Open Date` and click **Insert**.

Our formula now matches our original:

```
IF( ISBLANK( Close_Date__c ) ,
    TODAY() - Open_Date__c ,
    Close_Date__c - Open_Date__c )
```

Now that we've gone through those steps of the procedure, note that we could have just typed in the formula that we figured out in the last section. However, using the formula editor is a lot easier because you don't have to remember function syntax or API names of fields and objects. Let's keep going and finish up this field:

33. Click **Check Syntax** to check your formula for errors.
34. Select Treat blank fields as blanks, and click **Next**.
35. Accept all remaining field-level security and page layout defaults.
36. Click **Save**.
37. On the Positions Fields page, scroll down to the Positions Custom Fields & Relationships section.
38. Click **Edit** next to the new Days Open field.
39. In the Description text box, enter The number of days a position has been (or was) open.
40. Add an optional Help Text description if you wish.
41. Click **Save**.

Try It Out: Give Fields Dynamic Default Values

We can also use custom formulas to give our fields dynamic default values. While some fields like the Travel Required checkbox or the Job Location picklist have default values that apply in every situation, there are other fields with defaults that can't be so easily defined. For example, at Universal Containers, recruiters are generally expected to fill a position within 90 days of it being opened. While we can't choose a single date that will always be 90 days after a position is opened, we *can* define a custom formula that takes the date the position is created and adds 90 days. The platform allows us to specify this formula as the Hire By field's default value:

1. From Setup, click **Create > Objects**.
2. Click **Position**.
3. In the Custom Fields & Relationships related list, click **Edit** next to the **Hire By** field.
4. Next to the **Default Value** text box, click **Show Formula Editor**.

Look familiar? This is similar to the editor that we used to define our Days Open custom formula field.

5. From the Functions list, double-click TODAY.
6. Click the **Insert Operator** button, and choose Add.
7. Type 90.

Your default value formula should be:

```
TODAY() + 90
```

8. Click Save.

It's that easy! Now to wrap up the fields on our Positions tab, let's set the default value of the Open Date field to the day that the record is created. To do this, follow these steps again, but use TODAY() as the Default Value.

Look at What We've Done

Let's revisit the Positions tab to take a look at what we've just done.

1. Click the Positions tab.
2. Click New.

Our Days Open formula field doesn't show up on our Position edit page—that's because it's a formula field and doesn't require any user input to display. However, we can see that our Open Date and Hire By fields already have default values: Open Date should be today's date, and Hire By is 90 days later. We can change these values if we want, or we can just leave them as they are.

In order to see our Days Open field, we'll have to define our first position record. Let's do that now.

3. Enter any values you want to define for a new position. At the very least, you must enter a value for the required Position Title field.
4. Click Save.

The new position is now displayed in its own record detail page. At the bottom of the page, notice our Days Open formula field, just above the Created By field. It should show 0, since we just created the position. If you want to see the value change, edit the record and set the Open Date to a week earlier. Isn't that neat?

Introducing Validation Rules

Now that we've defined all the fields that we want on our Position object, let's see if we can articulate a couple of rules about the data that should be entered into those fields. Even though the recruiters and hiring managers at Universal Containers are bright people, everyone sometimes makes mistakes when filling out a form, and a good app should catch the obvious errors.

For example, does it ever make sense for the value of the `Min Pay` field to be more than the value of the `Max Pay` field? Or should `Close Date` ever be unspecified if the `Status` field is set to `Closed - Filled` or `Closed - Not Approved`? Clearly not. We can catch these sorts of errors in our app with yet another built-in feature of the platform: *validation rules*.

Validation rules verify that the data a user enters in your app meets the standards that you specify. If it doesn't, the validation rule prevents the record from being saved, and the user sees an error message that you define either next to the problematic field or at the top of the edit page. Let's build a couple of validation rules now for our Recruiting app.



Tip: You can find many sample validation rules in the Salesforce Help.

Try It Out: Define a Validation Rule for Min and Max Pay

For our first validation rule, let's start off simple: `Min Pay` should never be greater than `Max Pay`.

1. From the Positions tab, click  to open the quick access menu (if it isn't open already).
2. Hover over **View Validation Rules**, and click **New**.

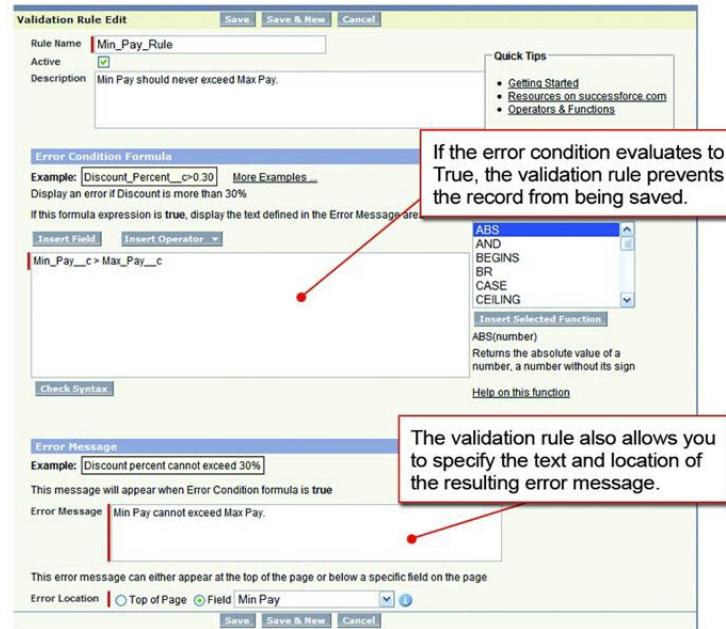


Figure 29: Validation Rule Edit Page

- In the Rule Name text box, enter `Min_Pay_Rule`.

The name of a validation rule can't include any spaces, but if you forget, the platform helpfully changes them to underscores (_) for you.

- Select the Active checkbox.

This checkbox specifies whether the validation rule should start working as soon as it's saved. Because this rule is pretty straightforward (and because we want to test it later!), it makes sense to turn it on right away.

- In the Description text box, enter `Min Pay should never exceed Max Pay`.

Now it's time to define the meat of our validation rule: the *error condition*. If you have a sense of déjà vu when looking at the Error Condition Formula area of the page, don't be alarmed! Just like formula fields and default field values, a validation rule can leverage a number of built-in operators and functions to define a true-or-false error condition that determines whether data is valid. When this condition evaluates to true, an error message displays and the record can't be saved.

We want our error condition to be true whenever `Min Pay` is greater than `Max Pay`, so let's use our formula editor to specify that now:

6. Click the **Insert Field** button. Just like in the formula field editor, two columns appear in an overlay.
7. In the left column, select Position.
8. In the right column, select `Min Pay`.
9. Click **Insert**.
10. Click the **Insert Operator** button, and choose Greater Than.
11. Click the **Insert Field** button once again.
12. In the left column, select Position.
13. In the right column, select `Max Pay`.
14. Click **Insert**.

You should now have an error condition formula that looks like this:

```
Min_Pay_c > Max_Pay_c
```

Now the only thing that remains is to specify the error message when our error condition evaluates to true.

15. In the **Error Message** text box, enter `Min Pay cannot exceed Max Pay`.
16. Next to the **Error Location** field, select the **Top of Page** radio button.



Tip: If a rule requires a user to review the values of multiple fields, it's more appropriate to place the error message at the top of the page because you don't know which field the user needs to change.

17. Click **Save**.

Easy! Now that we've familiarized ourselves with a simple validation rule, let's define one that's a little trickier.

Try It Out: Define a Validation Rule for Close Date

For our next validation rule, let's ensure that `Close Date` has a value whenever the `Status` field is set to `Closed - Filled` or `Closed - Not Approved`.

The hardest part of this validation rule is defining the error condition formula. When defining a condition like this, it's sometimes easiest to think about it in logical terms first, and then translate that logic to the functions and operators that are provided in the formula editor. In this case, our error condition is true whenever:

```
Close Date is Not Specified
```

AND

```
(Status is "Closed - Filled" OR  
"Closed - Not Approved")
```

Let's start with the first piece: "Close Date is Not Specified." To translate this into terms the formula editor understands, we'll need to use the `ISBLANK()` function again. As you might remember from defining the `Days Open` custom formula field, `ISBLANK()` takes a single field or expression and returns true if it doesn't contain a value. So, remembering that we have to use the internal field name of the `Close Date` field in our formula, `Close Date is Not Specified` translates to:

```
ISBLANK( Close_Date__c )
```

Next, let's figure out how to translate "Status is 'Closed - Filled'." To test for picklist values, we'll need to use another function: `ISPICKVAL()`. `ISPICKVAL()` takes a picklist field name and value, and returns true whenever that value is selected. So "Status is 'Closed - Filled'" translates to:

```
ISPICKVAL( Status__c , "Closed - Filled")
```



Tip: When working with picklists in formulas, convert them to text using either the `ISPICKVAL()` function or the `TEXT()` function. For example, to check the value of a picklist using the `TEXT()` function, use `TEXT(Status__c) = "Closed - Filled"`.

Now we just have to combine these translations, which we can do using a mix of the `&&` and `||` functions. Both functions evaluate an unlimited number of expressions, but `&&` returns true if **all** of the expressions are true while `||` returns true if **any** of the expressions are true. For example:

```
exp1 && exp2 && exp3
```

returns true when `exp1`, `exp2`, and `exp3` are all true. Likewise,

```
exp1 || exp2 || exp3
```

returns true when any one of `exp1`, `exp2`, or `exp3` are true.

Put these functions all together with our other expression translations, and we get our completed error condition formula:

```
ISBLANK(Close_Date__c) &&  
(ISPICKVAL(Status__c , "Closed - Filled") ||  
ISPICKVAL(Status__c , "Closed - Not Approved"))
```

Phew! Now we can quickly define our second validation rule using this formula:

1. From Setup, click **Create > Objects**.
2. Click **Position**.
3. In the Validation Rules related list, click **New**.
4. In the Rule Name text box, enter `Close_Date_Rule`.
5. Select the Active checkbox.
6. In the Description text box, enter `Close Date must be specified when Status is set to 'Closed - Filled' or 'Closed - Not Approved.'`
7. In the Error Condition Formula area, enter the following formula:


```
ISBLANK(Close_Date_c) &&
    (ISPICKVAL(Status_c , "Closed - Filled") || 
    ISPICKVAL(Status_c , "Closed - Not Approved"))
```
8. Click **Check Syntax** to make sure the format of the formula is correct.
9. In the Error Message text box, enter `Close Date must be specified when Status is set to 'Closed.'`
10. Next to the Error Location field, select the Field radio button, and then choose `Close Date` from the drop-down list.
11. Click **Save**.

Look at What We've Done

Let's revisit the Positions tab to test the validation rules that we've just made.

1. Click the Positions tab.
2. Click **New**.

First let's try defining a new position with a value for `Min Pay` that's larger than `Max Pay`.

3. Specify any value for the required `Position Title` field.
4. In the `Min Pay` field, enter `80,000`.
5. In the `Max Pay` field, enter `40,000`.
6. Click **Save**.

Did you see what happened? Your custom error message popped exactly like any other error message in the app!

The screenshot shows a 'Position Edit' page titled 'New Position'. At the top, there are three buttons: 'Save', 'Save & New', and 'Cancel'. Below them, an error message is displayed: 'Error: Invalid Data. Review all error messages below to correct your data. Min Pay cannot exceed Max Pay.' A red arrow points from this message to a callout box containing the text: 'Validation rule errors look and behave just like other errors in the app'. The main form area contains various input fields and dropdown menus. The 'Min Pay' field has the value '80,000.00' and the 'Max Pay' field has the value '40,000.00'. Other fields include 'Position Title' (Sales Representative), 'Job Description', 'Responsibilities', 'Skills Required', 'Educational Requirements', 'Travel Required' (checkbox), 'Java' (checkbox), 'JavaScript' (checkbox), 'C#' (checkbox), 'Apex' (checkbox), 'Open Date' (2/2/2010), 'Hire By' (5/3/2010), 'Close Date' (empty), 'Location' (San Francisco, CA), 'Status' (New Position), 'Type' (dropdown menu), 'Functional Area' (dropdown menu), and 'Job Level' (dropdown menu). At the bottom of the form are the same three buttons: 'Save', 'Save & New', and 'Cancel'.

Figure 30: Error Message from a Validation Rule

Now let's test our other validation rule:

7. In the Min Pay field, enter 40,000.
8. In the Max Pay field, enter 80,000.
9. From the Status drop-down list, choose Closed - Not Approved.
10. Click Save.

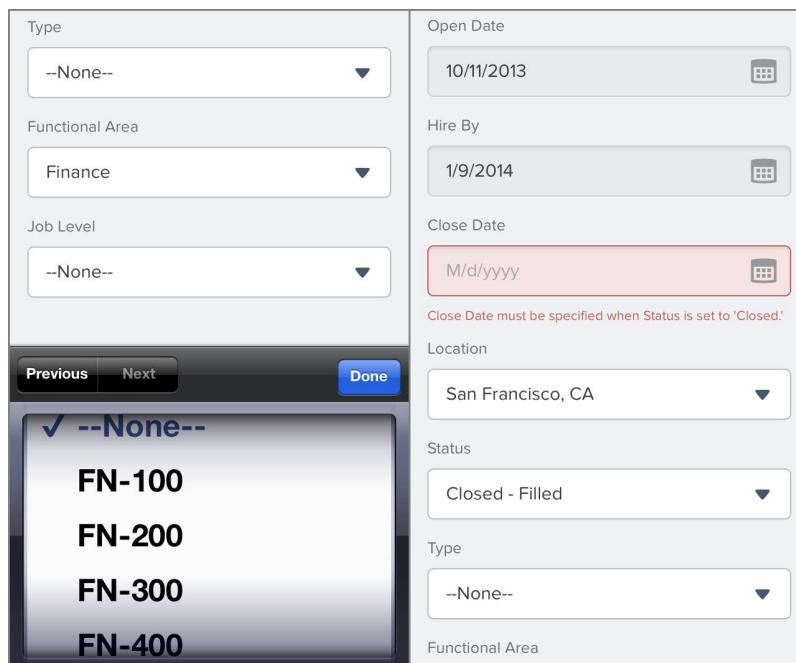
Our second validation rule is triggered, this time because we didn't specify a value for Close Date. Once we do, the record saves normally.

Check It Out in Mobile

Before we move on, let's take a look at how our new fields appear on a mobile device.

1. Launch Salesforce1 on your mobile device. If prompted, log in.
2. Tap  to open the navigation menu, and then tap **Positions**. If you don't see Positions in the list of items, remember to tap **Show More**.
3. Tap **New** to create a position record.

Just like when we first created fields for the Position object, all of our advanced fields appear in Salesforce1 automatically. Verify that all of our advanced fields work as expected.



The screenshot shows the Salesforce1 mobile interface for creating a new position. The main screen has several input fields: Type (dropdown, --None--), Functional Area (dropdown, Finance), Job Level (dropdown, --None--), Open Date (10/11/2013), Hire By (1/9/2014), Close Date (M/d/yyyy), Location (San Francisco, CA), Status (Closed - Filled), Type (dropdown, --None--), and Functional Area (dropdown). A validation message 'Close Date must be specified when Status is set to 'Closed.'' is displayed next to the Close Date field. A modal dialog box is overlaid, listing four functional areas: FN-100, FN-200, FN-300, and FN-400. FN-100 is selected, indicated by a checkmark and bold text.

Figure 31: Dependent Picklists and Validation Rules in Salesforce1

All of our advanced fields are in order if:

- We can only update Job Level once we've selected a value for Functional Area
- We don't see the Days Open formula field
- Open Date has already been populated with today's date
- Hire By has already been populated with 90 days from today
- A position's Min Pay can't be more than its Max Pay

- A position's Status can't be Closed – Filled or Closed – Not Approved if Close Date is empty

We also want to check that the Days Open field is working according to plan, but since we created a position when we checked our fields in the full site, we can look at that existing record.

4. Tap **Cancel** to return to the list of recent position records.
5. Tap the position record we just created.
6. Scroll down until you see Days Open.

We see that, just like in the full site, Days Open shows the number of days that have passed since Open Date: 0.

The Positions tab is now fully functional, with a couple of validation rules to ensure that users don't make certain mistakes. But are the fields where we want them? Are the fields that must have values marked as required? In the next section, we'll fine-tune our Position custom object by modifying its page layout.

Introducing Page Layouts

After defining all those fields and validation rules, we now have a fully functional Position custom object. However, it doesn't look all that nice—all of the long text areas appear at the top, and it's hard to scan in our desktop browser. Just imagine how hard it would be to scan in a mobile device! Let's move some things around to make this page easier for our users. We can do that by customizing the Position object's page layout.

A *page layout* controls the position and organization of the fields and related lists that are visible to users when viewing a record. Page layouts also help us control the visibility and editability of the fields on a record. We can set fields as read-only or hidden, and we can also control which fields require users to enter a value and which don't.

Page layouts are powerful tools for creating a good experience for our users, but it's crucial that we remember one important rule: *page layouts should never be used to restrict access to sensitive data that a user shouldn't view or edit*. Although we can hide a field from a page layout, users can still access that field through other parts of the app, such as in reports or via the API. (We'll learn more about security that covers all parts of the app in [Securing and Sharing Data](#) on page 149.)

Now let's see if we can organize the fields on our Position object in a way that's more user friendly.

Becoming Familiar with the Page Layout Editor

The Force.com platform has two drag-and-drop tools for editing page layouts: the original page layout editor and the enhanced page layout editor.

The enhanced page layout editor provides all of the same functionality as the original editor, but with additional enhancements, including an intuitive WYSIWYG interface and the ability to customize the space between fields in your layouts. Since the enhanced page layout editor is enabled by default, it's the one we'll use to edit page layouts in this book.

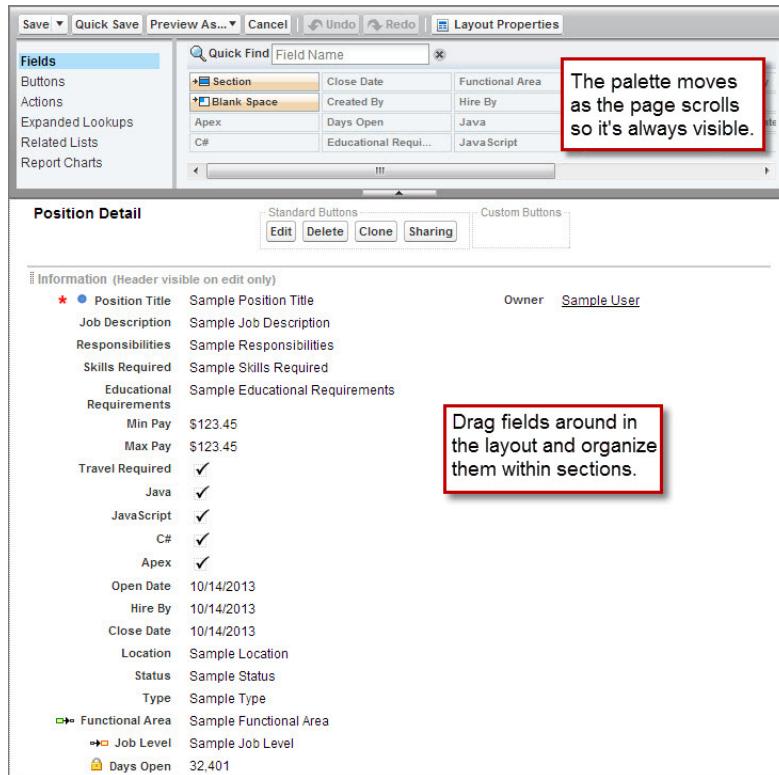


Note: The enhanced page layout editor doesn't work with some older browsers. If you don't want to upgrade your browser, you can always switch to the original page layout editor from Setup by clicking **Customize > User Interface** and deselecting **Enable Enhanced Page Layout Editor**; however, if you use the original page layout editor, what you see on your screen will not match the procedures in this book, and you won't be able to customize the space between fields in your layouts.

Let's try using the page layout editor to edit the page layout of the Position object:

1. From Setup, click **Create > Objects**.
2. Click **Position**.
3. In the Page Layouts related list, click **Edit** next to Position Layout.

Welcome to the page layout editor! As you can see, this editor is different from the ones that we've already used in other areas of the platform. That's because we're designing a user interface and need to see how our page will look as we're working. Before going any further, let's give ourselves a quick orientation to how this page is set up.

**Figure 32: Page Layout Editor**

The page layout editor consists of a palette at the top of the screen and the page layout below it. The palette contains the user interface elements that are available for you to add to the page layout, including fields, buttons, links, and related lists. To add one of these user interface elements to the page layout, simply select the category to which the element belongs on the left column of the palette and drag the element from the palette to the page layout. To remove a user interface element from the page layout, drag the element from the page layout to the right side of the palette, or hover over the element you want to remove and click . A toolbar above the palette provides various functions, such as saving and previewing your changes.

Now that we know what we're looking at, let's rearrange the fields in the way a user might want to see them.

Try It Out: Group Fields into a New Section

Let's start modifying our page layout by first defining a new section for salary information. On a page layout, a section is simply an area where we can group similar fields under an appropriate

heading. This makes it easy for our users to quickly identify and enter the information for a record, especially if our object has a large number of fields:

1. In the palette, select the Fields category.
2. Drag the Section user interface element from the palette to just above the System Information section on the page layout.

When you drag a new section on to the page layout, the Section Properties popup window appears.

3. In the Section Name text box, enter Compensation.

The Section Name field controls the text that's displayed as the heading for the section.

4. In the Display Section Header On area, select both Detail Page and Edit Page.

Displaying the header on both the detail and edit pages helps users understand the context of the information, regardless of whether they are editing the position or just viewing it.

5. In the Layout drop-down list, choose 2-Column.

This option allows us to choose whether we want the fields in our section to be arranged in two columns or one. The default is two columns and is the most common choice. However, if our section is going to contain text area fields, the one-column layout gives them more space on the page for display.

6. In the Tab-key Order drop-down list, choose Left-Right.

This setting controls the direction that a user's cursor will move when using the Tab key to navigate from field to field.

7. Click **OK**.

We have a new section for Compensation just above the System Information section! Let's add the Min Pay and Max Pay fields:

8. While pressing CTRL, click both the Min Pay and Max Pay fields in the Information section, and drag them to the new Compensation section as shown.

Information (Header visible on edit only)		Owner	Sample User
★ Position Title	Sample Position Title		
Job Description	Sample Job Description		
Skills Required	Sample Skills Required		
Educational Requirements	Sample Educational Requirements		
Travel Required	✓		
Java	✓		
JavaScript	✓		
C#	✓		
Apex	✓		
Open Date	8/24/2009		
Hire By	8/24/2009		
Close Date	8/24/2009		
Location	Sample Location		
Status	Sample Status		
Type	Sample Type		
Functional Area	Sample Functional Area		
Job Level	Sample Job Level		
Days Open	2,385		
Compensation			
Min Pay	\$123.45	Max Pay	\$123.45
System Information (Header visible on edit only)			
Created By	Sample User	Last Modified By	Sample User

Figure 33: Adding Fields to the Compensation Section

Pressing CTRL allows you to select multiple individual user interface elements with your mouse. Alternatively, pressing the SHIFT key allows you to select a group of elements.

Now that we've gone through the process for building one section, let's build two more. As we do this, you might have to scroll up and down to view the entire layout, depending on the size of your screen. Rest assured that if you have to scroll, the palette will move with you, making it easy to add user interface elements even at the very bottom of the page layout.

9. Create a new one-column Description section below the Compensation section, and drag Job Description, Responsibilities, Skills Required, and Educational Requirements into it.
10. Create a new two-column Required Languages section below the Description section, and drag Apex, C#, Java, and JavaScript into it.

As you work, you may notice that the fields you add to the page layout are grayed-out in the palette, but the Section user interface element is never grayed-out. This is because fields can only appear one time on each page layout, but the Section user interface element can be reused to create as many sections as you want.



Tip: If you make a mistake while editing the page layout, you can use CTRL+Z and CTRL+Y to undo and redo your recent moves, respectively. The toolbar contains **Redo** and **Undo** buttons as well.

While we're shuffling fields around, let's reorganize the Information section so it's more readable.

11. Arrange the first column of the Information section as follows:

- Position Title
- Status
- Type
- Functional Area
- Job Level
- Travel Required
- Created By

12. Arrange the second column of the Information section as follows:

- Owner
- Location
- Open Date
- Hire By
- Close Date
- Days Open
- Last Modified By

That's much better—our fields are organized and it's easy to locate all the information we need.

The Information section still looks a little dense, though. Fortunately, the page layout editor provides a way to add blank spaces that separate the fields within the section to improve its readability even further.

Try It Out: Add Spaces Between Fields

When designing a page layout, you'll often want to distinguish or “pop” certain fields within a section. An easy and effective way to do this is by inserting blank spaces between fields. For example, in the Information section, inserting blank spaces below the first row in each column draws a user's eye to the most important information in the section, the position title and owner. We can also use blank spaces above the bottom row in each column to separate the `Created By` and `Last Modified By` fields from the critical position information. Let's give it a try!

1. Select the Fields category.
2. Drag the Blank Space user interface element from the palette to the page layout right below the `Position Title` field.

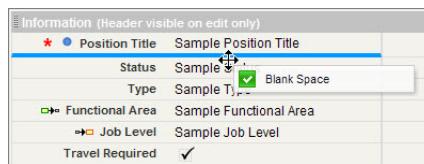


Figure 34: Dragging and Dropping Blank Spaces in a Page Layout

As with the Section user interface element, the Blank Space user interface element is never grayed-out in the palette when you drag it to the page layout because the element can be reused as many times as you want.

3. On the palette, select the Blank Space user interface element again and drag it below the `Owner` field.
4. Add two more blank spaces to the page layout, one above the `Created By` field and the other above the `Last Modified By` field.

Before we move on, you should be aware that if you accidentally navigate away from the page layout before saving your work, your changes will be lost. Rather than tempting fate, let's do a quick save of the work that we've done so far.

5. Click **Quick Save** in the toolbar above the palette, or press **CTRL+S** if you prefer using keyboard shortcuts.

The quick save feature allows you to save your changes and continue editing the page layout. Clicking **Save** in the toolbar also saves your work, but it takes you back to the page from which you accessed the page layout editor. We have a few more minor tweaks to make to our page layout, so we don't want to leave the page layout editor just yet.

Try It Out: Edit Field Properties

We just used the page layout editor to organize our Position page layout in a logical, easy-to-read fashion, but the page layout editor lets us do more than design the presentation of data—we can also use it to help determine which fields are required, and which fields are read-only:

- If a field is required, a user won't be able to create a position record without specifying a value.
- If a field is read-only, a user who views a position record edit page won't be able to change its value.

Required fields are denoted with a red asterisk (*****), while read-only fields are denoted with a lock icon ().



Warning: Although we can make these changes on the page layout, don't forget our earlier warning! Page layouts should never be used as the sole means to restrict access to sensitive data that a user shouldn't view or edit. That's because page layouts control only a record's edit and detail pages; they don't control access to those fields in any other part of the platform.

At this point, we don't have any fields that need to be read-only, but we do want to make sure that the salary range is always defined for each position, so let's make the `Min Pay` and `Max Pay` fields required. Once we do that, we'll be all done with our Position object!

To make the `Min Pay` and `Max Pay` fields required, we need to edit the properties of each field:

1. In the page layout editor, double-click the `Min Pay` field, or select the wrench icon (扳手图标) next to the field name.

This popup window allows us to edit the `Min Pay` field's properties. We can set the field to either read-only or required. If we didn't want a user to see the `Min Pay` field at all, we could simply drag it off the layout and onto the palette. We want to make sure it stays visible for right now, so let's leave it in its current spot.

2. Select the `Required` checkbox, and click **OK**.
3. Repeat these steps for the `Max Pay` field.
4. Click **Save** to finish customizing the page layout.

Hooray! We're all done with our Position object's page layout.

Look at What We've Done

Congratulations. We've just built ourselves a simple Recruiting app that tracks details about an organization's open positions. Let's check out what we've done by revisiting the Positions tab and clicking **New**. Because of the changes that we've made in our page layout, our Position edit page should now look like:

Figure 35: Final Version of the Position Layout

Let's take a look at our Position detail page before we move on. To do that, we have to create a position. Fill in the required fields, and click **Save**.

If we scroll to the bottom of the Position detail page, we'll notice a couple of related lists. Since we haven't customized the related lists that appear on positions, the platform displays the defaults: Open Activities, Activity History, and Notes & Attachments. Right now, there aren't any items in any of the lists. To see how one of those items would look, let's add a task.

1. In the Open Activities related list, click **New Task**.

Notice that some fields are already filled out for us. The platform made some educated guesses to determine who the task should be assigned to, what its status is, and how urgent it is. In addition, because we added the task through the related list on a position, the platform made the correct assumption that we want the task associated with that position. For now, let's leave the default values in those fields.

2. In **Subject**, enter Post position online.
3. In **Due Date**, select tomorrow's date.
4. Click **Save**.

Now, back on the detail page for our position, we see that the Open Activities related list contains the task we just created. From this list, we could dig in to the related task to see more details, make changes, or mark it complete.

Taking Your Page Layouts Mobile

Now that we've created a well-organized page layout and know that it works on the full Salesforce site, let's check how it looks on our mobile device.

1. Launch Salesforce1 on your mobile device, and log in.
2. From the navigation menu, tap **Show More > Positions**.
3. Tap **New**.

The screenshot shows the 'Create Position' screen in Salesforce1. At the top, there are three buttons: 'Cancel', 'Create Position' (which is highlighted in blue), and 'Save'. The screen is divided into two main sections: 'COMPENSATION' and 'DESCRIPTION'. The 'COMPENSATION' section contains two input fields labeled 'Min Pay*' and 'Max Pay*'. The 'DESCRIPTION' section contains two input fields labeled 'Job Description' and 'Responsibilities'.

Figure 36: Compensation and Description Sections in Salesforce1

Just like when we tested out the advanced fields earlier in this chapter, our changes to better organize the fields are reflected in Salesforce1.

Now let's take a look at the position we just created in the full site to see how saved records look on a mobile device.

4. Tap **Cancel**.
5. Tap the position we just created.

In Salesforce1, we see two views, which we can toggle by swiping left and right. There's a third view, but we won't see that until we enable feed tracking in [Collaborating with Chatter](#) on page 215—so stay tuned!

Introducing the Record Detail Page

Our current view is the *record detail page*, which includes all the information that appears above a related list or mobile card in the page layout editor. Luckily, all the fields we've added are supported, but you should be aware that Salesforce1 doesn't support rich text area custom fields.

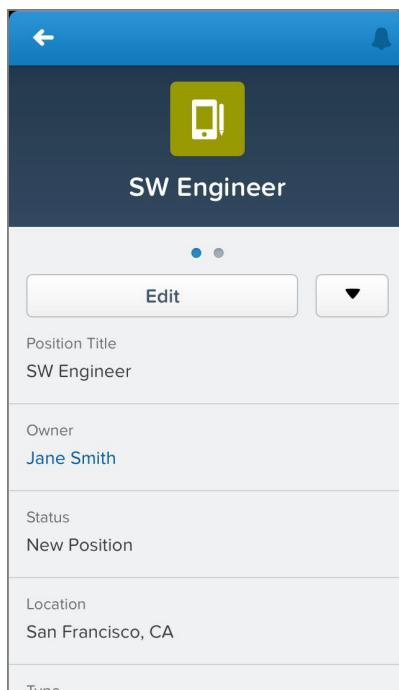


Figure 37: Record Detail Page for a Position Record

Beyond the Basics

Because our page layout only includes a handful of fields, our layout should be okay for a mobile user. But, for future reference, always be aware of the different devices your users

will be accessing these page layouts from. Having a large number of fields, such as more than 100, will make it difficult for your users to enter or find the information they need. It's best to either optimize all page layouts for mobile use or create page layouts specifically for mobile users. For more best practices, see the *Salesforce1 App Admin Guide*.

Introducing the Record Related Information Page

Swipe once to the left to see the record's *related information*.

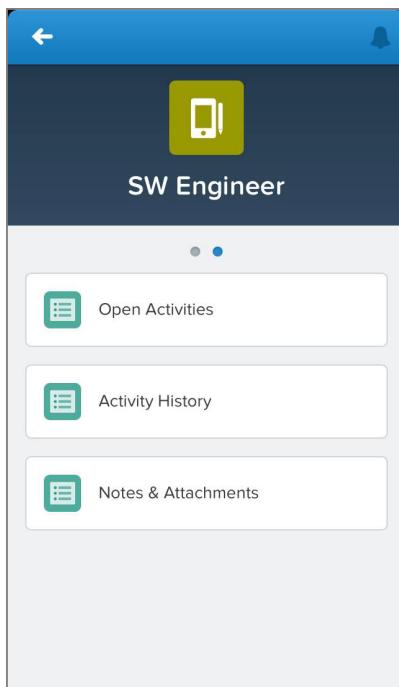


Figure 38: Related Information Page for a Position Record

Unlike the full site, which show us the details of each related list, Salesforce1 displays just the names of the related lists. We can tap any of the related lists to see related records. Since we know the Open Activities related list has one item—the task we just created—let's check that related list out.

Tap **Open Activities** to drill in to that related list. In the Open Activities page, we see the task we created in the full site. For even more information about the task, we can tap the item to see the task record details.

Introducing Mobile Cards

That's not all! We can also add *mobile cards* to the record's related information page. You can add three types of elements to the related information page using mobile cards: *related lookup cards*, *components*, and *Visualforce page cards*.

Related lookup cards

Related lookup cards appear when you add a field from the Expanded Lookups category to the Mobile Cards section in the enhanced page layout editor. These fields all have a lookup relationship to another record.

Component cards

Component cards appear when you add an element from the Components category to the Mobile Cards section in the enhanced page layout editor.

Visualforce page cards

Visualforce page cards display Visualforce pages that have been enabled for Salesforce mobile apps. If you aren't familiar with Visualforce, don't worry. We'll talk about that in [Moving Beyond Point-and-Click App Development](#) on page 333.

We don't have any Visualforce pages or components to add to the related information page, but we do have some expanded lookups! Let's add one now.

1. In the full Salesforce site, open the page layout for Positions.
2. In the palette, select the Expanded Lookups category.
3. Drag Last Modified By to the Mobile Cards section.
4. Click Save.

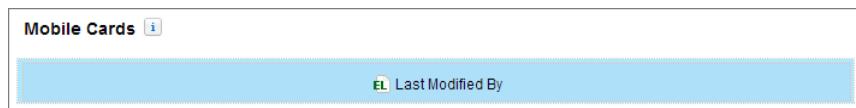


Figure 39: An Expanded Lookup in the Mobile Cards Section

We only need to know the last user who modified our position record, but it's important to know that the mobile cards follow the order established in the page layout editor here, and the related lists always appear after the mobile cards. In addition, mobile cards will only show up in Salesforce1.

5. In Salesforce1, open our position record again.

The expanded lookup card we added now appears at the top of the related information page, identifying the user who last modified the record.

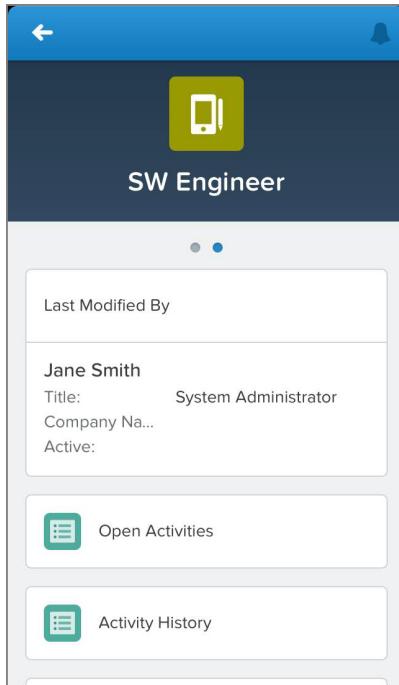


Figure 40: Related Information Page with an Expanded Lookup

It looks like everything is in order! Just by doing a few things in Setup, we've created an object with a tab, we've added custom fields, and we've arranged them in a page layout. We've finished our simple app, and now we're well on our way to creating the more complex Recruiting app that we described earlier.

Introducing Compact Layouts

Now that we've seen how page layouts end up looking in Salesforce1, let's talk about another way we can customize how our Salesforce data appears on a mobile device. *Compact layouts* are used to display a record's key fields at a glance. Using compact layouts, we can indicate which fields should appear in a record's highlights area. These layouts were designed with touchscreen mobile devices in mind, where space is limited and users need to find important information quickly.

We can customize which fields appear in the highlights by customizing that object's compact layout. However, creating a custom compact layout isn't required. If we don't create one, Salesforce1 will use a read-only, predefined system default compact layout. For custom objects, this system default includes the record's name. In the case of our Position object, the system default compact layout displays `Position Title`.

Try It Out: Create a Compact Layout

Let's give our mobile users some more context in the highlights.

1. In the full Salesforce site, from Setup, click **Create > Objects**.
2. Click **Position**.
3. In the Compact Layouts related list, click **New**.
4. In **Label**, enter Position. Press TAB to automatically populate Name.

Now it's time to select the fields we want to include in the compact layout. We can include up to ten fields, but only four of those will appear in the record highlights on a mobile device. Notice that the list of available fields doesn't completely match the list of fields we created for the Position object. Only field types that are supported in compact layouts appear here. Compact layouts don't support text areas, long text areas, rich text areas, and multi-select picklists.

It's also important to know that if a user doesn't have the field-level security for a field that's included in a compact layout, the user will not see the field's value in the compact layout. For example, if we included **Min Pay** in this compact layout, and a user without access to that field was viewing a position record on her mobile phone, the compact layout would display a blank value for **Min Pay**.

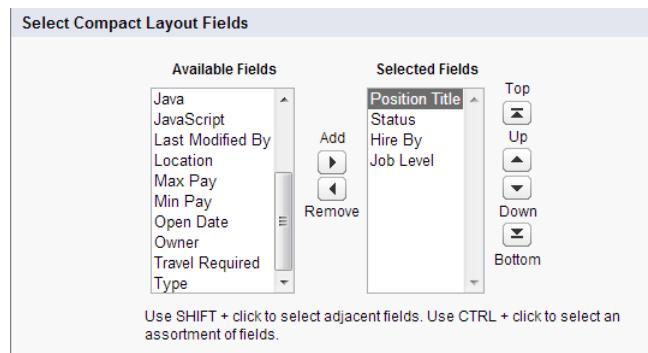


Figure 41: Compact Layout Edit Page for Positions

5. Select these fields for the compact layout, then click the **Add** button. You can select and add them individually or select them as a group using CTRL-click.
 - Hire By
 - Job Level
 - Position Title
 - Status
6. Using the **Up** or **Down** buttons, adjust the list so that the fields are in this order: Position Title, Status, Hire By, Job Level.
7. Click **Save**.

Try It Out: Assign the Primary Compact Layout

Before this compact layout will appear on our mobile device, we need to assign it to our users. Unlike with page layouts, where you can assign a different layout to each profile, one compact layout is applied to all users. Let's assign this new compact layout so our users will see more than just the position's title.

1. Click **Compact Layout Assignment**.
2. In the **Primary Compact Layout** drop-down list, select **Position**.
3. Click **Save**.

Now let's test it out on our mobile device. The changes we just made should be reflected immediately in Salesforce1.

1. Launch Salesforce1, and log in if you haven't already.
2. From the navigation menu, tap **Show More > Positions**.
3. Tap a recent position to open it.

Beyond the Basics

If you have record types associated with an object, you can override the primary compact layout assignment and assign specific compact layouts to different record types. If you don't set any record type overrides, all record types use the object's primary compact layout by default.

To find out more about compact layouts and record types, see "Assigning Compact Layouts to Record Types" in the Salesforce Help.

Look at What We've Done

As you can see, now the record highlights displays the fields we selected in our custom compact layout. Now, instead of just the position title, we also see its status, when it must be filled, and what kind of job it is.

Notice that **Position Title** is more dominant than the other three. This is the *primary field*. When designing your own compact layouts, be aware that the first field in the Selected Fields list is the primary field in the highlights.



Figure 42: Record Detail Page with Customized Compact Layout

Things are going to get even more interesting in the next chapter. We'll add a few more custom objects to track things like candidates, job applications, and reviews, and then we'll enhance our Recruiting app even further by defining how our objects relate to one another. Before you know it, we're going to have an incredibly powerful Web application, all implemented with a few clicks in the platform.

Chapter 6

Expanding the Simple App Using Relationships

In this chapter ...

- Introducing Relationships
- Introducing Relationship Custom Fields
- Adding Candidates to the Mix
- Bringing Candidates and Positions Together with Job Applications
- Introducing Search Layouts
- Managing Review Assessments
- Creating a Many-to-Many Relationship
- Putting it All Together

So far we've accomplished a fair amount—we've created the Recruiting app and built out a fully functional Position custom object with a tab and several types of fields. It's a good start, but there's more to do.

Having just one object in our Recruiting app is like having a party with just one guest—not all that interesting! We need to invite more “people” to the party by building custom objects to represent candidates, job applications, and reviews, and, even more importantly, we need to create *relationships* between them. Just like a party isn't all that fun if you don't know any of the other guests, an app isn't all that powerful unless its objects have links to other objects in the app. That's going to be the focus of this chapter, so let's get started!

Introducing Relationships

So what is a relationship, and why are they important for our app? Just as a personal relationship is a two-way association between two people, in terms of relational data, a relationship is a two-way association between two objects. Without relationships, we could build out as many custom objects as we could think of, but they'd have no way of linking to one another.

For example, after building a Position object and a Job Application object, we could have lots of information about a particular position and lots of information about a particular candidate who's submitted an application for it, but there would be no way of seeing information about the job application when looking at the position record, and no way of seeing information about the position when looking at the job application record. That's just not right!

With relationships, we can make that connection and display data about other related object records on a particular record's detail page. For example, once we define a relationship between the Position and Job Application objects we just talked about, our position record can have a related list of all the job applications for candidates who have applied for the position, while a job application record can have a link to the positions for which that candidate is applying. Suddenly the "people" at our Recruiting app "party" know some of the other guests, and the app just got a lot more interesting.

The screenshot shows a Salesforce Position detail page for a 'Technical Writer' position. The page includes fields for Position Title (Technical Writer), Status (Closed - Canceled), Type, Functional Area, Job Level, Travel Required, Created By (Jane Smith, 7/9/2010 12:59 PM), and Hiring Manager. Below the detail section is a 'Candidate Map' section. A red arrow points from the 'Job Applications' section of the Candidate Map to a callout box containing the text: 'There is a relationship between this Technical Writer position and the Job Applications on the related list.' Another red arrow points from the 'Job Applications' section of the Candidate Map to the 'Job Applications' section of the main detail page, which lists two entries: JA-00001 (Rejected, C-00001) and JA-00002 (New, C-00001).

Action	Job Application Number	Candidate	Status	Created Date	Owner First Name	Owner Last Name
Edit Del	JA-00001	C-00001	Rejected	7/22/2010	Jane	Smith
Edit Del	JA-00002	C-00001	New	7/29/2010	Jane	Smith

Figure 43: Relationships Allow Information about Other Object Records to be Displayed on a Record Detail Page

Introducing Relationship Custom Fields

As we learned in [Reviewing Database Concepts](#) on page 25, we can define a relationship between two objects through the use of common fields. On the platform, we can define relationships between objects by creating a *relationship* custom field that associates one object with another. A relationship field is a custom field on an object record that contains a link to another record. When we place a relationship custom field on an object, we're effectively creating a many-to-one relationship between the object on which the relationship field is placed and the other object.

There are different types of relationship fields, each with different implications. The simplest and most flexible type is a *lookup relationship* field, which creates a simple relationship between two objects. For example, if we place a lookup relationship field on a Job Application object that references position records, many job application records can be related to a single position record. This will be reflected both with a new `Position` field on the job application record and with a new Job Applications related list on the position record. You can also put multiple lookup relationship fields on a single object, which means that our Job Application object can also point to a Candidate object.

A second type of relationship field, *master-detail relationship*, is a bit more complex, but more powerful. Master-detail relationships create a special parent-child relationship between objects: the object on which you create the master-detail relationship field is the child or “detail,” and the object referenced in the field is the parent or “master.” In a master-detail relationship, the ownership and sharing of detail records are determined by the master record, and when you delete the master record, all of its detail records are automatically deleted along with it. Master-detail relationship fields are always required on detail records, and once you set a master-detail relationship field's value, you can't change it.

When do you use a master-detail relationship? If you have an object that derives its significance from another object. For example, say you have a Review custom object that contains an interviewer's feedback on a job application. If you delete a job application record, you will probably want all of its review records deleted as well, being that reviews of something that no longer exists aren't very useful. In this case, you want to create a master-detail relationship on the Review custom object with the Job Application object as the master object.

That's the sort of thing that we're going to do in this chapter. First, let's start with the really quick and easy example of putting a `Hiring Manager` field on our Position object—we'll create a many-to-one relationship between the Position object and the standard User object that comes with every organization, reflecting the fact that a hiring manager can be responsible for several positions at a time. Then we'll build out a few more objects and implement a more complex relationship involving positions, job applications, candidates, and reviews.

Try It Out: Relate Hiring Managers to Positions

For our first relationship, let's associate a hiring manager with a position by putting a lookup relationship field on the Position object. The lookup field will allow users to select the hiring manager for the position by selecting from all the users of the Recruiting app.

For example, if Mario Ruiz, our recruiter, wants to assign Phil Katz as the hiring manager for the Benefits Specialist position, he'll be able to do so by clicking the lookup icon () next to the lookup relationship field that we are going to create. His name will then appear on the Position detail page.

To create the lookup relationship field that accomplishes this, we'll need to go back to the now familiar Position object detail page.

1. From Setup, click **Create > Objects**.
2. Click **Position**.
3. In the Custom Fields & Relationships related list, click **New**.
4. Select **Lookup Relationship**, and click **Next**.
5. In the **Related To** drop-down list, choose **User**, and click **Next**.

As we've mentioned, User is a standard object that comes with all organizations on the platform. It contains information about everyone who uses the app in your organization.

6. In the **Field Label** text box, enter **Hiring Manager**. Once you move your cursor, the **Field Name** text box should be automatically populated with **Hiring_Manager**.
7. Click **Next**.
8. Accept the defaults in the remaining two steps of the wizard.
9. Click **Save**.

Look at What We've Done

Now return to the Positions tab, and click **New**. The Position edit page includes a new **Hiring Manager** lookup field! If you click the lookup icon next to this field () , you can search through all of the users of the Recruiting app and select one as the hiring manager. That user's name now appears on the position record.

The screenshot shows the 'Position Edit' page for creating a new position. The 'Information' section includes fields for Position Title, Status, Type, Functional Area, Job Level, Travel Required, Owner, Location, Open Date, Hire By, Close Date, and a 'Hiring Manager' field. The 'Hiring Manager' field is highlighted with a red box and labeled 'Hiring Manager Lookup Relationship Field'.

Figure 44: Hiring Manager Lookup Relationship

As you can see, it was easy to set up this simple relationship between positions and users. And as a general rule, you'll find that relationships are pretty easy to set up.

What gets a little tricky is when we start wanting to create relationships that don't represent a simple many-to-one relationship. We'll see an example of one of those in a little bit. Right now, let's build a custom object for candidates so we'll be able to create some more relationships in our Recruiting app.

Beyond the Basics

Did you know you can use Schema Builder to view the details of your schema and to quickly add and edit objects and relationship fields?

Say you're having a hard time visualizing how the Hiring Manager lookup is related to the Position and User objects. Schema Builder provides a dynamic environment that lets you see field details, such as whether the field is required, and shows how standard and custom objects are connected through lookup and master-detail relationships. You can zoom and pan in Schema Builder, edit an object's properties, and double-click any field to edit it.

To find out more, see "Working with Schema Builder" in the Salesforce Help.

Adding Candidates to the Mix

Let's add a Candidate custom object to our app so we can manage the information about our candidates. We'll also add fields to the object, modify the page layout properties, add a compact layout, and create a candidate record. The process for creating the Candidate custom object is almost identical to the one we followed to create the Position custom object, so we'll zip through this quickly.

Try It Out: Create the Candidate Object

To create our Candidate custom object, from Setup, click **Create > Objects**, click **New Custom Object**, and fill out the page according to the following table.

Table 8: Values for Defining the Candidate Object

Field	Value
Label	Candidate
Plural Label	Candidates
Object Name	Candidate
Description	Represents an applicant who might apply for one or more positions
Context-Sensitive Help Setting	Open the standard Salesforce Help & Training window
Record Name	Candidate Number
Data Type	Auto Number
Display Format	C-{00000}
Starting Number	00001
Allow Reports	Yes
Allow Activities	Yes
Track Field History	Yes
Deployment Status	Deployed

Field	Value
Add Notes & Attachments related list to default page layout	Yes
Launch New Custom Tab Wizard after saving this custom object	Yes

To create the Candidates tab, select a `Tab Style` in the first step of the wizard, and then accept all the defaults until you get to the Add to Custom Apps page. On this page, select only the Recruiting App and click **Save**.

The Recruiting app now has three tabs: Home, Positions, and Candidates. Now let's add some custom fields to the Candidate object.

Try It Out: Add Fields to the Candidate Object

To create custom fields on the Candidate object, from Setup, click **Create > Objects**, and click **Candidate** to view its detail page. In the Custom Fields & Relationships related list, use the **New** button to create custom fields according to the following table. Where necessary, we've indicated some additional values you'll need to fill in. Otherwise, you can simply accept all defaults.

One difference you'll see in the Candidate object fields is that three of them—`First Name`, `Last Name`, and `Email`—have the `External ID` option selected. This option allows the values in these fields to be indexed for search from the sidebar of the application. If we didn't select these values as external IDs, we'd only be able to search for records based on the `Candidate Number` field. Setting the `Email` field as an external ID is also going to help us with importing data a little later in this chapter.

Table 9: Candidate Object Custom Fields

Data Type	Field Label	Other Values
Text	First Name	Length: 50 External ID: Selected
Text	Last Name	Length: 50 External ID: Selected
Phone	Phone	

Data Type	Field Label	Other Values
Email	Email	External ID: Selected
Text	Street	Length: 50
Text	City	Length: 50
Text	State/Province	Length: 50
Text	Zip/Postal Code	Length: 15
Text	Country	Length: 50
Text	Current Employer	Length: 50
Number	Years of Experience	Length: 2 Decimal Places: 0
Text	SSN	Length: 9
Picklist	Education	Picklist values: <ul style="list-style-type: none"> • HS Diploma • BA/BS • MA/MS/MBA • Ph.D. • Post Doc
Checkbox	Currently Employed	Default: Checked
Checkbox	US Citizen	Default: Checked
Checkbox	Visa Required	Default: Unchecked
Phone	Mobile	
Phone	Fax	

Try It Out: Modify the Candidate Page Layout Properties

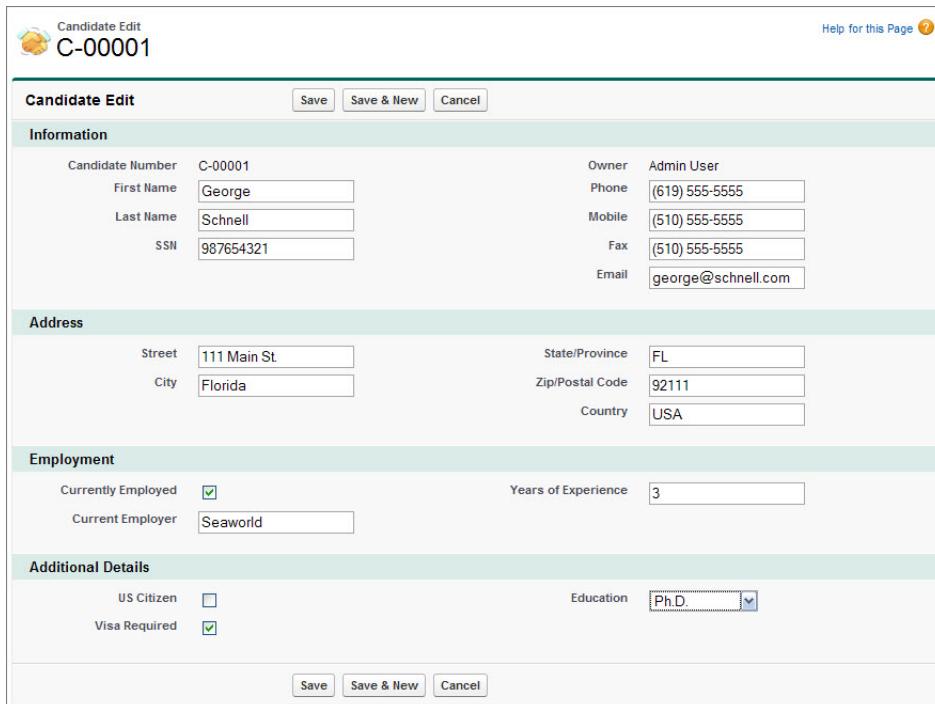
Now let's organize all of our fields on the page layout and mark some fields as required. To do so, let's go to the Candidate page layout page.

1. From Setup, click **Create > Objects**.

2. Click **Candidate**.
3. In the Page Layouts related list, click **Edit** next to the Candidate Layout.
4. Create three new double-column sections below the Information section: Address, Employment, and Additional Details. Drag the appropriate fields into them, as shown in the Candidate Object Page Layout image, and don't forget to click **Quick Save** so you can save your work as you go.
5. Set the First Name, Last Name, and Email fields to required as follows:

Use **CTRL+click** to select all three required fields.
Double-click your selection.
Select the Required checkbox in the Select All row, and click **OK**.
6. Click **Save**.

Your Candidate page layout should now look similar to the following screenshot.



The screenshot shows the 'Candidate Edit' page for record C-00001. The page has a header with a logo, the ID 'C-00001', and links for 'Help for this Page' and a question mark. Below the header is a toolbar with 'Save', 'Save & New', and 'Cancel' buttons. The main area is divided into several sections:

- Information**: Contains fields for Candidate Number (C-00001), First Name (George), Last Name (Schnell), SSN (987654321), Owner (Admin User), Phone ((619) 555-5555), Mobile ((510) 555-5555), Fax ((510) 555-5555), and Email (george@schnell.com).
- Address**: Contains fields for Street (111 Main St), City (Florida), State/Province (FL), Zip/Postal Code (92111), and Country (USA).
- Employment**: Contains fields for 'Currently Employed' (checkbox checked), 'Current Employer' (Seaworld), 'Years of Experience' (3), and a dropdown menu for Education (Ph.D.).
- Additional Details**: Contains fields for 'US Citizen' (checkbox unchecked) and 'Visa Required' (checkbox checked).

At the bottom of the page are the 'Save', 'Save & New', and 'Cancel' buttons.

Figure 45: Candidate Object Page Layout

Look at What We've Done

Here's a quick way to verify that you did everything correctly.

1. Click the Candidates tab.
2. Click **New**.
3. Create a new record for a candidate named Ethan Tran in San Francisco.
4. Enter a value for each of the required fields. Salesforce will not verify the email address you enter in the `Email` field right now, so feel free to enter a fictitious one.
5. For the candidate's `City`, enter San Francisco.
6. Click **Save**.

How does the page layout look? Are the fields where you want them?

If your page layout doesn't look quite right and you need to make a few adjustments, click the **Edit Layout** link in the upper right corner.

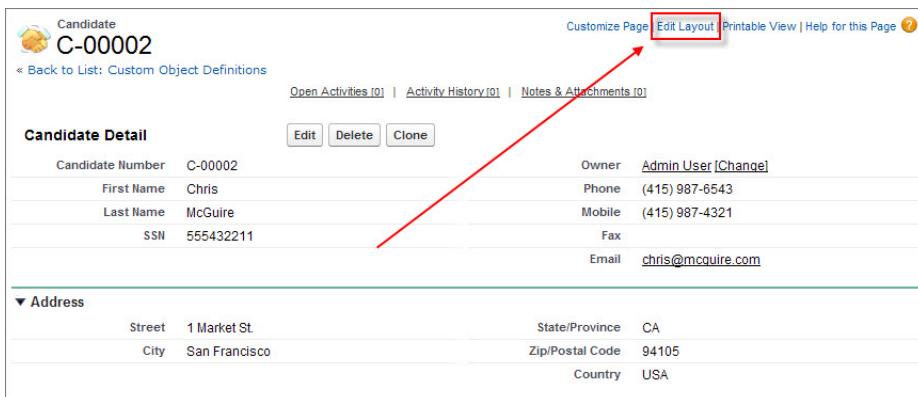


Figure 46: Edit Layout Link

The **Edit Layout** link takes you directly to the page layout editor and lets you modify the page you are currently viewing.

Try It Out: Customize the Candidate Record Highlights

To finish up with this object, let's help out our mobile users by adding a few fields to the record highlights. Right now, the only field that appears there is the candidate number, which isn't very helpful. We want the highlights to give our mobile user the information they need about this candidate at a glance. Some useful data points might be the candidate's location or level of expertise.

1. From Setup, click **Create > Objects**.
2. Click **Candidate**.

3. In the Compact Layouts related list, click **New**.
4. Give the compact layout a name, and move fields to Available Fields so that they appear in the following order.
 - Last Name
 - City
 - Education
 - Years of Experience
5. Click **Save**.

Remember to quickly assign our new compact layout as the primary compact layout for candidates.

6. Click **Compact Layout Assignment**.
7. Click **Edit Assignment**.
8. From the drop-down list, select the compact layout you just created.
9. Click **Save**.

Look At What We've Done

Now let's check how a candidate record looks on our mobile device.

1. Launch Salesforce1, and log in if you're prompted.
2. From the navigation menu, tap **Show More > Candidates**
3. Tap C-00001.



Figure 47: Customized Record Highlights for C-00001

The record highlights includes some information, but two of the fields are blank. This is because when we created this record in the last section, we only filled in the required fields (First Name, Last Name, and Email) and City. Let's fill in those other fields so we can see the compact layout in all its glory!

4. Swipe left to the record details page.
5. Tap **Edit**.

6. Fill in some of the empty fields. You can add more, but at least, make sure that Education and Years of Experience have values.
7. Tap Save.

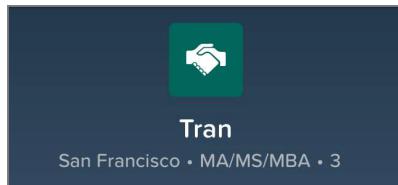


Figure 48: Customized Record Highlights for C-00001 with All Fields Filled In

If you are able to successfully create a new candidate record and see the right values in the highlights, let's move on to the Job Application object!

Bringing Candidates and Positions Together with Job Applications

Our app can track candidates and open positions, but there's a crucial element that's missing: how do we know which candidates are interested in which positions? We can create lookup relationship fields on the Candidate object that let recruiters specify the positions in which the candidate is interested, but what if we want to track additional information, such as whether the candidate is currently scheduled to interview for one of those positions? And wouldn't it be helpful if the recruiter has a way of storing the cover letters that candidates tailor for each specific job to which they are applying?

We can satisfy these requirements with a Job Application custom object that stores data about an individual candidate's application to a single position. Each time a candidate wants to apply for a position, the recruiter can create a job application record that contains the candidate's name and the position to which he or she is applying, as well as any cover letter that the candidate may have submitted specifically for that position. Recruiters will also be able to indicate the status of the candidate's application, such as whether he or she is scheduled for an interview or if the application has been rejected. After we create the Job Application object and its fields, we'll make a few small modifications to the Position, Candidate, and Job Application objects so that each position record displays the names of the candidates who have applied to it, and each candidate record displays the name of the positions to which the candidate has applied.

Try It Out: Create the Job Application Object

You should be a pro at this by now! To create our Job Application custom object, from Setup, click **Create > Objects**, click **New Custom Object**, and fill out the page according to the following table.

Table 10: Values for Defining the Job Application Object

Field	Value
Label	Job Application
Plural Label	Job Applications
Object Name	Job_Application
Description	Represents a candidate's application to a position
Context-Sensitive Help Setting	Open the standard Salesforce Help & Training window
Record Name	Job Application Number
Data Type	Auto Number
Display Format	JA-{00000}
Starting Number	00001
Allow Reports	Yes
Allow Activities	Yes
Track Field History	Yes
Deployment Status	Deployed
Add Notes & Attachments related list to default page layout	Yes
Launch New Custom Tab Wizard after saving this custom object	Yes

To create the Job Applications tab, select a **Tab Style** in the first step of the wizard, and then accept all the defaults until you get to the Add to Custom Apps page. On this page, select only the Recruiting app, and then click **Save**.

We're now just a few custom fields away from linking the Job Application object with the Position and Candidate objects.

Try It Out: Add Fields to the Job Application Object

Here's another procedure that we've done several times before, but this time we only need to define four custom fields instead of the nearly twenty that we built for the Candidate object. We'll need to add a text field for the candidate's cover letter, a picklist field so that we can track the application's status, and two lookup relationship fields that will create relationships between the Job Application object and the Position and Candidate objects.

Although these fields are almost identical to the ones we created earlier, you'll notice when you're defining the lookup relationship fields that there's a new step in the custom field wizard *Step 6: Add Custom Related Lists*. This step of the wizard is where we can specify a heading for the Job Applications related list that will show up on both the Candidate and Position detail pages.

Why didn't we see this step earlier when we created our `Hiring Manager` lookup field? It turns out that User is a unique standard object: it doesn't have a tab, and you cannot add related lists to it. The platform knows this, so it leaves out the related list step whenever someone adds a lookup relationship field that references the User object.

Now that we're all squared away with that small difference, let's finish up these Job Application fields. From Setup, click **Create > Objects**, and then click **Job Application** to view its detail page. In the Custom Fields & Relationships related list, use the **New** button to create custom fields according to the following table. Where necessary, we've indicated some additional values you'll need to fill in. Otherwise you can simply accept all defaults.

Table 11: Add Custom Fields to the Job Application Object

Data Type	Field Label	Other Values
Lookup Relationship	Candidate	Related To: Candidate Related List Label: Job Applications
Lookup Relationship	Position	Related To: Position Related List Label: Job Applications

Data Type	Field Label	Other Values
Text Area (Long)	Cover Letter	Length: 32,768 # of Visible Lines: 6
Picklist	Status	<p>Picklist values:</p> <ul style="list-style-type: none"> • New • Review Resume • Phone Screen • Schedule Interviews • Extend an Offer • Hired • Rejected <p>Use first value as default value: Selected</p>

Try It Out: Customize the Job Application Record Highlights

Since there are only a few fields, we don't need to worry about customizing the page layout. It's a good time, however, to customize the compact layout.

1. From Setup, click **Create > Objects**.
2. Click **Job Application**.
3. In the Compact Layouts related list, use the **New** button to create a compact layout with the following fields. Enter a name in **Label**, and use the **Up** and **Down** buttons to match the order.
 - Job Application Number
 - Status
 - Candidate
 - Position
4. Click **Save**.

Remember to quickly assign our new compact layout as the primary compact layout for job applications.

5. Click **Compact Layout Assignment**.
6. Click **Edit Assignment**.

7. From the drop-down list, select the compact layout you just created.
8. Click **Save**.

Look at What We've Done

Tada! If you click on the new Job Applications tab and click **New**, you'll see the Candidate lookup field, a Position lookup field, the candidate's cover letter, and a Status picklist field.

The screenshot shows the 'Job Application Edit' page for record JA-00001. At the top, there are buttons for 'Save', 'Save & New', and 'Cancel'. Below that is a 'Help for this Page' link. The main area is titled 'Information' and contains fields for 'Job Application Number' (JA-00001), 'Owner' (Admin User), 'Candidate' (C-00001), 'Position' (Benefits Specialist), and a large 'Cover Letter' text area. A 'Status' dropdown menu is open, showing options: 'Phone Screen', '--None--', 'New', 'Review Resume', 'Phone Screen' (which is selected and highlighted in blue), 'Schedule Interviews', 'Extend an Offer', 'Hired', and 'Rejected'. At the bottom right of the form are 'Save & New' and 'Cancel' buttons.

Figure 49: Custom Fields on the Job Application Edit Page

Don't forget to launch Salesforce1 to see our new compact layout in action. Now mobile users will see important details without having to scroll through a list of fields.



Figure 50: Record Highlights for a Job Application Record

But there's more! Because we've built a couple of lookup relationships, our candidate and position record detail pages now each have a new Job Applications related list. And the Job

Application detail page includes links to the candidate and position records that it references. All three objects are now related and linked to one another!

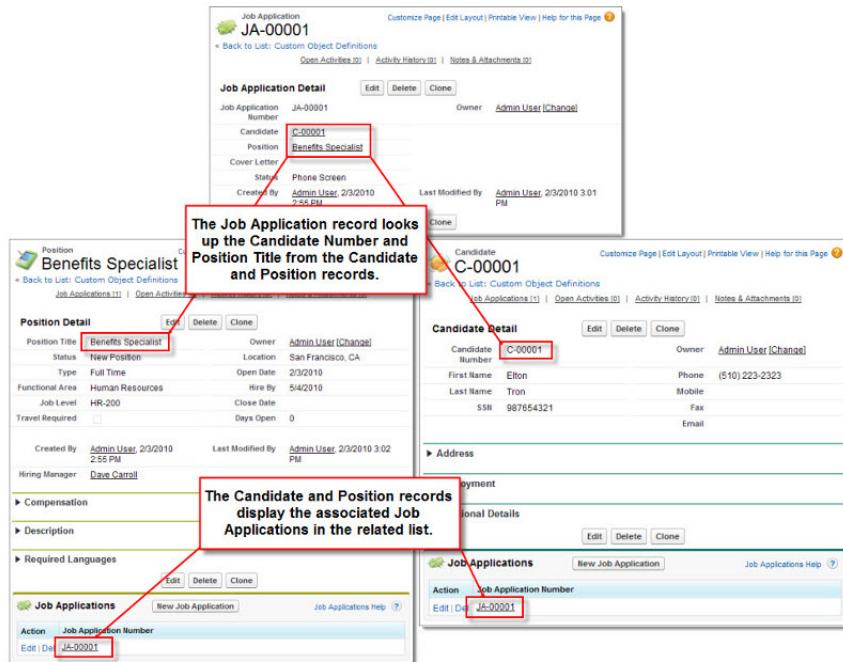


Figure 51: Job Application Links to Position and Candidate Data

Before we move on, let's see if we can clean up the usability of our app a bit more so our users don't have to identify candidates and job applications by number when they click the lookup button in the Job Application edit page, or when they look at the Job Applications related list on the Candidate or Position detail pages.

Introducing Search Layouts

By default, all lookup dialogs and related lists that result from new relationships, such as the ones we've defined in this chapter, only display the record name or number. For example, if you go ahead and create a job application, you might find the Candidate lookup dialog a little cryptic because the only listed field is Candidate Number. You probably expected to see the First Name, Last Name, and additional fields, as shown in the following screenshot.

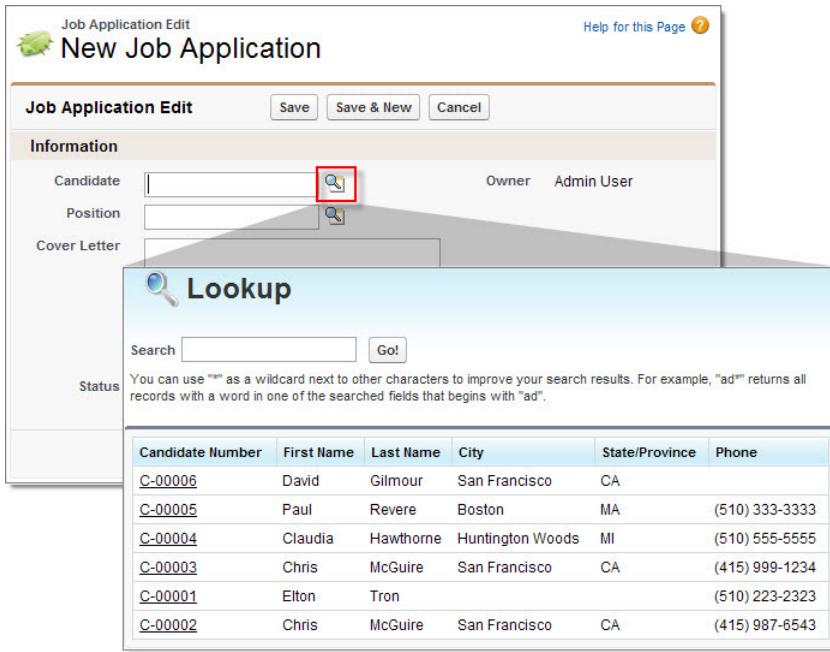


Figure 52: Default Candidate Lookup on the Job Application Object

Likewise, the Job Applications related lists on the Position and Candidate detail pages only display a job application number. It is much more useful if these related lists also include the associated candidate's name or position.

To fix these issues, we can add fields to the *search layouts* for the objects that we've defined. Search layouts are ordered groups of fields that are displayed when a record is presented in a particular context, such as in search results, a lookup dialog, or a related list. By adding fields, we can give users more information and help them locate records more quickly.

The Search Layouts related list on the custom object detail page is the place to modify these sets of fields. From Setup, click **Create > Objects** and select the Candidate object. You'll see that the available search layouts include:

Table 12: Available Search Layouts

Layout Name	Description
Search Results	The search results that originate from searching in the left sidebar search of the application or in advanced search.
Lookup Dialogs	The lookup dialog results that originate from clicking next to a lookup field on an edit page.

Layout Name	Description
Lookup Phone Dialogs	The lookup dialog results that originate from clicking  next to a lookup field with a phone data type on an edit page.
Candidates Tab	The list of recent records that appears on the home page of a tab, and in related lists on other object detail pages.
Candidates List View	This layout isn't for specifying fields. Instead, use it to specify the buttons that appear on the list view page for an object.
Search Filter Fields	The filters that can be applied to search results.

Try It Out: Add Fields to the Candidate Lookup Dialog

Let's add fields to our Candidate lookup dialog:

1. From Setup, click **Create > Objects**.
2. Click **Candidate**.
3. In the Search Layouts related list, click **Edit** next to the Lookup Dialogs layout.

The Edit Search Layout page includes a list of available fields from the Candidate object. You can choose up to ten fields to include in the lookup dialog, and order them in any way you choose, except that the object's unique name or number field (such as Candidate Number) must be listed first.

4. Move the following fields into the Selected Fields box under Candidate Number:
 - First Name
 - Last Name
 - City
 - State/Province
 - Phone
5. Click **Save**.

That's it! To try it out, return to the Job Applications tab, and click **New**. When you click the lookup icon next to the Candidate field, the dialog is now much more useful.

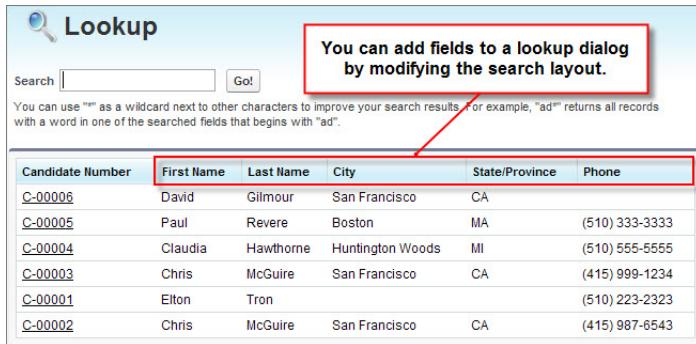


Figure 53: Modified Candidate Lookup on the Job Application Object

Try It Out: Update Additional Search Layouts

Now that we've updated one search layout for lookups, the rest should be easy. Use the Search Layouts related list on the custom object detail page to modify the other search layouts as described in the following table.

Table 13: Additional Search Layouts

Object	Search Layout	Add These Fields
Candidate	<ul style="list-style-type: none"> • Search Results • Candidates Tab 	<ul style="list-style-type: none"> • Candidate Number • First Name • Last Name • City • State/Province • Phone
Candidate	<ul style="list-style-type: none"> • Search Filter Fields 	<ul style="list-style-type: none"> • Candidate Number • First Name • Last Name • Education • Years of Experience • City • State/Province • Country • Currently Employed

Object	Search Layout	Add These Fields
Position	<ul style="list-style-type: none"> • Search Results • Lookup Dialogs • Positions Tab • Search Filter Fields 	<ul style="list-style-type: none"> • Position Title • Location • Functional Area • Job Level • Type • Hiring Manager • Status • Open Date • Close Date
Job Application	<ul style="list-style-type: none"> • Search Results • Lookup Dialogs • Job Applications Tab • Search Filter Fields 	<ul style="list-style-type: none"> • Job Application Number • Candidate • Position • Status • Created Date • Owner First Name • Owner Last Name

Now let's create another custom object to provide our hiring managers and interviewers with a place to enter their comments about job applications.

Managing Review Assessments

Interviewers, recruiters, and hiring managers need to be able to create reviews so that they can record their comments about each candidate's job application, and rate the candidate's suitability for the position. They also need to see the reviews posted by other people. To allow our users to perform these tasks, we'll need to create a custom Review object and relate it to the Job Application object.

The Review object has a many-to-one relationship with the Job Application object because one job application can have one or more reviews associated with it. A related list on the job application record will show the associated reviews, representing the “many” side of the relationship.

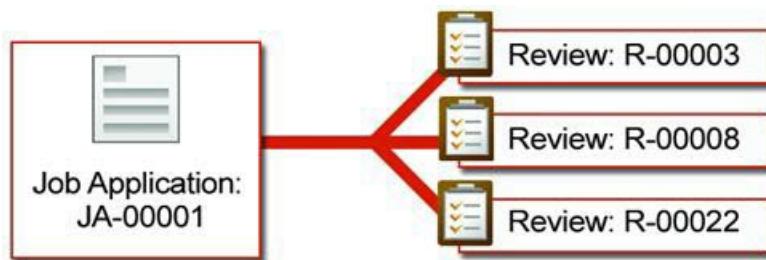


Figure 54: Review Has a Many-to-One Relationship with Job Application

However, instead of creating this relationship with a lookup relationship field, this time we'll use a master-detail relationship field. A master-detail relationship field makes sense in this case because reviews lose their meaning when taken out of the context of a job application, so we'll want to automatically delete reviews when we delete the job application to which they're related.

Try It Out: Create the Review Object

To create the Review object, from Setup, click **Create > Objects**, click **New Custom Object**, and fill out the page according to the following table.

Table 14: Values for Defining the Review Object

Field	Value
Label	Review
Plural Label	Reviews
Object Name	Review
Description	Represents an interviewer's assessment of a particular candidate
Context-Sensitive Help Setting	Open the standard Salesforce Help & Training window
Record Name	Review Number
Data Type	Auto Number
Display Format	R-{000000}
Starting Number	000001

Field	Value
Allow Reports	Yes
Allow Activities	Yes
Track Field History	Yes
Deployment Status	Deployed
Add Notes & Attachments related list to default page layout	Yes
Launch New Custom Tab Wizard after saving this custom object	No

Notice that we didn't launch the tab wizard this time. Reviews don't need a tab of their own because they can be accessed via a related list on the Job Application detail page. When you create an object with a tab, the platform provides access to that object's records in various places other than just the tab, such as in search results and the Recent Items list in the sidebar area of every page. Because most Recruiting app users won't need to see reviews unless it's in the context of a job application, we don't need to create a separate tab for them.

Now let's finish up the custom fields on the Review object.

Try It Out: Add Fields to the Review Object

Let's start by adding the master-detail relationship field, which will relate our Review object with the Job Application object. To create the master-detail relationship field, access the Review object detail page.

1. From Setup, click **Create > Objects**.
2. Click **Review**.
3. In the Custom Fields & Relationships related list, click **New**.
4. Select **Master-Detail Relationship**, and click **Next**.
5. In the **Related To** drop-down list, choose **Job Application**, and click **Next**.
6. Click in the **Field Name** text box to automatically populate it with the field name **Job_Application**.
7. Leave the **Read/Write** radio button selected.

This sharing setting prevents people from creating, editing, or deleting a review unless they can also create, edit, or delete the associated job application. We'll learn about sharing and security in the next chapter.

8. Click **Next**.
9. Accept the defaults in the remaining three steps of the wizard.
10. Click **Save**.

Your master-detail relationship is complete!

Beyond the Basics

Did you know you can create master-detail relationships with multiple levels? With multilevel master-detail relationships you can create reports that roll up data from all levels of the data model, and trigger cascading deletes when a master record is deleted.

Say you want a candidate's applications and review records to be deleted when a hiring manager deletes a candidate. You can create a new master-detail relationship field that relates the Job Application object with the Candidate object. Because the Review and Job Application objects are already related to each other in a master-detail relationship, you've built a multilevel relationship where Candidate is the master, Job Application is the detail, and Review is the subdetail.

Now that your master-detail relationship is in place, let's think about the other types of fields that would be useful to people looking at a review record.

Most likely, users will want to see the name of the candidate and the position for which they are being reviewed. We could create a lookup relationship to the Position and Candidate objects, and then require reviewers to enter those fields when creating a review record, but what if they select the wrong value? Besides, wouldn't it be better if these fields were somehow automatically populated?

To solve this, we'll tap into the synergy of formulas and relationships to create *cross-object formulas*. Cross-object formulas are formulas that span two or more objects by referencing merge fields from related records. This means that formulas on our Review object can access fields on the Job Application object, and formulas on the Job Application object can access fields on both the Position and Candidate objects. We're going to take it even one step further by creating formula fields on our Review object that *span* the Job Application object to reference fields on the Candidate and Position objects. You'll quickly discover that using related data is much easier than it sounds!

Let's begin by building a formula field on the Review object that references the title of the position on the review's parent job application record.

1. From Setup, click **Create > Objects**.
2. Click **Review**.

3. In the Custom Fields & Relationships related list, click **New**.
4. Select the **Formula** data type, and click **Next**.
5. In the **Field Label** field, enter **Position**. Once you move your cursor, the **Field Name** text box automatically populates with **Position**.
6. Select the **Text** formula return type and click **Next**.
7. Click the **Insert Field** button.

The Insert Field overlay appears, as shown below.

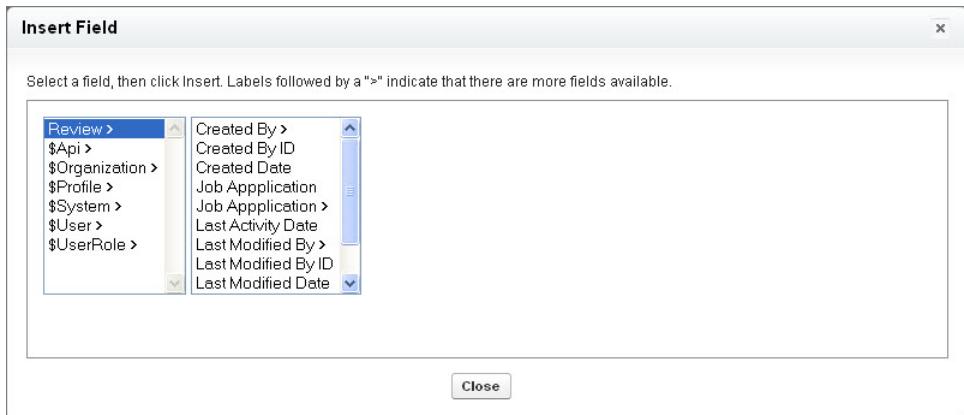


Figure 55: Insert Field Overlay

8. Select **Review** in the first column.

When you choose **Review**, the second column displays all of the **Review** object's fields as well as its related objects, which are denoted by a greater-than sign (>). Notice that the **Created By** and **Last Modified By** fields also have greater-than signs. This is because these are lookup fields to the **User** object.

9. Select **Job Application >** in the second column. The third column displays the fields of the **Job Application** object.
10. Select **Position >** in the third column. The fourth column displays the fields of the **Position** object.

Be sure that you select **Position >** (with the greater than sign) and not **Position**. The one with the greater-than sign is the **Position** object, while the one without the greater than sign is the **Position** lookup field on the **Job Application** object. In most cases, formulas that access lookup fields return a cryptic record ID. Instead, we want our formula to return the position's title.

11. Choose **Position Title** in the fourth column.
12. Click **Insert**.

Your formula now looks like:

```
Job_Application__r.Position__r.Name
```

The formula spans to the review's related job application (`Job_Application__r`), then to the job application's related position (`Position__r`), and finally references the position's title (Name). Notice that each part of the formula is separated by a period, and that the relationship names consist of the related object followed by `_r`.

- 13.** Click **Next**.
- 14.** Accept all remaining field-level security and page layout defaults.
- 15.** Click **Save**.

That wraps up our first cross-object formula field. Let's try another. This time, we'll add a cross-object formula field on our Review object that displays the first and last names of the candidate being reviewed. We'll also up the ante by using the `HYPERLINK` function so that users can access the candidate's record by clicking the field.

- 1.** From Setup, click **Create > Objects**.
- 2.** Click **Review**.
- 3.** In the Custom Fields & Relationships related list, click **New**.
- 4.** Select the `Formula` data type, and click **Next**.
- 5.** In the `Field Label` field, enter Candidate. Once you move your cursor, the `Field Name` text box automatically populates with Candidate.
- 6.** Select the `Text` formula return type and click **Next**.
- 7.** From the Functions list, double-click `HYPERLINK`.

The `HYPERLINK` function lets you create a hyperlink to any URL or record in Salesforce. The text of the hyperlink can differ from the URL itself, which is useful here because we want our hyperlink to display the first and last names of the candidate while the URL points to the candidate record itself.

- 8.** Delete `url` from the `HYPERLINK` function you just inserted, but leave your cursor there.
- 9.** Click the **Insert Field** button, and select `Review >, Job Application >, Candidate >, Record ID`, and click **Insert**.

Salesforce generates a unique ID for every record. By inserting the record ID of the candidate in our `HYPERLINK` function, we're enabling our formula field to locate and link to the candidate's record.

- 10.** Delete `friendly_name` from the `HYPERLINK` function, but leave your cursor there.

11. Click the **Insert Field** button, and select Review >, Job Application >, Candidate >, First Name, then click **Insert**.
12. Enter a space, then click the **Insert Operator** button and choose Concatenate.

The Concatenate operator inserts an ampersand (&) in your formula, and joins the values on either side of the ampersand. Here we're going to use the Concatenate operator to join the first and last names of the candidate in a single field, even though they are stored in separate fields on the Candidate object. The Concatenate operator also lets us insert a space between the two names, as you'll see in the next step.

13. Enter another space, then type a blank space enclosed in quotes, like this:

```
" "
```

This appends a blank space after the first name of the candidate.

14. Enter a space, then click the **Insert Operator** button and choose Concatenate once more to add a second ampersand in your formula.
15. Click the **Insert Field** button, and select Review >, Job Application >, Candidate >, Last Name, then click **Insert**.
16. Delete `[target]` from the HYPERLINK function. This is an optional parameter that isn't necessary for our formula field.
17. Click **Check Syntax** to check your formula for errors. Your finished formula should look like this:

```
HYPERNLINK
  ( Job_Application__r.Candidate__r.Id ,
    Job_Application__r.Candidate__r.First_Name__c
  &
  " "
  &
  Job_Application__r.Candidate__r.Last_Name__c )
```

18. Click **Next**.
19. Accept all remaining field-level security and page layout defaults.
20. Click **Save**.

Whew! That one required a little more thought, but using a bit of brainpower here has tremendously improved the usability of our app, which you'll see in a moment when we test our changes to the Review object. Before we start testing, though, let's quickly add two more easy fields to finish our Review object. We need a text area field for the reviewer's assessment, and a number field in which the reviewer can give the candidate a numeric score.

From Setup, click **Create > Objects** and select the Review object. Use the **New** button in the Custom Fields & Relationships related list to create the remaining custom fields for the Review object according to the following table. Where necessary, we've indicated some additional values you'll need to fill in. Otherwise, accept all defaults.

Table 15: Add Custom Fields to the Review Object

Data Type	Field Label	Other Values
Text Area (Long)	Assessment	Length: 32,768 # of Visible Lines: 6
Number	Rating	Length: 1 Always require a value in this field in order to save a record Help text: Enter a 1-5 rating of the candidate.

When you're done, add a quick validation rule to ensure that the Ratings field only accepts the numbers 1 through 5. This will keep our review rating system consistent throughout our organization.

1. From Setup, click **Create > Objects**.
2. Click **Review**.
3. In the Validation Rules related list, click **New**.
4. In the Rule Name text box, enter **Rating_Scale_Rule**.
5. Select the Active checkbox.
6. In the Description text box, enter **Rating must be between 1 and 5**.
7. Enter the following error condition formula:

```
(Rating__c <1 || Rating__c > 5)
```

This formula prevents the record from being saved if the value of the Rating field is less than one or greater than five.

8. In the Error Message text box, enter **Invalid rating. Rating must be between 1 and 5**.
9. Next to the Error Location field, select the Field radio button, and then choose Rating from the drop-down list.
10. Click **Save**.

Our Review object is complete! We've added several features that will help users access the data they need in order to assess each job application. There's one more easy improvement we need to streamline our job application review process. It involves returning to our Job

Application object and taking advantage of one of the benefits we gain by using a master-detail relationship.

Introducing Roll-Up Summary Fields

The rating system we created on the Review object lets users quickly see each reviewer's opinion of the candidate's suitability for the position. While each individual opinion is important, it would be even better to see these ratings compiled in a way that summarizes how the candidate did overall. For example, wouldn't it be great if we could have a `Total Rating` field on each Job Application record that shows the sum of all the job application's review ratings?

The good news is that we can! A simple roll-up summary field on the Job Application object can summarize data from a set of related detail records and automatically display the output on a master record. Use roll-up summary fields to display the sum, minimum, or maximum value of a field in a related list, or the record count of all records listed in a related list.

Try It Out: Create Roll-Up Summary Fields

Begin creating your roll-up summary just as you create any other custom field:

1. From Setup, click **Create > Objects**.
2. Click **Job Application**.
3. In the Custom Fields & Relationships related list, click **New**.
4. Select the **Roll-Up Summary** data type, and click **Next**.

When creating a field on an object that is not the master in a master-detail relationship, the **Roll-Up Summary** data type is not available. This is because roll-up summary fields are only available on the master object in a master-detail relationship.

5. In the **Field Label** field, enter `Total Rating`. Once you move your cursor, the **Field Name** text box automatically populates with `Total_Rating`.
6. Click **Next**.
7. In the **Summarized Object** drop-down list, choose **Reviews**.
8. Under **Select Roll-Up Type**, select **SUM**.
9. In the **Field to Aggregate** drop-down list, select **Rating**.
10. Leave **All records should be included in the calculation** selected, and click **Next**.
11. Accept all remaining field-level security and page layout defaults.
12. Click **Save**.

Now our job application records aggregate the ratings of their related reviews. This data could be a little deceptive, though, since some job applications might get reviewed more than others. It would be more helpful if we could see the average rating.

Roll-up summary fields themselves don't allow you to average values together, but you can use them in formulas that do. Let's create a second roll-up summary field on the Job Application object, and then build a simple formula field that uses both roll-up summary fields to find the average rating.

1. From Setup, click **Create > Objects**.
2. Click **Job Application**.
3. In the Custom Fields & Relationships related list, click **New**.
4. Select the Roll-Up Summary data type, and click **Next**.
5. In the Field Label field, enter Number of Reviews. Once you move your cursor, the Field Name text box automatically populates with Number_of_Reviews.
6. Click **Next**.
7. In the Summarized Object drop-down list, choose Reviews.
8. Under Select Roll-Up Type, select COUNT.

We don't need to specify a Field to Aggregate this time since we're just counting the number of related detail records and are not interested in any specific field.

9. Leave All records should be included in the calculation selected, and click **Next**.
10. Accept all remaining field-level security and page layout defaults.
11. Click **Save**.

Both roll-up summary fields are in place now. Let's build a formula field called Average Rating that divides the value of the first roll-up summary field by the value of the second.

1. From Setup, click **Create > Objects**.
2. Click **Job Application**.
3. In the Custom Fields & Relationships related list, click **New**.
4. Select the Formula data type, and click **Next**.
5. In the Field Label field, enter Average Rating. Once you move your cursor, the Field Name text box automatically populates with Average_Rating.
6. Select the Number formula return type and click **Next**.
7. Click the **Insert Field** button.
8. Select Job Application >, then Total Rating, and click **Insert**.
9. Click the **Insert Operator** button and choose Divide.
10. Click the **Insert Field** button again.

11. Choose Job Application >, then Number of Reviews, and click **Insert**. Your formula should look like this:

```
Total_Rating__c / Number_of_Reviews__c
```

12. Click **Next**.

13. Accept the defaults in the remaining steps of the wizard.

14. Click **Save**.

That wraps up all the fields and relationships we need to manage our reviews. Let's quickly organize the presentation of our fields and then test everything we've created.

Try It Out: Customize the Review Object's Page and Search Layouts

First, let's update the page layout of the Review object so that the Assessment text field is in a single column section of the same name.

1. From Setup, click **Create > Objects**.
2. Click **Review**.
3. In the Page Layouts related list, click **Edit** next to Review Layout.
4. Drag a new section just below the System Information section. The Section Properties dialog box opens.
5. Name the section **Assessment**, and configure it to contain one column.
6. Drag the **Assessment** and **Rating** fields into the **Assessment** section.
7. Click **Save**.

Now, let's configure our Review search layouts so that reviews are always displayed with the associated job application, position, and candidate.

1. In the Search Layouts related list on the Review object detail page, click **Edit** next to **Lookup Dialogs** and add the following fields:
 - **Review Number**
 - **Rating**
 - **Job Application**
 - **Candidate**
 - **Position**
 - **Created Date**
2. Repeat for the **Search Filter Fields** layout.

To update the Reviews related list that appears on the Job Application detail page, we'll have to edit the related list directly on the Job Application page layout. This is different from how we added fields to the Job Application related list on the position and candidate detail pages because the Review object doesn't have an associated tab, and therefore, doesn't have a tab search layout. Remember—the tab search layout is responsible for both the fields that appear in the list on the tab home page and the default fields that appear in related lists on other object detail pages.



Note: The tab search layout is responsible for the fields in the related list layout only if the related list properties have not been modified on other objects' page layouts.

For example, if you modify the properties of the Job Application related list on the Position page layout, those changes will always override the field specifications of the Job Application tab search layout.

Because the Review object doesn't have a tab search layout, we have to set those fields another way.

1. From Setup, click **Create > Objects**.
2. Click **Job Application**.
3. In the Page Layouts related list, click **Edit** next to Job Application Layout.
4. On the Job Application page layout, locate the Reviews related list and click the wrench icon (🔧) to edit its properties.
5. On the Related List Properties dialog box, add the following fields to the Selected Fields box:
 - Review Number
 - Rating
 - Candidate
 - Position
 - Created Date
6. From the Sort By drop-down list, choose Review Number.
7. Click **OK**.
8. Click **Save** on the page layout edit page.

Try It Out: Customize Record Highlights for Reviews

Now, let's create a custom compact layout to give mobile users more context when looking at review records.

1. From Setup, click **Create > Objects**.
2. Click **Review**.
3. In the Compact Layouts related list, use the **New** button to create a compact layout with the following fields. Enter a name in **Label**, and use the **Up** and **Down** buttons to match the order.
 - Review Number
 - Rating
 - Candidate
 - Created By
4. Click **Save**.

Remember to quickly assign our new compact layout as the primary compact layout for reviews.

5. Click **Compact Layout Assignment**.
6. Click **Edit Assignment**.
7. From the drop-down list, select the compact layout you just created.
8. Click **Save**.

Look at What We've Done

Terrific! Let's go see what we've made:

1. Click the Job Applications tab and select a record, or create one if you haven't already.



Tip: When you use the Candidate and Position lookup dialogs as you're creating a job application record, note that, by default, they only display the most recently viewed records. You can locate additional records by using the search box, which returns records based on the Candidate Number or Position Title fields, respectively.

Use the * wildcard with other characters to improve your search results. For example, searching on C* returns every candidate record. Likewise, searching on *e returns all position records that include the letter 'e' in the title.

After the job application is created, notice that the Reviews related list now appears on the Job Application detail page. That's because we related the Review object to the Job Application object with a master-detail relationship.

2. In the Reviews related list, click **New Review** to create a review.

Do you see how the platform automatically filled in the job application number in the review's edit page? That's one of the small, but important, benefits of using the platform to build an

application like this—not only is it easy to create links and relationships between objects, but the platform anticipates what we're doing and helps us accomplish our task with as few clicks as possible.

3. Complete the fields on the review, and click **Save**.

Notice that the name of the candidate and the title of the position appear on the review detail page. If you click the candidate's name, his or her record displays.

Before we move on, let's check out how that review we created looks in Salesforce1 with our compact layout.

1. In Salesforce1, open the navigation menu and tap **Show More > Job Applications**.
2. Tap **JA-00001** to open the job application record we just created.
3. Swipe over the related information page.
4. Tap the Reviews preview card to see all the reviews associated with this application.
5. Tap **R-000001** to open the review record.

Go ahead and tap—or click, if you're back in the full site—around the rest of the app, creating a few more positions, job applications, candidates, and reviews. Pretty neat, huh? Our data is all interconnected, and our edits to the search layouts allow us to view details of several related objects all at once.

Creating a Many-to-Many Relationship

Our Recruiting app now has quite a few many-to-one relationships, but what if we needed to create a many-to-many relationship? For example, what if we have an object that stored information about various employment websites, and we wanted to track which open positions we posted to those sites? This would require a many-to-many relationship because:

- One position could be posted on many employment websites.
- One employment website could list many positions.

Here's where we get a little creative. Instead of creating a relationship field on the Position object that directly links to the Employment Website object, we can link them using a *junction object*. A junction object is a custom object with two master-detail relationships, and is the key to making a many-to-many relationship.

For our app, we're going to create a junction object called Job Posting. A job posting fits into the space between positions and employment websites—one position can be posted many times, and one employment website can have many job postings, but a job posting always represents a posting about a single position on a single employment website. In essence, the

Job Posting object has a many-to-one relationship with both the Position and the Employment Website objects, and through those many-to-one relationships, we'll have a many-to-many relationship between the Position and Employment Website objects.



Tip: In many apps, the sole purpose of a junction object is to simply relate two objects, so it often makes sense to give the junction object a name that indicates the association or relationship it creates. For example, if you wanted to use a junction object to create a many-to-many relationship between bugs and cases, you could name the junction object BugCaseAssociation.

Let's look at a typical scenario at Universal Containers. There are open positions for a Project Manager and a Sr. Developer. The Project Manager position is only posted on Monster.com, but the Sr. Developer position is more difficult to fill, so it's posted on both Monster.com and Dice. Every time a position is posted, a job posting record tracks the post. As you can see in the following diagram, one position can be posted many times, and both positions can be posted to the same employment website.

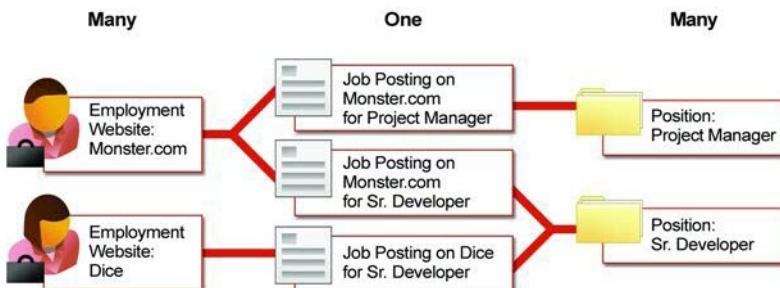


Figure 56: Using a Job Posting Object to Create a Many-to-Many Relationship Between Positions and Employment Websites

In relational database terms, each job posting record is a row in the Job Posting table consisting of a foreign key to a position record and a foreign key to an employment website record. The following entity relationship diagram shows this relationship.

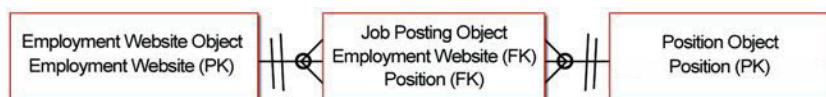


Figure 57: Entity Relationship Diagram for the Position, Job Posting, and Employment Website Objects

Consequently, in order to define a many-to-many relationship between the Position and Employment Website objects, we'll need to create a Job Posting object with the following fields:

- A Position master-detail relationship
- An Employment Website master-detail relationship

Let's get started.

Try It Out: Create the Employment Website Object

To create our Employment Website custom object, from Setup, click **Create > Objects**, click **New Custom Object**, and fill out the page according to the following table.

Table 16: Values for Defining the Employment Website Object

Field	Value
Label	Employment Website
Plural Label	Employment Websites
Starts with Vowel Sound	Checked
Object Name	Employment_Website
Description	Information about a particular employment website
Context-Sensitive Help Setting	Open the standard Salesforce Help & Training window
Record Name	Employment Website Name
Data Type	Text
Allow Reports	Yes
Allow Activities	Yes
Track Field History	Yes
Deployment Status	Deployed
Add Notes & Attachments related list to default page layout	Yes
Launch New Custom Tab Wizard after saving this custom object	Yes

To create the Employment Website tab, select a **Tab Style** in the first step of the wizard, and then accept all the defaults until you get to the Add to Custom Apps page. On this page, select only the Recruiting App, and then click **Save**.

Let's wrap up the Employment Website object by adding a few custom fields.

Try It Out: Add the URL Field to the Employment Website Object

Obviously, the Employment Website object needs to store the Web address of the employment website. We'll use the URL data type for this field. That way, when users click the field, the URL will open in a separate browser window. In addition to the URL, since most employment websites charge per posting, we'll want to keep track of how much it costs to post there, as well as our maximum budget for posting on the site.

From Setup, click **Create > Objects**, and then click **Employment Website** to view its detail page. In the Custom Fields & Relationships related list, use the **New** button to create three custom fields according to the following table. Where necessary, we've indicated some additional values you'll need to fill in when creating the fields. Otherwise you can simply accept all defaults.

Table 17: Add Three Custom Fields to the Employment Website Object

Data Type	Field Label	Other Values
URL	Web Address	Required
Currency	Price Per Post	Length: 5 Decimal Places: 2 Required
Currency	Maximum Budget	Length: 6 Decimal Places: 2 Required

Try It Out: Create the Job Posting Object

Now it's time to create our Job Posting junction object! From Setup, click **Create > Objects**, click **New Custom Object**, and fill out the page according to the following table.

Table 18: Values for Defining the Job Posting Object

Field	Value
Label	Job Posting
Plural Label	Job Postings
Object Name	Job_Posting
Description	Represents the junction object between a position and an employment website
Context-Sensitive Help Setting	Open the standard Salesforce Help & Training window
Record Name	Job Posting Number
Data Type	Auto Number
Display Format	JP-{00000}
Starting Number	00001
Allow Reports	Yes
Allow Activities	Yes
Track Field History	Yes
Deployment Status	Deployed
Add Notes & Attachments related list to default page layout	Yes
Launch New Custom Tab Wizard after saving this custom object	No

That was simple enough, but we're not quite done. We need to create the master-detail relationship fields that relate the Job Posting object with the Position and Employment Website objects.

Try It Out: Add Fields to the Job Posting Object

To turn the Job Posting object into the junction object that relates the Position and Employment Website objects, we'll need to add two master-detail relationship fields. The first master-detail relationship will be the *primary relationship*. The detail and edit pages of our junction object (Job Posting) will use the color and any associated icon of the primary master object (Position). In addition, the junction object records will inherit the value of the Owner field and sharing settings from their associated primary master record.

1. From Setup, click **Create > Objects**.
2. Click **Job Posting**.
3. In the Custom Fields & Relationships related list, click **New**.
4. Select **Master-Detail Relationship**, and click **Next**.
5. In the **Related To** drop-down list, choose **Position**, and click **Next**.
6. In the **Field Label** text box, enter **Position**. When you move your cursor, the **Field Name** text box should be automatically populated with **Position** as well.
7. Accept the remaining defaults, and click **Next** until you reach the final step of the wizard.

Here, we are given the chance to add the Job Postings related list to the Position object page layout. Instead of displaying information about related job postings, we want this list to show all the employment websites where this position is posted. So let's add the Job Posting related list, but rename it **Employment Websites**.

8. In the **Related List Label** text box, enter **Employment Websites**.
9. Accept the other defaults and click **Save & New**.

We're halfway through the creation of our many-to-many relationship. The next step is to create a second master-detail relationship on the Job Posting object to link it with the Employment Website object.

The second master-detail relationship creates a *secondary relationship*. Unlike the primary relationship, the secondary relationship has no affect on the look and feel of the junction object. However, just as in the primary relationship, the sharing settings of the master record in the secondary relationship also affect who can access the junction record, and deleting a record of the secondary master object will automatically delete its associated junction object records. So in our app, if you delete an employment website record, all of its associated job posting records are deleted as well, even if the position is open.

10. Select **Master-Detail Relationship**, and click **Next**.
11. In the **Related To** drop-down list, choose **Employment Website**, and click **Next**.

12. In the **Field Label** text box, enter Employment Website. When you move your cursor, the **Field Name** text box should be automatically populated with Employment_Website as well.
13. Click **Next**. Because we are creating a master-detail relationship, these settings cannot be changed.
14. Click **Next**. These settings cannot be changed as well.
15. Click **Next** to view the final step of the wizard.

This time we are given the chance to add the Job Postings related list to Employment Website object page layout. We'll eventually configure this related list to show all the positions that are posted on this website, so let's add the Job Postings related list but rename it Positions.

16. In the **Related List Label** text box, enter Positions.
17. Accept the other defaults and click **Save**.

Now our many-to-many relationship is complete! Or is it?

While we have an Employment Websites related list on the Position object and a Positions related list on the Employment Websites object, both related lists still display job posting records. This won't do.

In order to achieve our goal of listing multiple positions on an employment website record and multiple employment websites on a position record, we need to customize the fields in these related lists.

Customizing Related Lists in a Many-to-Many Relationship

The capability to customize related lists in a many-to-many relationship is more robust than the capability to customize related lists in a lookup relationship. When you have a lookup relationship between two objects (like the one we created between the Job Application and Candidate objects), the related list on one object can only display fields from the object to which it is directly related; it cannot span to other objects the way formulas can. For example, the Job Applications related list on a candidate record can display any job application field, but it can't display any fields from the Position object, even though the Job Application object has lookup relationships with both the Candidate and Position objects.

Fortunately for us, many-to-many relationships allow for greater flexibility. When working with a many-to-many relationship, the junction object's related list on one master object can display the other master object's fields. We're going to take advantage of this by configuring the Positions related list on each employment website record to display fields from the Position

object and vice versa, thus allowing these two objects to span to each other. It's all coming together now!

Try It Out: Customize the Positions and Employment Websites Related Lists

Let's start by modifying the Employment Websites related list on the Position object.

1. From Setup, click **Create > Objects**.
2. Click **Position**.
3. In the Page Layouts related list, click **Edit** next to the Position Layout.
4. Locate the Employment Websites related list and click its wrench () icon.

In the popup window that appears, you'll notice the Available Fields column lists fields from both the Job Posting object and the Employment Website object. If there wasn't a master-detail relationship between job postings and employment websites, the Available Fields column list would only list job posting fields.

5. Move the Employment Website: Employment Website Name and Employment Website: Web Address fields to the Selected Fields column, and use the up and down arrows to arrange the fields in the following order:
 - Employment Website: Employment Website Name
 - Employment Website: Web Address
 - Job Posting: Job Number
6. Click **OK**.
7. Click **Save** on the page layout.

Now do the same for the Positions related list on the Employment Website object as follows:

1. From Setup, click **Create > Objects**.
2. Click **Employment Website**.
3. In the Page Layouts related list, click **Edit** next to the Employment Website Layout.
4. Locate the Positions related list and click its wrench icon () .
5. Move the following fields to the Selected Fields column, and use the up and down arrows to arrange them in the following order:
 - Position: Position Title
 - Job Posting: Job Posting Number
 - Position: Functional Area

- Position: Location
 - Position: Open Date
6. Click **OK**.
 7. Click **Save** on the page layout.

Try It Out: Customize Record Highlights for Employment Websites and Job Postings

Like with our other custom objects, we need to customize the record highlights by creating a new compact layout for each object.

1. From Setup, click **Create > Objects**.
2. Click **Employment Website**.
3. In the Compact Layouts related list, use the **New** button to create a compact layout with the following fields. Enter a name in **Label**, and use the **Up** and **Down** buttons to match the order.
 - Employment Website Name
 - Price Per Post
 - Web Address
 - Maximum Budget
4. Click **Save**, and then assign our new compact layout as the primary compact layout for employment websites.

Now let's do the same thing for job posting.

1. From Setup, click **Create > Objects**.
2. Click **Job Posting**.
3. In the Compact Layouts related list, use the **New** button to create a compact layout with the following fields. Enter a name in **Label**, and use the **Up** and **Down** buttons to match the order.
 - Job Posting Number
 - Employment Website
 - Position
4. Click **Save**.

Remember to quickly assign our new compact layout as the primary compact layout for job postings.

5. Click **Compact Layout Assignment**.
6. Click **Edit Assignment**.
7. From the drop-down list, select the compact layout you just created.
8. Click **Save**.

Look at What We've Done

Our many-to-many relationship is complete! Let's see it in action.

1. Create a few sample position and employment website records.
2. Scroll down to the Employment Websites related list at the bottom of any position record, and click **New Job Posting**. The Job Posting edit page appears.
3. Use the lookup icon to select the employment website where you want to post the position, and click **Save**.
4. Launch Salesforce1 and open your sample position and employment website records.

The Employment Websites related list on that position now shows the name and Web address of the website to which you just posted, as well as the job posting number. Click the name of the employment website in the related list and scroll down to view the Positions related list, which shows all the positions posted to that website.

Now you know how easy it is to make related information just a click away!

Putting it All Together

We just created several objects and a lot of relationships. The following simple diagram shows us what we've accomplished so far.

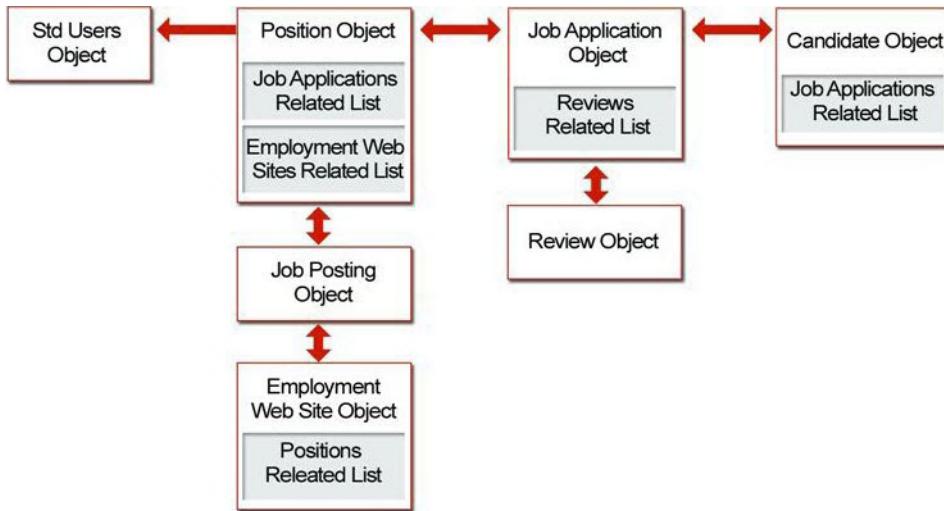


Figure 58: Recruiting App Relationships

All of these relationships, objects, and fields are shown below in an entity relationship diagram. An entity relationship diagram (ERD) is a conceptual representation of structured data, and is especially useful for planning and understanding an app.

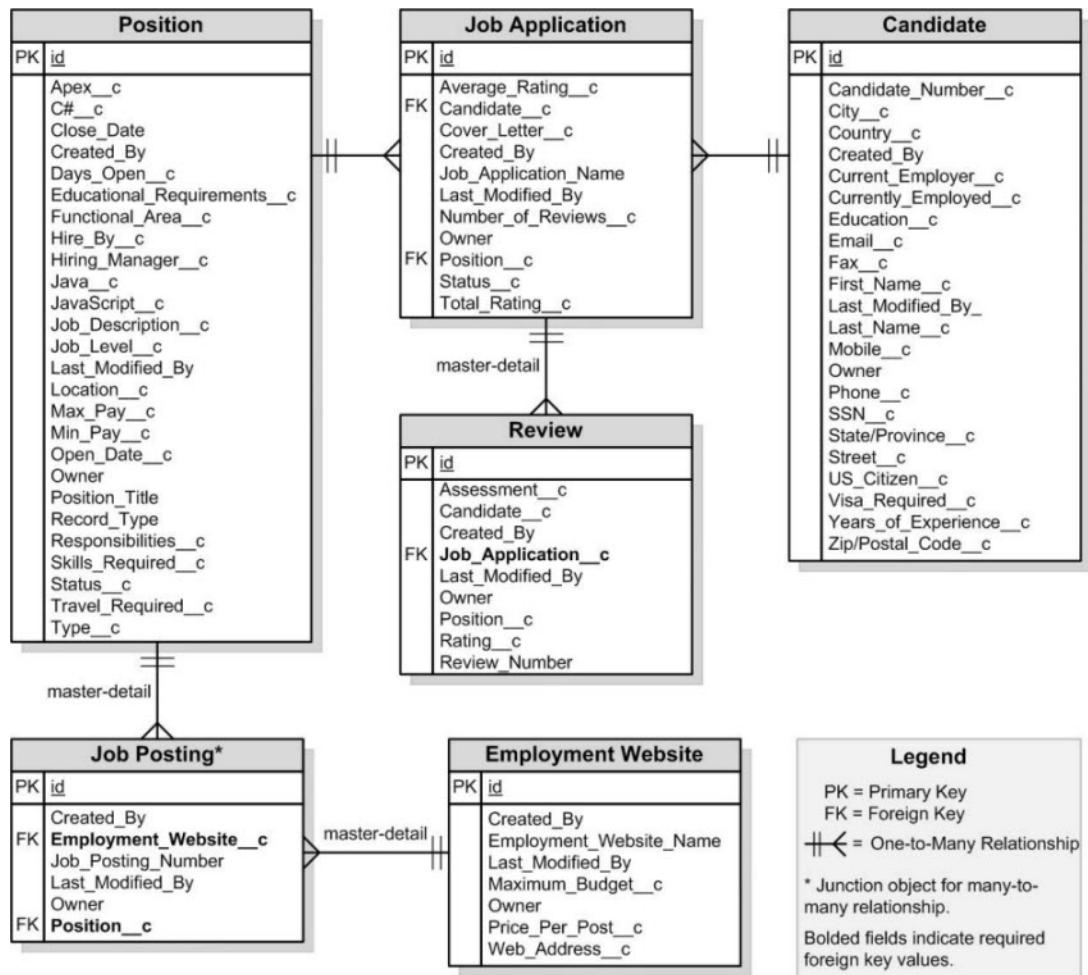


Figure 59: Recruiting App Entity Relationship Diagram

We've now built all of our Recruiting app objects and tabs, and we've defined lots of custom fields—everything from text fields and picklists to more complex formula fields and lookup relationship fields. We've created a robust user interface so that our recruiters and hiring managers can enter and retrieve data about positions and related candidates, job applications, and reviews, and we did all of this without writing a single line of code!

Remember when we assigned Phil Katz as the hiring manager for the Benefits Specialist position? Let's look at what Phil can do now: He can create and update his positions, and track which websites he's posted them on. He can look at details about any candidates who have applied for the Benefits Specialist job, and he can review their related job applications. He can also check the status of the job applications. He no longer has to go to Human Resources to search through Microsoft Word documents and spreadsheets to manage his tasks in the hiring

process. The Recruiting app is well on its way to becoming a fully-functional and useful application!

However, before we leave this chapter behind, let's get ourselves prepared for the rest of this book by creating and importing some real data. It'll help us when we get to our next chapter on security and sharing if we have some records that we can work with.

Try It Out: Download Sample Data

In addition to entering data via our tabbed pages, we can also use the handy Import Wizard to import multiple records at a time. The ability to easily import data into your custom objects is one of the Force.com platform's key benefits. Let's download some sample data so we can add more records to our custom objects without tons of typing.

1. Download the RecruitingApp-7_0.zip file containing the sample CSV (comma-separated values) import files from developer.salesforce.com/page/Force_Platform_Fundamentals.
2. Extract the zip file to any directory on your computer.
3. Go to the directory to which you extracted the zip file. This directory contains three CSV files: Positions.csv, Candidates.csv, and Job_Applications.csv. (The directory also contains other files that you'll use later in [Moving Beyond Point-and-Click App Development](#) on page 333.)

Before we import anything, we need to make a modification to the import file for positions. The sample Positions.csv you downloaded contains fictional users in the Hiring Manager column. The names of these users most likely won't match any user in your organization, and if you import the file "as is," the Import Wizard won't be able to find any matching users, and the Hiring Manager field on each position record will be left blank. So let's go ahead and make that change.

4. Go to the directory to which you extracted the zip file and open Positions.csv in Excel, a text editor, or any other program that can read CSV files.
5. In the Hiring Manager column, replace the fictional users with the first and last name of a user in your organization.
6. Save the file, making sure to maintain the CSV format.

 **Note:** If your locale isn't English (United States), the date and field values in Positions.csv are also invalid. You'll need to change them before you import.

Try It Out: Use the Import Wizard

Now, let's walk through the process of importing position records using the Import Wizard and the `Positions.csv` file you downloaded.

1. From Setup, click **Data Management > Import Custom Objects**.
2. Click **Start the Import Wizard!**. The Import Wizard appears.
3. Select **Position** for the type of record you're importing, and click **Next**.
4. Choose **Yes** to prevent duplicate position records from being created as a result of this import. Accept the other defaults for matching, and click **Next**.
5. Select **None** for the record owner field. We didn't include a **User** field in the CSV file to designate record owners. The Import Wizard assigns you as the owner of all new records.
6. Choose the **Hiring Manager** lookup relationship field so you can link position records with existing **User** records in the Recruiting app, and click **Next**.
7. Select **Name** as the field you want to match against as the Import Wizard compares **Hiring Manager** names in your import file with **User** names in the system, and click **Next**.
8. Click **Browse** and find `C:\recruiting\Positions.csv`. Click **Next**.
9. Use the drop-down lists to specify the Salesforce fields that correspond to the columns in your import file. For your convenience, identically matching labels are automatically selected. Click **Next**.
10. Click **Import Now!**
11. Click **Finish**.

Use the following table to repeat the import process for candidate records. You'll notice the wizard skips the two steps about lookup relationship field matching—because the **Candidate** object doesn't have any lookup relationship fields, the Import Wizard automatically leaves those steps out.

Table 19: Importing the Candidates.csv File

For this wizard step...	Select these options...
Choose Record	Candidate
Prevent Duplicates	No—insert all records in my import file
Specify Relationships	None
File Upload	Browse to <code>C:\recruiting\Candidates.csv</code>
Field Mapping	Accept all defaults

For this wizard step...	Select these options...
Verify Import Settings	Click Import Now!

Finally let's do it one more time for job application records. In this iteration, we're going to make use of the `Email` field, an external ID on the Candidate object, to match up job applications with the correct candidate records.

Table 20: Importing the `Job_Applications.csv` File

For this wizard step...	Select these options...
Choose Record	Job Application
Prevent Duplicates	No—insert all records in my import file
Specify Relationships	Which user field...? None Which lookup fields...? Candidate, Position
Define Lookup Matching	Which field on Candidate...? Email (External ID) Which field on Position...? Position Title
File Upload	Browse to <code>C:\recruiting\Job_Applications.csv</code>
Field Mapping	Email (col 0): Candidate Position Title (col 1): Position
Verify Import Settings	Click Import Now!

Great! While the files are importing, you can from Setup, click **Imports** or **Monitor > Imports** to check on their status.

Once the import operations have completed, return to the Positions, Candidates, or Job Applications tab and click **Go!** next to the View drop-down list. You'll see a list of all the new records you just imported.

We've just added a bunch of data to our app without a lot of work. In the next chapter, we'll take a look at all the ways we can control access to this data using the built-in tools of the platform. We'll get into the nitty-gritty about security, sharing rules, permissions, roles, and profiles.

Chapter 7

Securing and Sharing Data

In this chapter ...

- Controlling Access to Data in Our App
- Data Access Concepts
- Controlling Access to Objects
- Controlling Access to Fields
- Controlling Access to Records
- Displaying Field Values and Page Layouts According to Profiles
- Putting It All Together
- Delegating Data Administration
- Summing Up

In the last chapter, we expanded the Recruiting app to include advanced fields and complex object relationships. The new Candidate object tracks information about prospective employees, recruiters can relate candidates to positions through the new Job Application object, and interviewers can add assessments and ratings of the candidates on the new Review object. That's a pretty robust app! The enhanced data model also lays the groundwork for adding powerful functionality like workflow and approvals and reporting, which we'll cover in later chapters.

Now that we've got all of our object relationships in place, it's time to start thinking about who's actually going to be using the app and how much access they should have to its data. As with many apps, our Recruiting app exposes sensitive information, like social security numbers, salary amounts, and applicant reviews that could really come back to haunt us if the wrong people saw them. We need to provide security without making it harder for our recruiters, hiring managers, and interviewers to do their jobs.

Here we're going to see another one of the huge benefits that the Force.com platform has to offer. You get simple-to-configure security controls that easily allow us to restrict access to data that users shouldn't see, without a lot of headaches. Similar to Access Control Lists or Windows folder permissions, the Force.com platform allows us to specify who can view, create, edit, or delete any record or field in the app. In this chapter, we'll see how

we can use the Force.com platform to implement those rules.

Controlling Access to Data in Our App

As we've already seen, there are three types of users who will need to access the data in our Recruiting app: recruiters, hiring managers, and interviewers. To these three, let's add a fourth type of user—a standard employee who doesn't perform any interviews and who never needs to hire anyone. (This employee will help us determine the default permissions that should apply to all of the new recruiting objects in our app.)

One by one, let's take a look at the kinds of access that each one of these users needs and, more importantly, the kinds of access they *don't* need to do their jobs. Once we've compiled a set of required permissions, we'll figure out how to implement them in the rest of the chapter.

Required Permissions for the Recruiter

For our first set of required permissions, let's take a look at Mario Ruiz, a recruiter at Universal Containers. To do his job, Mario needs to be able to create, view, and modify any position, candidate, job application, or review that's in the system, and have full control over job postings on employment websites. Likewise, Mario needs to view and modify the recruiting records that all of the other recruiters own, since all of the recruiters at Universal Containers work together to fill every position, regardless of who created it.

Although Mario has the most powerful role in our Recruiting app, we still can't give him complete free reign. While it's OK for job posting and employment website data to be permanently deleted at any time, state and federal public records laws require that all other recruitment-related records be saved for a number of years so that if a *hiring* decision is questioned, it can be defended in court. Consequently, we need to make sure that Mario will never accidentally delete a record that needs to be saved to fulfill the law.

But how will he keep the number of positions, candidates, job applications, and reviews in check if he can't delete them? Won't the app become swamped with old data? Not if we're smart about it—instead of having Mario delete old records, we can use the `Status` field on a record as an indication of whether it's current. We'll filter out all of the old records by using a simple list view.

Here's a summary of the required permissions that we need to implement for a recruiter:

Table 21: Summary of Required Permissions: Recruiter

	Read	Create	Edit	Delete
Position	✓	✓	✓	
Candidate	✓	✓	✓	
Job Application	✓	✓	✓	
Review	✓	✓	✓	
Job Posting	✓	✓	✓	✓
Employment	✓	✓	✓	
Website				✓

Required Permissions for the Hiring Manager

Our next set of required permissions is more challenging. Ben Stuart, our hiring manager, needs to be able to access the recruiting records related to his open positions, but he shouldn't be mucking around with other recruiting records (unless they're owned by other hiring managers who report to him). Also, there are certain sensitive fields that he has no need to see, like the social security number field. Let's go object by object to really drill down on what Ben does and doesn't need to access in order to perform his job.

Position

First of all, Ben likes to post his own positions so that he can publicize them as fast as possible, but in our app, Mario the recruiter ultimately needs to take ownership of the record to make sure the position gets filled. As a result, Ben needs the ability to create positions, but then we'll need to find a mechanism to make sure that they ultimately get transferred to Mario for ownership. (Hint: as you'll see in [Using Custom Workflow and Approval Processes](#) on page 241, we'll tackle that problem with a workflow rule that transfers position ownership to a recruiter when a new position is created by a hiring manager. For now just assume that this already works.)

Ben should also be able to update and view all fields for positions for which he's the hiring manager, but he should only be able to view other managers' positions.

Candidate

Ben sometimes wants to poach a prime candidate who's applying for a position under another manager, but this is a practice that Universal Containers frowns upon. As a result, Ben should only be able to view those candidates who have applied for a position

on which he's the hiring manager. Also, since Ben has no reason to see a candidate's social security number, this field should be restricted from his view.

Job Application

As the hiring manager, Ben needs to be able to update the status of those job applications to specify which candidates should be selected or rejected. However, he should not be able to change the candidate listed on the job application, nor the position to which the candidate is applying, so we'll have to find a way of preventing Ben from updating the lookup fields on job applications.

Review

To make a decision about the candidates who are applying, Ben needs to see the reviews posted by the interviewers, as well as make comments on them if he thinks the interviewer was being too biased in his or her review. Likewise, Ben needs to be able to create reviews so that he can remember his own impressions of the candidates he interviews.

Job Posting

Ben wants to make sure his harder-to-fill positions are visible to the most talented people in the field. The most efficient way to do this is by posting open positions on various employment websites. Given that employment websites have different types of users with varying skill sets, we should give Ben the power to unilaterally create job postings on employment websites, since Ben is the best person to ascertain which skill sets are necessary for his open positions.

Employment Website

If Ben had his way, he would usurp all of the company's budget for posting his open positions on employment websites; therefore, Ben shouldn't be allowed to modify employment website records, as that would let him redefine the company's budget for posting jobs and could lead to an accounting fiasco. Still, we need to make sure that Ben can view employment website records to get an idea of the employment websites with which Universal Containers has accounts, and how much of the budget for that employment website is available.

Here's a summary of the required permissions we need to implement for a hiring manager:

Table 22: Summary of Required Permissions: Hiring Manager

	Read	Create	Edit	Delete
Position	✓	✓	✓*	
Candidate	✓* (No SSN)			

	Read	Create	Edit	Delete
Job Application	✓		✓ (No lookup fields)	
Review	✓	✓	✓	
Job Posting	✓*	✓*	✓*	
Employment Website	✓			

* Only for those records that are associated with a position to which the hiring manager has been assigned

Required Permissions for the Interviewer

For our third set of required permissions, let's take a look at Melissa Lee's role as an interviewer. Ben, her manager, likes Melissa to interview candidates for highly technical positions, but doesn't want her speaking with folks who are applying for roles on the user interface team. As a result, Melissa should be able to view only the candidates and job applications to which she's assigned as an interviewer. No such restriction needs to exist on the positions that are out there, but she shouldn't be able to view the minimum and maximum salary values for any of them. Likewise, she shouldn't see the social security number of any candidate, since it's sensitive information that has nothing to do with her job.

Melissa must be able to create and edit her reviews so that she can record her comments about each candidate, but she shouldn't be able to see the reviews of other interviewers—reading them might sway her opinion one way or the other. As with hiring managers and recruiters, Melissa also shouldn't be allowed to delete any records to ensure that public records laws are fulfilled.

Finally, the posting of jobs to employment websites has no bearing on Melissa's responsibilities, so both the employment website and job posting records should be completely off-limits to her.

Here's a summary of the required permissions we need to implement for an interviewer:

Table 23: Summary of Required Permissions: Interviewer

	Read	Create	Edit	Delete
Position	<input checked="" type="checkbox"/> (No min/max pay)			
Candidate	<input checked="" type="checkbox"/> * (No SSN)			
Job Application	<input checked="" type="checkbox"/> *			
Review	<input checked="" type="checkbox"/> **	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> **	
Job Posting				
Employment Website				

* Only for those records that are associated with a position to which the interviewer has been assigned

** Only for those records that the interviewer owns

Required Permissions for the Standard Employee

Employees, such as Manny Damon on the Western Sales Team, are often the best resources for recruiting new hires, even if they are not active hiring managers or interviewers. For this reason, we need to make sure that employees like Manny can view open positions, but that they can't see the values for the positions' minimum and maximum salary fields—otherwise they might tip off friends to negotiate for a position's maximum salary value! Manny also shouldn't be able to view any other records in our Recruiting app.

Here's a summary of the required permissions we need to implement for a standard employee:

Table 24: Summary of Required Permissions: Standard Employee

	Read	Create	Edit	Delete
Position	<input checked="" type="checkbox"/> (No min/max pay)			
Candidate				
Job Application				

	Read	Create	Edit	Delete
Review				
Job Posting				
Employment Website				

So Where Are We Now?

Now that we've gone through the required permissions for each of our four users, let's organize our thoughts by summarizing them in the following table. In the rest of this chapter, we'll figure out how we can use the platform to implement these rules in our Recruiting app.

Table 25: Summary of Required Permissions

	Recruiter	Hiring Manager	Interviewer	Standard Employee
Position	Read Create Edit	Read Create Edit*	Read (No min/max pay)	Read (No min/max pay)
Candidate	Read Create Edit	Read* (No SSN)	Read * (No SSN)	
Job Application	Read Create Edit	Read Edit (No lookup fields)	Read *	
Review	Read Create Edit	Read Create Edit	Read ** Create Edit **	
Job Posting	Read Create Edit Delete	Read *Create *Edit *		
Employment Website	Read Create Edit	Read Delete		

* Only for those records that are associated with a position to which the hiring manager/interviewer has been assigned

** Only for those records that the interviewer owns



Tip: When implementing the security and sharing rules for your own organization, it's often useful to create a required permissions table like this to organize your thoughts

and make sure you don't forget to restrict or grant access to a particular user. You'll see that we're going to refer back to this table again and again as we go through this chapter.

Data Access Concepts

Before we get started implementing our security and sharing rules, let's quickly take a look at all the ways that we can control data on the platform:

Object-Level Security

The bluntest way that we can control data is by preventing a user from seeing, creating, editing, or deleting any instance of a particular type of object, like a position or review. Object-level access allows us to hide whole tabs and objects from particular users, so they don't even know that type of data exists.

On the platform, we set object-level access with object permissions in user profiles and permission sets. We'll learn more about them in a little bit.

Field-Level Security

A variation on object-level access is field-level access, in which a user can be prevented from seeing, editing, or deleting the value for a particular field on an object. Field-level access allows us to hide sensitive information like the maximum salary for a position or a candidate's social security number without having to hide the whole object.

On the platform, we set field-level access with field permissions, also in profiles and permission sets. We'll also learn more about them shortly.

Record-Level Security

To control data with a little more finesse, we can allow particular users to view an object, but then restrict the individual object records that they're allowed to see. For example, record-level access allows an interviewer like Melissa Lee to see and edit her own reviews, without exposing the reviews of everyone else on her team.

On the platform, we actually have several ways of setting record-level access rules:

- *Organization-wide defaults* allow us to specify the baseline level of access that a user has in your organization. For example, we can make it so that any user can see any record of a particular object to which their object permissions give them access, but so that they'll need extra permissions to actually edit one.
- *Role hierarchies* allow us to make sure that a manager will always have access to the same records as his or her subordinates.
- *Sharing rules* allow us to make automatic exceptions to organization-wide defaults for particular groups of users.

- *Manual sharing* allows record owners to give read and edit permissions to folks who might not have access to the record any other way.

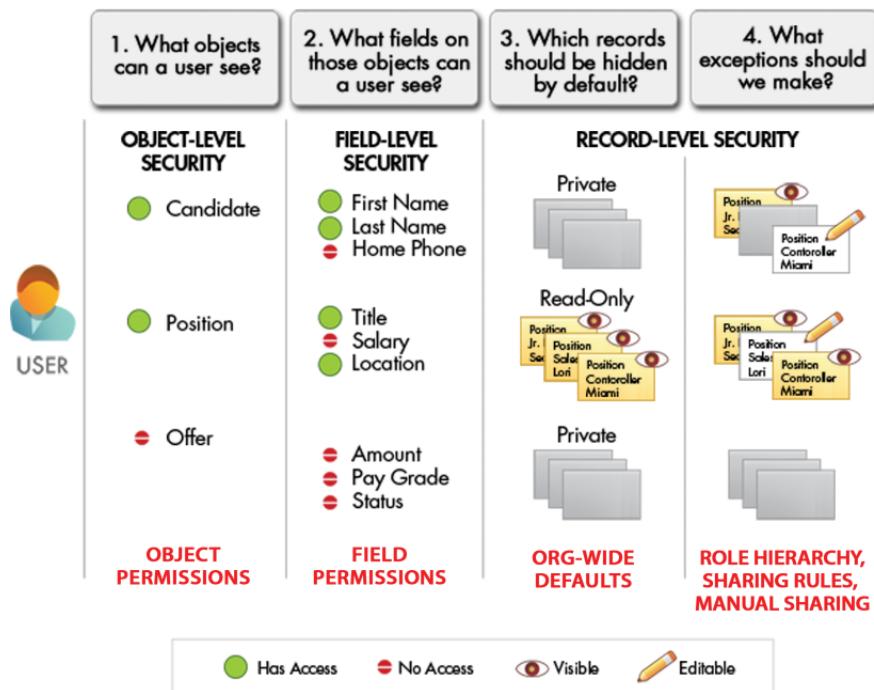


Figure 60: Controlling Data with the Force.com Platform

The combination of all of these sharing and security settings in the platform means that we can easily specify user permissions for an organization of thousands of users without having to manually configure the permissions for each individual. Pretty neat! Now let's get started learning more about each of these methods for controlling data, and actually implementing the security and sharing rules for our app.

Controlling Access to Objects

First let's configure access to our Recruiting app custom objects. As we mentioned previously, we can control whether a user knows that a particular object exists in the app by setting permissions in his or her profile and permission sets. But exactly what are profiles and permission sets, and what do they control?

Introducing Profiles

A *profile* is a collection of settings and permissions that determine what a user can do in the platform, kind of like a group in a Windows network, where all of the members of the group have the same folder permissions and access to the same software. Profiles control:

- **Object permissions**—The objects the user can view, create, edit, and delete
- **Field permissions (also known as “field-level security”)**—The object fields the user can view and edit
- **User permissions**—The specific functions that users can perform, like viewing the Setup menu and customizing applications
- **Tab settings**—The tabs the user can view in the app
- **App settings**—The standard and custom apps the user can access
- **Apex class access**—The Apex classes a user can execute
- **Visualforce page access**—The Visualforce pages a user can execute
- **Page layouts**—The page layouts a user sees
- **Record types**—The record types available to the user
- **Login hours**—The hours during which the user can log in to the app
- **Login IP ranges**—The IP addresses from which the user can log in to the app

Profiles are typically defined by a user's job function (for example, system administrator or sales representative), but you can have profiles for anything that makes sense for your organization. A profile can be assigned to many users, but a user can be assigned to only one profile at a time.

Standard Profiles

The platform provides the following set of standard profiles in every organization:

- Read Only
- Standard User
- Marketing User
- Contract Manager
- Solution Manager
- System Administrator

Each of these standard profiles includes a default set of permissions for all of the standard objects available on the platform.

When a custom object is created, most profiles (except those with “Modify All Data”) don’t give access to the object. You can find more detailed descriptions of all the standard profiles in the Salesforce Help, but the important thing to know is that you can never edit the object permissions on a standard profile. If you have access to the Enterprise, Unlimited, Performance, or Developer Editions of the platform, it’s a good idea to make copies of the standard profiles and then customize the copies to fit the needs of your organization. You can also use permission sets to grant additional permissions.

For our Recruiting app, we’ll make a copy of the standard profile and customize it (and as a result, Enterprise, Unlimited, Performance, and Developer Editions will be the only editions that the Recruiting app will support). We’ll also use permission sets to grant additional permissions to a smaller set of users.

Introducing Permission Sets

Like a profile, a *permission set* is a collection of settings and permissions that determine what a user can do. Permission sets include some of the same permissions and settings you’ll find in profiles.

- Object permissions
- Field permissions (also known as “field-level security”)
- User permissions
- Tab settings
- App settings
- Apex class access
- Visualforce page access

So why profiles *and* permission sets?

The most significant difference between the two is that users can have only one profile, but they can have many permission sets. This means you can use profiles to grant the minimum permissions and settings that every type of user needs, then use permission sets to grant additional permissions, without changing anyone’s profiles.

There are a couple of ways to use permission sets to your advantage.

- **To grant access to custom objects or entire apps.**

Let’s say you have many users in your organization with the same fundamental job functions. You can assign them all one profile that grants them all the access they need to do their job. But suppose a few of those users are working on a special project and they need access to an app that no one else uses. And suppose a few other users need access to that app, as

well as *another* app that the first group doesn't need. If we only had profiles, you'd have to create more profiles that were customized to those few users' needs, or take your chances and add more access to the original profile, making the apps available to users that don't need it. Neither of these options is ideal, especially if your organization is growing and your users' needs change regularly. Permission sets make it easy to grant access to the various apps and custom objects in your organization, and to take away access when it's no longer needed.

- **To grant permissions—temporarily or long term—to specific fields.**

For example, let's say you have a user, Dana, who needs temporary edit access to a field while her co-worker is on vacation. You can create a permission set that grants access to the field and assign the permission set to Dana. When Dana's co-worker returns from vacation and Dana no longer needs access to the field, you just remove the permission set assignment from Dana's user record.

Profiles and Permission Sets in Our Recruiting App

We've talked about four types of users: recruiters, hiring managers, standard employees, and interviewers. Let's take a closer look.

Recruiters are pretty straightforward—they definitely represent a particular job function, and they need access to different types of data than other users. They need their own profile.

A hiring manager, however, is not exactly a single type of position. For most organizations, a hiring manager in the Sales department will almost certainly need access to a different type of data than a hiring manager in Engineering. However, for our app, sales managers and software managers still need the same types of access to recruiting data—reviews, candidates, positions, job applications, job postings, and employment websites. If we incorporated our app into an organization with other CRM functionality, the hiring manager permissions for recruiting-related data might need to be shared by several types of users who may have different profiles. In this case, we'll make a hiring manager permission set that can be assigned to various types of users.

Standard employees are pretty generic, and they don't reflect a particular job function. Standard employees can start with a profile that gives access to a small set of data, and then depending on what their specialties are, we can create and assign permission sets to give them more access as needed.

Finally, let's look at interviewers. When you think about it, just about anyone in an organization might be called upon to perform an interview. Furthermore, a company may have a peak recruiting season, when many employees will be interviewers for a limited amount of time. Ideally, permissions for interviewers could be easily granted and revoked as needed. It's easy to define permission sets based on a particular task—and even easier to assign and unassign them, so let's define a permission set for interviewers.

Try It Out: Create the Recruiter Profile

All right—we're finally ready to dig into the app and create our first profile! Let's start with the Recruiter profile.

1. From Setup, click **Manage Users > Profiles**.

Action	Profile Name	User License	Custom
Edit	Authenticated Website	Authenticated Website	<input type="checkbox"/>
Edit	Chatter Moderator	Chatter	<input type="checkbox"/>
Edit	Chatter User	Chatter	<input type="checkbox"/>

Figure 61: Standard Profiles

Here you should see the list of standard profiles that we talked about earlier. After we create our custom profiles, they'll also show up in this list.

First, we can quickly tell which profiles we can play with by looking at the **Custom** column—if it's checked, that means it's a custom profile and we can edit anything about it. If that column is not checked, we can still click the **Edit** link; we just can't modify any of the permission settings. (What does that leave for us to edit on a standard profile? Well, we can choose which tabs should appear at the top of a user's page, and we can also select the apps that are available in the Force.com app menu in the top-right corner of the page.)

2. Create a new profile named Recruiter based on the Standard User profile.

There are actually two ways of doing this—we can either click **New Profile**, select an existing profile to clone, name it, and click **Save**, or we can simply click **Clone** in the detail page of the profile that we want to copy, name it, and click **Save**. Ultimately, it's the same number of clicks, so choose the method you like best. Standard User is the profile that most closely resembles what we want our new Recruiter profile to look like, so it's a good starting point.

3. In the new Recruiter profile's detail page, click **Edit**.

The Recruiter edit page should look and function exactly like the Standard User profile edit page except with one important difference: you have the ability to modify any of the permission settings.

4. In the Custom App Settings area, make the Recruiting app visible to users assigned to the Recruiter profile, as shown in the following screenshot.



Figure 62: Profile Custom App Settings Area



Tip: You can also give this profile access to any of the other available apps as well. Every profile needs to have at least one visible app.

When an app is visible, a user can select it from the Force.com app menu at the top-right corner of the page. Be aware, however, that even if an app is visible, the app's tabs won't show up unless a profile has permissions to view the tabs and permission to view the associated object. (We'll set both of those permissions lower down in the Profile edit page.)

5. Select **Default** next to the Recruiting app.

Making this selection means that the Recruiting app will be displayed when a user logs in. You'll notice that when you select an app as the default, its **Visible** checkbox is automatically selected, because it doesn't make sense for an app to be the default if it's not visible to the user.

6. In the Tab Settings area, select **Default On** for the Candidates, Employment Websites, Job Applications, and Positions tabs.



Tip: You can choose whether you want other tabs to be displayed based on the additional apps that you made visible in the last step.

For the purposes of our Recruiting app, all of our custom recruiting tabs are on by default. For any other tabs that you select, you can choose which should be displayed on top of the user's page (**Default On**), hidden from the user's page but available when he or she clicks the All Tabs tab on the far right (**Default Off**), or completely hidden from the user (**Tab Hidden**).

Realize that even if you completely hide a tab, users can still see the records that would have appeared in that tab in search results and in related lists. (To prevent a user from accessing

data, we have to set the proper restrictions in the Standard and Custom Object Permissions areas lower down in the Profile edit page—we'll get there shortly!)

The Overwrite users' personal tab customizations setting appears if you have an organization that's currently in use and you want to make sure your existing users are viewing the tabs that you've selected. You don't need to select this for our app because we're defining a brand-new profile and no one has personalized his or her tab visibility settings yet. However, if you do want to select this option at some point in the future, just make sure you're not going to annoy your users by deleting all of their customizations!

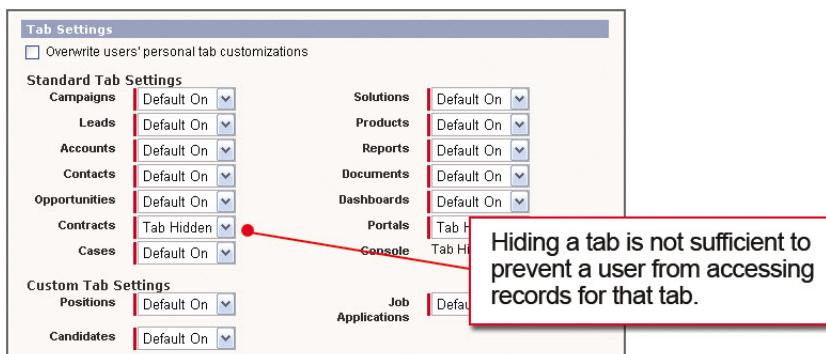


Figure 63: Profile Tab Settings Area

Just below the Tab Settings area, the Administrative and General User Permissions areas of the profile allow you to grant special access to features and functionality that don't map directly to particular objects. None of these permissions affects our Recruiting app, but you can learn more about them in the Salesforce Help.

It's time to move on to the object-level permissions.

- In the Custom Object Permissions area, specify the object-level permissions for our Recruiter profile according to the following table.

Table 26: Summary of Required Permissions: Recruiter

	Read	Create	Edit	Delete	View All	Modify All
Candidate	✓	✓	✓			
Employment	✓	✓	✓	✓	✓	✓
Website						
Job Application	✓	✓	✓			

	Read	Create	Edit	Delete	View All	Modify All
Job Posting	<input checked="" type="checkbox"/>					
Position	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	
Review	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			



Tip: Depending on the apps that you made visible previously, you can also set additional object permissions on standard or other custom objects.

Since there are no instances when a recruiter should be allowed to delete positions, candidates, job applications, and reviews, we should make sure that the object-level permissions for deletion are turned off for these objects. Also, make sure the “View All” permission is only selected for Employment Websites, Positions, and Job Postings, and the “Modify All” permission is only selected for Job Postings and Employment Websites. These are special kinds of object permissions that we'll discuss later in this chapter.

By restricting the power to delete recruiting-related objects here, recruiters will *never* be able to delete these objects. However, the fact that we're granting recruiters permission to create, read, or edit our recruiting objects does not necessarily mean that recruiters will be allowed to read or edit *every* recruiting object record. Why?

Here we see the result of two really important concepts in the platform:

- The permissions on a record are always evaluated according to a combination of object-, field-, and record-level permissions.
- When object- versus record-level permissions conflict, the most restrictive settings win.

What this means is that even though we are granting this profile create, read, and edit permissions on the recruiting objects, if the record-level permissions for an individual recruiting record prove to be more restrictive, those will be the rules that will define what a recruiter can access.

For example, our new profile gives a recruiter permission to create, edit, and view reviews. However, if we set organization-wide defaults for reviews to Private (a record-level permission), our recruiter will be allowed to edit and view only his own reviews, and not the reviews owned by other users. We'll learn more about record-level permissions later and go through more examples of how they work with the object-level ones, but for now, just understand that object-level permissions are only one piece of the puzzle.

8. Click **Save** to create your profile and return to the profile detail page.

Congratulations! We're done with our first profile. As you can see, it really wasn't that hard, because we'd already analyzed our required permissions and knew what objects recruiters will need access to. In the next section, let's quickly finish up our other two profiles and then move on to field-level security.

Beyond the Basics

Did you know that you can use an improved user interface to manage profiles?

Say you manage a lot of profiles and you'd like a more streamlined experience. With the enhanced profile user interface, you can easily navigate, search, and modify profile settings.

To find out more, see “Enhanced Profile User Interface Overview” in the Salesforce Help.

Try It Out: Create the Standard Employee Profile

Now that we've created our Recruiter profile, let's finish up with a profile for standard employees. As we mentioned earlier, in your own company, you may want to create additional profiles with basic access settings for the various core job functions, but for our purposes, these will work just fine for now.

To refresh our memories, let's take a look at our required permissions summary table:

Table 27: Summary of Required Permissions: Standard Employee

	Positions	Candidates	Job Applications	Reviews	Job Postings	Employment Websites
Standard Employee	• Read (No min/max pay)	-	-	-	-	-

Standard employees don't need much access, but we do want them to be able to view all the open positions so they can help recruit new employees. Creating this profile will be easy. Go ahead and follow the steps that we outlined in the previous section and specify the following.

- Name the profile **Standard Employee**, and base it on the Standard User profile.
- Enable the “Read” permission on the Positions object.

Fantastic! We've just finished defining profiles for all the users in our Recruiting app. Next we'll create permission sets to grant additional permissions to the people that need them.

Try It Out: Create the Hiring Manager Permission Set

We've created two profiles for our easy-to-define job functions. Now we need to grant additional access for functions that may not be specific to any given job title.

1. From Setup, click **Manage Users > Permission Sets**.
2. On the Permission Sets page, click **New**.
3. In the **Label** field, enter **Hiring Manager**.
4. The **API Name** field is defaulted to **Hiring_Manager**. Let's leave it as is.

When you assign permission sets to a user, you can only assign permission sets that have the same user license as the user or permission sets with no associated license. You can't change the license later, so it's important to choose the correct user license when you create a permission set.

5. In the **User License** field, select **Salesforce**.
6. Click **Save**.

The screenshot shows the 'Permission Set Overview' page for a permission set named 'Hiring Manager'. At the top, there's a search bar labeled 'Find Settings...', and buttons for 'Clone', 'Delete', and 'Edit Properties'. Below the header, the 'Assigned Users' tab is selected. A table displays basic information: Description (''), User License ('Salesforce'), API Name ('Hiring_Manager'), Namespace Prefix (''), Created By ('Jane Smith, 7/3/2012 5:12 PM'), and Last Modified By ('Jane Smith, 7/5/2012 12:52 PM'). The main content area is divided into sections: 'Apps' and 'System'. The 'Apps' section contains a table with five rows: 'Assigned Apps' (Settings for app visibility), 'Object Settings' (Permissions for object access), 'App Permissions' (Permissions for app-specific actions), 'Apex Class Access' (Permissions for executing Apex classes), and 'Visualforce Page Access' (Permissions for executing Visualforce pages). The 'System' section contains a table with two rows: 'Available Apps' (Settings for system-wide actions) and 'System Permissions' (Permissions for actions like 'Modify All Data').

Figure 64: Permission Set Overview Page

We've taken the initial step of creating a permission set. While you can clone permission sets, you can also create one completely from scratch, and that's what we did when we created this one. At the moment, this permission set has no enabled settings or permissions—it's a blank slate. So let's enable some permissions and settings. Since this permission set is for hiring managers, we'll start by making the Recruiting app visible.

7. Click **Assigned Apps**.
8. In the Assigned Apps page, click **Edit**.
9. Under Available Apps, select Recruiting and click **Add** to add it to the Enabled Apps list.

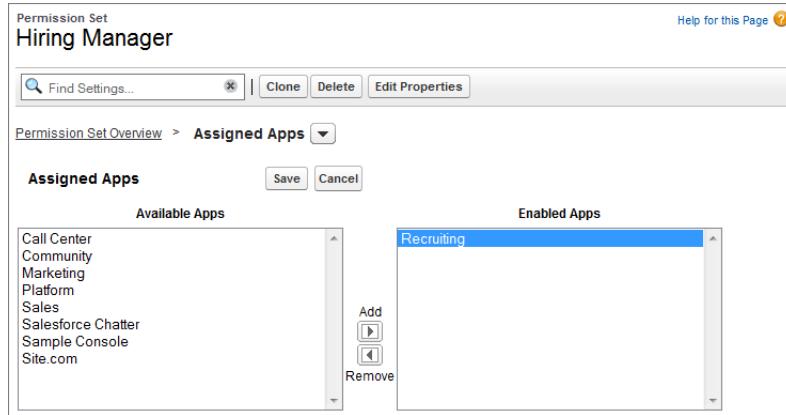


Figure 65: Assigning the Recruiting App in the Hiring Manager Permission Set

10. Click Save.

Next we want to enable tab settings and permissions for our custom objects. Where are those enabled and how do we get there? In permission sets, you have a few easy ways to move from one page to another. Let's take a look.

11. Next to Assigned Apps, click the down arrow to open the navigation menu, and select Object Settings.

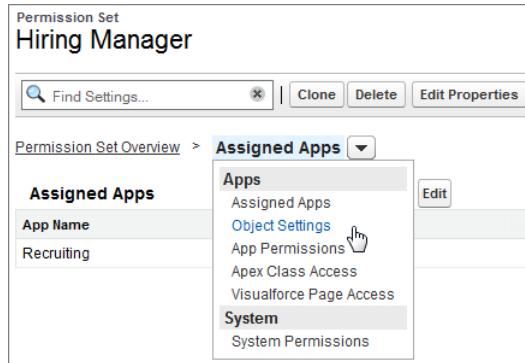


Figure 66: Permission Set Navigation Menu

The Object Settings page shows an overview for all objects and tabs in your organization. It includes a summary of tab settings, object permissions, and field permissions for every object and tab. Let's drill down to the Positions object.

- 12. In the list of objects, click **Positions**.**
- 13. On the Positions page, click **Edit**.**

You may notice that tab settings labels in permission sets are different from the labels in profiles. They are configured a bit differently, but you'll get the same results.

Table 28: Comparing Tab Settings in Permission Sets and Profiles

Enabled Settings in Permission Sets	Enabled Setting in Profiles	Description
Available	Default Off	The tab is available on the All Tabs page. Individual users can customize their display to make the tab visible in any app.
Available and Visible	Default On	The tab is available on the All Tabs page and appears in the visible tabs for its associated app. Individual users can customize their display to hide the tab or make it visible in other apps.
None	Tab Hidden	The tab isn't available on the All Tabs page or visible in any apps.

14. Under Tab Settings, select **Available** and **Visible**.
15. Under Object Permissions, enable **Read**, **Create**, and **Edit**.

Now we'll grant access to the fields in position records. We'll learn lots more about field permissions in [Introducing Field-Level Security](#) on page 174, but for now, we'll enable the field permissions we need.

16. Under Field Permissions, enable the **Edit** checkboxes for all the fields.



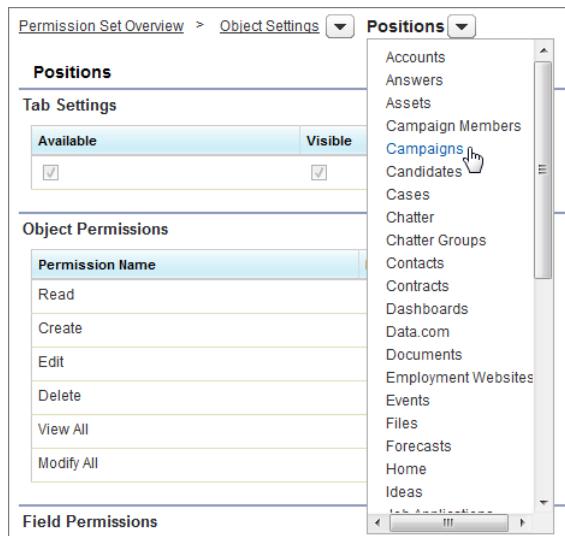
Tip: When you enable **Edit** for a field, **Read** is automatically enabled as well.

You'll probably notice that you can't change the settings for some of the fields. These fields have preset access because they are required or their data is automatically calculated. For example, because Days Open is a formula field, it's never editable, but you should make it readable.

17. Enable **Read** for Days Open.

18. Click Save.

Now we need to specify access for our remaining objects. As we saw previously, you can use the navigation menu to quickly jump from one page to another. On the Positions page, notice that there are now two down arrows: one next to Object Settings, and another one next to Positions. Whenever you're in a specific object page, this second navigation menu is available. Click the second down arrow and you'll see all of the objects and tabs in your organization.

**Figure 67: Object Navigation Menu**

But that's not the only way to jump around in a permission set. Another option is the **Find Settings...** box, which is available on every page in a permission set. Here you can enter three or more consecutive letters of an object, setting, or permission name, then select the item you want from the list that appears. Let's try it.

19. Click in the **Find Settings... box and type job.**

There are two objects with the string “job” and they both appear in the list.

20. Select Job Applications.**Figure 68: Using the Find Settings Box**

Now that we know how to move around easily in a permission set, go ahead and add the rest of the permissions and settings, according to this table.

Table 29: Tab Settings and Object Permissions for Hiring Managers

Object Name	Tab Settings	Object Permissions	Field Permissions
Job Applications	<ul style="list-style-type: none"> • Available • Visible 	<ul style="list-style-type: none"> • Read • Edit 	<ul style="list-style-type: none"> • Read on all • Edit on Cover Letter and Status
Candidates	<ul style="list-style-type: none"> • Available • Visible 	• Read	<ul style="list-style-type: none"> • No access on SSN • Read on all others
Reviews	-	<ul style="list-style-type: none"> • Read • Create • Edit 	<ul style="list-style-type: none"> • Read on Candidate and Position • Read and Edit on Assessment
Job Postings	-	<ul style="list-style-type: none"> • Read • Create • Edit 	-
Employment Websites	-	• Read	-

Great! We've created our first permission set and added the settings we need for hiring managers. Now we'll create another permission set for a different job function, interviewing candidates.

Try It Out: Create the Interviewer Permission Set

Now we're ready to create the Interviewer permission set.

Using the steps that we discussed in the last section, create a permission set with the following settings:

- Name this permission set **Interviewer** and assign the Salesforce user license.
- Under Assigned Apps, make the Recruiting app visible.
- Enable the following tab settings and object permissions:

Table 30: Tab Settings and Object Permissions for Interviewers

Object Name	Tab Settings	Object Permissions	Field Permissions
Positions	◊ Available ◊ Visible	◊ Read	◊ No access on Min Pay and Max Pay ◊ Read on all others
Candidates	◊ Available ◊ Visible	◊ Read	◊ No access on SSN ◊ Read on all others
Job Applications	◊ Available ◊ Visible	◊ Read	◊ Read on all
Reviews	-	◊ Read ◊ Create ◊ Edit	◊ Read on Candidate and Position ◊ Read and Edit on Assessment

Let's review the required permissions for hiring managers, interviewers, and standard employees.

Table 31: Summary of Required Permissions: Hiring Manager, Interviewer, and Standard Employee

	Positions	Candidates	Job Applications	Reviews	Job Postings	Employment Websites
Hiring Manager	• Read • Create • Edit*	• Read* (No SSN)	• Read • Edit (No lookup fields)	• Read • Create • Edit	• Read* • Create* • Edit*	• Read
Interviewer	• Read (No min/max pay)	• Read* (No SSN)	• Read*	• Read** • Create • Edit**	-	-

	Positions	Candidates	Job Applications	Reviews	Job Postings	Employment Websites
Standard Employee	• Read (No min/max pay)	-	-	-	-	-

* Only for those records that are associated with a position to which the hiring manager/interviewer has been assigned

** Only for those records that the interviewer owns

Great, but what about those asterisks? Do we need to take those into account when we set our object permissions?

Not at all. Those asterisks represent record-level security settings that we're going to specify shortly. The only things we need to care about here are the permissions that these users will need to have access to at least *some* of the time—that's the whole point of object permissions.

However, we do need to make sure that sensitive data on these objects is protected from users who don't need access, and then we need to drill down on the actual records that each user should be allowed to view and edit.

Controlling Access to Fields

Now that we've restricted access to objects as a whole, it's time to use a finer-toothed comb to manage the security of individual object fields. These are the settings that allow us to protect sensitive fields such as a candidate's social security number without having to hide the fact that the candidate object even exists.

Introducing Field-Level Security

In the platform, we control access to individual fields with *field-level security*. Field-level security controls whether a user can see, edit, and delete the value for a particular field on an object.

Unlike page layouts, which only control the visibility of fields on detail and edit pages, field-level security controls the visibility of fields in any part of the app, including related lists, list views, reports, and search results. Indeed, in order to be absolutely sure that a user can't access a particular field, it's important to use the field-level security page for a given object to restrict

access to the field. There are simply no other shortcuts that will provide the same level of protection for a particular field.

Field-Level Security in Our Recruiting App

Just to refresh our memories about what field-level security settings we need for our Recruiting app, let's take another look at our required permissions in the following table. We'll keep them organized by recruiter, hiring manager, and standard employee, because it turns out that (surprise!) field-level security settings are closely related to profiles and permission sets:

Table 32: Revised Summary of Required Permissions

	Recruiter	Hiring Manager	Standard Employee
Position	Read Create Edit	Read Create Edit*	Read (No min/max pay)
Candidate	Read Create Edit	Read* (No SSN)	Read* (No SSN)
Job Application	Read Create Edit	Read Edit (No lookup fields)	Read*
Review	Read Create Edit	Read Create Edit	Read** Create Edit**
Job Posting	Read Create Edit Delete	Read*Create*Edit*	
Employment Website	Read Create Edit Delete	Read	

* Only for those records that are associated with a position to which the hiring manager/interviewer has been assigned

** Only for those records that the interviewer owns

For field-level security settings, we'll first zero in on those rules that include field restrictions in parentheses, specifically:

- On the Position object, hide minimum and maximum pay from standard employees and interviewers
- On the Candidate object, hide social security numbers from hiring managers and interviewers
- On the Job Application object, make the Position and Candidate lookup fields read-only for hiring managers

So let's get down to it!

Try It Out: Limit Access to Fields in the Standard Employee Profile

Let's review our field-level security rules.

- *On Positions, hide minimum and maximum pay from standard employees and interviewers*
- *On Candidates, hide social security numbers from interviewers and hiring managers*
- *On Job Applications, make Candidate and Position lookup fields read only for hiring managers.*

To define these rules, we'll access field-level security settings in the Standard Employee profile.

You may be wondering: the last two rules are about interviewers and hiring managers, but those functions are defined by permission sets. Why are we concerned with them right now?

Permissions are additive: you can never remove a user's existing permissions by assigning a permission set; you can only add permissions. If we want to limit access, we need to make sure that the base profile for our users—as well as any of their permission sets—limits this type of access. In the case of our organization, we know we're going to assign the Interviewer and Hiring Manager permission sets to users with the Standard Employee profile, so we need to restrict field permissions in this profile as well as in the permission sets.

So let's set up field-level security in the Standard Employee profile, and later we'll check the field-level security for our permissions sets.

1. From Setup, click **Manage Users > Profiles**, and select the Standard Employee profile.

The screenshot shows the 'Profile' section for the 'Standard Employee' profile. At the top right is a 'Help for this Page' link. Below it, a message states: 'Users with this profile have the permissions and page layouts listed below. Administrators can change a user's profile by editing that user's personal information.' A note below says: 'If your organization uses Record Types, use the Edit links in the Record Type Settings section below to make one or more record types available to users with this profile.' Below this are three links: 'Login IP Ranges [0]', 'Enabled Apex Class Access [0]', and 'Enabled Visualforce Page Access [0]'. A 'Profile Detail' section follows, containing fields for Name (Standard Employee), User License (Salesforce), Description (Custom Profile checked), Created By (Jane Smith, 7/30/2010 10:49 AM), and Modified By (Jane Smith, 7/30/2010 11:03 AM). Below this is a 'Console Settings' section with a 'Console Layout' field and an 'Edit' link. The final section is 'Page Layouts', which lists 'Standard Object Layouts' for Home Page Layout (DE Default) and Event (Event Layout, View Assignment).

Figure 69: Standard Employee Profile Detail Page

The first thing you'll notice about the Standard Employee profile's detail page is that it includes several more areas than the edit page that we originally used to define the profile. These additional areas include Page Layouts (which we learned about earlier), Field-Level Security, Record Type Settings, Login Hours, and Login IP Ranges. Although we won't go into detail in this book about how to use any areas other than Field-Level Security (and record types later on), they're part of what makes a profile so powerful in our application. You can learn more about them in the Salesforce Help.

2. In the Field-Level Security area, click **View** next to the Position object.
3. Click **Edit**.

Position Field-Level Security for profile Standard Employee			
Field Name	Field Type	Visible	Read-Only
Apex	Checkbox	<input checked="" type="checkbox"/>	<input type="checkbox"/>
C#	Checkbox	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Close Date		<input checked="" type="checkbox"/>	<input type="checkbox"/>
Created By		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Days Open	Number	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Educational Requirements	Long Text Area	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Functional Area		<input checked="" type="checkbox"/>	<input type="checkbox"/>
Hire By		<input checked="" type="checkbox"/>	<input type="checkbox"/>
Hiring Manager	Lookup	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Java	Checkbox	<input checked="" type="checkbox"/>	<input type="checkbox"/>
JavaScript	Checkbox	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Job Description	Long Text Area	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Job Level	Picklist	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Last Modified By	Lookup	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Location		<input checked="" type="checkbox"/>	<input type="checkbox"/>
Max Pay		<input type="checkbox"/>	<input type="checkbox"/>
Min Pay		<input type="checkbox"/>	<input type="checkbox"/>
Open Date	Date	<input checked="" type="checkbox"/>	<input type="checkbox"/>

Figure 70: Field-Level Security Edit Page

Here we see security settings for all of the fields on the Position object, including Min Pay and Max Pay, the two fields that we want to restrict. You'll notice that some field-level security settings on some fields cannot be modified—this is because either they are system-generated fields or they act as lookup relationship fields (foreign keys) to other records.

Since the security settings checkboxes can be a little bit confusing, let's do a quick exercise to map their values (Visible and Read-Only) to the three logical permission settings for a field: "Hidden," "Read Only," and "Editable":

Table 33: Field-Level Permission Mappings

Permission	Visible	Read-Only
Hidden		
Read Only	X	X
Editable	X	

After doing this exercise, it's easy to see that most fields are editable, because their Visible checkbox is the only one selected. To restrict a field from ever being viewed by a user, all we have to do is deselect both checkboxes.

4. Next to the `Max Pay` field, deselect `Visible`.
5. Next to the `Min Pay` field, deselect `Visible`.
6. Click **Save**.

Now let's take care of the remaining field-level security rules. Again, since we know that our interviewers and hiring managers will be assigned the Standard Employee profile, we'll ensure that its field permissions are set correctly.

7. Click **Back to Profile**.
8. In the Field-Level Security area, click **View** next to the Candidate object.
9. Click **Edit**.
10. Next to the `SSN` field, deselect `Visible`.
11. Click **Save**.
12. Click **Back to Profile**.
13. In the Field-Level Security area, click **View** next to the Job Application object.
14. Click **Edit**.
15. Next to the `Candidate` and `Position` fields, select `Read Only`.
16. Click **Save**.

We're done setting field-level security for the Standard Employee profile. We didn't have to change anything in the Recruiter profile because, as we already determined in the planning stage, recruiters can access all the fields we created in our objects.

Try It Out: Check Field-Level Security in Permission Sets

But what about the permission sets we created?

Remember how we specified field permissions when we created the Hiring Manager and Interview permission sets? Now that we know more about field-level security, let's double-check the most sensitive fields in our permission sets to make sure they are correct.

If any of these settings are incorrect, go ahead and edit them. Be sure to click **Save** each time you go to a different page. First, let's check field permissions in the Interviewer permission set.

1. From Setup, click **Manage Users > Permission Sets**, and select the Interviewer permission set.
2. In the  **Find Settings...** box, type `pos`, then select Positions.
3. Next to the `Max Pay` and `Min Pay` fields, both **Read** and **Edit** should be disabled.

Now let's check the Hiring Manager permission set.

4. Open the Hiring Manager permission set and navigate to the Positions object.
5. Next to the Max Pay and Min Pay fields, both **Read** and **Edit** should be enabled.

Finally, we want to make sure hiring managers can see which candidate and position are associated with each job application, but prevent them from changing those lookup fields.

6. In the  **Find Settings...** box, type job, then select Job Applications.
7. Next to the Candidate and Position fields, **Read** should be enabled and **Edit** should be disabled.

All done! We've just finished the second piece of our security and sharing puzzle by defining field-level security for the sensitive fields in our Recruiting app. Now, for the final piece of the puzzle, we need to specify the individual records to which each user needs access. We need to protect our data without compromising any employee's ability to perform his or her job.

Controlling Access to Records

By setting object and field-level access permissions in our profiles and permission sets, we have effectively defined all of the objects and fields that any one of our Recruiting app users can access. In this section, we'll focus on setting permissions for the actual records themselves. Should our users have open access to every record, or just a subset? If it's a subset, what rules should determine whether the user can access them? We'll use a variety of platform security and sharing tools to address these questions and make sure we get it right.

Introducing Organization-Wide Defaults

When dealing with record-level access settings, the first thing we need to do is to determine the organization-wide defaults (commonly called “org-wide defaults”) for each object in our Recruiting app. Also called a sharing model, org-wide defaults specify the baseline level of access that the most restricted user should have. We'll use org-wide defaults to lock down our data to this most restrictive level, and then we'll use our other record-level security and sharing tools (role hierarchies, sharing rules, and manual sharing) to open up the data to other users who need to access it.

Org-Wide Defaults in Our Recruiting App

To determine the org-wide defaults that we'll need in our Recruiting app, we need to answer the following questions for each object:

1. Who is the most restricted user of this object?
2. Is there ever going to be an instance of this object that this user shouldn't be allowed to see?
3. Is there ever going to be an instance of this object that this user shouldn't be allowed to edit?

Based on our answers to these questions, we can determine the sharing model that we need for that object as illustrated in the following diagram.

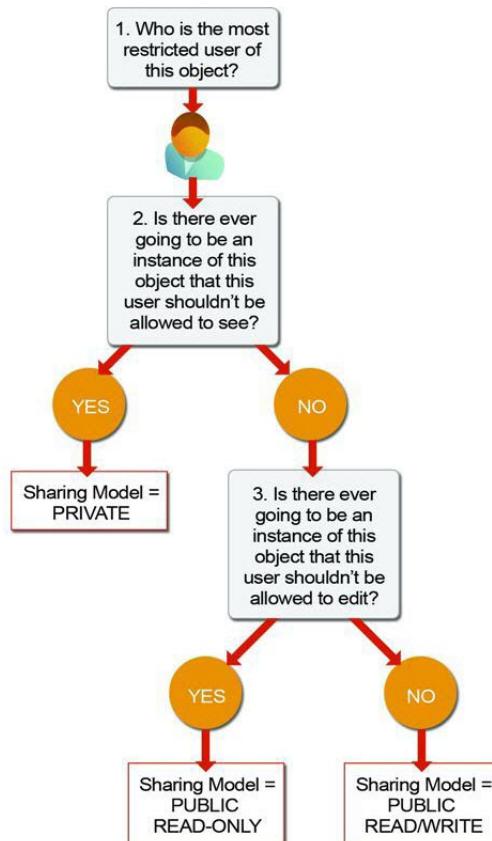


Figure 71: Determining the Sharing Model for an Object

For example, let's consider the Position object in our recruiting app. To refresh our memories, here's our table of required permissions:

Table 34: Revised Summary of Required Permissions

	Recruiter	Hiring Manager	Standard Employee
Position	Read Create Edit	Read Create Edit*	Read (No min/max pay)
Candidate	Read Create Edit	Read* (No SSN)	Read* (No SSN)
Job Application	Read Create Edit	Read Edit (No lookup fields)	Read*
Review	Read Create Edit	Read Create Edit	Read** Create Edit**
Job Posting	Read Create Edit Delete	Read*Create*Edit*	
Employment Website	Read Create Edit Delete	Read	

* Only for those records that are associated with a position to which the hiring manager/interviewer has been assigned

** Only for those records that the interviewer owns

Now let's go through and answer our list of questions for the Position object:

1. Who is the most restricted user of this object?

A member of the Standard Employee profile. All that they're allowed to do is view a position.

2. Is there ever going to be an instance of this object that this user shouldn't be allowed to see?

No. Although the values for the minimum and maximum pay are hidden from standard employees, they're still allowed to view all position records.

3. Is there ever going to be an instance of this object that this user shouldn't be allowed to edit?

Yes. Standard employees aren't allowed to edit any position record.

According to our flowchart, answering "Yes" to question #3 means that the sharing model for the Position object should be set to Public Read-Only.

The same is true for the Employment Website and Job Posting objects, except hiring managers are the most restricted users instead of standard employees. (Standard employees have no permissions on these objects, but of the users that *do* have permissions, hiring managers are

most restricted.) We want to allow hiring managers to view all employment website and job posting records without being able to edit them, so the answer to the second question is “No” while the answer to the third question is “Yes,” therefore, the sharing model for the Employment Website and Job Posting objects should be Public Read-Only.

Going through the rest of our recruiting objects required permissions, we can easily figure out their sharing models, too. The Standard Employee profile is the most restricted user for each object, and there are going to be candidate, job application, and review records that particular employees won't be able to view. Consequently, the sharing model for the Candidate, Job Application, and Review objects should all be set to Private.

Try It Out: Set Org-Wide Defaults

Now that we've figured out the org-wide defaults for each of our recruiting objects, let's go ahead and implement them in our Recruiting app.

1. From Setup, click **Security Controls > Sharing Settings**. If you see an introductory splash page, click **Set Up Sharing** at the bottom of the page to skip to the actual tool.

The Sharing Settings page is where we control both org-wide defaults and sharing rules. We'll talk more about this page when we talk about sharing rules a little further down. For now, let's just edit our org-wide default settings.

2. In the Organization Wide Defaults area, click **Edit**.

This page controls the org-wide defaults for every object in our organization. You'll notice that some standard objects (like leads and calendars) use a different set of org-wide default values than we have available for our custom recruiting objects. You can learn more about them in the Salesforce Help. For now, let's just set our recruiting objects to the org-wide defaults that we decided on in the last section.

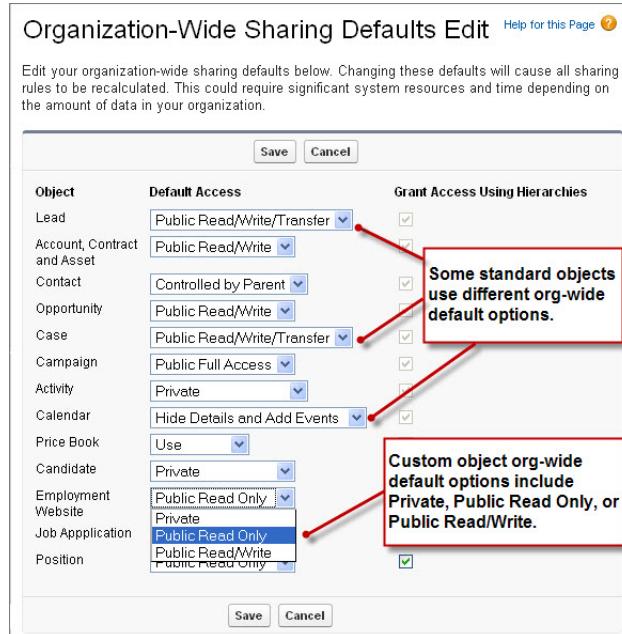


Figure 72: Org-Wide Defaults Edit Page

3. Next to Candidate and Job Application, select Private.
4. Next to Employment Website and Position, select Public Read Only.

Right about now, you're probably wondering why you can't set the org-wide defaults for the Review and Job Posting objects. The reason is that those objects are on the detail side of master-detail relationships, and, as mentioned in the last chapter, a detail record automatically inherits the sharing setting of its parent. So in our app, the Review object is automatically set to Private, and the Job Posting object is automatically set to Public Read Only.

You also might be wondering about the Grant Access Using Hierarchies column of checkboxes. Leave these selected for now. We'll discuss hierarchies in the next section.

5. Click Save.

Easy! Now that we've locked down our data with org-wide defaults, users are currently allowed to work on only candidate, job application, and review records that they own, and are allowed to view position, employment website, and job posting records that anyone owns. Because those settings are way too restrictive for any user to get any benefit out of our app, now we need to use role hierarchies, sharing rules, and manual sharing to open up candidate, job application, and review record access to those employees who'll need it.

Introducing Role Hierarchies

The first way that we can share access to records is by defining a role hierarchy. Similar to an org chart, a role hierarchy represents a level of data access that a user or group of users needs. Users assigned to roles near the top of the hierarchy (normally the CEO, executives, and other management) get to access the data of all the users who fall directly below them in the hierarchy. The role hierarchy enables these behaviors:

- A manager will always have access to the same data as his or her employees, regardless of the org-wide default settings. For custom objects, you can override this behavior by deselecting the `Grant Access Using Hierarchies` checkbox. However, we want our role hierarchy to apply to all of our custom objects, so leave the checkboxes selected.
- Users who tend to need access to the same types of records can be grouped together—we'll use these groups later when we talk about sharing rules.

To illustrate, let's take a look at a portion of the role hierarchy for Universal Containers:

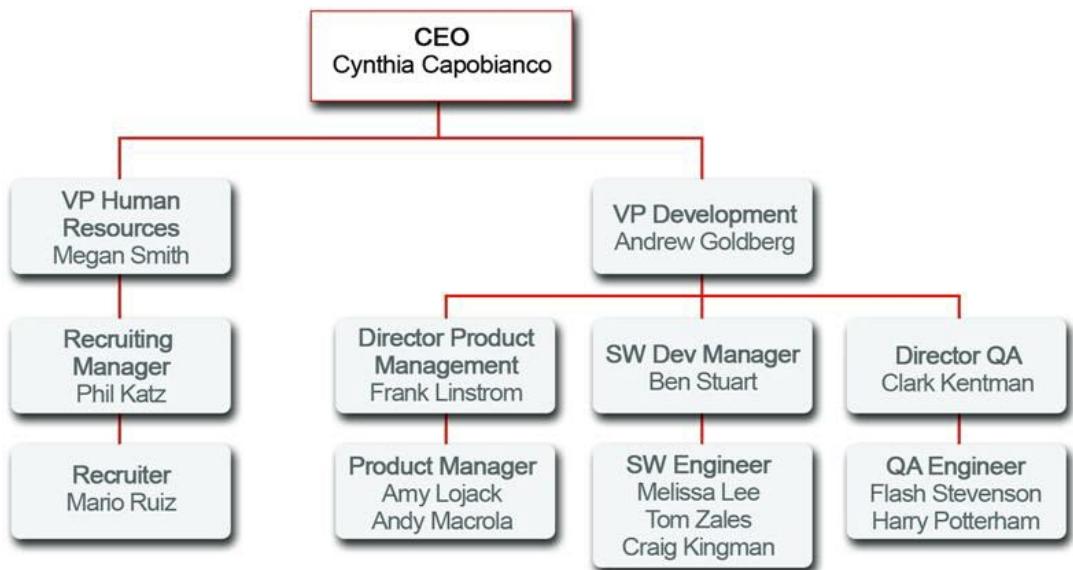


Figure 73: Universal Containers Role Hierarchy

Role hierarchies don't necessarily need to match your org chart exactly. Instead, each role in the hierarchy should just represent a level of data access that a user or group of users needs. For example, suppose your organization employs a corporate lawyer who needs to access all of the records in the app. One easy way to accomplish this is by assigning the lawyer to the CEO role in your organization's role hierarchy. Since the CEO role is placed at the top of the

hierarchy, anyone assigned to that role automatically gets full access to any record in the organization. It doesn't matter that technically the lawyer appears below the CEO in the regular org chart.

Comparing Roles, Profiles, and Permission Sets

Although it's easy to confuse profiles and permission sets with roles, they actually control two very different things.

As we learned earlier in this chapter, profiles and permission sets control a user's object- and field-level access permissions. Indeed, a user can't be defined without being assigned to a particular profile, since the profile specifies the most basic access for users.

Roles, on the other hand, primarily control a user's record-level access permissions through role hierarchy and sharing rules. Although a role assignment isn't exactly required when we define a user, it would be foolish of us *not* to assign a role since it makes it so much easier to define our record-level permissions. Indeed, trying to define record-level permissions without assigning a role to a user would be a lot like trying to travel from New York to San Francisco by car when there's an airplane available—there's just a much more efficient way of doing it!

To help you remember which controls what, remember: **R**oles control **R**ecords.

Role Hierarchies in Our Recruiting App

Given the Universal Containers role hierarchy that's pictured in the Universal Containers Role Hierarchy image, let's think about how implementing this hierarchy will open up certain kinds of record-level permissions to various users of our Recruiting app. Remember, since defining our org-wide defaults, our hiring managers are currently allowed to only view all position, job posting, and employment website records, and to view and update other recruiting records that they own. That doesn't make our app all that useful. However, once we implement our role hierarchy, we'll automatically grant several kinds of record-level permissions to various users. For example:

- The CEO, Cynthia Capobianco, will be able to view and update every record that anyone else in the organization can view and update.
- The VP of Development, Andrew Goldberg, will be able to view and update any record that his managers or his managers' employees can view or update.
- The VP of Human Resources, Megan Smith, will be able to view and update any record that Phil Katz, her recruiting manager, or Mario Ruiz, Phil's recruiter, can view and update.

- The Recruiting Manager, Phil Katz, will be able to view and update any record that is owned by Mario Ruiz, his recruiter.
- The Software Development manager, Ben Stuart, will be able to view and update any record that is owned by Melissa Lee, Tom Zales, or Craig Kingman, his software engineers.
- The director of QA, Clark Kentman, will be able to view and update any record that is owned by Flash Stevenson or Harry Potterham, his QA Engineers.
- The director of Product Management, Frank Linstrom, will be able to view and update any record that is owned by Amy Lojack or Andy Macrola, his product managers.

As we can see, the role hierarchy is very powerful in opening up data for people high up in the role hierarchy tree! However, let's look at some of the gaps that we still have in our record-level permissions:

- Megan Smith (and her whole recruiting team) won't be able to view any reviews that are owned by members of Andrew Goldberg's Development team because she doesn't have a direct line down to any Development roles in the role hierarchy.
- Ben Stuart, the software development manager, also won't be able to see any reviews that were written by members of the QA or Product Management groups, even if QA engineers or product managers interviewed candidates for a software engineering position in his group.
- Melissa Lee, a software engineer, won't be able to see the records for candidates that she's supposed to interview.

Clearly we'll need to use other record-level sharing methods to open up data between peers in the same group, and also between groups that appear in different branches of the role hierarchy (we'll get to those later in this chapter). However, the role hierarchy does give us a good start toward opening up record access, so let's take a look now at how to define it.

Try It Out: Create a User

Before we set up the role hierarchy, we're going to need some users to assign the roles to. First let's create the CEO of Universal Containers: Cynthia Capobianco.

1. From Setup, click **Manage Users > Users**.
2. Click **New User**.
3. In **First Name**, enter **Cynthia**.
4. In **Last Name**, enter **Capobianco**.
5. Enter your email address in the **Email** field, and a fake email in **Username**.

Each user must have a unique username across all Salesforce organizations. The value in **Email** must be a valid email address, though. We can use the “fake” value in the **Username** field to

log in to the app as Cynthia, but we'll get her automatically generated password at the real email account specified in Email. Without that password, we'd never be able to log in!

Figure 74: New User Edit Page



Tip: When creating a new user, you're also required to create the user's nickname. The nickname is used to identify the user in the Ideas app, which is a community of users who post, vote for, and comment on ideas. Consider it an online suggestion box that includes discussions and popularity rankings for any subject. The nickname can contain up to 40 alphanumeric characters. For more information, see the Salesforce Help.

6. Leave Role unspecified. We'll assign this when we create our role hierarchy.
7. In User License, leave the default selection of Salesforce.
8. In Profile, select Standard Employee.
9. Fill in any remaining fields that you want to.
10. Click Save.

Try It Out: Define a Role Hierarchy

Implementing a role hierarchy in the platform is easy once you have an idea of what the hierarchy should look like. It's best to start with your company's org chart and then consolidate different job titles into single roles wherever possible. For example, if Ben Stuart's software development group has a staff software engineer and a junior software engineer, these positions can be consolidated into a single Software Engineer role in the hierarchy.

Once that's squared away, we can get started defining the role hierarchy itself. For our exercise, we'll use the role hierarchy we talked about previously.

- From Setup, click **Manage Users > Roles**. If you see an introductory splash page called Understanding Roles, click **Set Up Roles** at the bottom of the page to skip to the actual tool.

Figure 75: Empty Role Hierarchy Page in Tree View Mode

The default view for this page is the tree view, as indicated in the drop-down list on the far right side of the Role Hierarchy title bar. When creating a role hierarchy, it's probably easiest to stick with this or the list view, because they both make it easy to see how the roles all fit together in the hierarchy. The sorted list view is best if you know the name of a role that you want to find but aren't sure where it fits in the hierarchy, or if you don't want to click open all the tree nodes. For our purposes, we'll stick with the tree view.

When you first start defining a role hierarchy, the tree view displays a single placeholder node with the name of your organization. From this point, we need to add the name of the role that is highest up in the hierarchy—in our case, the CEO.



Note: If you're building your Recruiting app with a free Developer Edition organization, you may have a role hierarchy predefined as a sample. That's alright. You can still follow along and create some more roles.

- Just under Universal Containers, click **Add Role**.



Note: If the CEO role already exists, click **Edit**.

- In the **Label** text box, enter **CEO**. The **Role Name** text box autopopulates with **CEO**.
- In the **This role reports to** text box, click the lookup icon
- and click **Select** next to the name of your organization.

By choosing the name of the organization in the **This role reports to** text box, we're indicating that the CEO role is a top-level position in our role hierarchy and doesn't report to anyone.

5. In the **Role Name as displayed on reports** text box, enter CEO. This text is used in reports to indicate the name of a role. Since you may not want a long role name, like Vice President of Product Development, taking up too much space in your report columns, it's advisable to use a shortened, yet easily identifiable, abbreviation.
6. Leave any other options, such as **Opportunity Access**, set to their defaults. These access options don't have anything to do with our Recruiting app, and only appear if you have the org-wide defaults for a standard object set to a level more restrictive than **Public Read/Write**.
7. Click **Save**.

The screenshot shows the 'Role Detail' page for the 'CEO' role. At the top, it says 'Role' and 'CEO'. Below that is a note about assigned users. It shows the 'Hierarchy: Universal Containers > CEO' and 'Siblings:'. There are links for 'Users in CEO Role [0]' and 'Category Group Visibility Settings [0]'. The 'Role Detail' section has fields for 'Role Name' (CEO), 'Role Name as displayed on reports' (CEO), 'This role reports to' (None), 'Sharing Groups' (Role, Role and Subordinates), 'Modified By' (Jane Smith, 8/16/2010 1:58 PM), and 'Customer Portal Role' (unchecked). A red box highlights the 'Sharing Groups' field with the text 'Every role can have one or more assigned users.' An arrow points from this text to the 'Assign Users to Role' button. At the bottom, there are buttons for 'Users in CEO Role' (with a user icon), 'Assign Users to Role' (highlighted in red), 'New User', and 'Users in CEO Role Help'.

Figure 76: CEO Role Detail Page

Now that we've created our first role, we can assign the appropriate user to it.

8. Click **CEO** to open the CEO role detail page.
9. In the CEO role detail page, click **Assign Users to Role**.
10. In the Available Users drop-down list, select All Unassigned.
11. Choose a user from the list (in our case, Cynthia Capobianco), and click **Add** to move her to the Selected Users for CEO list.
12. Click **Save**.

If we return to the main Roles page from Setup by clicking **Manage Users > Roles**, we can now see our new CEO role in the hierarchy.



Note: If you see the Sample Role Hierarchy image, click **Set Up Roles**.

13. Define the rest of the roles according to the Universal Containers Role Hierarchy diagram.

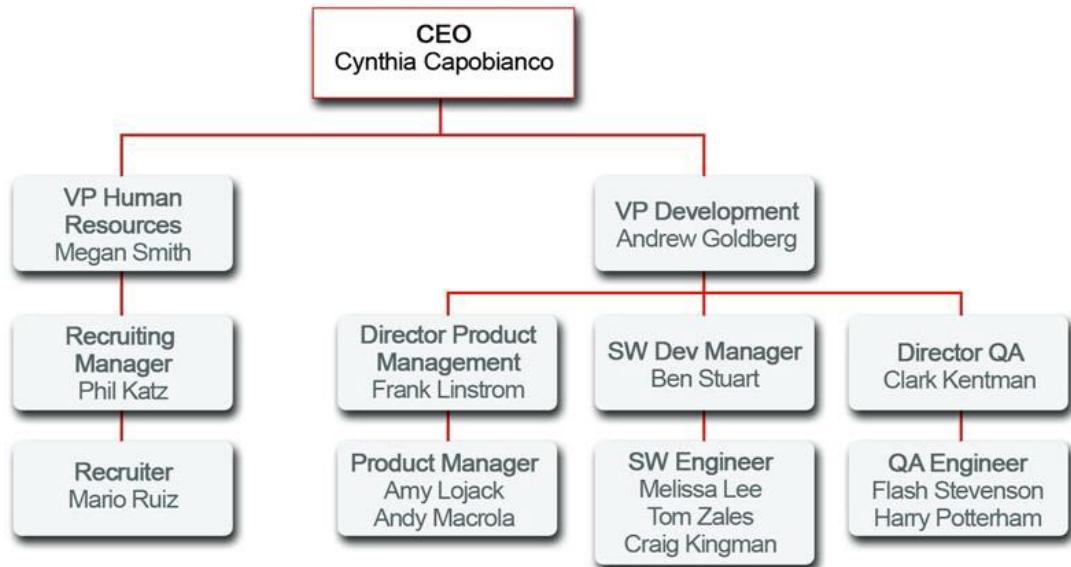


Figure 77: Universal Containers Role Hierarchy

There's no need to assign users to every role at this point—we'll do that later when we create the rest of our users and test out our app.



Tip: To speed up the process of adding a new role, click **Add Role** directly under the name of the role to which the new role should report. When you do this, the **This role reports to** text box is automatically filled in with the name of the appropriate role.

Not too hard, right? With org-wide defaults and a role hierarchy in place, we're actually pretty close to finishing up our record-level access permissions. All we have left to do is share recruiting-related records between groups that appear in separate branches of the role hierarchy, and between peers in a single group. Fortunately, we can accomplish both of those tasks with a combination of sharing rules and manual sharing. We just need to figure out what's left that needs to be shared, and with whom.

What's Left to be Shared?

So what *is* left to be shared? After reviewing our table of required permissions, it turns out it's just a few more things (remember, since users always have access to the records that they own, we need to worry only about the read and update permissions for our record-level access settings):

- Recruiters need read and update access on every position, candidate, job application, and review record that exists in the app.
- Hiring managers need:
 - ◊ Read and update access on position and job posting records on which they're the hiring manager
 - ◊ Read access on candidate records for which they're the hiring manager
 - ◊ Read and update access on every job application and review record
- Interviewers need read access on the candidate and job application records for people they're interviewing, and the ability to update their reviews.

That shouldn't be too hard! Let's go do it.

Introducing Sharing Rules

First let's see what we can do with sharing rules. Sharing rules let us make automatic exceptions to organization-wide defaults for particular groups of users. We've already defined several specific groups with the roles that we created in the previous section, but we can also make up other groups as needed.

The thing to remember with sharing rules is that, like role hierarchies, we can use them only to open up record access to more users. Sharing rules and role hierarchies can never be stricter than our org-wide default settings.

Sharing Rules in Our Recruiting App

Sharing rules work best when they're defined for a particular group of users that we can determine or predict in advance, rather than a set of users that is frequently changing. For example, in our Recruiting app, we need to share every position, candidate, job application, and review with every recruiter. Since recruiters all belong to either the Recruiting Manager or Recruiter roles in the role hierarchy, we can easily use a sharing rule to share those objects with the Recruiting Manager role and its subordinates.

Alternatively, consider another use case from our Recruiting app: interviewers need read access on the candidates and job applications for people they're interviewing. In this case, the set of interviewers is a lot harder to predict in advance—hiring managers might use different sets of interviewers depending on the position for which they're hiring, and the interviewers might come from different groups in the role hierarchy. As a result, this use case probably shouldn't be handled with sharing rules—the team of interviewers for any given manager is just too hard to predict.

Let's go through the set of required permissions we still need to implement and pick out the ones that would work best with sharing rules:

Use Case	Should we use a sharing rule?
Recruiters need read and update access on every position, candidate, job application, and review record that exists in the app.	Yes. As we discussed previously, it's easy to pick out the group of recruiters in our role hierarchy.
Hiring managers need read and update access on position and job posting records on which they're the hiring manager.	No. It's too hard to predict which positions will be assigned to which hiring manager. We'll need to handle this use case some other way.
Hiring managers need read access on candidate records on which they're the hiring manager.	No. Again, it's too hard to predict which positions will be assigned to which hiring manager.
Hiring managers need read and update access on every job application and review record.	Yes. Since we're not restricting which job applications and reviews a hiring manager gets to read and update, we can easily pick out all of the hiring managers from our role hierarchy and define a sharing rule for them.
Interviewers need read access on the candidate and job application records for people they're interviewing.	No. As we discussed previously, it's hard to predict who will be a member of an interview team for a particular position.

Great! Now that we know the required permissions we want to implement with sharing rules, let's go ahead and define them.

Try It Out: Define a Public Group

Before we dive head first into creating our sharing rules, we need to make sure that we have the appropriate public groups set up. A *public group* is a collection of individual users, other

groups, individual roles, and/or roles with their subordinates that all have a function in common. For example, users with the Recruiter profile as well as users in the SW Dev Manager role both review job applications. Using a public group when defining a sharing rule makes the rule easier to create and, more important, easier to understand later, especially if it's one of many sharing rules that you're trying to maintain in a large organization. You'll need to create a public group if you ever want to define a sharing rule that encompasses more than one or two groups or roles, or any individual.

Looking at the required permissions that we want to implement, there are just two objects that need a public group for their sharing rules: Job Application and Review. The good news is that we can cover these objects in a single group because the Review object is on the detail side of a master-detail relationship, so it inherits the sharing settings we apply to the Job Application object. Since both recruiters and hiring managers need read and update access to job applications and reviews, let's go ahead and make a public group called Reviewers that encompasses recruiters and hiring managers.

1. From Setup, click **Manage Users > Public Groups**.
2. Click **New**.

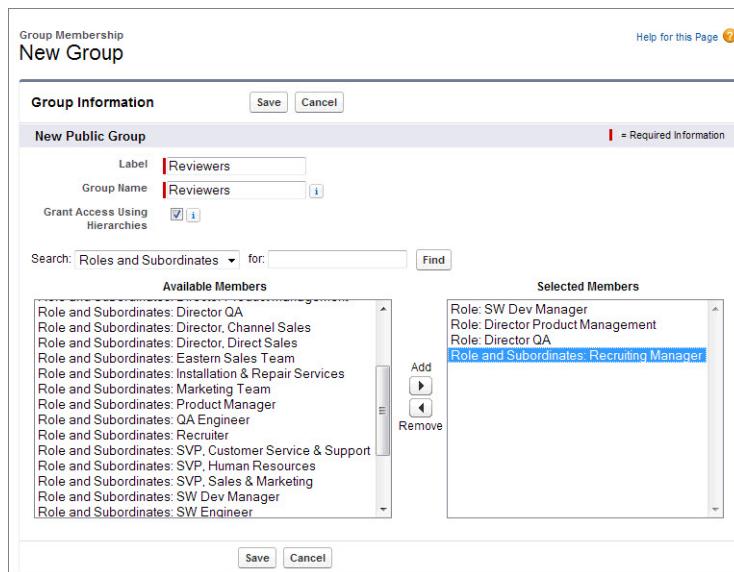


Figure 78: New Public Group Page

The New Public Group page allows you to choose other public groups, individual roles, individual roles including the roles' subordinates, or individual users.

3. In the Label text box, enter Reviewers. Click in the Group Name text box to populate it automatically. Group Name refers to the unique name used by the API and managed packages.
4. In the Search drop-down list, choose Roles.
5. In the Available Members list, select SW Dev Manager, Director Product Management, and Director QA, then click Add.
6. Go back up to the Search drop-down list, and this time choose Role and Subordinates.
7. In the Available Members list, select Recruiting Manager, and click Add.
8. Click Save.

Easy! Now we're ready to define our sharing rules.

Try It Out: Define Sharing Rules

Since we just defined our Reviewers public group, let's use it to define our sharing rule for review records.

1. From Setup, click **Security Controls > Sharing Settings**.

Remember this page? We were last here when we defined our org-wide defaults.

2. In the Manage sharing settings for drop-down list, choose Job Application.

Choosing an object in this drop-down list allows us to focus in on the org-wide defaults and sharing rules for a single object at a time rather than looking at all of them in a long page—a really useful thing if you've got a large organization with several custom objects.

If you had chosen Review instead of Job Application, you wouldn't have the option of creating sharing rules, since you can't create sharing rules for a detail record in a master-detail relationship. However, since you chose Job Application, a Sharing Rules related list appears. We'll use that to create the sharing rules that will apply to both the Job Application and the Review objects.

3. In the Job Application Sharing Rules area, click New.
4. In the Label text box, enter Review Records.
5. Click the Rule Name text box to populate it automatically.
6. For the rule type, make sure Based on record owner is selected.
7. In the Job Application: owned by members of drop-down list, select Public Groups.
8. Next to that drop-down list, choose Entire Organization.

Just as we talked about already, you can define a sharing rule only for a single public group, role, or role with all of its subordinates. By default, the platform includes a default public group that encompasses every user in your organization.

9. In the Share with drop-down list, select Public Groups.
10. Next to that drop-down list choose Reviewers.
11. In the Access Level drop-down list, select Read/Write.
12. Click **Save**.
13. Click **OK** in the dialog box that says this operation could take significant time.

And that's it! We just created a rule that shares reviews written and owned by any member of the organization with all recruiters and hiring managers. Since reviewers and hiring managers all need the power to read and update reviews, we handled everyone with a single sharing rule and a public group.

To finish up, create the following owner-based sharing rules:

Table 35: Additional Sharing Rules

Object	Rule Label	Owned by...	Should be shared with...	Access Level
Candidate	Edit Candidates	Entire Organization	The role and subordinates of the Recruiting Manager	Read/Write
Employment Website	Edit Employment Websites	The role and subordinates of the Recruiting Manager	Reviewers	Read/Write
Position	Edit Positions	The role and subordinates of the Recruiting Manager	The role and subordinates of the Recruiting Manager	Read/Write

The sharing rule for the Employment Website object is necessary to let hiring managers post jobs, even though they will never update employment website records directly (the org-wide defaults prevent that). Without the rule, hiring managers can see employment website records but can't create job postings. This is because the Job Posting object is a junction object (as you may recall from the last chapter), and the Employment Website object is one of the Job Posting object's two master-detail relationships. Sharing access to a junction object record is determined by a user's sharing access to both associated master records (in this case, the associated position and employment website records) and the Sharing Setting option on the relationship field. For example, if the sharing setting on both parents is Read/Write, then the user must have Read/Write access to both parents in order to have Read/Write access to the junction object.

In the sharing rule for the Employment Website object, we opted to use the existing Reviewers public group. Doing this saved us a few clicks without granting access to any users who shouldn't be looking at employment website records.

Beyond the Basics

Did you know you can use criteria-based sharing rules to open up record access to users?

Say you want to share records based on field values in records instead of record owners. You can set up sharing rules based on field value criteria and apply filter logic to open up specific record access to users.

To find out more, see “Criteria-Based Sharing Rules Overview” in the Salesforce Help.

Introducing Manual Sharing

Now let's talk about what we have left to do to finish defining our sharing model. After implementing our sharing rules, the following required permissions remain:

- *Hiring managers need read and update access on position records on which they're the hiring manager.*
- *Hiring managers need read access on candidate records on which they're the hiring manager.*
- *Interviewers need read access on the candidate and job application records for people they're interviewing.*

We didn't implement those required permissions with sharing rules because it was too hard for us to come up with a consistent group of users who would need access to a particular set of records. Really, this is where the job of the recruiter comes into play. A recruiter like Mario Ruiz owns the position, candidate, and job application records for jobs that he's trying to fill, and he also knows the hiring manager and interviewers who should be assigned to them.

Fortunately, we have one final type of record-access setting that allows Mario to share specific records with other specific users: manual sharing. With manual sharing, Mario can grant read or read/write access on records that he owns to any other user, role, or public group. Although it isn't automated like organization-wide defaults, role hierarchies, or sharing rules, manual sharing gives Mario the flexibility to share particular records with the ever-changing groups of interviewers and hiring managers with whom he has to deal every day.

Try It Out: Define a Manual Sharing Rule

Let's pretend that we're a recruiter like Mario and we need to share a particular candidate record that we own with another role, group, or user:

1. On the detail page for the candidate, click **Sharing**.

The screenshot shows the 'Sharing Detail' page for candidate record C-00002. At the top, there's a navigation bar with a user icon, the record number 'C-00002', and a 'Help for this Page' link. Below the navigation is a message stating: 'This page lists the users, groups, roles, and territories that have sharing access to C-00002. Click Expand List to view all users who have access to it.' A 'View' dropdown menu is set to 'All'. Below the message is a table titled 'User and Group Sharing' with columns for Action, Type, Name, Access Level, and Reason. One row is visible, showing 'User' as the type, 'Jane Smith' as the name, 'Full Access' as the access level, and 'Owner' as the reason.

Action	Type	Name	Access Level	Reason
	User	Jane Smith	Full Access	Owner

Figure 79: Sharing Detail Page

Since we own this candidate record, we get to see details about who else can see the record and why. If we didn't own this record, there would be a message about not having sufficient privileges.



Tip: If we wanted to view the names of each user who has access to the record rather than just the names of the roles and public groups, we could click **Expand List** in this page. Although the operation can take some time depending on the number of users in our organization, it's helpful to determine whether we need to define a manual sharing rule for a particular user or if he or she already has access.

2. Click **Add**.
3. In the **Search** drop-down list, choose whether we want to manually share the record with a user, public group, role, or role and subordinates.
4. In the **Available** list, select the user, public group, or role that should have access to the record, and click **Add**.
5. In the **Access Level** drop-down list, specify whether the user, public group, or role should have read or read/write access to the record.
6. Click **Save**.

Not too hard! When we roll out our Recruiting app to users, we'll have to train our recruiters to take these steps for the position, candidate, and job application records that their hiring managers and interviewers need to access. Once this training is complete, we will have

implemented all of the required sharing and security settings that we discussed at the beginning of the chapter—well done!

Displaying Field Values and Page Layouts According to Profiles

Before we give our security and sharing model a thorough testing, let's leverage the work we've done to further enhance our app's usability and, at the same time, give our data integrity a little boost.

Both usability and data integrity are adversely affected by irrelevant data. The less irrelevant data we display to users, the better off everyone will be. Not only can irrelevant data be confusing and impede a user's efficiency, but it also makes he or she more prone to entering incorrect values. By taking away unnecessary choices, we reduce the risk of making avoidable mistakes.

Although we've already put plenty of thought into our app's usability, there's always room for improvement. We won't go into a detailed usability analysis here, but let's make minor modifications to get a feel for some of the ways you can improve the usability and data integrity of your apps in the future.

The modifications we're going to make involve position records. Currently, each position record displays the same data, even though there are a few items on the position record that are of no use to recruiters who create positions for departments other than Development. For example, a recruiter who is creating a position for a Sr. Financial Analyst would have no use for the Required Programming Languages section.

By the same token, there are some options on position records that have nothing to do with technical positions, such as the Human Resources and Warehousing values in the Functional Area picklist. Wouldn't it be nice if we could create two types of position records: one with IT-related data for IT positions, and another for non-IT personnel?

Fortunately, we can with *record types*! Record types allow you to specify categories of records that display different picklist values and page layouts. You can also associate record types with profiles, so you can specify the picklist values and page layouts that different types of users can see in record detail pages.

To address the issues discussed above, we'll create two position record types. The first position record type will be for IT positions and will include the Required Programming Languages section of the page layout. Additionally, it will exclude all of the options in the Functional Area picklist except for Information Technology and Miscellaneous. The second position record type will be for all non-IT positions and will include all of the Functional Area

picklist values except for Information Technology, but will omit the Required Programming Languages section.

Try It Out: Create a Record Type

Let's start by creating the position record type for standard, non-IT positions.

1. From Setup, click **Create > Objects**.
2. Click **Position**.
3. In the Record Types related list, click **New**.
4. In the Record Type Label field, enter Standard Position. When you move your cursor, the value of the Record Type Name field changes to Standard_Position.
5. In the Description field, enter Record type for all non-IT positions.
6. Select the Active checkbox.

The bottom of the screen lists all your profiles. Here is where we can determine which profiles have access to this record type. All of them are selected by default.

7. Click **Next**.
8. Leave the Apply one layout to all profiles radio button selected, and select Position Layout in the adjacent drop-down list.
9. Click **Save**.

The Standard Position record type detail page appears. The page lists the picklist fields found on the record type's associated page layout, the Position Layout.

10. Click **Edit** next to the Functional Area field.

Since this is the record type for all non-IT positions, let's remove Information Technology from the Functional Area picklist.

11. In the Selected Values box, select Information Technology and use the arrows to move it to the Available Values box.
12. Leave the Default drop-down list set to None, and click **Save**.

You're done creating your first record type, but it's not quite configured the way we want it. While it omits the Information Technology value in the Functional Area picklist, it still displays the Required Programming Languages section. We'll fix this later when we modify the page layouts for our record types, but first we have to create one more record type.

1. From Setup, click **Create > Objects**.

2. Click **Position**.
3. In the Record Types related list, click **New**.
4. In the Record Type Label field, enter **IT Position**. When you move your cursor, the value of the Record Type Name field changes to **IT_Position**.
5. In the Description field, enter **Record type for all IT positions**.
6. Select the **Active** checkbox.

Once again, the bottom of the screen lists your org's profiles, although this time they are deselected by default.

7. Next to the Recruiter and Standard Employee profiles, select the **Enable for Profile** checkbox.
8. Click **Next**.

We are again given the option to apply different layouts to different profiles. We still need to create the page layout for this record type, though, so we'll have to apply the page layouts later.

9. Leave the **Apply one layout to all profiles** radio button selected, and select **Position Layout** in the adjacent drop-down list.
10. Click **Save**.

The IT Position record type detail page appears.

11. Click **Edit** next to the **Functional Area** field.

Since this is the record type for all IT positions, let's remove all the options from the **Functional Area** picklist except for **Information Technology** and **Miscellaneous**.

12. Use the arrows to move the values until the **Selected Values** box only contains **Information Technology** and **Miscellaneous**.
13. In the **Default** drop-down list, select **Information Technology**.
14. Click **Save**.

Both record types are now in place, and both are omitting the picklist values they're supposed to omit. It's time to configure the page layouts for these record types.

We'll need a separate page layout for each record type. Lucky for us, we already have one page layout for the **Position** object (**Position Layout**), so we just need to create one more.

1. From Setup, click **Create > Objects**.
2. Click **Position**.
3. In the **Page Layouts** related list, click **New**.
4. In the **Existing Page Layout** drop-down list, select **Position Layout**.

Selecting the existing page layout creates a copy on which we can base our new page layout. This saves us from having to create the layout from scratch.

5. In the Page Layout Name field, enter **IT Position Layout**, and click **Save**.

We're done creating our new IT position page layout. Now, let's edit both our new and original page layouts so they display relevant data. Since we're on the IT Position page layout, we'll start with that one.

This page layout already includes the Required Programming Languages section, so we don't need to add that; however, we do want to add the Record Type field to the page layout so users will instantly be able to tell what type of position record they're editing.

6. Select the Fields category in the palette, then drag the Record Type field to just below the Last Modified By field.
7. Click **Save**.

Now, let's edit the Position Layout page layout. This is the layout we'll use for our Standard Position record type, so we'll want to remove the Required Languages section.

1. From Setup, click **Create > Objects**.
2. Click **Position**.
3. In the Page Layouts related list, click **Edit** next to Position Layout.
4. Click  in the upper right corner of the Required Languages section.

We'll want to add the Record Type field to this page layout as well.

5. Select the Fields category in the palette, then drag the Record Type field to just below the Last Modified By field.
6. Click **Save**.

We're on the verge of finishing! There's just one more easy task to complete: assigning our Position page layouts to our new record types.

Assigning page layouts is easy because you can make all of the assignments for an object on a single page.

1. From Setup, click **Create > Objects**.
2. Click **Position**.
3. In either the Page Layouts related list or Record Types related list, click **Page Layout Assignment**.
4. Click **Edit Assignment**.

A table shows the Position page layout assignments for all of the different profile and position record type combinations. In the table, select the profile and position record type combinations

you want to change. Use SHIFT+click to select a range of cells or CTRL+click to select multiple cells at once. Use the drop-down list above the table to indicate the page layout to which you want to reassign your selections.

5. Click the IT Position column heading. This selects all of the values in the IT Position record type column.
6. Select IT Position Layout in the Page Layout To Use drop-down list.
7. Click Save.

Your record types are good to go!

Putting It All Together

Congratulations! We've just implemented all of our required security and sharing settings, first by defining object-level access with profiles and permission sets, then by securing field-level access with field-level security, and finally by defining record-level access using org-wide defaults, role hierarchies, sharing rules, and manual sharing.

We learned about the difference between object-, field-, and record-level security, and how profiles, permission sets, and roles work together to first determine the objects and tabs that a user can possibly use, and then the specific records that the user can actually access and edit. We also learned ways to set up other profile-based features like record types to improve both our data integrity and our app's usability.

Let's now try it out for ourselves. To do so, we'll first have to define a number of users, and then we can play around with creating records and seeing who has access to what.

Try It Out: Create More Users

To really put our Recruiting app through its paces, we'll first need to define the rest of our users and assign a couple of them to some of the recruiting records that we imported earlier.



Note: If you're implementing the Recruiting app in a Developer Edition organization, you'll have only a few additional users to play with besides the System Administrator user. You can still try out all of the use cases that we describe here, but you'll have to update the user's profile, permission sets, and role for whatever use case you're working on.

Table 36: Summary of Required Permissions: Recruiter and Standard Employee Profiles

	Recruiter	Standard Employee
Position	Read Create Edit	Read (No min/max pay)
Candidate	Read Create Edit	
Job Application	Read Create Edit	
Review	Read Create Edit	
Job Posting	Read Create Edit Delete	
Employment Website	Read Create Edit Delete	

Let's walk through the creation of our recruiter: Mario Ruiz. Then you can finish the other users on your own.

1. From Setup, click **Manage Users > Users**.
2. Click **New User**.
3. Fill out the required fields in the User edit page.

Just as you did with Cynthia Capobianco, in the `Email` field enter a real email address that you have access to, and in the `Username` field enter a “fake” email address (for example, `mario.ruiz@recruiting.com`).

4. From the `Profile` drop-down list, select Recruiter.
5. Click **Save**.

Now that we've created the Mario Ruiz user, let's give him ownership of the DBA position and its associated job application and candidate records.

6. Click the Positions tab.
7. From the `View` drop-down list, select All and click **Go**.



Tip: If you want to see more than just the `Position Title` field in this view, click **Edit** next to the `View` drop-down list and add additional fields in the `Select Fields to Display` section.

8. Click **DBA**.
9. Next to the `Owner` field, click **Change**.
10. Click the lookup icon and choose Mario Ruiz.
11. Click **Save**.

12. In the Job Applications related list, click the name of the listed job application and repeat Steps 8-10.
13. Click the ID of the associated candidate on the Job Application detail page and repeat Steps 8-10.



Note: When you imported records from Candidate, Job Application, and Position CSV files, you were probably logged in as a user other than a Recruiting Manager or subordinate. We created sharing rules that share the records that are owned by the role and subordinates of the Recruiting Manager, so now you should transfer ownership of the rest of these records to a Recruiting Manager or subordinate (Phil Katz or Mario Ruiz).

Now create the other users in [Summary of User Profile Assignments](#) on page 205 and assign them the profiles listed in the table. Since Mario is our only recruiter, he's the only user we'll assign the Recruiter profile to. Everyone else should have the Standard Employee profile.

Table 37: Summary of User Profile Assignments

User	Profile
Phil Katz	Standard Employee
Megan Smith	Standard Employee
Craig Kingman	Standard Employee
Tom Zales	Standard Employee
Melissa Lee	Standard Employee
Ben Stuart	Standard Employee
Andy Macrola	Standard Employee
Amy Lojack	Standard Employee
Frank Linstrom	Standard Employee
Andrew Goldberg	Standard Employee
Harry Potterham	Standard Employee
Flash Stevenson	Standard Employee
Clark Kentman	Standard Employee
Cynthia Capobianco	Standard Employee

Notice that most of our users have the same profile. With the Standard Employee profile, the only thing these users can do in our recruiting app is look at positions (not including certain fields). But what about the users who need to access more information, such as hiring manager Ben Stuart? Well, this is where our permission sets come in, which we created in [Introducing Permission Sets](#) on page 160. Here's a recap of the permissions we gave the Hiring Manager and Interviewer permission sets.

Table 38: Summary of Required Permissions: Hiring Manager and Interviewer Permission Sets

	Hiring Manager	Interviewer
Position	Read Create Edit*	Read (No min/max pay)
Candidate	Read* (No SSN)	Read * (No SSN)
Job Application	Read Edit (No lookup fields)	Read *
Review	Read Create Edit	Read ** Create Edit **
Job Posting	Read *Create *Edit *	
Employment Website	Read	

* Only for those records that are associated with a position to which the hiring manager/interviewer has been assigned

** Only for those records that the interviewer owns

Since Ben is a hiring manager for software development, he needs to be able to do things like creating new positions or looking at a candidate and her application. Let's assign the Hiring Manager permission set to Ben so he can accomplish those tasks.

1. From Setup, click **Manage Users > Users**.
2. Click Ben Stuart's name.
3. In the user detail page, scroll to the Permission Set Assignments related list and click **Edit Assignments**.
4. In the Available Permission Sets box, select Hiring Manager and use the arrows to move it to the Enabled Permission Sets box.
5. Click **Save**.

Repeat these steps for the other hiring managers: Andy Macrola, Amy Lojack, and Clark Kentman.

Now that we've assigned all of our hiring managers the right permission set, let's focus on our interviewers. Mario has scheduled a candidate for an interview next week, and Ben has asked

two of his developers to interview the candidate. Assign the Interviewer permission set to Melissa Lee and Craig Kingman, so that they can check out the position and application, as well as leave their reviews of the interview.

Beyond the Basics

Did you know you can control who sees whom in the organization?

Say you want to let recruiters, hiring managers, and interviewers see and collaborate with each other, but not with standard employees. You can set the organization-wide default for the user object to Private, and create sharing rules to enable recruiters, hiring managers, and interviewers to see and collaborate with each other in the Recruiting App, while preventing standard employees from viewing those users and vice versa.

To find out more, see “User Sharing Overview” in the Salesforce Help.

Try It Out: Verify that Everything Works

Now that we've got data assigned to actual users, let's go through our Recruiting app and see how the security and sharing permissions that we defined in this chapter play out:

1. First log in as Mario Ruiz—verify that he can see and edit all positions, all candidates, and all job applications. Verify that the **New** buttons are there for all objects in the Recruiting app. Verify that he can create positions using either position record type.
2. Log in as Melissa Lee—verify that she can view positions but that there's no **New** button. Verify that she can't see any candidates, job applications, reviews, or employment websites.
3. Log in as Ben Stuart—verify that he can view positions and that there's a **New** button. Verify that he can view but not edit employment websites. Verify that he can't see any candidates. Verify that he can view job applications, but not edit their lookup fields. Verify that he can view reviews and that there's a **New** button. (What do reviews look like? Can he see the names of the candidates and job applications on them?)
4. Log in again as Mario Ruiz—have him manually share read/write access on the DBA position with Ben. Have him manually share read access on the candidate with Melissa and Ben. Have him manually share read/write access on the job application with Melissa and Ben.
5. Log in again as Melissa Lee—verify that she can now see the candidate and job application that Mario just shared with her but that she can't see the candidate's social security number. Have her create a review for that candidate.

6. Log in again as Ben Stuart—verify that he can edit the DBA position. Verify that he can read and update Melissa's review. Verify that he can update the job application Status to Extend an Offer.

How did we do? If all of these use cases worked correctly, you've just successfully set up security and sharing for our Recruiting app! If a use case didn't work, check the role, profile, permission set, and sharing rules of each user against the information in the Summary of Required Permissions: Recruiter and Standard Employee Profiles table.

There is one critical security-related issue that we have yet to address: who will be responsible for overseeing the operation of the Recruiting app and its related data when the app goes live?

Delegating Data Administration

As with nearly all Force.com apps, our Recruiting app doesn't require tedious ongoing administration or a watchful eye monitoring its daily operation. Once the app is deployed, it just works! But from time to time, a decision or issue arises that requires human intervention, and some basic manual administration is required, like:

- A hiring manager is retiring and has forty open positions that need to be transferred to another manager
- A current Recruiting app user needs immediate access to private data owned by another user who happens to be on vacation
- Duplicate records have piled up in the Recruiting app and need to be removed
- A new employee just got hired and needs access to the Recruiting app

To handle these situations, someone might need to override the security and sharing configurations we just created. Who should have such powers within our app, and how can these powers be granted?

Obviously, your company's primary Salesforce administrator can handle just about any issue that users may encounter in Salesforce. Primary administrators are assigned to the System Administrator profile, which automatically grants several global administrative permissions, including:

- “View All Data”—View all data owned by other users in your organization
- “Modify All Data”—Modify all data owned by other users in your organization, mass update and mass delete records, and undelete records that other users deleted
- “Customize Application”—Customize just about anything in Salesforce, from page layouts to the data model
- “Manage Users”—Add and remove users, reset passwords, grant permissions, and more

For smaller companies, it makes sense to have a single administrator be the “go-to” person for all Salesforce issues. But for medium to large companies, assigning all Salesforce responsibilities to one person is not practical, especially when you consider that a company can run its entire business in the cloud using a different Force.com app to suit each of its business needs. This could add up to dozens of apps and hundreds or thousands of users! Your primary Salesforce administrator will likely go insane unless other folks can help with the administration. At the same time, every administrative privilege you grant increases the risk of exposing your company's sensitive data, so you need precise control over the amount of access you enable.

To preserve both your administrator's sanity and your company's security, the Force.com platform provides two ways to quickly delegate restricted data administration access: object-level permissions and delegated administration groups.

Overriding Sharing with Object Permissions

Believe it or not, we already delegated a few administrative responsibilities a few pages ago when we created the Recruiter permission set. If you go back to that section, you'll see that we selected the “View All” and “Modify All” object permissions for job postings and employment websites. As you might expect, “View All” lets users view all of the records of that object, while “Modify All” lets users read, edit, and delete all of the records of that object. So how does selecting these permissions differ from just selecting the “Create,” “Read,” “Edit,” and “Delete” permissions individually? And how do “View All” and “Modify All” help you delegate administration?

The keyword here is “all.” When you grant “View All” or “Modify All” for an object on a profile or permission set, you grant any associated users access to *all* records of that object regardless of the sharing and security settings. In essence, the “View All” and “Modify All” permissions ignore the sharing model, role hierarchy, and sharing rules that the “Create,” “Read,” “Edit,” and “Delete” permissions respect. Furthermore, “Modify All” also gives a user the ability to mass transfer, mass update, and mass delete records of that specific object, and approve such records even if the user is not a designated approver. These tasks are typically reserved for administrators, but because “View All” and “Modify All” let us selectively override the system, responsibilities that are usually reserved for the administrator can be delegated to other users in a highly controlled fashion.



Note: We'll learn more about approving records in the next chapter. Other administrative actions, such as mass updates, are covered in the Salesforce online help.

You may wonder if the “View All” and “Modify All” object permissions are similar to the “View All Data” and “Modify All Data” global permissions. It's true that they all ignore the sharing model, hierarchy, and sharing rules, but bear in mind that object permissions only apply to

records of a specific object, whereas global permissions apply to records of every object in your organization. As a rule of thumb, when global administration permissions are too permissive for a particular user, use the object permissions instead to control data access on an object-by-object basis.

Because we already applied object permissions when we created the Recruiter permission set, there's no need to walk through the process again here; however, you can probably imagine other ways in which the "View All" and "Modify All" permissions might be useful for this app. For example, as we discussed before, certain laws may require your company to keep all position, candidate, and job application records for a specific amount of time. This law is why we opted not to give recruiters the ability to delete those records. When that legal time limit expires, though, your company may want to hire a contractor who specializes in data cleansing to remove old recruiting data from the system. By creating a permission set with the "Modify All" object permission on positions, candidates, and job applications, you can quickly give the contractor the permissions needed to get the job done without exposing the rest of your company's data.

Delegated Administration Groups

We just saw how the "View All" and "Modify All" object permissions can be used to take a considerable load off of the primary administrator's shoulders; however, there are still a few other administrative responsibilities that you might want to delegate but can't with object permissions. For example, you might not want to burden the primary administrator with the tasks of manually adding every new employee to Salesforce or resetting a user's password every time it's forgotten. Also, as time passes, your company may need a new field or two added to review records, or a new record type for positions. Sometimes, it's more efficient to delegate basic administrative tasks like these to members of a group so the primary administrator can focus on other things.

A *delegated administration group* is a group of non-administrator users with limited administrative privileges. These privileges can include:

- Creating and editing users and resetting passwords for users in specified roles and all subordinate roles
- Assigning users to specified profiles
- Logging in as a user who has granted login access to an administrator
- Managing custom objects created by the primary administrator

Let's define a delegated administration group in our Recruiting app that enables its members to manage our Recruiting app's users and make adjustments to the app's custom objects without having access to all of the other data in Salesforce.

Try It Out: Define the Recruiting Manager Administration Group

We'll start by creating the delegated administration group:

1. From Setup, click **Security Controls > Delegated Administration**.
2. Click **New**.
3. In the Delegated Group Name text box, enter Recruiting App Admins.
4. In the Delegated Group detail page, click **Edit**.
5. Select the **Enable Group for Login Access** checkbox.

The **Enable Group for Login Access** option allows the delegated administrators in this group to log in as a user who has explicitly granted login access to administrators for a specific period of time. This can be useful for troubleshooting problems that might arise for the user.

6. Click **Save**.

In the Delegated Group detail page, we can use the Delegated Administrators related list to specify the users to include in this group.

7. Click **Add** in the Delegated Administrators related list.
8. In the first empty text box, enter Phil Katz, the Recruiting Manager at Universal Containers.



Note: Members of delegated administrator groups must have the “View Setup and Configuration” permission.

Each delegated administration group can have up to five members, but we're only going to include our Recruiting Manager in this group, due to the focus of our app.

9. Click **Save**.

We're back on the Delegated Group detail page. The User Administration related list lets us specify the kinds of users this group can manage.

10. Click **Add** in the User Administration related list.

Instead of selecting individual users to manage, we'll select them by their roles. For each role we select, its subordinate roles are automatically selected too. (Flip back to the [Universal Containers role hierarchy](#) on page 185 if you can't remember which roles are subordinate.) We don't want to let members of this group administer the Salesforce accounts of executives at

Universal Containers, but the group should be able to administer the Recruiting app for recruiters, directors, managers, and their subordinates.

11. In the Roles and Subordinates boxes, enter:

- Recruiter
- Director Product Management
- Director QA
- SW Dev Manager

12. Click **Save**.

The Assignable Profiles related list lets us specify the profiles this group can assign to the users they manage. Note that delegated administrators can't modify these profiles; they can only assign users to them.

13. Click **Add** in the Assignable Profiles related list.

14. In the Assignable Profiles boxes, enter Recruiter and Standard Employee.

15. Click **Save**.

The Custom Object Administration related list lets us specify the custom objects that delegated administrators of this group can administer. The delegated administrators can manage just about every aspect of the custom object, such as modifying page layouts, adding fields, and even deleting the object; however, they can't set permissions for the custom object, manage workflow and sharing for the object, and modify relationships to other objects.

16. Click **Add** in the Custom Object Administration related list.

Let's give the members of this delegated administrator group (in this case, Phil) the ability to modify the Position object. That way, if position records need another field or hiring managers request another record type in the future, Phil can handle it. (Of course, we'll also want to warn Phil that he should be careful not to delete the Position object altogether—custom object administrative rights give him that power as well!)

17. In the first empty text box, enter `Position`.

18. Click **Save**.

That wraps up the configuration of our delegated administration group! Our Recruiting app now has a delegated administrator who can provide our primary Salesforce administrator with some relief.

Try It Out: Verify that Delegated Administration Works

To see what a delegated Recruiting App administrator can and can't do, log in as Phil Katz.

1. From Setup, click **Manage Users > Users**.

Notice that the **Edit** link appears next to any user assigned to a role or subordinate role for which our delegate administrator group can manage users. The **Edit** link does not appear to users assigned to other roles, such as Cynthia Capobianco, the CEO.

You'll also see the **New User**, **Reset Password(s)**, and **Add Multiple Users** buttons are now available to Phil. Let's see what happens if Phil adds a new user.

2. Click **New User**.

The User Edit page appears. At first glance, this page looks just like the User Edit page we saw when we added users while logged in as the system administrator. If you look closely at the options available in the **Role** and **Profile** drop-down lists, though, you'll notice a difference—the options are limited to what we specified when we created our delegated administration group. For example, Phil can't create a user with an executive role, nor can he assign a user to any profile other than Recruiter or Standard Employee.

We don't need to create any more users right now, so just click **Cancel**.

The last thing to verify is Phil's ability to modify the Position object.

3. From Setup, click **Create > Objects**.

We see that the **Edit** and **Del** links are available next to the Position object. This means that Phil now has the ability to both edit and delete the Position object. Our testing is complete!

Beyond the Basics

Did you know that you can set up single sign-on between your organization and other authorized Web resources?

Say you want your employees to only have to remember one password when they sign on to the recruiting app, as well as your company website. You can work with an identity provider, exchange information with them, then configure Salesforce for single sign-on.

To find out more, see “About Single Sign-On” in the Salesforce Help.

Summing Up

This chapter has covered quite a bit of ground! We discussed the differences between object-, field-, and record-level security. We learned how profiles and roles work together to first determine the objects and tabs that a user can possibly use, and then the specific records that the user can actually access and edit. We also discovered ways to set up other profile-based features like record types to improve both our data integrity and our app's usability. Finally, we tested everything, and delegated the administration of our Recruiting app in an efficient and secure way. Now that we've got security squared away, let's go incorporate some business logic into our app with workflow rules.

Chapter 8

Collaborating with Chatter

In this chapter ...

- Introducing Chatter
- Tracking Fields on Your Objects
- Following Records
- Starting a Group or Two
- Introducing Notifications
- Introducing Actions
- Summing Up

In the last chapter, we established a security and sharing model to determine who gets to see which data in the expanded Recruiting app. We've seen how easy it is to restrict access to fields and records using the Force.com platform. Now that our application is secure, let's make it easier for recruiters, interviewers, and hiring managers to collaborate on the hiring process. With Chatter, we provide them a fun, fast, and effective way to get and share information.

In this chapter, we'll introduce some of Chatter's basic features—like feed tracking and following records—and show how Chatter makes collaboration a piece of cake.

Introducing Chatter

Chatter makes your app collaborative like never before. Once you enable Chatter for your organization, you can turn on feeds for most standard objects and all custom objects, allowing you to see real-time updates whenever anything changes. Users can post to feeds, comment on other posts, share files and links, work together on documents, follow people and records, and more. With feed tracking, users can even follow specific fields on a record; when a value for one of those fields changes, Chatter posts an update to the feed, instantly alerting everyone who follows that record. With mentions, users can mention someone to make sure that person sees their update. And with hashtags, users can add topics to posts and comments so other people can find their updates more easily.

Chatter users have their own personal profile feeds, where they can post updates and see updates from the people and records they're following. Users can also form public or private groups for more focused collaboration. Each group has its own feed, where the group members can share information, ask questions, and upload files for collaboration. Chatter makes it easy to connect with the people and information you care about most.

For more information, see “Chatter Overview” in the Salesforce Help.

Tracking Fields on Your Objects

Chatter can track field changes for most of your records and objects, including your custom objects, and automatically push that information to the record's feed. Tracking fields keeps you up to date with the latest changes on objects and records that interest you. Simply enable feed tracking on the object, then choose the fields to track.

Try It Out: Enable Feed Tracking on Positions and Job Applications

The recruiters at Universal Containers want to know when a position's status or location changes. Hiring managers want to know when a job application is submitted. Let's track these fields for them in Chatter.

To enable Chatter for your organization:

1. From Setup, click **Customize > Chatter > Settings**.
2. Click **Edit**.

3. Select **Enable**.

4. Click **Save**.

The screenshot shows the 'Chatter Settings' page. At the top, there are 'Save' and 'Cancel' buttons. A note says 'Chatter is a corporate network that lets your users work together, talk to each other, and share information, all in real time.' Below this is a section titled 'Chatter Settings' with a note: 'Turn on Chatter and Global Search features. We have given you a head start - your users may auto-follow a few people or records by default and your search box is in the header. [Learn More](#)'. An 'Enable' checkbox is checked and has a red border around it. The next section is 'Email Notifications' with a note: 'Allow users to receive personal Chatter email notifications.' An 'Allow Emails' checkbox is checked and has a blue border around it. There is also a note indicating that the 'Enable' field is required.

Figure 80: Chatter Settings

Now, let's track changes to the **Status** and **Location** fields for positions:

1. From Setup, click **Customize > Chatter > Feed Tracking**.
2. Select the Position object.
3. Select the **Enable Feed Tracking** checkbox.
4. Select the **Status** and **Location** fields. If either of these fields changes for a position, that position's feed is updated, alerting the recruiters following it.
5. Click **Save**.

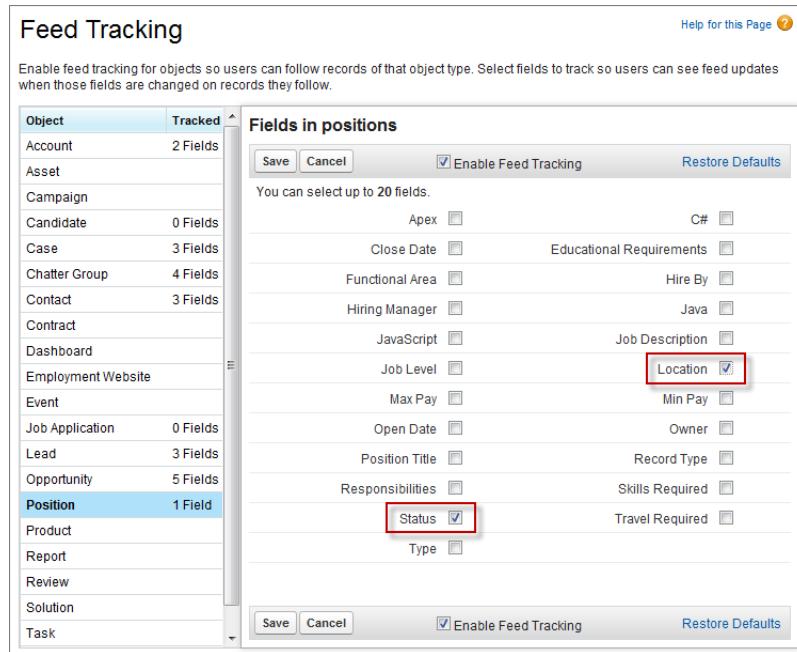


Figure 81: Feed Tracking for Positions

Similarly, the hiring manager wants to be notified when a Job Application's Status changes. Let's track that field:

1. From Setup, click **Customize > Chatter > Feed Tracking**.
2. Select the Job Application object.
3. Select Enable Feed Tracking.
4. Select the Status field. When the value changes—for instance, from New to Review Resume—the Job Application feed is updated, and hiring managers following that application are notified.
5. Click **Save**.

While we're at it, let's enable the rest of our custom objects for feed tracking. Repeat the steps you did for the Position and Job Application objects to enable Candidate, Employment Website, Job Posting, and Review for feed tracking.

Look At What We've Done

We chose to track updates to the Status and Location fields on the Position object. If people want to see field updates for a position, they can view the feed on that record's detail page. For example, when the recruiter helping to staff the Technical Publications department

looks at the Documentation Writer record, she'll see that the location has changed to San Francisco, CA.

The screenshot shows a 'Position' record detail page for 'Documentation Writer'. At the top, there's a navigation bar with links for 'Customize Page', 'Edit Layout', 'Printable View', and 'Help for this Page'. Below the navigation is a toolbar with 'Post', 'File', 'Link', and 'More' buttons. A text input field says 'Write something...'. To the right, there's a 'Share' button, a 'Follow' button with a green plus sign, and a 'Followers' section showing 'No followers.' Below the toolbar, a search bar and a 'Show All Updates' dropdown are visible. The main content area displays a post from 'Jane Smith' with the message: 'Jane Smith changed Location from San Francisco, CA to New York, NY.' Below the message are 'Comment', 'Like', and 'September 25, 2013 at 2:25 PM'. The entire message block is highlighted with a red rectangular box.

Figure 82: Location Field Update in a Position Record Feed in the Full Site

Launch Salesforce1 to see how field updates look on position records in a mobile device. From the navigation menu, tap **Show More > Positions**, and then tap **Documentation Writer**.

There are now three views, rather than the two we have seen in previous chapters. The new view, which appears first when you open a record, is the *record feed*. Record feeds appear only if feeds are enabled for the record's object type. The record feed displays any Chatter field updates for this record—for the fields that we selected when we enabled feeds on the Position object.

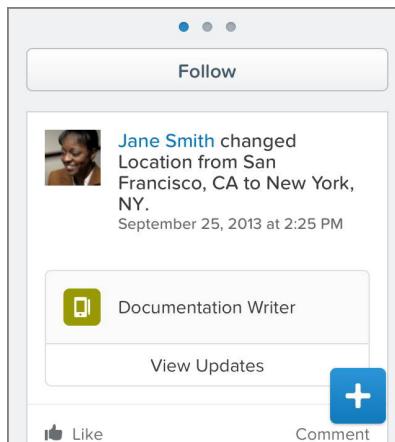


Figure 83: Location Field Update in a Position Record Feed in Salesforce1

Feed tracking is great, but who wants to keep going to the record detail page to see updates? Next, we'll show how easy it is to follow records, which brings the updates to you.

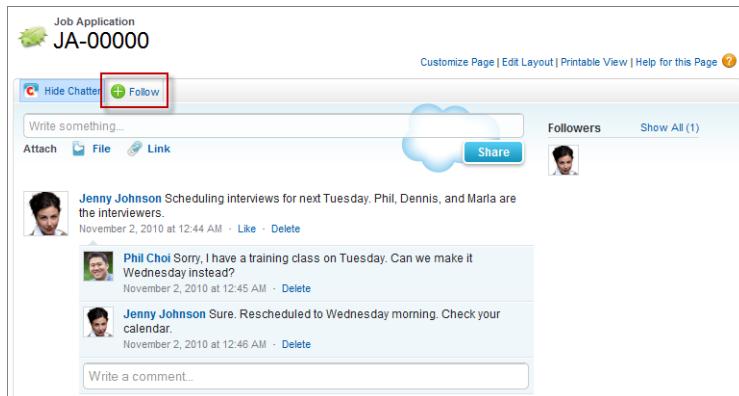
Following Records

Chatter lets you follow the users, groups, documents, and records that you're interested in. Updates on the people and information you care about are posted to your personal feed. You can also enable email alerts for actions, like someone commenting on your post, as well as get daily or weekly digests with posts and comments from your personal feed and groups you belong to.

Try It Out: Follow a Job Application Record

For our Recruiting app, we know that hiring managers want to keep track of job applications for their open positions. All they have to do is follow those records.

To try it yourself, just open the detail page for a job application and click **Follow**. It's that simple!



The screenshot shows a Chatter feed for a 'Job Application' record with ID 'JA-00000'. At the top, there are buttons for 'Hide Chatter' and '+ Follow' (which is highlighted with a red box). Below that is a text input field with placeholder 'Write something...'. Further down are buttons for 'Attach', 'File', and 'Link', followed by a 'Share' button. To the right, there are 'Followers' and 'Show All (1)' buttons, with a small profile picture next to it. The feed itself contains three comments:

- Jenny Johnson: Scheduling interviews for next Tuesday. Phil, Dennis, and Maria are the interviewers.
November 2, 2010 at 12:44 AM · Like · Delete
- Phil Choi: Sorry, I have a training class on Tuesday. Can we make it Wednesday instead?
November 2, 2010 at 12:45 AM · Delete
- Jenny Johnson: Sure. Rescheduled to Wednesday morning. Check your calendar.
November 2, 2010 at 12:46 AM · Delete

At the bottom of the feed, there is a text input field labeled 'Write a comment...'.

Figure 84: Following a Job Application Record

All tracked field updates, as well as other users' posts and comments on the records you're following, are posted to your personal feed. Use Chatter to connect the right people to the right records, and start collaborating in real time on the hiring process.

Beyond the Basics

Did you know you can use Chatter to collaborate outside of your browser?

Say you want to keep an eye on Chatter updates, but you can't log in through a browser. For example, you're creating a slide deck on your laptop and there's not enough screen room for your browser. In these cases, it helps to have a Chatter client app installed.

Chatter Desktop is a Chatter client app that integrates your computer with Chatter. Chatter Desktop makes collaboration easier than ever. Want alerts when people you're following post something new? Just install Chatter Desktop and watch it display pop-up notifications for each update. Need to share a file with your coworkers? Just drag it to the Chatter Desktop interface.

To install Chatter Desktop:

1. At the top of any Salesforce page, click the down arrow next to your name. From the menu under your name, select **My Settings** or **Setup**—whichever one appears.
2. From the left pane, select one of the following:
 - If you clicked **My Settings**, select **My Settings > Desktop Add-Ons > Chatter Desktop**.
 - If you clicked **Setup**, select **Desktop Integration > Chatter Desktop**.

Starting a Group or Two

Now that you've enabled Chatter, encourage people to collaborate by creating public and private focus groups around common interests. For example, you can create groups for the sales, marketing, product development teams, and so on.

Groups are a great way for users to share information and files and ask questions. Instead of sending out a mass email, group members can post questions on the group's page; when a question is answered, it's answered for all group members. Groups give instant access to subject matter experts.

Try It Out: Create a Group

Chatter is all about sharing information and collaboration. Now that you've turned on feeds, one of the best ways to get people to collaborate is to create groups around common interests. Let's create a private collaboration group for the recruiters so they can collaborate on recruiting efforts and share information within the group in a secure way.

1. In Chatter, click **Groups > New Group**.
2. Use a descriptive name for your group—for example “Recruiting Team”. You also have the option of adding a short description of the group.
3. Select **Private** if you want to create a group for just the recruiters. If you don’t make the group private, any Chatter user in your organization can join. Similarly, because customers are users from outside your company, you probably don’t want to allow them to join this particular group. If it makes sense to allow customers at a later point, you can always do so by changing the group’s settings.
4. Click **Save**.

The screenshot shows the 'New Group' page in Salesforce. At the top left is a 'Group Edit' icon and the title 'New Group'. At the top right are 'Help for this Page' and a question mark icon. Below the title is a 'Basic Information' section with fields for 'Group Name' (set to 'Recruiting Team'), 'Owner' (set to 'Owner'), and a 'Description' box containing the text 'This is a private group for recruiters.'. Below this is a 'Group Access' section with two radio button options: 'Public' (unchecked) and 'Private' (checked). Under 'Private', there is a checked checkbox for 'Allow Customers' with the note 'You can invite customers to this group.' At the bottom of the form are 'Save' and 'Cancel' buttons.

Figure 85: Creating a Private Collaboration Group

You’ve created the group. Now you can simply add or invite members—in this case, recruiters—and maybe upload a snazzy picture for the group.

Introducing Notifications

For users who are frequently away from their desks, knowing when something in Salesforce needs their attention is incredibly important. If they use Salesforce1 on their mobile device, users can get notifications when certain events happen, such as when they receive approval requests or when someone mentions them in Chatter.

Two types of notifications can appear to Salesforce1 users.

- *In-app notifications* keep users aware of relevant activity while they're using Salesforce1. By tapping , a user can view the 20 most recent notifications received within the last 90 days.
- *Push notifications* are alerts that appear on a mobile device when a user has installed the Salesforce1 downloadable app but isn't using it. These alerts can consist of text, icons, and sounds, depending on the device type. If an administrator enables push notifications for your organization, users can choose individually whether to receive push notifications on their devices.



Note: Some notifications include text that your users enter in Salesforce. To ensure that sensitive information isn't distributed through a third-party service without proper authorization, push notifications include minimal content (such as a user's name) unless you enable full content in push notifications.

For example, suppose an in-app notification reads: "Allison Wheeler mentioned you: @John Smith, heads-up! New sales strategy for Acme account." By default, the equivalent push notification would be "Allison Wheeler mentioned you." However, if you enabled full content in push notifications, this push notification would include the same (full) content as the in-app notification.

By enabling the option to include full content in push notifications, you're agreeing on behalf of your company to the terms and conditions displayed when you save the setting. For details, see Notifications Overview in the Salesforce help.

Try It Out: Enable Notifications

Let's make sure notifications are enabled, so we can trust that users will know when someone comments on one of their posts or mentions them somewhere in Salesforce.

1. From Setup, click **Mobile Administration > Notifications > Settings**.
2. Select the notifications you want your Salesforce1 users to receive.
3. If you're authorized to do so for your company, select **Include full content in push notifications**.
4. Click **Save**. If you checked the box to include full content in push notifications, a pop-up appears displaying terms and conditions. Click **OK** or **Cancel**. By enabling this option, you're agreeing to the terms and conditions on behalf of your company. For details, see Notifications Overview in the Salesforce help.

Look At What We've Done

As we did when we tested user access in [Securing and Sharing Data](#) on page 149, we'll have to log in as multiple users to test notifications.

First, let's create some Chatter activity.

1. If you aren't already, log in to Salesforce as Ben Stuart.
2. Open Mario Ruiz's profile. You can do this by entering his name in the global search box and clicking the recent record that appears below the box.
3. In the text box, enter Can you share the candidates and applications for the SW Engineer position with me and @Melissa Lee? Thanks!, and click **Share**.
4. Log in as Melissa Lee, and comment on that post: Thanks in advance, @Mario Ruiz!.

Now let's verify that our user received the right notifications in Salesforce1.

1. Log in to Salesforce1 as Mario Ruiz. Tap **!**, and verify that you have two new in-app notifications: one from when Ben posted to your profile, and one from when Melissa mentioned you.

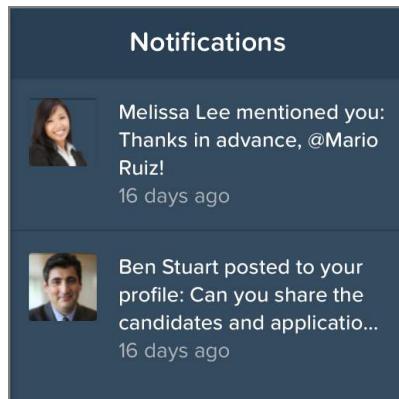


Figure 86: Notifications for Mario Ruiz

2. Log in to Salesforce1 as Ben Stuart. Verify that you have one new in-app notification from when Melissa commented on your post.

Introducing Actions

Now that we've turned on Chatter, we've seen what it can do for users who are communicating with each other directly. There's one more feature that takes advantage of Chatter to save your users time in their day-to-day tasks: *publisher actions*, also known as simply *actions*. The publisher actions feature lets you create actions and add them to the Chatter publisher on the home page, on the Chatter tab, in Chatter groups, and on record detail pages. Actions also appear in the action tray in Salesforce1.

Actions make it easier for your users to work directly from wherever they are in the app.

For example, Megan Smith no longer has to go to the navigation menu, open the Contacts item, click New, and specify which account her new contact should be associated with. With actions, she can create a new contact from that account's feed by simply clicking—or tapping—the associated action in the publisher. Actions do the work for her.

In the Chatter publisher, we already have a handful of *default actions*.

- *Standard actions* are actions that are automatically included when Chatter is enabled—like Post, File, Link, and Poll.
- *Create actions* are actions that let users create records—like New Contact, New Opportunity, and New Lead. They respect your validation rules and field requiredness, and you can choose which fields display for each action.
- *Log a call actions* let users record the details of phone calls or other customer interactions. These call logs are saved as completed tasks.
- *Question actions* let users ask and search for questions about the records they're working with.
- *Update actions* let users make changes to a record through its detail page

Most of these out-of-the-box actions aren't very helpful for users of our recruiting app, but we can easily customize this feature. In this section, we'll be personalizing the actions that appear for our users throughout the full site and Salesforce1.

With the platform, we can declaratively create three types of actions.

- Create actions
- Log a call actions
- Update actions

We can't create standard actions, but we can control whether they show up or not, as well as what order they show up in. For create and log a call actions, we can create either global or object-specific actions. For update actions, we can only create object-specific actions.

Try It Out: Create a Global Action

Global actions let users do tasks such as creating records or recording call details directly from the publisher on the Home tab, the Chatter tab, the Salesforce1 feed, and Chatter groups. You can also add global create actions to record detail pages. Global create actions, don't automatically establish a relationship between the record that's created and any other record. For example, if Ben Stuart uses a global create action on an account to create a contact, the action doesn't automatically associate the new contact with the account. However, object-specific actions do. We'll get to those later.

Let's create a global action.

1. From Setup, click **Create > Global Actions > Actions**.
2. Click **New Action**.
3. For **Action Type**, leave Create a Record selected.
4. For **Target Object**, select Position.
5. For **Record Type**, select Standard Position. We'll create an action for IT positions after we finish this action.
6. Leave **Label** blank for now.
7. For **Standard Label Type**, select New "Record Type". Notice that **Label** no longer appears. By selecting a value other than --None--, we're telling Salesforce to automate the label of this action. The standard label type we selected uses the record type we selected to form the label: New Standard Position.
8. For **Name**, enter `New_Standard_Position`.
9. Enter a description.
10. Click **Save**.

Now let's configure the fields that will show up in the publisher when a user selects this action.

Introducing Action Layouts

Just like we can customize object record pages with page layouts, we can customize actions using *action layouts*. Using the action layout editor, we can select the fields that will show up when a user clicks on an action.

The action layout editor has a palette on the upper section of the screen, and the action layout is below it. The palette contains fields from the action's target object that you can add to the action layout. However, the following field types aren't supported, and won't show up in the palette:

- Record type fields
- Read-only field types such as roll-up summary, formula, and auto-number fields
- Read-only system fields such as `Created By` or `Last Modified By`



Note: If you convert a field's type from one that is supported for actions to a type that isn't supported, the field is removed from the action layout. If you convert the field back to a supported type without changing the action layout, the field is automatically added back onto the layout. If you've edited the layout and then convert the field back to a supported type, you must add the field back onto the layout manually.

Rich text area fields are supported only when you add them to one-column layouts, or as fields that span both columns in two-column layouts. If you add a rich text area field to only one column in a two-column layout, it appears as a plain text area, as there's not enough space to display the full rich text editor.

Try It Out: Customize an Action Layout

We want to minimize the number of fields on the action layout, so that users can focus on the most important information. For optimal usability, eight fields is a good limit. Adding more than 20 fields can severely impact user efficiency. We'll set predefined field values for `Status`, `Open Date`, and `Hire By`, so we won't add those fields to the layout.

1. Drag the following fields into the first column of the action layout.
 - Type
 - Min Pay
 - Functional Area
2. Drag the following fields into the second column.
 - Hiring Manager
 - Location
 - Max Pay
 - Job Level

Position Title *	Sample Position Title	Hiring Manager	Sample User
Type	Sample Type	Location	Sample Location
Min Pay	\$123.45	Max Pay	\$123.45
Functional Area ➔	Sample Functional Area	Job Level ➔	Sample Job Level

Figure 87: Layout for New Standard Position Action

3. Click **Save**.

Try It Out: Add Predefined Field Values

A few fields still need to be filled out: Status, Open Date, and Hire By. These fields represent important details, but we don't need our users to fill them out from the publisher. We know that every new position record should have a Status of New Position, an Open Date of the current date, and a Hire By of 90 days after the Open Date. Let's take care of those with predefined field values now from the detail page for the New Standard Position global action.

1. In the Predefined Field Values related list, click **New**.
2. For the Field Name drop-down list, select **Status**.
3. For the specific value, select **New Position**.
4. Click **Save**.

Field Information	
Target Object	Position
Field Name	Status
Field Type	Picklist
Specify New Field Value	
A specific value	New Position

Figure 88: Setting the Predefined Value for a New Position's Status

Now every position created using this global action will automatically have a Status of New Position. Users creating a position from the publisher don't have to worry about selecting that field. They can focus on the variable information. Use the same steps to create predefined field values for Open Date and Hire By using this table.

Table 39: Additional Predefined Field Values

Field Name	New Field Value
Open Date	TODAY()
Hire By	TODAY() + 90

That's it! Now let's create a few more global actions. We currently have one for creating new standard positions, but what about IT positions? And our recruiters would also appreciate being able to easily create new candidate and job application records. Let's get busy!

Try It Out: Create More Global Actions

We'll start with a global action to create new IT positions. Repeat all the steps you completed to create the New Standard Position global action, but set the record type to IT Position. When that's done, use the following table to create the other two global actions.

Global Action	Action Information	Action Layout
New Candidate	<ul style="list-style-type: none"> Action Type: Create a Record Target Object: Candidate Standard Label Type: New "Record" Name: New_Candidate 	<ul style="list-style-type: none"> Column 1: First Name Email Education Column 2: Last Name Years of Experience City
New Application	<ul style="list-style-type: none"> Action Type: Create a Record Target Object: Job Application Label: New Application Standard Label Type: --None-- 	<ul style="list-style-type: none"> Candidate Position Cover Letter

Our New Candidate action doesn't need any predefined field values, since we can't predict the values of any of the fields. The New Application action, however, does. We know that every job application created from the publisher should be marked as new. So now create a predefined field value for New Application, automatically setting the Status field to New.

Introducing Global Publisher Layouts

Global publisher layouts determine which actions appear in the publisher in various pages throughout Salesforce, including the Home tab, Chatter tab, and Chatter group detail pages in the full site, as well as the feed in Salesforce1. Global publisher layouts can include only global actions.



Note: Chatter groups without customers display the global publisher layout by default, unless you override it with a customized group publisher layout. In Chatter groups with customers, the publisher displays only standard actions, such as Post, File, Link, and Poll.

Now that we've created all the global actions we need for our recruiters, let's add them to a global publisher layout.

Try It Out: Customize a Global Publisher Layout

Before we begin, let's make sure we can add our actions to a global publisher layout. From Setup, click **Customize > Chatter > Settings**, and make sure **Enable Publisher Actions** is selected.

Now let's get to that layout.

1. From Setup, click **Create > Global Actions > Publisher Layouts**.

Like page layouts and compact layouts, each global publisher layout can be assigned to a user profile. Since our recruiters have different needs from the rest of the company, let's create a custom layout with actions tailored to their typical tasks. We'll assign that layout to the Recruiter profile so our standard employees, who don't often need to do things like creating candidates or job applications, aren't bogged down by irrelevant actions.

2. Click **New**.
3. Select **Global Layout** as the **Existing Publisher Layout** to clone.
4. For **Publisher Layout Name**, enter **Recruiter Layout**.
5. Click **Save**.

Let's get rid of the actions that are more relevant to our sales representatives than to our recruiters.

1. Drag **New Contact**, **Log a Call**, **New Opportunity**, **New Case**, and **New Lead** back to the palette.
2. Drag **New IT Position**, **New Standard Position**, **New Application**, and **New Candidate** to the layout, so that they appear after **Poll**.
3. Click **Save**.

Now that we have a working publisher layout for recruiters, let's make sure they can see it by assigning the new layout to the Recruiter profile.

1. Click **Publisher Layout Assignment**.
2. Click **Edit Assignment**, and change the publisher layout for the Recruiter profile to Recruiter Layout.
3. Click **Save**.

Look At What We've Done

Before we move on to create the other type of action—object-specific—let's make sure our global actions are working as expected.

To test our changes, log in to Salesforce as Mario Ruiz, and verify that Mario can create an IT position, a standard position, a candidate, and a job application from the global publisher. Check it out in Salesforce1 as well.

1. Log in to Salesforce as our recruiter, Mario Ruiz.
2. In the publisher on the Home tab, click **More**. The bottom four options should be **New IT Position**, **New Standard Position**, **New Application**, and **New Candidate**.
3. Click **New IT Position**. The fields that appear should match what we configured in the action layout.

The screenshot shows the Chatter Publisher interface for creating a new IT position. The form includes fields for Position Title (QE Engineer II), Hiring Manager (Ben Stuart), Type (Full Time), Location (San Francisco, CA), Min Pay (70000), Max Pay (100000), Functional Area (Information Technology), and Job Level (IT-200). A green 'Create' button is at the bottom.

Figure 89: Fields for a New IT Position in the Chatter Publisher

- Fill in the fields, and click **Create**.

As soon as we click **Create**, a feed item is created.

**Figure 90: Feed Item for New QE Engineer II Position**

- Click the position name for the new IT position.
- Verify that our predefined field values have values assigned to them: Status should be New Position, Open Date should be today, and Hire By should be 90 days from today.
- Return to the Home tab, and repeat these verification steps for the New Standard Position, New Application, and New Candidate actions.

Introducing Object-Specific Actions

But wait! That's not all. We can also create *object-specific actions*.

Like global actions, object-specific actions let users create records or log details about calls or other interactions. The key difference is that you can only add these actions to record detail pages, since they are automatically associated with a specific object.

When a user creates a record by using an object-specific create action, a feed item for that record appears:

- In the feed for the record on which the new record was created
- As the first entry in the feed for the new record
- In the Chatter feed of the user who created the record
- In the user profile feed for the user who created the record
- In the Chatter feed of any users who follow the record on which the record was created
- In the Chatter feed of any users who, through custom triggers or auto-follow rules for new records, automatically follow the new record

Try It Out: Create an Object-Specific Action

Object-specific actions will be very useful for our recruiters. If we add an action to the position record to create a new job application, users won't have to specify the position that new application is associated with. The platform will just know to associate it with the position record. Let's get to it! More efficiency is just around the corner.

1. From Setup, click **Create > Objects**, and then click **Position**.
2. In the Buttons, Links, and Actions related list, click **New Action**.

This should look familiar. The fields we need to fill out to create an object-specific action are almost identical to the ones we filled out for a global action. There's just one new field: **Object Name**. Because we are creating a new action on the Position object, the platform knows that the **Object Name** should be **Position**. This means that this action can only be added to page layouts for the Position object. Now let's fill in the rest of the fields.

3. For **Action Type**, select **Create a Record**.
4. For **Target Object**, select **Job Application**.
5. For **Label**, enter **New Application**.
6. Leave **Standard Label Type** set to its default value.
7. Click **Save**.

As soon as we save, we see the action layout editor for our new action. There are only a few fields on the Job Application object, so it should be easy to determine which fields we want to add to the layout. Since any job applications created using this action will be automatically related to the position the user has open, we don't need to add the **Position** field to the layout. **Owner** will be automatically assigned to the user who creates the record. As for **Status**, we can trust that any job applications created should be **New** by default, so we can take care of that field with a predefined field value.



Note: You might get a message, warning you that there are required fields missing from the layout. In this case, that required field is Position, but don't worry! The platform will automatically associate the job application with the position we create it on, since this action will only be accessed from a position record.

That leaves only two fields, so add Candidate and Cover Letter to the layout, and save the layout.

Now let's assign a predefined field value to Status before we forget.

8. From Setup, click **Create > Objects**, and select **Position**.
9. In the Buttons, Links, and Actions related list, click **New Application**.
10. In the Predefined Field Values related list, click **New**.
11. For **Field Name**, select **Status**.
12. For the specific value, select **New**.
13. Click **Save**.

Try It Out: Create More Object-Specific Actions

Now that we've had some practice creating object-specific actions, let's add a few more.

Object	Action Information	Action Layout
Position	<ul style="list-style-type: none"> • Action Type: Create a Record • Target Object: Job Posting • Label: New Posting • Standard Label Type: --None-- 	<ul style="list-style-type: none"> • Employment Website
Candidate	<ul style="list-style-type: none"> • Action Type: Create a Record • Target Object: Job Application • Label: New Application • Standard Label Type: --None-- 	<ul style="list-style-type: none"> • Position • Cover Letter
Employment Website	<ul style="list-style-type: none"> • Action Type: Create a Record 	<ul style="list-style-type: none"> • Position

Object	Action Information	Action Layout
	<ul style="list-style-type: none"> • Target Object: Job Posting • Label: New Posting • Standard Label Type: --None-- 	
Job Application	<ul style="list-style-type: none"> • Action Type: Create a Record • Target Object: Review • Standard Label Type: New “Record” • Name: New_Review 	<ul style="list-style-type: none"> • Rating • Assessment

Just one of these actions needs a predefined value, so let's take care of that now.

1. From Setup, click **Create > Objects**, and then click **Candidate**.
2. In the Buttons, Links, and Actions related list, click **New Application**.
3. Create a predefined field value that automatically sets Status to New.

Try It Out: Assign Object-Specific Actions to Page Layouts

Unlike global actions, there isn't a new type of layout for object-specific actions. There is, however, a special place for them on every page layout. The Publisher Actions section of the page layout editor looks and acts much like the editor for global publisher layouts. All we have to do is drag actions from the palette and drop them into the right spot.

1. From Setup, click **Create > Objects**, and then click **Position**.
2. In the Page Layouts related list, click **Edit** next to IT Position Layout.

Notice that the Publisher Actions section is empty. Currently, this page layout is using the global publisher layout assigned to each user's profile. Since we created object-specific actions, we can't add them to the global publisher layout. That's okay! In order for our new actions to appear in the publisher on position records, we just need to override the global publisher layout.

3. In the Publisher Actions area, click **override the global publisher layout**.

When we override the global publisher layout, the platform automatically provides some actions: standard Chatter actions like Post and File, as well as Mobile Smart Actions. *Mobile smart*

actions are a set of pre-configured actions, just like default actions. However, they are only available in Salesforce1. Mobile smart actions appear as a single action element in the page layout editor, but appear in the actions tray in Salesforce1 as distinct create actions, which allow users to create records directly in the feed. For custom objects like ours, these actions are New Task, New Contact, Log a Call, New Group, New Opportunity, New Case, and New Lead. We can't change which actions are included as part of a mobile smart actions bundle, so we're going to remove it and manually add actions that are relevant to this object. For more information on mobile smart actions, and a list of what the mobile smart action element on each supported object expands to include, see "Mobile Smart Actions Overview" in the Salesforce Help.

4. In the palette, click **Actions**.
5. Drag Mobile Smart Actions back to the palette.
6. Drag actions from the palette to the Publisher Actions section so that they're in this order.
 - New Application
 - New Candidate
 - New Posting
 - Post
 - New Task
 - New Note
 - File
 - Link



Note: We have some duplicates, since we created a "New Application" global action and a "New Application" object-specific action. The Force.com platform helps us out with this—using the hover text over the actions. One of the actions has a name of "New_Application," and the other has a name of "Position__c.New_Application". Our object-specific action is the second. The name indicates that it's directly associated with the position object using the Position__c prefix. That means that this action can only be added to a position page layout.

7. Click **Save**.

A screenshot of the Salesforce1 page layout editor. At the top, there's a green header bar with the title "Position Sample". Below it is a section titled "Publisher Actions" with a dotted border. Inside this section, there are eight rectangular buttons arranged horizontally, each representing an action: "New Application", "New Candidate", "New Posting", "Post", "New Task", "New Note", "File", and "Link".

Figure 91: Customizing the Actions Available on a Standard Position Record

8. Click **IT Position Layout** at the top of the palette, and from the drop-down list select **Position Layout**.
9. Customize the Publisher Actions section for the Position Layout so that it matches the IT Position Layout.

Now let's add our object-specific actions for candidates, employment websites, and job applications to those page layouts. Go to each page layout, and add the actions in the order indicated in this table.

Table 40: Summary of Publisher Actions in Page Layouts

Object	Page Layout	Actions
Candidate	Candidate Layout	<ul style="list-style-type: none"> • New Application • New Task • New Note • Post • File • Link
Employment Website	Employment Website Layout	<ul style="list-style-type: none"> • New Posting • New Task • New Note • Post • File • Link
Job Application	Job Application Layout	<ul style="list-style-type: none"> • New Review • New Task • New Note • Post • File • Link

Look At What We've Done

Now that we've created all of our object-specific actions and assigned them to the associated page layouts, let's make sure it's working in the Salesforce1 app.

1. Launch Salesforce1, and log in as Mario Ruiz.
2. Open a position record by tapping **Positions** in the navigation menu and tapping one of your recent positions.
3. Tap **+** to open the publisher, and tap **New Application**.
4. Select a candidate, enter text for the cover letter, and then tap **Submit**.

We didn't have to specify that the new job application should be related to the position we have open, but the application appears in the position's Job Applications related list anyway. This is the power of object-specific actions.

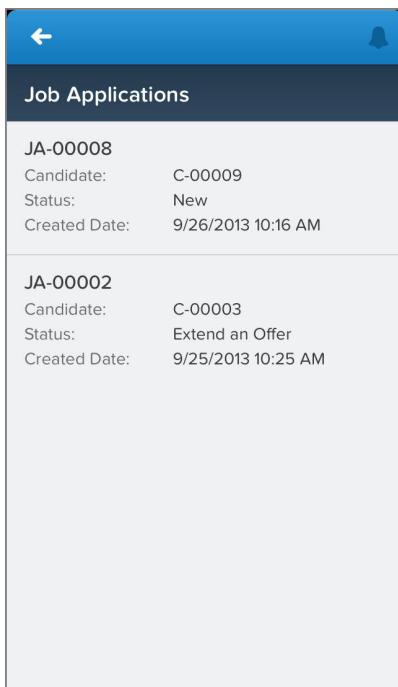


Figure 92: A Position's Related Job Applications

5. From the position's related information page, tap **Job Applications** to see the items in that related list.
6. Tap the related item associated with our new job application to open that record.
7. Verify that the predefined field value we set is working as designed: Status should be set to New, even though we didn't manually select that when we created the record.

Now let's verify the other object-specific actions. From the publisher, make sure that:

- From a position record, we can create a new candidate.

- From a position record, we can create a new job posting. The posting is automatically associated with the position.
- From a candidate record, we can create a new job application. The application is automatically associated with the candidate, and its status is New.
- From an employment website record, we can create a new job posting. The posting is automatically associated with the employment website.
- From a job application record, we can create a new review. The review is automatically associated with the job application.

Summing Up

We've added Chatter and actions to our Recruiting app, but we've barely scratched the surface. With Chatter, you give your users the power to stay on top of everything that's happening in your company, and you enable them to easily collaborate and share information. With actions, you let your users more easily create and relate records. And because it's part of the Force.com platform, you can incorporate real-time feed updates, user profiles, groups, and more into all of your custom applications.

If you dig a little further, you can learn how to programmatically add posts and comments, add feeds to custom pages, and even expose actions for integration with external systems.

These advanced subjects are beyond the scope of this book, but you can find out more on the Chatter Developer Resource page at

developer.salesforce.com/page/An_Introduction_to_Salesforce_Chatter.

Chapter 9

Using Custom Workflow and Approval Processes

In this chapter ...

- Introducing Workflow
- Workflow in Our Recruiting App
- Creating Workflow Rules That Assign Tasks
- Creating a Workflow Rule That Updates Fields
- Creating a Workflow Rule That Sends Email Alerts
- Introducing Approvals
- Summing Up

Robust application? Check. Secure data access? Check. Fast, fun, and collaborative? Check! Our hiring team at Universal Containers has never been more productive. The last chapter demonstrated how easy it is to collaborate in real time with Chatter. Now it's time to find ways to make our app more powerful.

Up to this point, we've created little more than a glorified database—it holds the information we need and lets us search for records based on various criteria, but it doesn't help our recruiters and hiring managers do their jobs more effectively. There's no automation that lets a recruiter know when the status of a candidate has changed or when a new position has been entered into the system. Chatter will let them know about the records they're following, but we want to build automation into our app to keep the processes moving forward.

Once again, the Force.com platform helps us out with more built-in functionality. In this case, the tools that we'll use to solve our process automation problem are called *workflow* and *approval processes*. We'll take a look at the various ways that we can use workflow first, and then we'll tackle an approval process at the end of the chapter.

Introducing Workflow

Workflow is a Force.com platform business-logic engine that allows us to define rules to automate certain actions, such as sending email alerts, assigning tasks, or updating field values. Any time that changes to a record meet the conditions in a workflow rule, the platform automatically performs the actions associated with the rule.

For example, let's say Ben Stuart, a software development manager, has decided to extend an offer to Ethan Tran, a bright young candidate who's interested in the Software Engineer position. At Universal Containers, it's a recruiter's job to extend offers, but in this case, Mario Ruiz, the recruiter responsible for the Software Engineer position, doesn't know whether or not Ben has made a decision unless Ben emails or calls him directly.

Instead of relying on Ben to remember to tell Mario, we can set up a simple workflow that triggers the assignment of the appropriate task whenever the status on a job application record is set to Extend an Offer or Rejected. As soon as Ben changes the status of the candidate's job application, workflow creates the appropriate task and sends Mario a notification email, as shown in the following diagram.

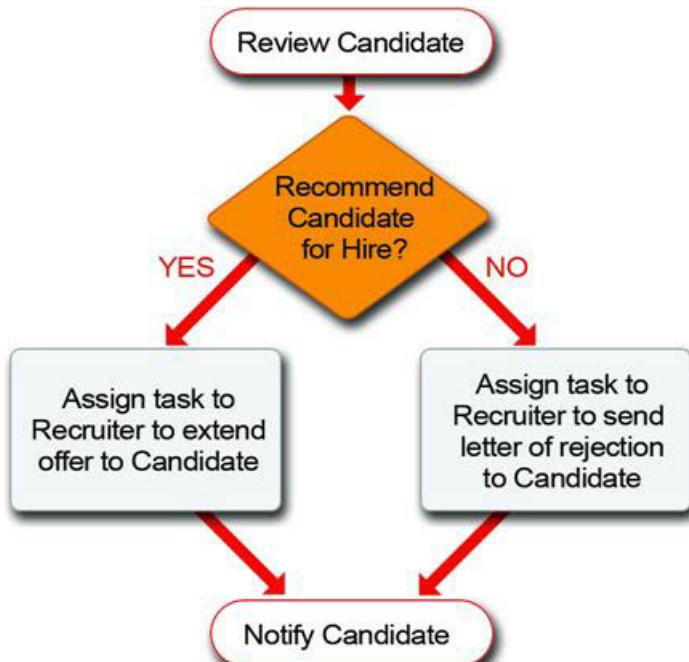


Figure 93: Automatically Assigning a Task to a Recruiter Using Workflow

Pretty powerful, isn't it? In general, if we can come up with a standard rule that specifies when a particular event should happen, we can make it happen automatically with workflow. Workflow is one of the secret ingredients that's going to transform our Recruiting app from a glorified database into a fully functional tool that everyone finds useful.

Now that we've got a general idea of what workflow's all about, let's take a closer look at the individual components that make up workflow: rules and actions.

Introducing Workflow Rules

In general, a *workflow rule* is the main container for a set of workflow instructions. It includes the criteria for when the workflow should execute, as well as the specific actions, such as tasks, email alerts, and field updates, that should execute when the criteria for that rule are met.

Every workflow rule must be based on a single object you choose when you define the rule. This object influences the fields that are available for setting the workflow rule criteria.

For example, if we define a workflow rule for the Job Application object, we'll be able to set the rule criteria based on the values of fields like Job Application Number and Status. We can also set the rule criteria based on standard fields, such as Record Owner or Created Date, as well as fields based on the currently active user when a rule is evaluated, such as their Role or Time Zone.

We'll look at all the ways that we can set the workflow rule criteria a little later. For now, just understand that the platform makes it very easy to create detailed workflow rules that target specific situations.

Introducing Workflow Actions

When a workflow rule is triggered, its associated actions are executed.

Workflow Tasks

A *workflow task* assigns a task to a user according to a particular template.

Just as in Microsoft Outlook, tasks include information about something that needs to be done by a certain time, such as making a telephone call or returning a library book. Assigned tasks appear in a user's My Tasks related list on their Home tab and generate reminder messages that pop up when a user logs in.

When we define a workflow task, we provide default values for the Assignee, Subject, Status, Priority, and Due Date fields for tasks that are generated by an associated

workflow rule. We can also make sure that a notification email is sent to the assignee when a task is automatically generated.

Workflow Field Updates

A *workflow field update* changes the value of a particular field on the record that initially triggered the workflow rule.

Cross-object field updates are also available for changing the values of fields on a related master record. For details and limitations, see “Understanding Cross-Object Field Updates” in the Salesforce Help.

Workflow Email Alerts

A *workflow email alert* sends an email according to a specified email template. Unlike workflow tasks, which can only be assigned to users of the app, workflow alerts can be sent to any user or contact, as long as they have a valid email address.



Note: Additional actions are available. For example, a *workflow outbound message* sends data to an external Web service, such as another application in the cloud. Outbound messages are used primarily with application programming interfaces, so we won't be using them in this chapter. For information about more actions, see “Workflow and Approvals Overview” in the Salesforce Help.

A workflow rule can include any combination of actions when the rule is triggered. For example, one rule might send out an alert and update two fields on a particular record. The action that one workflow rule takes can also trigger the execution of another workflow rule.

Workflow in Our Recruiting App

Now that we've oriented ourselves to the different components involved with workflow, see how we can use workflow to help us build out the requirements that we talked about in [About the Sample Recruiting App](#) on page 19. Then we'll spend time implementing the rules that we come up with here.

We've already talked about one instance where workflow will give us a big advantage: automatically assigning a task to a recruiter when the status of a job application record changes to Reject or Extend an Offer. This will be a great start, but what else can we do?

If we look back at our last chapter on security and sharing, recall that we wanted to grant both recruiters and hiring managers permission to create new positions, but that ultimately we always wanted a recruiter to own those records because filling them is the recruiter's job responsibility. We hinted in the security and sharing chapter that we could accomplish this with workflow,

and indeed we can! We'll simply need to use a workflow field update to change the record owner of a position record to a recruiter if it was originally created by a hiring manager. To prevent a single recruiter from getting overloaded with all these additional positions, we'll also use another platform feature, *queues*, to divvy up the orphaned position records fairly. We'll place the record in a queue of other position records without owners, and then let individual recruiters claim the positions they want.

Let's also think about how position availability is advertised throughout Universal Containers. Like many organizations, Universal Containers prefers to fill positions with employee referrals, but employees often aren't aware of which positions are currently open. We can use a workflow alert to automatically send email to every employee whenever a new position opens up. This way employees learn about positions as they become available and can immediately think of friends and family members who might be interested.

Sound good? While there are probably many more ways to use workflow to build a killer on-demand Recruiting app in the cloud, let's stick with these three for now since they'll give us a good example of the main types of workflow actions that are available. To summarize what we'll be building:

1. A workflow task that assigns a task to a recruiter when the status of a job application changes to Rejected or Extend an Offer
2. A workflow field update that reassigns ownership of a position that's created by a hiring manager to a queue of position records without owners, so that individual recruiters can claim ownership of the positions they want
3. A workflow alert that sends an email to every employee when a new position is created

Now let's get started!

Creating Workflow Rules That Assign Tasks

For our first use of workflow, we want to create two rules: one that assigns a “Send Rejection Letter” task to the relevant recruiter whenever the `Status` field of a job application record is set to `Rejected`, and one that assigns an “Extend Offer” task to the relevant recruiter whenever the `Status` field of a job application record is set to “`Extend an Offer`.” Let's start with the “Send Rejection Letter” workflow rule.

Try It Out: Create the “Send Rejection Letter” Workflow Rule

To make this rule entirely functional, we'll need to define both a workflow rule, which specifies the criteria for when the rule should be executed, and a workflow task that includes the “Send Rejection Letter” task template. Although we can define workflow components in any order, let's start with defining the workflow rule itself. It'll save us a couple of clicks a little later when we define the rule's associated workflow task.

1. From Setup, click **Create > Workflow & Approvals > Workflow Rules**.
2. If you see an introductory splash page, simply click **Continue**.
3. Click **New Rule**.

The first thing we need to do is select the object that will be associated with our workflow rule. As we talked about earlier, every workflow rule must be associated with a single object to determine the fields that we can use to set criteria. Since we need to trigger this workflow rule when the Status field of a job application record is set to “Reject,” we need to select Job Application here.

4. In the Object drop-down list, choose Job Application, and click **Next**.

Now it's time to set our workflow rule details.

5. In the Rule Name text box, enter **Send Rejection Letter**.
6. In the Description text box, enter **Send a rejection letter when a hiring manager changes the status of a job application to Rejected**.

Now use the Evaluation Criteria area to specify when this rule should be evaluated. The options are:

Evaluate the rule when a record is:	Description
created	<p>Evaluate the rule criteria each time a record is created. If the rule criteria is met, run the rule. Ignore all updates to existing records.</p> <p>With this option, the rule never runs more than once per record.</p>

Evaluate the rule when a record is:	Description
created, and every time it's edited	<p>Evaluate the rule criteria each time a record is created or updated. If the rule criteria is met, run the rule.</p> <p>With this option, the rule repeatedly runs every time a record is edited, as long as the record meets the rule criteria.</p> <p> Note: You can't add time-dependent actions to the rule if you select this option.</p>
created, and any time it's edited to subsequently meet criteria	<p>(Default) Evaluate the rule criteria each time a record is created or updated.</p> <ul style="list-style-type: none"> For a new record, run the rule if the rule criteria is met. For an updated record, run the rule only if the record is changed from not meeting the rule criteria to meeting the rule criteria. <p>With this option, the rule can run multiple times per record, but it won't run when the record edits are unrelated to the rule criteria.</p> <p>For example, suppose that for an opportunity record to meet the rule criteria, the opportunity probability must be greater than 50%. If you create an opportunity with a probability of 75%, the workflow rule runs. If you edit that opportunity by changing the probability to 25%, the edit doesn't cause the rule to run. If you then edit that opportunity by changing the probability from 25% to 75%, the edit causes the rule to run. With this last edit, the rule runs because the record is changed from not meeting the rule criteria to meeting the rule criteria.</p>

Since we don't want to assign duplicate tasks to a recruiter every time the record is saved, we'll keep the default option.

- Under "Evaluate the rule when a record is:", select **created, and any time it's edited to subsequently meet criteria**.

To finish up defining the rule, we need to specify the conditions that will trigger execution of the rule's associated actions. We can do this by defining a set of criteria that trigger the workflow rule when met, or we can create a formula that triggers the workflow rule if it evaluates to

True. While creating a formula provides more flexibility, setting the criteria is easier. For this rule, we can achieve our objective by setting the criteria, so let's do that.

Every workflow rule requires at least one row of filter criteria, but we can set as many filters as we want using additional rows.

8. In the first row of Rule Criteria filters:

- Set the Field column to Job Application: Status.
- Set the Operator column to equals.
- Set the Value column to Rejected.

9. Click Save & Next.

The screenshot shows the 'Step 2: Configure Workflow Rule' screen for a 'Job Application' rule named 'Rejection Letter'. The rule description is 'Send a rejection letter when a hiring manager changes the status of a job application to Rejected.' In the 'Evaluation Criteria' section, the rule is evaluated when a record is created. In the 'Rule Criteria' section, there is a table with one row: **Status** equals **Rejected**. A red box highlights this row, and a callout bubble points to it with the text 'The rule criteria define what triggers the workflow rule to fire.'

Field	Operator	Value
Status	equals	Rejected
-None-	--None--	

Figure 94: Creating a New Workflow Rule

At this point, we've just defined our "Send Rejection Letter" workflow rule. If we canceled out of the workflow wizard and, from Setup, clicked **Create > Workflow & Approvals > Workflow Rules**, we'd see it in the list view. However, because workflow rules aren't all that useful without an associated action, the workflow wizard takes us directly to a screen where we can define the "Send Rejection Letter" workflow task. Let's work through that now.

Try It Out: Create the “Send Rejection Letter” Workflow Task

The Specify Workflow Actions step of the workflow wizard allows you to specify which actions, such as tasks, field updates, and email alerts, should occur when the condition of our workflow rule is met.

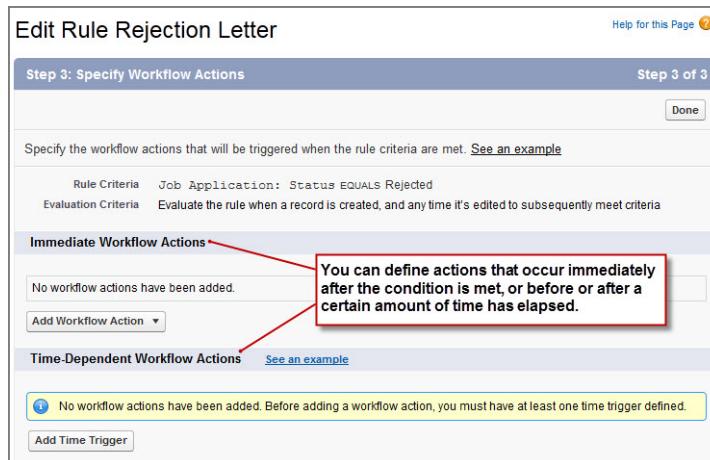


Figure 95: Specifying Workflow Actions

You can either define actions that occur immediately after the condition is met, or you can define actions that occur before or after a certain amount of time has elapsed (for example, seven days before the value of the `Hire By` field, or three days after the workflow rule is triggered). We'll talk more about these *time-dependent workflow actions* a little later. For now, we just need to define a single workflow task that executes as soon as our rule criteria is met.

1. In the Immediate Workflow Actions area, click **Add Workflow Action** and select **New Task**.

Did you notice that the `Object` field is already filled in with `Job Application`? Here's where we saved ourselves a couple of clicks—if we'd started building our workflow task before our workflow rule, we would have needed to specify the object with which the task would be associated. That's because, like workflow rules, workflow actions need to be associated with a single object.

In this case, we got to skip a page because the object with which a workflow action is associated must match the object of a workflow rule that uses it. For example, if we had a workflow rule associated with the `Candidate` object, any action that's triggered by our candidate workflow

rule must also be associated with the Candidate object. Because we started building our “Send Rejection Letter” workflow task in the wizard right after defining our “Send Rejection Letter” workflow rule, the platform knew that the object associated with our task had to match the rule that we’d already built. That’s why our new workflow task is already associated with the Job Application object.

The rest of the fields on this edit page make up the template for any “Send Rejection Letter” tasks that our workflow rule will generate.

2. Next to the **Assigned To** field, click the lookup icon ().

Here we can choose the assignee of the task either by specifying a particular user, role, or the owner of the job application record that triggered the workflow rule in the first place. Since recruiters always own the job application records of the positions that they’re responsible for, and recruiters are responsible for sending rejection letters at Universal Containers, let’s select the record owner.

3. In the **Type** drop-down list, choose **Owner**.
4. Click **Job Application Owner**.



Warning: If you thought that choosing the Recruiter role for the **Assigned To** field might have been another valid option, be careful. If the assignee of a workflow task is a role that contains more than one assigned user, the person who triggered the rule will become the task assignee instead. For this reason, you never want to assign workflow tasks to roles unless you’re sure that only one user will ever be assigned to them at a time.

The rest of the workflow task fields are easy.

5. In the **Subject** text box, enter **Send Rejection Letter**.
6. In the **Due Date** drop-down lists, choose **Rule Trigger Date plus 2 days**.

This **Due Date** setting will give our recruiters two days to notify the candidate after they’re first assigned the task.

7. In the **Status** drop-down list, choose **Not Started**.
8. In the **Priority** drop-down list, choose **High**.

The **Notify Assignee** checkbox allows us to send an email to the assignee as soon as the task is created by the workflow rule. This ensures that the assignee knows about the task without having to log in to the application on a regular basis, so let’s select it.

9. Select the **Notify Assignee** checkbox.
10. Click **Save**.

11. Click Done.

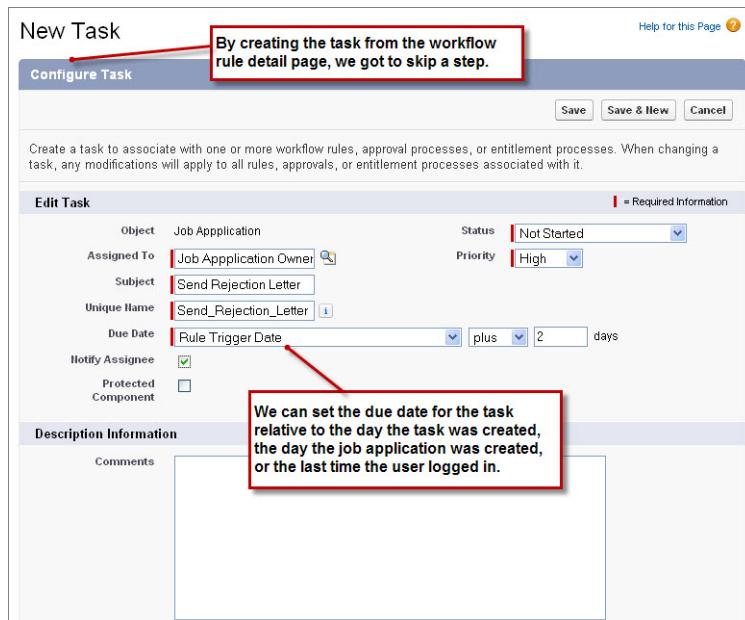


Figure 96: Creating the “Send Rejection Letter” Workflow Task

At this point, we finally get to see the detail page for the workflow rule that we just created. It includes the workflow rule criteria and a list of the associated actions. The only thing that remains to be done is to activate the rule.

12. Click Activate.

All done! We've just created our first workflow rule and task. You'll find that the remaining workflow actions all operate in a very similar way, so we'll speed through the rest of them, focusing just on the fields and options that are unique to each.

Try It Out: Create the “Extend an Offer” Workflow Rule and Task

To wrap up our first use case, we need to create another workflow rule for when the status of a job application is set to Extend an Offer. This rule and task are almost identical to the “Send Rejection Letter” workflow rule and task, so we'll just list the values that you'll need in the following two tables.

Table 41: Values for Creating the “Extend an Offer” Workflow Rule

Field	Value
Object	Job Application
Name	Extend an Offer
Description	Make an offer when a hiring manager changes the status of a job application to Extend Offer.
Evaluate the rule when a record is:	created, and any time it's edited to subsequently meet criteria
Filter Criteria	Job Application: Status equals Extend an Offer

Table 42: Values for Creating the “Extend an Offer” Workflow Task

Field	Value
Assigned To	Job Application Owner
Subject	Extend an Offer
Due Date	Rule Trigger Date plus 1 days
Status	Not Started
Priority	High
Notify Assignee?	Yes

All done! Make sure the “Extend an Offer” rule is also activated, and let's go try out one of our new workflow rules.

Look at What We've Done

Let's try out our new “Send Rejection Letter” workflow rule and see what happens:

1. Click the Job Applications tab, and select a job application record.
2. Click **Edit**, and change Status to **Rejected**.
3. Click **Save**.

The Send Rejection Letter task automatically appears in the Open Activities related list on the Job Application detail page, as shown in the following screenshot.

Job Application
JA-00002
< Back to List: Pages

Customize Page | Edit Layout | Printable View | Help for this Page ?

[Open Activities \[1\]](#) | [Activity History \[0\]](#) | [Notes & Attachments \[0\]](#) | [Reviews \[3\]](#)

Job Application Detail [Edit](#) [Delete](#) [Clone](#)

Job Application Number	JA-00002	Owner	Cynthia Capobianca [Change]
Candidate	C-00008		
Position	Documentation Writer		
Cover Letter			
Status	Rejected		
Total Rating	9		
Number of Reviews	3		
Average Rating	3.00		
Created By	Cynthia Capobianca, 2/4/2010 2:58 PM	Last Modified By	Dave Carroll, 6/10/2010 12:45 PM
		Edit Delete Clone	

Open Activities [New Task](#) [New Event](#) [Open Activities Help ?](#)

Action	Subject	Name	Task	Due Date	Status	Priority	Assigned To
Edit Cls	Send Rejection Letter		✓	2/6/2010	Not Started	High	Cynthia Capobianca

New task created by the workflow rule

Figure 97: Open Activities Related List on Job Application Detail Page

Pretty neat, don't you think? Not only that, but if you check in the recruiter's email inbox, he should have received an automatically-generated email notification that looks like the following:

Jane Smith has assigned you a new task:
 Subject: Send Rejection Letter
 Job Application: JA-00002
 Due Date: 8/29/2013
 Priority: High

For more details, click the following link:
<https://na1.salesforce.com/00Tx04123s5k1>

The link in the email message takes the recruiter directly to the task detail page, where he or she can locate the contact information of the candidate and update the task status after the task is completed. The task also shows up in the My Tasks area on the recruiter's Home tab, and a reminder message will pop up in another day if the recruiter hasn't yet changed the task's status to "Completed." Suddenly, our Recruiting app has become a lot more interactive and powerful!

Creating a Workflow Rule That Updates Fields

For our next use case, we want to create a workflow rule that ensures the owner of a new position record is always a recruiter. To do this, we're going to define a workflow field update that reassigns ownership of a position that's created by a hiring manager to a *queue* of position records without owners. Once a position record is in that queue, individual recruiters can claim ownership of the positions they want. But before we jump ahead of ourselves, let's stop a moment. Just what, exactly, is a queue?

Introducing Queues

Much like a collection of items in a lost and found drawer, a queue is a collection of records that don't have an owner. Users who have access to the queue can examine every record that's in it and claim ownership of the ones they want.

Queues are traditionally used in sales and support organizations to distribute new leads and support cases to the employees who have the most availability. Because the platform natively supports queues for Leads, Cases, and any custom object, we can create a queue for the Recruiting app's Position object.

Try It Out: Create a Queue for Positions

To define a queue, we simply need to know the types of records that can be placed in the queue (in our case, Positions), and the users who are allowed to pull records out of it (in our case, Recruiters). Once we know those two things, defining the queue itself is just a matter of a few simple clicks:

1. From Setup, click **Manage Users > Queues**.
2. Click **New**.
3. In the **Label** text box, enter **Unclaimed Positions Queue**.
4. In the **Queue Email** text box, enter an email address for an individual or a distribution list, such as `recruiters@universalcontainers.com`.

When you click in the **Queue Email** text box, the **Queue Name** text box is automatically populated.

5. Select **Send Email to Members**.

Notice here that if `recruiters@universalcontainers.com` was a real email distribution list that went to all recruiters, we wouldn't need to select `Send Email to Members`. We do it here only because `recruiters@universalcontainers.com` is a fake email address and can't be used for testing later.

You have two options for notifying queue members when new records are added to the queue.

Send Email to Members not selected

- If you don't specify a queue email, individual queue members are always notified, regardless of the `Send Email to Members` checkbox.
- If you specify a queue email address, only that address is notified.

Send Email to Members selected

- If you don't specify a queue email, individual queue members are always notified, regardless of the `Send Email to Members` checkbox.
- If you specify a queue email address, that address *and* individual queue members are notified.

Note that if an individual queue member also receives email sent to the specified queue email address, they'll receive duplicate notifications.

6. In the Supported Objects section, move Position into the Selected Objects list.

New Queue

Help for this Page [?](#)

Queue Edit Save Cancel

Queue Name and Email Address ! = Required Information

Enter the name of the queue and the email address to use when sending notifications (for example, when a case has been put in the queue). The email address can be for an individual or a distribution list. When an object is assigned to a queue, only the queue members will be notified.

Queue Name	Uncleimed Positions Qu
Queue Email	recruiters@universalcor
Send Email to Members	<input checked="" type="checkbox"/>

If a queue email is not specified, individual queue members are always notified, regardless of the checkbox.

Supported Objects

Select the objects you want to assign to this queue. Individual records for those objects can then be owned by this queue.

Available Objects	Selected Objects
Candidate Case Employment Website Job Application Lead	Position
Add	
Remove	

Queue Members

To add members to this queue, select a type of member, then choose the group, role, or user from the "Available Members" and move them to the "Selected Members." If the sharing model for all objects in the Queue is Public Read/Write/Transfer, you do not need to assign users to the queue, as all users already have access to the records for those objects.

Search: Roles and Subordinates for:	Find
Available Members	Selected Members
Role and Subordinates: CEO Role and Subordinates: Channel Sales Team Role and Subordinates: Customer Support, International Role and Subordinates: Customer Support, North America Role and Subordinates: Dir Product Management Role and Subordinates: Director QA Role and Subordinates: Director, Channel Sales Role and Subordinates: Director, Direct Sales Role and Subordinates: Eastern Sales Team Role and Subordinates: Installation & Repair Services Role and Subordinates: Marketing Team Role and Subordinates: Recruiter Role and Subordinates: SVP, Human Resources Role and Subordinates: SVP, Sales & Marketing	Role and Subordinates: Recruiting Manager
Add	
Remove	

Save Cancel

Figure 98: Defining a Queue

As you can see, a single queue can handle multiple objects—the platform allows you to do this so that you don't have to define multiple queues for the same group of users.

7. In the Queue Members section, select Roles and Subordinates from the Search drop-down list.
8. Move Role and Subordinates: Recruiting Manager to the Selected Members list.
9. Click Save.

Perfect! We've just defined a new queue that can act as a temporary owner for all of the position records that are created by hiring managers. Whenever a position is placed in the queue, all recruiters are notified, and the appropriate person can claim ownership. All we need to do now is define the workflow rule that places those position records into the queue.

Try It Out: Create a Workflow Rule That Updates Fields

Now that we've got our queue ready to go, we can go ahead and define our workflow rule.

1. From Setup, click **Create > Workflow & Approvals > Workflow Rules**.
2. Click **New Rule**.
3. In the Object drop-down list, choose **Position**, and click **Next**.
4. In the Rule Name text box, enter **Assign Position to Recruiter**.
5. In the Description text box, enter **Reassign position records to a recruiter if they were created by another type of employee**.

While we know that recruiters should almost always own position records, we don't want to impede the organization if there's a special case in which a non-recruiter should own the record instead. Let's choose to evaluate this rule only when a record is created so that if an exception needs to be made, the workflow won't supersede any changes that were made by a recruiter.

6. In the Evaluate the rule when a record is: field, select `created`.

Finally, we need to make sure that this rule is initiated whenever a position record is created by someone who isn't a recruiter or a recruiting manager. We can specify this filter criteria in a single row by using a comma in the Value column.

7. In the Rule Criteria section:
 - Set the Field column to **Current User: Role**.
 - Set the Operator column to **not equal to**.
 - Set the Value column to **Recruiter, Recruiting Manager**.
8. Click **Save & Next**.

Now let's create the field update action for this workflow rule.

9. In the Immediate Workflow Actions area, click **Add Workflow Action**, and select **New Field Update**.
10. In the Name text box, enter **Reassign Position to Queue**.

11. In the Description text box, enter Assign the Position to the Unclaimed Positions Queue.
12. In the Field to Update drop-down list, choose Owner.

Once you make a selection in this drop-down list, new options appear just below depending on the selection that you made.

13. In the Owner drop-down list, choose Queue.
14. Click the lookup icon () , and select **Unclaimed Positions Queue**.
15. Select Notify Assignee.
16. Click **Save**.

Not too hard! Before we leave this workflow rule behind, though, let's give it a second workflow action—one that ensures that no positions will languish in the queue without being claimed by a recruiter. This time, we'll use a time-dependent workflow action.

Introducing Time-Dependent Workflow Actions

As we mentioned earlier, time-dependent workflow actions are actions that occur before or after a certain amount of time has elapsed (for example, seven days before the value of the Hire By field, or three days after the workflow rule is triggered). We can use time-dependent workflow actions to fire tasks, field updates, and email alerts while the condition of a workflow rule remains true.

For example, the goal of reassigning position records to the Unclaimed Positions queue is to have the appropriate recruiter take ownership. However, there might be situations in which a position is placed in the queue and no recruiter claims it. Rather than leaving the position to languish unclaimed in the queue, we can define a time-dependent workflow action that alerts the recruiting manager if no recruiter claims a position record within a certain number of days. Because this action only takes place while the workflow condition remains true (that is, while the position is owned by a non-recruiter), the manager will only be alerted when necessary.

Neat, huh? Let's see how time-dependent actions are defined.

Try It Out: Create the “Notify Recruiting Manager” Time-Dependent Workflow Task

At this point, we should still be on the Specifying Workflow Actions page for our Assign Position to Recruiter Queue workflow rule. If not, you can return there from Setup by clicking

Create > Workflow & Approvals > Workflow Rules, clicking Assign Position to Recruiter, and then clicking **Edit** in the Workflow Actions area.

Before we can define a time-dependent workflow task, we first must specify a *time trigger*. Time triggers define when the time-dependent workflow actions should fire.

1. Click **Add Time Trigger**.

In this case, we want our recruiting manager to be notified three days after a position has been assigned to the Unclaimed Positions queue.

2. Use the text box and drop-down lists to specify 3 Days After Rule Trigger Date.
3. Click **Save**.

Figure 99: The Time Trigger Edit Page

Our time trigger is now listed in the Time-Dependent Workflow Actions area. The **Add Workflow Action** drop-down button is now active, and we can define our workflow task as usual.

4. In the Time-Dependent Workflow Actions area, click **Add Workflow Action** and select **New Task**.
5. In the **Assigned To** field, select the Recruiting Manager role.



Note: Remember, workflow tasks should only be assigned to a role if you're confident that only one user will ever be assigned to that role at a time. If the role contains multiple users, the owner of the workflow rule is assigned the task.

6. In the **Subject** field, enter **Assign Unclaimed Position Record to Recruiter**. When you move your mouse from the **Subject** field, the Unique Name field should be **Assign_Unclaimed_Position_Record_to_Recruiter**.
7. Set the **Due Date** field to **Rule Trigger Date plus 4 days**.

Since this workflow action won't fire until three days after the original Rule Trigger Date, making the Due Date four days after the Rule Trigger Date gives the recruiting manager one additional day to assign the position to a recruiter.

8. Set the Status to Not Started.
9. Set the Priority to High.
10. Select Notify Assignee.
11. Click **Save**.
12. Click **Done**.

Almost done! At this point, all we need to do is activate our workflow rule. However, if you click the **Activate** button now, an error message appears saying that the Default Workflow User must be set before activating the rule. What's that?

The default workflow user is the user who should be assigned as the owner of a workflow action if the user who originally triggered the rule is no longer active. If your organization uses time-dependent actions in workflow rules, you must designate a default workflow user. Salesforce displays this username in the `Created By` field for tasks, the `Sending User` field for email, and the `Last Modified By` field for field updates. Salesforce does not display this username for outbound messages. If a problem occurs with a pending action, the default workflow user receives an email notification. To set the default workflow user:

13. From Setup, click **Create > Workflow & Approvals > Settings**.



Note: If you click **Activate** without previously setting the default workflow user and then click **OK** in the error dialog, you're sent directly to the Workflow & Approvals Settings page.

14. Set the `Default Workflow User` field to any user in your organization. In most cases, it's best to choose a system administrator.
15. Click **Save**.

Now we can activate the workflow rule:



Note: If you reached the Workflow & Approvals Settings page by clicking **Activate** and then **OK** in the error dialog, clicking **Save** also automatically activates your workflow rule.

16. From Setup, click **Create > Workflow & Approvals > Workflow Rules**.
17. Click **Activate** next to the `Assign Position to Recruiter` workflow rule.

Look At What We've Done

Great! We've now got a workflow rule that moves position records created by non-recruiters to a queue of unclaimed positions, and if not claimed by a recruiter in three days, assigns a task to the recruiting manager.

To try it out, simply make sure that you're logged in as a hiring manager (such as Ben Stuart) and create a new position. As soon as you return to the detail page for the position, you'll see that the Unclaimed Positions Queue has automatically been assigned as the record owner, and that any user assigned to the Recruiter or Recruiting Manager role will have received an email notification.

To actually view the contents of the queue, click the Positions tab, and choose **Unclaimed Positions Queue** from the View drop-down list. Any recruiter or recruiting manager can click the **Accept** button on this page and take ownership of the new position.

Although our Assign Unclaimed Position Record to Recruiter workflow task won't be activated for another three days, we can see that it's currently scheduled to fire by checking out the *workflow queue*. This queue lists all of the time-dependent workflow actions that are scheduled for the future. To view it:

1. Log back in to your organization as an administrator.
2. From Setup, click **Time-Based Workflow or Monitoring > Time-Based Workflow**.
3. Click **Search**.

The screenshot shows the 'Time-Based Workflow' page. At the top, there's a search bar and a 'Help for this Page' link. Below the search bar, a message says: 'When salesforce.com triggers a workflow rule, its time-dependent actions are placed in the workflow queue. Use the criteria below to monitor the queue.' There are five dropdown menus for filtering the queue, each with an 'AND' connector after it. A red box highlights the fifth dropdown menu, with a note: 'The Scheduled Date shows when this workflow action will execute.' Below the filters is a 'Search' button and a 'Delete' button. At the bottom, there's a table with columns: Record Name, Object, Workflow Rule Name, Scheduled Date, Created By, and Created Date. One row is shown: QA Engineer, Position, Assign Position to Recruiter, 8/22/2010 12:05 PM, Smith, Jane, 8/19/2010 12:05 PM. A red arrow points from the note about the scheduled date to the 'Scheduled Date' column in the table.

Record Name	Object	Workflow Rule Name	Scheduled Date	Created By	Created Date
QA Engineer	Position	Assign Position to Recruiter	8/22/2010 12:05 PM	Smith, Jane	8/19/2010 12:05 PM

Figure 100: The Monitor the Workflow Queue Page

As soon as a recruiter takes ownership of the new position record, this task is deleted from the workflow queue. Pretty slick, isn't it?

Now let's build one final workflow rule so we can see how to create a workflow email alert.

Creating a Workflow Rule That Sends Email Alerts

For our final workflow use case, let's create a workflow rule and email alert that sends a notification whenever a new position is created. We want all the employees at Universal Containers to know when there are new positions available so they have the best opportunity to bring in referrals.

For this workflow rule, there's a step that we'll need to handle first: we need to design a template for what the email alert should look like.

Introducing Email Templates

Just as the platform includes built-in tools for setting security permissions, tracking events and tasks, and building business logic with workflow, it also provides a built-in tool for writing emails to users and contacts in your organization. *Email templates* allow you to create form emails that communicate a standard message, such as a welcome letter to new employees or an acknowledgement that a customer service request has been received.

To personalize the content of an email template, we can use *merge fields* to incorporate values from records that are stored in the system. For example, if we wanted to address an email recipient by their first name, we could write an email template.

```
Dear {!Contact.FirstName},
```

```
...
```

In this example, `{!Contact.FirstName}` is a merge field that brings in the first name of the contact to whom the email is addressed, so an email to John Smiley would read:

```
Dear John,
```

```
...
```

For our workflow alert, we can build an email template to notify users of new positions that have been added to the system. We can use merge fields to include information from the position record, such as its title and the required skills. Let's go do that now, and then we can get back to finishing up our final workflow rule.

Try It Out: Build an Email Template

To build a new email template, we have to go to the Setup area.

1. From Setup, click **Communication Templates > Email Templates**.

Here you should see a list of all the email templates that have already been defined for your organization, including several sample templates from salesforce.com.

2. Click **New Template**.

We can choose to create a text, HTML, or custom email template. HTML and custom email templates are the same except that HTML templates allow you to specify a letterhead to give your email the same look and feel as other emails from the same source.



Note: A fourth option, Visualforce, lets developers create email templates using salesforce.com's tag-based markup language. We'll touch on Visualforce in [Moving Beyond Point-and-Click App Development](#) on page 333.

To keep things simple, we'll just stick with a plain text email for now.

3. Select **Text**, and click **Next**.

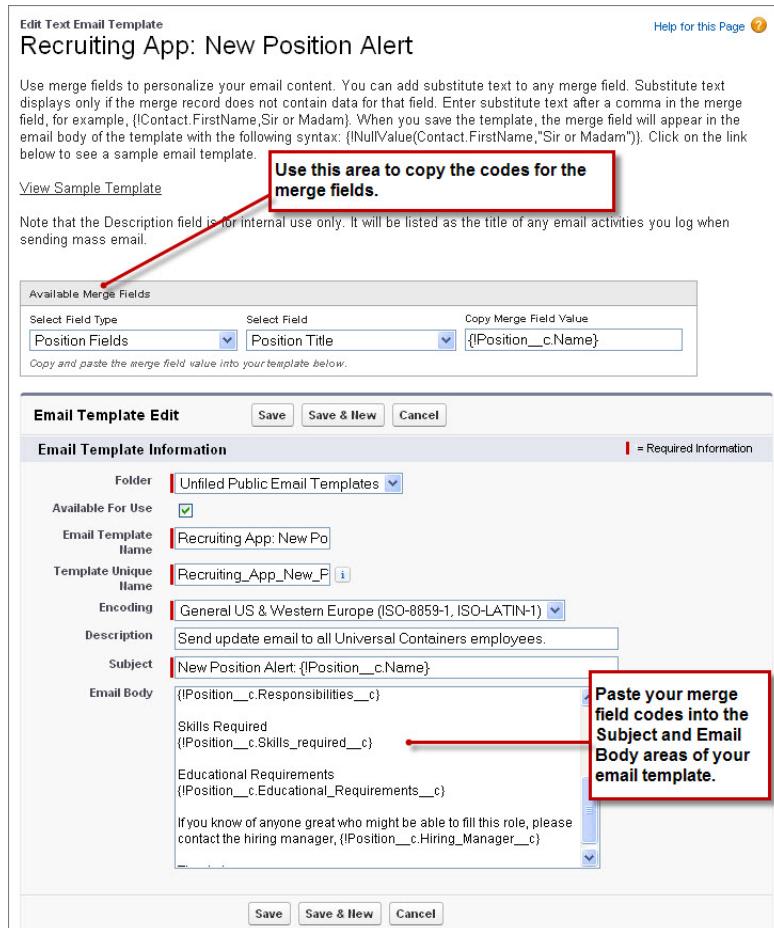


Figure 101: Defining an Email Template

The New Template page allows us to define the email template itself. The area near the top is where we'll generate the merge field codes for the fields in the email template below it, so let's skip past it for now and start with the Folder drop-down list.

4. In the Folder drop-down list, choose Unfiled Public Email Templates.

The Unfiled Public Email Templates folder is a standard, public folder available in every organization. By keeping the email template in a public folder, it'll be available to other users who have permission to view and edit email templates.

5. Select the Available For Use checkbox.

This option will make our email template available when we create our workflow alert.

6. In the Email Template Name text box, enter Recruiting App: New Position Alert.



Tip: To help keep your email templates organized, it's a good idea to preface any template name with the name of the app that uses it. Or, even better, you can create a public email template folder with the name of the app, such as Recruiting App Templates, and file all the relevant email templates in it.

7. In the Encoding text box, accept the default of General US & Western Europe (ISO-8859-1, ISO-Latin-1).
8. In the Description text box, enter Send update email to all Universal Containers employees.

Now we get to the heart of our email template—the email's subject and body text.

9. In the Subject text box, enter New Open Position Alert:.

We want to put the title of the new position in the subject of our email, so we'll need to use our first merge field here, just after the colon in our subject. To get the proper code, we'll have to go back to the merge field area near the top of the page.

10. In the Select Field Type drop-down list, choose Position Fields.

Although there are many objects to choose from in the Select Field Type drop-down list, because we're creating an email template for a workflow rule, we're limited to the fields for the object that will be associated with that workflow—in our case, Position. That's because the workflow rule that uses this email template won't know about any records other than the position record that triggered the workflow rule. If we put in fields from another object, they'd be left blank in our email.

Now let's grab the field we want.

11. In the Select Field drop-down list, choose Position Title.

In the Copy Merge Field Value text box, a merge field code appears for Position Title. We can copy and paste it to the end of our subject line so the subject now looks like: New Open Position Alert: {!Position__c.Name}. When an email is generated from this template, {!Position__c.Name} will be replaced with the relevant position title.

Easy, right? Now let's finish the remainder of our email.

12. In the text area just below the Subject text box, enter the following text:

There's a new position open at Universal Containers!

Title: {!Position__c.Name}

```

Functional Area: {!Position__c.Functional_Area__c}
Location: {!Position__c.Location__c}

Job Description
{!Position__c.Job_Description__c}

Responsibilities
{!Position__c.Responsibilities__c}

Skills Required
{!Position__c.Skills_Required__c}

Educational Requirements
{!Position__c.Educational_Requirements__c}

If you know of anyone great who might be able to fill this role,
please contact the hiring manager, {!Position__c.Hiring_Manager__c}.

Thanks!

```

13. Click **Save**.

That's it for our email template. Now that it's done, we're ready to create our New Position workflow rule and alert.

Try It Out: Create the New Position Workflow Rule and Alert

Now that we've built our email template, we're ready to build the workflow rule and email alert that use it. By now this procedure should be very familiar to you:

1. From Setup, click **Create > Workflow & Approvals > Workflow Rules**.
2. Click **New Rule**.
3. In the Object drop-down list, choose **Position** and click **Next**.
4. In the Rule Name text box, enter **Email New Position Alert**.
5. In the Description text box, enter **Send an email to everyone whenever a position record is opened**.

We only want this rule to execute when a position record's status changes to Open - Approved.

6. In the Evaluate the rule when a record is: field, select **created**, and any time it's edited to subsequently meet criteria.
7. In the first row of rule criteria:
 - Set the Field to **Job Application: Status**.
 - Set the Operator to **equals**.

- Set the Value to Open – Approved. Although New Position is the default value of the Status picklist, we only want to publicize those positions that have been approved for hire by an executive.

8. Click Save & Next.

Now let's create the email alert for this workflow rule:

9. In the Immediate Workflow Actions area, click **Add Workflow Action**, and select **New Email Alert**.
10. In the Description text box, enter Email New Position Alert.
11. Next to the Email Template field, click the lookup icon () , and select **Recruiting App: New Position Alert**.

We want to send this email to everyone at Universal Containers, but for this workflow rule there's no obvious way of doing that. We can work around this by relying on our role hierarchy and sending the email to everyone in the CEO role and its subordinates.

12. In the Recipient Type Search field, choose Role and Subordinates.
13. In the Available Recipients list, select Role and Subordinates: CEO and click **Add**.
14. Click **Save**.
15. Click **Done**.
16. Click **Activate**.

And that's all there is to it! To test out this workflow rule, all you need to do is create a new position record with a status of Open - Approved. Within a few seconds, all users within your organization will receive an email letting them know that a position has just been created. Go ahead—try it!

Beyond the Basics

Did you know you can use the Developer Console to troubleshoot Apex, workflow rules, and validation logic?

Say you want to debug a workflow rule that isn't working correctly. You can use the console to step through the execution log of everything that occurred during the request, line by line, until you find the problem.

To open the Developer Console, click **Your Name** > **Developer Console**. To find out more, click **Help** in the Developer Console.

Introducing Approvals

Now that we've just made a handful of workflow rules, let's take a look at another business logic tool that the platform provides: *approval processes*.

Approval processes allow you to specify a sequence of steps that are required to approve a record. Each step allows one or more designated approvers to accept or reject a record. The steps can apply to all records for the object associated with the process, or just to records that meet certain requirements. Like workflow, approval processes also allow you to specify actions—like sending an email alert, updating a field value, or assigning a task—that should occur whenever a record is approved, rejected, first submitted for approval, or recalled.

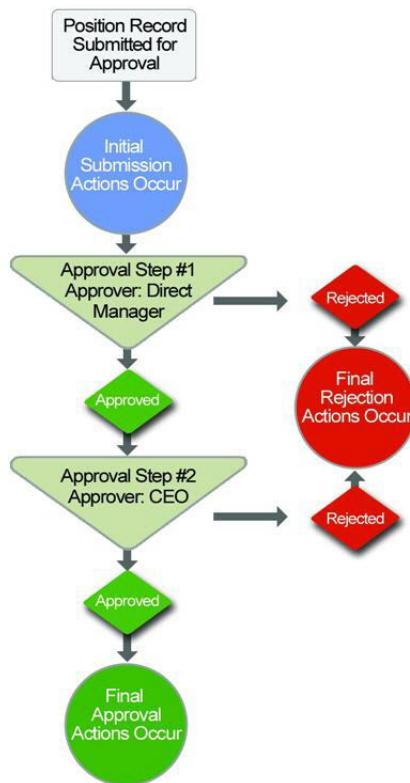


Figure 102: Approval Processes Consist of Steps and Actions

For example, your organization may have a three-tier process for approving expenses: submitted expenses that are less than \$50 are automatically approved, those over \$50 must be approved by a manager, and those over \$5,000 must also be approved by a Vice President. In this example, your approval process would specify the following:

- If an expense record is submitted for approval, lock the record so that users cannot edit it and change the status to “Submitted.”
- If the amount is \$50 or less, automatically approve the request.
- If the amount is greater than \$50, send an approval request to the direct manager.
- If the amount is greater than \$5,000 and the first approval request is approved, send an approval request to the Vice President.
- If all approval requests are approved, change the status to “Approved” and unlock the record.
- If any approval requests are rejected, change the status to “Rejected” and unlock the record.

For our recruiting app, we're going to define a similar approval process to submit new positions for approval. We want to make sure that a manager approves any position that his or her employee creates, and that any position with a minimum salary of more than \$150,000 is approved by the CEO. Let's get started.

Planning for Approval Processes

In most cases you'll find that you have to do a little advance planning before implementing an approval process on your own. The checklist available from “Getting Started with Approval Processes” in the Salesforce Help outlines the things that you should think about and the components you should build before diving in.

For this approval process, the only preliminary step we need to do is define an email template that can be used to notify the designated approver that he or she has a pending approval request.

Beyond the Basics

If Chatter is enabled for your organization, your users can receive approval requests as posts in their Chatter feed. You can also customize the way approval requests appear in the feed by creating post templates and associating them with your approval processes. For more information about how this works, see “About Approvals in Chatter” in the Salesforce Help.

Since we turned on notifications for Salesforce1, your users can receive in-app and push notifications when someone submits a record for approval. Individual users can opt in or out of approval request notifications in both email and Salesforce1 via the *Receive Approval Request Emails* user field. For more information, see “Changing Your Approval User Preferences” in the Salesforce Help.

Try It Out: Create an Email Template for Approvals

Since we've already talked about email templates in [Introducing Email Templates](#) on page 262, we'll simply include the values that we want to use for the template in the following table. You can build it from Setup, in **Communication Templates > Email Templates**.

Table 43: The “Recruiting App: New Position Requires Approval” Email Template

Parameter	Value
Template Type	Text
Available For Use	Selected
Email Template Name	Recruiting App: New Position Requires Approval
Encoding	General US & Western Europe (ISO-8859-1, ISO-LATIN-1)
Description	Send notification email to designated approver when new position record requires approval.
Subject	New Position Requires Approval
Email Body	<p>A new position record has been submitted for your approval. Please visit the link below and either approve or reject it.</p> <p>{ !Position__c.Link }</p> <p>Thanks!</p>

Try It Out: Create an Approval Process

Now that we've finished our preparation, we're ready to define the approval process itself. The approval process definition acts as a framework for the approval steps and actions that we'll define later.

1. From Setup, click **Create > Workflow & Approvals > Approval Processes**.
2. From the Manage Approval Processes For drop-down list, choose **Position**.

There are two different wizards that we can use to create a new approval process: a Jump Start Wizard and the Standard Setup Wizard. The Jump Start Wizard sets several default values for us and only requires input for the most crucial fields: the approval assignment email template, filter criteria to enter the approval process, and the designated approvers. The Standard Setup Wizard, on the other hand, allows us to configure every possible option for our approval process. We'll stick with the latter for now so we can take a look at all of the options that are available.

3. From the **Create New Approval Process** drop-down button, choose **Use Standard Setup Wizard**.
4. In the **Process Name** field, enter **Approve New Position**.
5. In the **Description** field, enter **Ensure that a manager approves any position that his or her employee creates, and that any position with a minimum salary of more than \$150,000 is approved by the CEO.**
6. Click **Next**.

After entering the name and description, our next step is to specify the conditions that determine which positions need approval. As with workflow rules, we can do this by either defining a set of criteria or creating a formula. Let's define the criteria so that all positions created by a user other than the CEO must be approved by at least a direct manager.

7. In the first row of filter criteria, select **Current User: Role not equal to CEO**.
8. Click **Next**.
9. From the **Next Automated Approver Determined By** drop-down list, select **Manager**.

The Manager field is a standard field on the User object that designates the user's manager. The field establishes a hierarchical relationship between users, which prevents you from selecting a user that directly or indirectly reports to his or herself. This manager will be the designated approver for the first step of our approval process.

Alternatively, you could have selected the **Create New Hierarchical Relationship Field** option in the drop-down list to define a new custom *hierarchical relationship* lookup field on the fly. The hierarchical relationship field type is specifically designed for the User object, and mimics the behavior of the standard Manager field by associating one user with another without indirectly associating that user to him or herself. For this approval process, though, the standard Manager field is perfect, so let's move on.

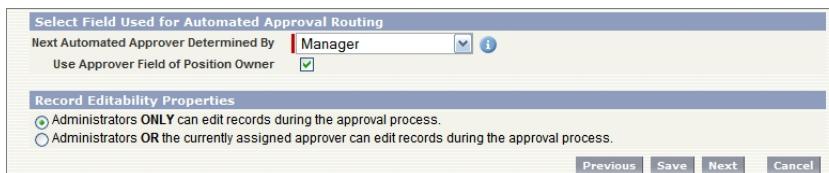


Figure 103: Specifying the Approver Field

10. Select the Use Approver Field of Position Owner checkbox.

The Use Approver Field of Position Owner checkbox becomes editable when you select Manager in the Next Automated Approver Determined By drop-down list. When you select this checkbox, the approval request is routed to the user specified in the Manager field on the record owner's user record. If you don't select this checkbox, the approval request is routed to the manager of the user submitting the record. In our case, we want to obtain approval from the position owner's manager, so select this checkbox.

11. In the Record Editability Properties area, choose Administrators ONLY can edit records during the approval process.

Record editability allows you to specify whether a record that's been submitted for approval can be edited by the approver before being approved. Since we don't want managers to change the positions that a hiring manager or recruiter creates without alerting the owner, we'll only let administrators perform edits while a record is in our approval process.

12. Click **Next**.

13. In the Approval Assignment Email Template lookup field, select **Recruiting App: New Position Requires Approval**.

14. Click **Next**.

Our next step in defining the approval process is specifying which fields should be displayed on the Approval page layout, which the approver sees when he or she approves or rejects a record. Each approval process has its own page layout, and, unlike other page layouts, the Approval page layout can only be configured from within its approval process.

15. Move the following fields from Available Fields to Selected Fields.

- Position Title
- Owner
- Hiring Manager
- Type
- Location
- Hire By
- Job Description

- Min Pay
- Max Pay

The approval page is where an approver will actually approve or reject a request. Using the options below, choose the fields to display on this page.

Approval Page Fields

Available Fields	Selected Fields
Created By Days Open Educational Requirements Functional Area Java JavaScript Job Level Last Modified By Open Date Record Type Responsibilities Skills required Status Travel Required	Position Title Owner Hiring Manager Type Location Hire By Job Description Min Pay Max Pay

Display approval history information in addition to the fields selected above.

Security Settings

Allow approvers to access the approval page only from within the salesforce.com application. (Recommended)
 Allow approvers to access the approval page from within the salesforce.com application, or externally from a wireless-enabled mobile device. [i](#)

Figure 104: Defining the Record Approval Page Layout

On this page we can also specify whether approval history information should be displayed on the Approval page layout. This information shows whether this record was submitted for approval in the past, who the designated approvers were, and whether it was approved or rejected.

16. Select **Display approval history information in addition to the fields selected above.**

Finally, before leaving this page, we can specify security settings to determine whether approvers can access an external version of the approval page from any browser, including those on mobile devices, without logging in to Salesforce. Unless it's a mandatory requirement for your approvers, it's better not to choose this option because you won't be able to add approval steps that let users manually select the next approver. We'll leave the default choice selected for now.

17. Click Next.

The last page of the New Approval Process wizard allows us to choose who should be allowed to submit position records for approval. Again, we'll just leave the default Position Owner selected, because there's no reason for another user to have this power.

The last two options on this page allow us to place the Approval History related list on all Position page layouts and give users the ability to recall pending approval requests after they've submitted them. The Approval History related list is the same history related list that we included on the Approval page layout, so we'll also include it on the Position detail page. From this related list users can also click the **Recall Approval Request** button to withdraw their pending approval requests. If we didn't enable this last option, only administrators would have access to the **Recall Approval Request** button.

18. Select Add Approval History Related List to All Position Page Layouts.**19. Select Allow submitters to recall approval requests.****20. Click Save.**

Phew! We've finished defining the framework for our approval process, but we won't be able to activate it until we've given it some steps and some actions to fire when records are actually approved or rejected. Let's move on to those now.

21. Select Yes, I'd like to create an approval step now.**22. Click Go!**

Try It Out: Create Approval Steps

As we said earlier, every approval process consists of a set of steps that are required to approve a record, and each step allows one or more designated approvers to accept or reject the submitted record. In other words, every round of “signatures” that you need to get a record approved must have a corresponding step in the approval process. An approval step consists of:

- One or more designated approvers
- Optional filter criteria, so that only records that meet certain conditions will require approval at that step
- Optional step approval actions that execute regardless of the outcome of the whole approval process
- Optional step rejection actions that execute regardless of the outcome of the whole approval process
- Optional step recall actions that execute if the record is recalled

For our New Position approval process, we'll need to define two steps—one that requires approval from the record submitter's manager for all new position records, and one that requires additional approval from the CEO for position records with minimum salaries in excess of \$150,000. Let's define the first step for all new position records now.

Because we selected Yes, I'd like to create an approval step now at the end of the Standard Approval Process wizard in the last section, we're already at the beginning of the New Approval Step wizard. If we weren't, we could return to the same wizard with the following steps:

1. From Setup, click **Create > Workflow & Approvals > Approval Processes**.
2. In the Inactive Approval Processes related list, click **Approve New Position**.
3. In the Approval Steps related list, click **New Approval Step**.

In this first step, we want the approval request to go to the Position owner's manager:

4. In the Name field, enter Manager Approval.
5. In the Description field, enter Every new position record must be approved by the Position owner's manager.
6. In the Step Number field, enter 1.

The Step Number field specifies the order in which multiple steps should be processed. By assigning this as Step 1, it will be the first to execute when the approval process is triggered.

7. Click Next.

The Specify Step Criteria area allows us to define the criteria or create a formula that filters the records that require approval during this step. Because we've already filtered out position records that are owned by the CEO from the whole approval process, this step does not need any additional filtering.

8. Click Next.

Finally, we have to select the assigned approver for this step, and specify whether his or her delegate is allowed to approve the request as well. Because this is the Manager Approval step, it clearly makes sense to accept the default option of Automatically assign using the custom field selected earlier. (Manager). However, because position records aren't particularly sensitive, it's okay for managers to assign delegated approvers. So managers who go on vacation, or who receive large quantities of approval requests, can share their work with another employee.

9. Select The approver's delegate may also approve this request.
10. Click Save.

Having completed our first approval step, we're faced with another choice: to create optional approval or rejection actions for this step, or to return to the approval process detail page. While we ultimately need to specify *final* approval and rejection actions that occur when the approval process ends one way or the other, there's nothing in particular that needs to happen after this first step that we can't specify elsewhere. Let's return to the detail page for our approval process and define our second approval step for positions with minimum salaries of more than \$150,000.

11. Select **No, I'll do this later**. Take me to the approval process detail page to review what I've just created.
12. Click **Go!**.
13. In the Approval Steps related list, click **New Approval Step**.

Once again we're back in the New Approval Step wizard, but this time it includes a summary of the previous step that we created. This helps us to remember where we are in our approval process.

The screenshot shows the 'New Approval Step' wizard. At the top, it says 'Step 1 of 3'. Below that is a summary box containing the text: 'A summary of the previous step reminds us of where we are in the approval process.' A red arrow points from this summary box down to the 'Step Number' field in the main form. The main form has sections for 'Step 1. Enter Name and Description' and 'Step 2. Enter Approval Process Information'. The 'Step 2' section contains a table with the following data:

Previous Approval Step Information	
Step Number:	1
Name:	Manager Approval
Criteria:	
Assign To:	Manager

The 'Step 1' section contains fields for 'Approval Process Name' (Approve New Position), 'Name' (CEO Approval), 'Unique Name' (CEO_Approval), 'Description' (Every new position record with a minimum salary over \$150,000 must be approved by the CEO.), and 'Step Number' (2). A red box highlights the 'Step Number' field, and a red arrow points from the text 'Step Number indicates the order in which approval steps will execute.' to this field. At the bottom right of the form are 'Next' and 'Cancel' buttons.

Figure 105: Defining a Second Approval Step

14. In the Name field, enter CEO Approval.
15. In the Description field, enter Every new position record with a minimum salary over \$150,000 must be approved by the CEO.
16. In the Step Number field, enter 2.

17. Click Next.

For this approval step, we only want to send positions with a minimum salary over \$150,000 to the CEO. Additionally, we want to exclude any records that the CEO has already approved (for example, because one of the CEO's direct reports created the record).

- 18.** Select the Enter this step if the following radio button, then choose criteria are met from the drop-down list.
- 19.** In the first row of filters, enter Position: Min Pay greater or equal 150000.



Tip: As a shortcut, you can specify 150,000 as 150k.

- 20.** In the second row of filters, enter Current User: Manager not equal to Cynthia Capobianco (the acting CEO in [Universal Containers Role Hierarchy](#) on page 185).
- 21. Click Next.**

Finally, we need to select the approver (the CEO), and specify what should happen if he or she rejects this request.

- 22.** Select the Automatically assign to approver(s) radio button.
- 23.** In the drop-down list below the radio button, select User, click the lookup icon (🔍), and choose the name of the CEO in your organization (Cynthia Capobianco).

We're keeping this approval process fairly simple, but if we wanted to, we could use the **Add Row** and **Remove Row** links to send the approval request to multiple approvers in this step. We could also select **Related Users** in the first drop-down list in the row to add an approver who is listed in fields on the submitted record. For example, since this is an approval process for Position records, we could add the position's hiring manager to the list of approvers.

- 24.** Below the **Add Row** and **Remove Row** links, select Approve or reject based on the FIRST response.

If this step was requesting approval from multiple users, the radio buttons below the **Add Row** and **Remove Row** links would determine whether the approve request needed unanimous approval, or if the record would be approved or rejected based on the first user to respond to the request.

- 25.** Select The approver's delegate may also approve this request.

The next section allows us to specify what to do with the record if it's rejected at this step. Because the position record is locked from editing during the approval process, it makes the most sense to perform the final rejection.

- 26.** Select Perform all rejection actions for this step AND all final rejection actions. (Final Rejection).
- 27.** Click **Save**.

Once again, we're faced with a choice to define approval or rejection actions for this particular step. Let's circumvent those, and return to the approval process detail page to define our initial submission, final approval, and final rejection actions for the whole process.

- 28.** Select No, I'll do this later. Take me to the approval process detail page to review what I've just created.
- 29.** Click **Go!**

Try It Out: Create Approval Actions

Now that we've finished defining our approval process steps, we're nearly done. All that remains is to specify the *approval actions* that should occur whenever a record is initially submitted, or when it's finally approved or rejected.

Just like workflow actions, approval actions allow you to create and assign tasks, update fields, and send email updates and outbound messages. They can be associated with the approval process as a whole or with individual approval steps.

Approval Processes
Position: Approve New Position Help for this Page ?

[« Back to Approval Process List](#)

Process Definition Detail [Edit](#) [Clone](#) [Deactivate](#) [View Diagram](#)

Process Name	Approve New Position	Active	<input checked="" type="checkbox"/>
Unique Name	Approve_New_Position	Next Automated Approver Determined By	Manager of Record Owner
Description	Ensure that a manager approves any position that his or her employee creates, and that any position with a minimum salary of more than \$150,000 is approved by the CEO.		
Entry Criteria	Current User: Role NOT EQUAL TO CEO		
Record Editability	Administrator ONLY	Allow Submitters to Recall Approval Requests	<input checked="" type="checkbox"/>
Approval Assignment	Recruiting Ann: New Position Requires Approval		
Email Temp	Approval actions can also be associated with individual approval steps.		
Initial Submit			
Create			
Modified By: Jane Smith, 8/19/2010 2:36 PM			

Initial Submission Actions [Add Existing](#) [Add New](#) ▾

Action	Type	Description
Record Lock		Lock the record from being edited
Edit Remove	Field Update	Set Status to Pending Approval

Approval Steps i

Action	Step Number	Name	Description	Criteria	Assigned Approver	Reject Behavior
Show Actions	1	Manager Approval	Every new position record must be approved by the Positions owner's manager.			Final Rejection
Show Actions	2	CEO Approval	Every new position record with a minimum salary over \$150,000 must be approved by the CEO.	(CURRENT_USER: Manager: NOT EQUAL TO Jane Smith)		Final Rejection

Final Approval Actions [Add Existing](#) [Add New](#) ▾

Action	Type	Description
Edit	Record Lock	Lock the record from being edited
Edit Remove	Field Update	Set Status to Open Approval

Final Rejection Actions [Add Existing](#) [Add New](#) ▾

Action	Type	Description
Edit	Record Lock	Unlock the record for editing
Edit Remove	Field Update	Set Close Date to Today
Edit Remove	Field Update	Set Status to Closed - Not Approved

Recall Actions [Add Existing](#) [Add New](#) ▾

Action	Type	Description
	Record Lock	Unlock the record for editing

Approval actions can also be associated with individual approval steps.

You can define approval actions that occur when a record is initially submitted, finally approved, or finally rejected.

Figure 106: The Approval Process Detail Page

Because defining an approval action is almost identical to the way we created workflow actions, we'll quickly step through the process of updating the `Status` field to `Pending Approval` when a position is initially submitted and then leave our other approval actions as exercises.

1. If you're not on the approval process detail page already, from Setup, click **Create > Workflow & Approvals > Approval Processes**, and then click **Approve New Position**.

2. In the Initial Submission Actions related list, click **Add New**, and select **Field Update**.

Does the New Field Update Action page look familiar? That's because we've seen it before—all approval tasks, field updates, email alerts, and outbound messages use the same editing interface as workflow actions. In fact, every workflow and approval action that you create can be used interchangeably on both workflow and approval processes.

3. In the Name field, enter Set Status to Pending Approval.
4. In the Description field, enter While a position is in an approval process, its status should be set to Pending Approval.
5. In the Field to Update drop-down list, select Status.
6. In the Picklist Options area, select A specific value and choose Pending Approval from the list.
7. Click **Save**.

Now, to finish up the rest of the approval process, define the remaining approval actions on your own according to the values in the following table.

Table 44: Additional Approval Actions

Category	Type	Values
Final Approval Actions	Field Update	Name: Set Status to Open Approved Field to Update: Status A specific value: Open - Approved
Final Rejection Actions	Field Update	Name: Set Status to Closed - Not Approved Field to Update: Status A specific value: Closed - Not Approved
Final Rejection Actions	Field Update	Name: Set Close Date to Today Field to Update: Close Date Use a formula to set the new value: TODAY()

Try It Out: Activate Our Approval Process

We're all done with defining our Approve New Position approval process, but in order to test it one final step remains: we've got to activate it. Before we do so, however, be careful! Once an approval process has been activated, its approval steps can no longer be edited, even if you deactivate it. The only way to make changes is to clone the existing approval process and make edits in the cloned one.

Once you're ready to test the approval process:

1. From Setup, click **Create > Workflow & Approvals > Approval Processes** to return to the approval process list page.
2. Click **Activate** next to the Approve New Position approval process.

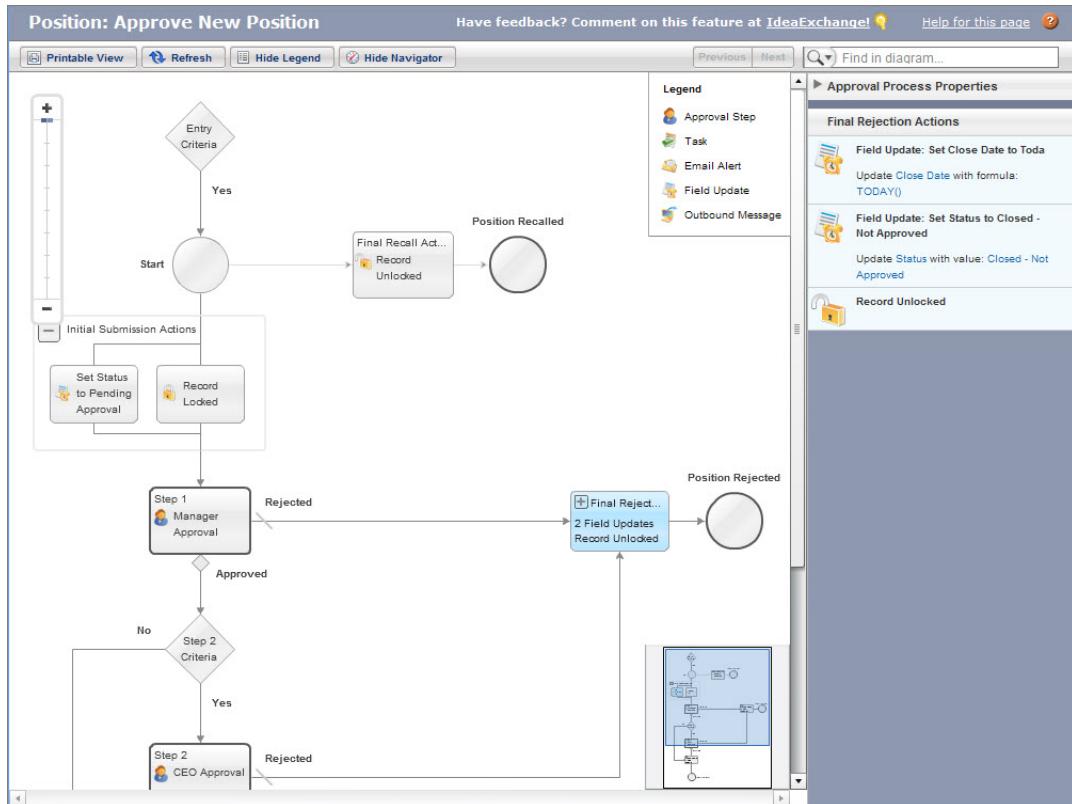
The Approve New Position approval process automatically moves to the Active list, and a new field is displayed: **Process Order**. This field is important if we're trying to use more than one approval process at a time because it tells us the order in which each approval process will be evaluated.

Look At What We've Done

As we've seen, approval processes are inherently complex and take a bit of work to set up. You have to walk through multiple screens and set several parameters, making it difficult to visualize and understand the approval process holistically.

Fortunately, the Force.com platform has a Process Visualizer that renders each approval process as a flowchart. The flowchart contains all of the critical details for each approval process, including the steps necessary for a record to be approved, the designated approvers for each step, the criteria used to trigger the approval process, and the actions that take place when a record is approved, rejected, recalled, or first submitted for approval.

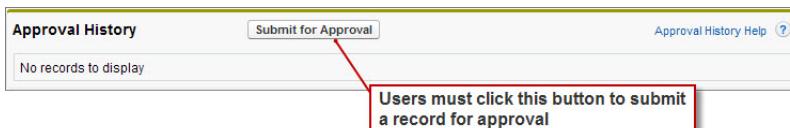
To access the Process Visualizer, click the **View Diagram** button at the top of any approval process detail page.

**Figure 107: The Process Visualizer**

Now let's test our approval process:

1. From Setup, click **Manage Users > Users** and edit the user record for your Recruiting Manager to fill in the Manager field so the approval chain is properly set up. Set Phil Katz's manager to Amy Lojack (the Product Manager).
2. Log in to your app as Phil Katz, and create a new position.

Notice that after clicking **Save**, the detail page displays a **Submit for Approval** button in the new Approval History related list.

**Figure 108: The Submit for Approval Button**

3. Click **Submit for Approval** and then click **OK**.

Clicking the **Submit for Approval** button causes several things to happen. First, the record is locked from editing, as shown by the lock icon at the top of the page. Additionally, two new entries appear in the Approval History related list showing who submitted the record and the current approval assignment. Finally, the manager of the position owner receives an email reporting that there's a new position to approve.

Position Detail

Position Title	Test Position	Owner	George Abitbol [Change]
Status	Pending Approval	Location	San Francisco, CA
Type	Part Time	Open Date	6/4/2010
Functional Area	Human Resources	Hire By	9/2/2010
Job Level	HR-200		
Travel Required	<input type="checkbox"/>		
Created By	George Abitbol	Last Modified By	George Abitbol 6/4/2010 4:12 PM
Hiring Manager			

Compensation

Min Pay	\$151,000.00	Max Pay	\$160,000.00
---------	--------------	---------	--------------

Description

Job Description
Responsibilities
Skills Required
Educational Requirements

Required Languages

Java
JavaScript
C#
Apex

Job Applications

New Job Application | Job Applications Help

No records to display

Open Activities

New Task | New Event | Open Activities Help

No records to display

Activity History

Log A Call | Mail Merge | Send An Email | Activity History Help

No records to display

Notes & Attachments

New Note | Attach File | Notes Help

No records to display

Employment Websites

New Job Posting | Employment Websites Help

No records to display

Approval History

Recall Approval Request | Approval History Help

Action	Date	Status	Assigned To	Actual Approver	Comments	Overall Status
Step: Manager Approval (Pending for first approval)	6/4/2010 4:12 PM	Pending	Cynthia Capobianca	Cynthia Capobianca		Pending
Reassign Approve / Reject						
Approval Request Submitted	6/4/2010 4:12 PM	Submitted	George Abitbol	George Abitbol		

Figure 109: A Submitted Position Record

When the manager next logs in and visits the record, an **Approve/Reject** button is visible on the Approval History related list. She can click this button to see the approval request and approve or reject the record, with comments.

4. Log in as Amy Lojack, the direct manager who is responsible for approving the request.
5. Click **Approve/Reject** in the Approval History related list on the record, enter any optional comments, and then click **Approve**.



Tip: To make accepting and rejecting approval requests more convenient, consider adding the Items to Approve related list to the default Home tab layout.

1. From Setup, click **Customize > Home > Home Page Layouts**.
2. Click **Edit** next to the Dashboard Home Page Default or DE Default.
3. Select **Items to Approve** and click **Next**.
4. Arrange the **Items to Approve** component on the page layout by moving it up and down the Wide (Right) Column list as desired.
5. Click **Save**.

Date	Status	Assigned To	Actual Approver	Comments	Overall Status
Step: Manager Approval (Pending for first approval)	Pending	Cynthia Capobianca	Cynthia Capobianca		Pending
6/4/2010 4:12 PM	Pending	Cynthia Capobianca	Cynthia Capobianca		
Approval Request Submitted					
6/4/2010 4:12 PM	Submitted	George Abitbol	George Abitbol		

Figure 110: The Approval Request Page

If the approver accepts the record, it progresses to the next step of the approval process (if its Min Pay field is greater than \$150,000 and the CEO still hasn't approved it), or else the position's Status field is set to Open - Approved. The record details remain locked to protect

them from being changed, but recruiters can still associate the position with job applications, tasks, or other activities. If the record is rejected, its status is set to Closed - Not Approved, the Close Date field is set to today's date, and the record is unlocked in case it just needs a simple edit before it reenters the approval process. With just a few minutes of work, we've built an effective business process that will make all of Universal Containers' users more effective.

Summing Up

Check out our Recruiting app now! By leveraging the platform's built-in workflow and approval process tools, we've transformed our app from a glorified database into a fully functional application that provides real value to its users.

Next we'll tackle something that provides real value to our executive users: reports and dashboards that give our users a complete analytical picture of how the recruiting program at Universal Containers is going.

Chapter 10

Analyzing Data with Reports and Dashboards

In this chapter ...

- Introducing Reports
- Introducing Dashboards
- Introducing Custom Report Types
- Look At What We've Done

We've come a long way with our Recruiting app—not only do we have custom objects to store our data, we also defined security and sharing rules to protect that data, while making it easier for the hiring team to collaborate. And we added automation by implementing several business processes with workflow and approvals. We've built a functional application in the cloud, and we haven't even written a single line of code!

Now it's time to turn our attention to the needs of the Universal Containers managers and executive staff. Because they need to keep track of many different aspects of the business, we need a way to give them a bird's-eye view of the company's recruiting activity without forcing them to delve into piles and piles of data. To do this, we'll create a set of custom reports for our Recruiting app and then build a dashboard that allows users to view summaries of key Recruiting app statistics every time they log in.

Introducing Reports

We can help users monitor and analyze the data that's being generated in their organization by building *reports*. Reports are summaries of the data that's stored in an app. They consist primarily of a table of data, but can also include data filters, groupings, and a customized graph.

While a comprehensive set of reports is included with every organization to provide information about standard objects, such as contacts and accounts, we can also build custom reports that highlight interesting metrics about the data stored in our custom objects.

For example, an executive at Universal Containers might have the following questions about recruiting.

- On average, how many days does it take for each recruiter to fill a position?
- Which functional areas have the most open positions?
- Which positions have been open for more than 90 days?
- Which positions are getting the most candidates?
- Which employees conduct the most interviews?
- What does the job application pipeline look like for each open position?
- Who have we hired in the last 90 days?

We can answer all of these questions and more by creating custom reports in the Reports tab of the app. Although this tab isn't visible by default in our Recruiting app, any user can click the arrow tab on the right side of the tab bar to display all available tabs, and then navigate to the reports area by clicking **Reports**.

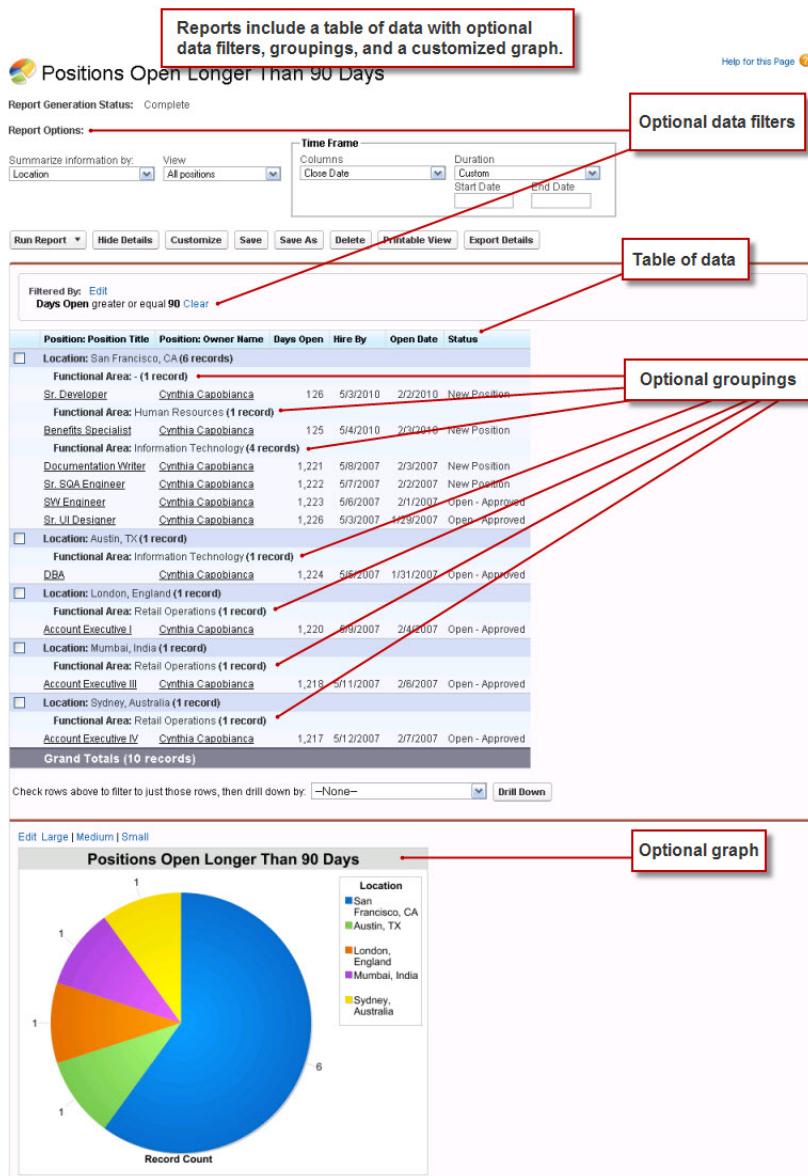


Figure 111: A Sample Report

Report Formats

The platform supports four different report formats, each with varying degrees of functionality and complexity.

- *Tabular reports* are the simplest and fastest way to look at your data. Similar to a spreadsheet, they consist simply of an ordered set of fields in columns, with each matching record listed in a row. While easy to set up, they can't be used to create groups of data or graphs. Consequently, they're best used just for tasks like generating a mailing list.



Tip: Use tabular reports when you want a simple list or a list of items with a grand total.

- *Summary reports* are similar to tabular reports, but also allow users to group rows of data, view subtotals, and create charts. For example, in the sample Employee Interviewer reports that appear in the following screenshot, the summary report groups the rows of reviews by the possible values of the `Owner Name` field, allowing us to see at a glance subtotals of how many times the two interviewers have talked to candidates and entered reviews for them.

While a little more time-consuming to set up, summary reports give us many more options for manipulating and organizing the data, and, unlike tabular reports, they can be used in dashboards. Summary reports are the workhorses of reporting—you'll find that most of your reports tend to be of this format.



Tip: Use summary reports when you want subtotals based on the value of a particular field or when you want to create a hierarchically grouped report, such as sales organized by year and then by quarter.

- *Matrix reports* allow you to group records both by row and by column. For example, in the following sample Employee Interviewer reports, the matrix report groups the review rows by the possible values of the `Owner Name` field, and also breaks out the possible values of the `Position` field into columns. Consequently, the report gives us summarized information such as the number of times an interviewer has interviewed candidates and entered reviews for a particular position. These reports are the most time-consuming to set up, but they also provide the most detailed view of our data. Like summary reports, matrix reports can have graphs and be used in dashboards.



Tip: Use matrix reports when you want to see data by two different dimensions that aren't related, such as date and product.

- *Joined reports* let you create different views of data from multiple report types. In a joined report, data is organized in blocks. Each block acts like a “sub-report,” with its own fields, columns, sorting, and filtering. You can add a chart to a joined report. For example, in the following sample, the joined report pulls data from two report types related to the `Positions` object. Together, the report shows applications received from job ads posted for each position.



Tip: Use joined reports to group and show data from multiple report types in different views.

Chapter 10: Analyzing Data with Reports and Dashboards

Tabular reports can't be used to create graphs or group data

Review: Owner Name	Review: Created Date	Job Application: Candidate	Job Application: Position	Job Application: Status
Cynthia Capobianca	6/10/2010	C-00001	Benefits Specialist	Phone Screen
George Abitbol	6/10/2010	C-00008	Documentation Writer	Rejected
George Abitbol	6/10/2010	C-00012	Sr. UI Designer	Extended Offer
George Abitbol	6/10/2010	C-00029	DBA	Rejected
George Abitbol	6/10/2010	C-00014	Sr. Benefits Specialist	Hired
George Abitbol	6/10/2010	C-00037	Inside Sales Rep.	Hired
George Abitbol	6/10/2010	C-00008	Sr. Benefits Specialist	Phone Screen
George Abitbol	6/10/2010	C-00003	Documentation Writer	New
George Abitbol	6/10/2010	C-00008	Documentation Writer	Schedule Interviews
Grand Totals (13 records)				

Summary reports allow you to create a graph and group rows of data

Review: Owner Name	Record Count
Cynthia Capobianca	1
Dave Carroll	2
George Abitbol	2
Grand Total	

Matrix reports allow you to create a graph and group both rows and columns of data

Review: Owner Name	Job Application Position					Grand Total
	Benefits Specialist	DBA	Documentation Writer	Inside Sales Rep.	Sr. Benefits Specialist	
Cynthia Capobianca	1	1	1	1	2	5
Dave Carroll	0	0	1	0	1	2
George Abitbol	1	0	1	0	0	2
Grand Total						9

JOINED REPORTS LET YOU GROUP DIFFERENT VIEWS OF DATA FROM MULTIPLE REPORT TYPES AND CREATE A GRAPH.

POSITIONS WITH JOB POSTINGS AND EMPLOYMENT WEBSITES
Posted to job sites

Position Title	Employment Website Name	Employment Website: Created Date
Get a Job	4/25/2012	
Hot Hot Jobs	4/25/2012	
Job Buddies	6/21/2012	
Jobs Now	4/25/2012	
Want in Play	6/21/2012	

POSITIONS WITH JOB APPLICATIONS
Candidates who applied

Candidate: First Name	Candidate: Last Name	Created Date
Claudia	Hawthorne	6/20/2012
Sandy	Chopra	6/21/2012

Job Applications and Job Postings

Legend: Candidates who applied - Record Count (Blue), Posted to job sites - Record Count (Green)

Position Title	Posted to job sites (Record Count)	Candidates who applied - Record Count (Record Count)
Get a Job	4	2
Hot Hot Jobs	4	2
Job Buddies	6	2
Jobs Now	4	2
Want in Play	4	2

Figure 112: Tabular, Summary, Matrix, and Joined Reports Offer Different Options for

Viewing Data

Setting Up the Recruiting App for Reports

Before we get started building reports, we first need to take care of a couple tasks that will make our reports easy to find in the Recruiting app. We need to add the Reports tab to the default tab display along with our Positions, Candidates, and Job Applications tabs. We'll also need to create a folder for storing all the reports that we create. While both of these tasks are purely optional, they'll go a long way towards improving the experience of our Recruiting app users.

Try It Out: Add the Reports Tab

First we'll start by adding the Reports tab to the set of default tabs that are displayed for every Recruiting app user. To do so, we need to revisit the Recruiting app that we created way back in [Building a Simple App](#) on page 33.

1. From Setup, click **Create > Apps**.
2. Click **Edit** next to the Recruiting app.
3. In the Choose the Tabs section, add Reports to the Selected Tabs list.
4. Optionally, select Overwrite users' personal custom app customizations.

If you choose this option, the Reports tab is automatically added to the tab bar by default for all users. If you've already deployed your app and you'd rather not overwrite existing users' changes, leave this option unchecked. Users can manually add the Reports tab to their personal tab bar by clicking the + tab.

5. Click **Save**.

Perfect! Now let's visit the Reports tab to perform our next task: creating a folder for Recruiting reports.

Try It Out: Create a Recruiting Reports Folder

On the Reports tab, you see recently viewed reports and dashboards organized in report or dashboard folders. You can quickly browse the Folders pane or search what you're looking for. To see all items, or only reports for example, you can filter the list view. Every organization, by default, has standard folders, some that contain report templates.

Unfiled Public Reports is a standard folder all users can access. As an administrator, you can store reports in that folder to share with everyone in your organization. You can make any other folder public, by sharing it with all users. Personal folders (also standard folders) such as Personal Custom Reports and Personal Dashboards are an exception. They contain reports or dashboards private to each user and can't be accessed by others.

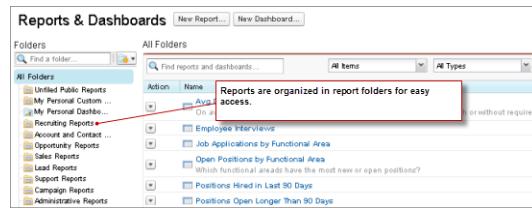


Figure 113: The Reports Tab and Folders

To let users access your reports, make the folder that stores the reports accessible to them. Let's create a folder to organize reports that your users can find easily.

1. In the Reports tab, click next to the Folders pane and choose **New Report Folder**.
2. In the Report Folder Label field, enter Recruiting Reports. Folder Unique Name autopopulates with Recruiting_Reports. Leave this default value.
3. Click **Save**.
4. Next to the Recruiting Reports folder, click and select **Share**.

Note:

If you don't see the Share option, you just need to turn on folder sharing. From Setup, click **Customize > Reports & Dashboards > Folder Sharing**, and make sure **Enable access levels for sharing report and dashboard folders** is selected.

You can share all of the contents of a report folder by selecting one of the options at the top of the dialog: Users, Roles, Roles and Subordinates, or Public Groups. We want everyone at Universal Containers to be able to see, but not change, the reports in this folder.

5. Click **Roles and Subordinates**.
6. Next to CEO, click **Share**.
7. Make sure that the level selected in the Access column is **Viewer**. This allows all users in your company to view this folder and the reports in it, but allows only administrators to modify the reports inside the folder or add new reports to it.
8. Click **Done** to save our settings, and then click **Close**.

Great—we're now ready to create our first report.

Creating a Summary Report

To get started, we'll create a summary report that answers the question, "Which functional areas have the most new or open positions and in what region?" This report will include the title, hiring manager, location, and status of each position, as well as a pie chart that presents the data visually. As we do this, we'll skip over some of the more complicated reporting options so we can quickly create a report that fits our requirements. Our second example will then define a more complex matrix report that shows off some of the more advanced reporting features.

Because this report is going to use so many different reporting features, we'll break down the procedure into three parts:

1. Creating a summary report
2. Adding columns and filters
3. Adding a chart

Try It Out: Create a Summary Report

To create our summary report, we'll start by opening the report builder, a powerful visual editor for reports.

1. On the Reports tab, click **New Report**.

The first step in creating a report is choosing the right report type. A *report type* defines the set of records and fields available to a report based on the relationships between a primary object and its related objects. Reports display only records that meet the criteria defined in the report type. Your administrators may have set up custom report types for you, or you can select from the available standard report types.

To help with navigation in this screen, all objects and relationships are grouped in categories like Accounts & Contacts or Customer Support Reports. The custom objects and relationships that we built for our Recruiting app can be found in Other Reports.



Note: The Other Reports category contains all reports based on custom objects. If you've built a custom object that's related to a standard object, such as Account or Contact, you'll also be able to report on your custom object in the standard object's category.

- From the Create New Report page, select the Other Reports category.

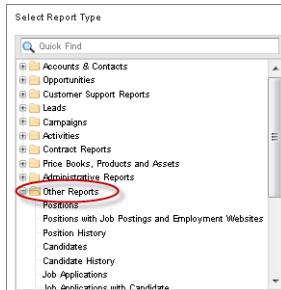


Figure 114: The Other Reports Category in the Create New Report Page

Objects that have a many-to-one relationship with another object, like Job Applications and Positions, can either be selected on their own or in the context of their relationship with the other object. For example, if we select Job Applications with Position, our report will count job application records, but can filter, group, or display fields from the related position records as well. This will come in handy a little later when we build reports that count job application records. But because we need to count position records in our report and positions aren't on the many side of a relationship, we'll stick with a standalone positions report for now.

- Select Positions.
- Click **Create**.

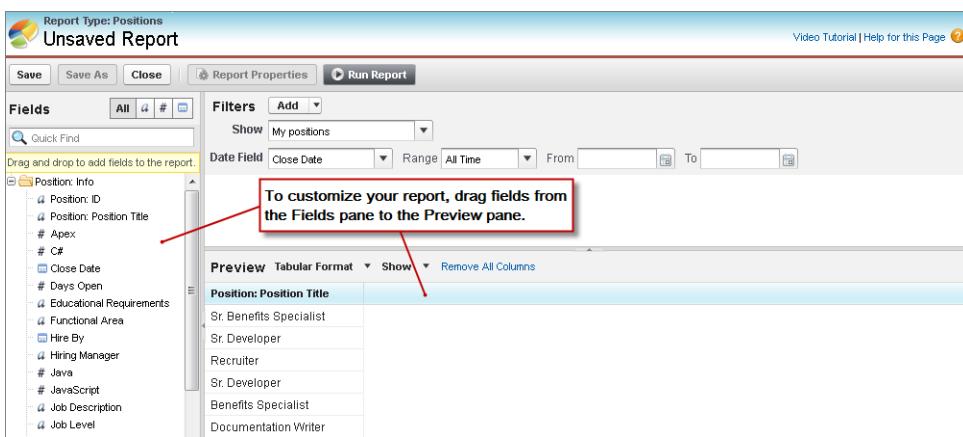


Figure 115: Custom Report in Report Builder

Now that we've chosen the report type, we can customize the report. Note that we can't go back and change the report type. To do that, you have to start with a whole new report. The report builder's Preview pane displays a limited set of data; we can also run the report at any

time to see if we have the results we're looking for. For example, let's see what a baseline positions report looks like without any customizations.

5. Click Run Report.

The screenshot shows a report titled "Position Report". At the top, it says "Report Generation Status: Complete". Below that is a "Report Options" section with dropdown menus for "Summarize information by" (set to "None") and "Show" (set to "My positions"). To the right is a "Time Frame" section with dropdowns for "Date Field" (set to "Close Date") and "Range" (set to "Custom"), along with "From" and "To" date fields. Below these are buttons for "Run Report", "Hide Details", "Customize", "Save As", "Printable View", and "Export Details". The main area is titled "Position: Position Title" and lists several positions: "Sr Benefits Specialist", "Sr Developer", "Recruiter", "Sr Developer", "Benefits Specialist", and "Documentation Writer". At the bottom, it says "Grand Totals (6 records)".

Figure 116: A Positions Report with No Customizations



Note: The Show drop-down list defaults to My Positions. If you are logged in as a user who does not own any positions, select All Positions before you click **Run Report**. The report will then display all the positions to which you have access.

As you can see, without specifying any details, we already have a list of position records with a Grand Total at the bottom. This is the equivalent of what we might see if we were creating a tabular report without additional columns. Now let's take this basic report to the next level.

6. Click Customize to return to the report builder.

When creating a new report, we first need to choose the format of the report that we want to create. The default is tabular. Because we want to group rows of open positions by functional area, we'll create a summary report.

7. Click Tabular Format and select Summary to change the format.

Now we want to group our rows of data by the Functional Area field.

8. Find Functional Area in the Fields pane and drag it to the grouping drop zone in the Preview pane. When you have lots of fields, using Quick Find is usually fastest.

The screenshot shows a report builder interface with three main panes: Fields, Filters, and Preview.

- Fields Pane:** On the left, it lists various fields under categories like Position Info, Formulas, and Apex. A red arrow points from the "Functional Area" field in this list to the grouping area in the Preview pane.
- Filters Pane:** In the top center, it includes a "Show" dropdown set to "My positions", a "Date Field" dropdown set to "Close Date" with a "Range" of "All Time", and date input fields for "From" and "To".
- Preview Pane:** On the right, it shows a table with columns for "Position Title" and "Functional Area". The first row has "Position Title" as "Sr. Benefits Specialist" and "Functional Area" as "Recruiter". The second row has "Position Title" as "Sr. Developer" and "Functional Area" as "Sr. Developer". The third row has "Position Title" as "Benefits Specialist" and "Functional Area" as "Documentation Writer". A red box highlights the "Functional Area" column header with the text "Drag the Functional Area field to create a grouping.".

Figure 117: Adding a Grouping for a Report

Say we want to see positions also grouped by region. While the Location field gives us city and state, we want to group data geographically by regions, like USA, UK, and Asia Pacific. By categorizing the location field into buckets, we get a field that can be used for the grouping.

9. Drag `Location` from the Field pane into the preview after `Position Title`.
10. Click on `Location`, and select **Bucket this Field**.
11. Type `Region` in the Bucket Field Name.
12. Click **New Bucket**, type `USA`, and press Enter.
13. Select:
 - San Francisco, CA
 - Austin, TX
 - Boulder, CO
 - New York, NY
14. Click **Move To**, and from its drop-down select **USA**.
15. Click **New Bucket**, type `UK`, and press Enter.
16. Move `London, England` into the `UK` category.
17. Move the remaining items into an Asia Pacific bucket.
18. Click **OK**.

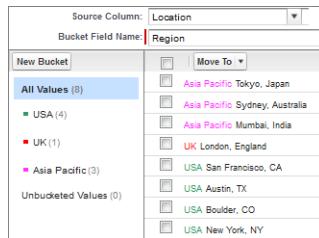


Figure 118: Creating a Bucket Field

When done, locations are categorized regionally, and you have a bucket field called Region, which appears in the Field pane. However, we don't need to do anything, because the Platform has automatically added it to the left of Position Title.

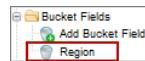


Figure 119: Bucket Fields in the Report Preview

We're closer now! Our report still only lists position titles, but now they're grouped by functional areas and by region. Also, each grouping has a record count subtotal in parentheses. These counts will be the basis of the pie chart that we'll add later.

Try It Out: Add Columns and Filters

Now, let's select and order the fields shown, and set the filters that restrict the set of records included in the report.

In addition to Position Title and Location, we also want to display the Hiring Manager and Status fields for each record. To select multiple fields or columns, press CTRL (Windows) or Command (Mac).

1. In report builder, drag the following fields into the preview.
 - Hiring Manager
 - Status
 You can also double-click fields to add them to the end of the report.
2. Reorder columns by dragging them. When you're done, the order should be:
 - Position Title
 - Location
 - Hiring Manager

- Status

Position: Position Title	Location
Functional Area: Finance (1 Record)	
Region: USA (1 Record)	
Drop a field here to create a grouping. Hide	
Senior Analyst	San Francisco, CA
Functional Area: Human Resources (2 Records)	
Region: USA (2 Records)	
Sr. Benefits Specialist	San Francisco, CA

Figure 120: Adding a Column Using Drag-and-Drop

We're even closer to our goal. However, the Status field shows us that the report includes some position records that have already been filled. Since we only want to view the new and open ones, we need to set some filters. Filters define the set of records to be included in the report; for example, you can include only records created this month or only records that belong to a certain user. With standard filters, you can quickly filter by record owner or date field. With field filters, you can filter on any field in the report. Because we want to view open positions across the entire organization and not just positions that we own (by default, all custom reports include "My" records only), we need to set two filters.

3. In the Show drop-down, select All Positions.
4. Click **Add > Field Filter**.
5. Define a filter for Status equals New Position, Pending Approval, Open - Approved.



Tip: Notice that whenever you choose a checkbox field or a picklist field, like Status, in your filter, a lookup icon (🔍) shows up next to the filter row. Click the icon to view valid values for that field and quickly insert the ones by which you want to filter.

Using this filter of Status equals New Position, Pending Approval, Open - Approved means that our report will include only those position records with one of these three statuses. Note that the comma between the three Status values is treated as an OR function, so this one filter is the same as using these three filters.

- Status equals New Position, OR
- Status equals Pending Approval, OR
- Status equals Open - Approved

Beyond the Basics

Did you know you can filter on a bucket field?

Say you want to view data for non-UK regions. You can add a filter for the bucket field, Region that you created to group data in the last exercise. You can filter bucket fields like any other field in the report. You would set the filter in this example as: Region does not contain UK.

As you add more filters, by default, they're applied cumulatively on the report using the AND function. That means, only data that meets all the filter conditions is displayed. But you can control how filters behave by using **Filter Logic** from the Add drop-down.

Try It Out: Add a Pie Chart

The final step is to display a chart with the report. In our case, we want a pie chart.

1. Click **Add Chart** and choose the pie chart type.

The chart builder automatically knows that we want the values to be the record count, and the wedges to be the different functional areas. That's because chart values correlate to a report's summary fields, and pie chart wedges correlate to a report's groupings. Since we have a second grouping by **Region**, we can choose a different field to display in the wedges. But we'll keep the default selections.

Now let's finish up our chart and generate our final report.

2. Click **OK**.

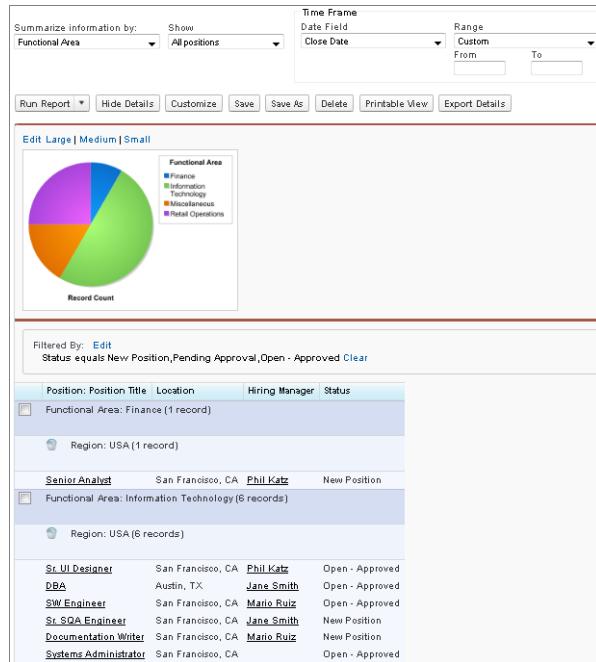


Figure 121: Summary Report Showing Open Positions by Region and Functional Area

When the report is run, you have several options for viewing data.

- Group, summarize data by a different field. For example instead of Functional Area, you can summarize by Hiring Manager.
- Export data into an Excel spreadsheet or CSV (comma separated values) format.
- Clear any filters applied.
- Refine results with standard filters such as date or range.

Because our report meets all of our criteria, let's save it to the Recruiting Reports folder.

3. Near the top of the report, click **Save**.
4. In the Report Name field, enter **Open Positions by Functional Area and Region**.
5. In the Report Description field, enter **Which functional areas have the most new or open positions by region?**
6. In the Report Unique Name field, enter **Open_Positions_by_Functional_Area** if that's not already the value.
7. From the Report Folder drop-down list, select **Recruiting Reports**.
8. Click **Save**.

Now if we view the Recruiting Reports folder, we can see our new summary report. Next, we'll make a matrix report that takes advantage of some of the more advanced reporting features.

Creating a Matrix Report

For our next report, we'll answer the question, "On average, how many days does it take each recruiter to fill a position with or without required travel?" This report will use a matrix format to highlight the difference that mandatory travel makes in how long it takes for positions to be filled. Looking at data only for this year and the last, the report will include:

- Record counts for each position a recruiter owns
- A custom summary formula for the percentage of a recruiter's positions that require travel
- A time-based filter that restricts the data only to positions that were created this year or last
- A color-coded field summary for the average number of days positions remain open:
 - ◊ Averages of less than 30 days are color-coded green
 - ◊ Averages of between 30 and 60 days are color-coded yellow
 - ◊ Averages of more than 60 days are color-coded red

Because this report is going to use so many different reporting features, we'll break down the procedure into four parts:

1. Creating a matrix report
2. Adding custom summary fields
3. Adding columns and filters
4. Adding a chart and conditional highlighting

Try It Out: Create a Matrix Report

To create the matrix report, we'll use the report builder again, this time highlighting steps that are different from how we defined the summary report.

1. In the Reports tab, click **New Report**.

Once again, we'll be creating a report that counts position records.

2. From the list, click the "+" to expand Other Reports.
3. Select Positions, and click **Create**.

Because we want to directly compare individual recruiter performance for positions that do and do not require travel, we'll use a matrix report. That way we can group the rows of positions by recruiter, and columns of positions by whether or not they require travel.

- From the Format drop-down, select Matrix.

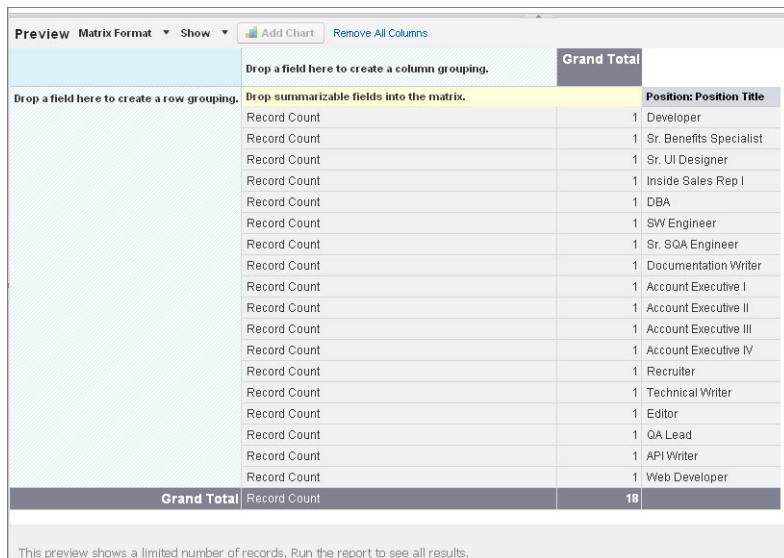


Figure 122: Specifying Groupings in a Matrix Report

Now let's group by both rows and columns. Notice the two sets of drop zones for matrix reports.

- From the Fields pane, drag `Position: Owner Name` to the row grouping drop zone.
- Now, drag `Travel Required` to the column grouping drop zone.

Our report now breaks out the possible values for the `Travel Required` field in the columns dimension. Recruiters are also broken out in the row dimension, but because all custom reports query just the report creator's data by default (that is, "My" records only), only one recruiter is listed in the report so far. Let's keep going.

Try It Out: Add Summary Fields

In the next step, we want to specify which numerical or checkbox field values to include in our report, and how each of them should be summarized in subtotals and grand totals. Though record count is always summarized as a sum total, we can summarize other numerical and checkbox fields in different ways.

For example, it doesn't make sense to sum the values of the Days Open column—the resulting total wouldn't provide much value. However, if we calculate the average for Days Open, we'd know roughly how long positions stay open.

For our report, we need to include three different types of summaries: record count, average days open, and a formula that calculates the percentage of records requiring travel. While the first two are standard summary fields, the third will require a visit to the Custom Summary Formula editor. Let's start with the first two. By default, the report already adds Record Count, so let's add the average for the number of days a position stays open.

1. Find the Days Open field and drop it into the matrix.
2. In the Summarize dialog, select Average.

Now, let's create that formula to calculate the percentage of records requiring travel.

3. Double-click **Add Formula**. You'll see the Custom Summary Formula editor.

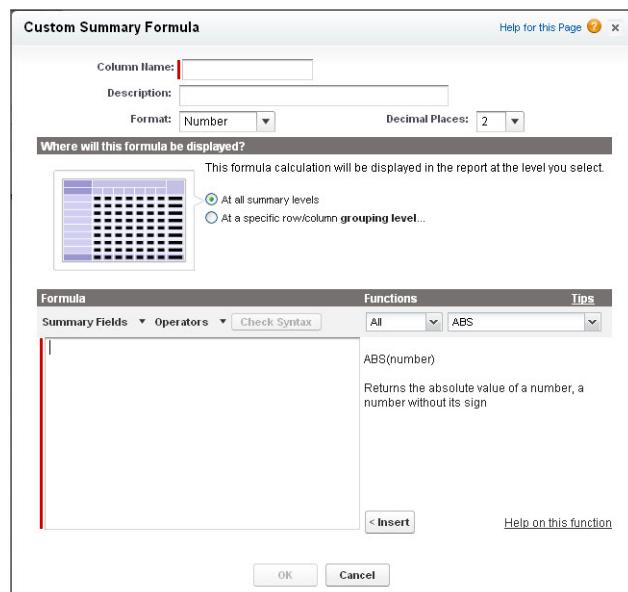


Figure 123: The Custom Summary Formula Builder

The formula editor lets us define a new formula based on the summarizable fields in the report. In our case, we want to include a summary that shows the percentage of position records that require travel in any given segment. To make this calculation we need to divide the sum of records that require travel by the sum of all records:

4. In the Column Name field, enter Travel Required Percentage.

5. In the Description field, enter The percentage of total position records that require travel.
6. In the Format drop-down list, choose Percent.
7. In the Decimal Places drop-down list, choose 0.
8. For Where will this formula be displayed?, choose At all summary levels.

Now, let's write our formula. Similar to other formula editors in the platform, this provides tools to make it easier.

9. In the Formula section, click **Summary Fields** and select Travel Required, then select Sum.

The formula editor displays the following API representation of those values:

```
Position__c.Travel_Required__c:SUM
```

10. Click the **Operators** drop-down and select **Divide**.
11. Click **Summary Field** and select Record Count.

The final formula looks like this:

```
Position__c.Travel_Required__c:SUM / RowCount
```

We can quickly verify that the formula is correct by checking its syntax before saving.

12. Click **Check Syntax**.
13. Click **OK**.

Try It Out: Add Columns and Filters

In the next steps, we'll select report columns, then define our filters. Because we're already familiar with adding columns, let's zip through that step first.



Note: Before you can add fields to a matrix report, make sure Details is selected under the **Show** drop-down list. If details aren't shown, you can only add summary fields.

1. Add the following report columns by double-clicking them.

- Functional Area
- Status

Position: Position Title, Days Open and Travel Required should already be part of your report.

For our report, we want to define three filters: one to include all positions, one to include only those positions created in the last year, and one to include those with a Status of Open - Approved or Closed - Filled.

2. In the Show drop-down list, choose All Positions.
3. In the Date Field filter select Position: Created Date.

Notice that all other date fields defined on the Position object are also available in the Date Field filter, including Close Date, Hire By, and Open Date.

4. For Range, choose Current and Previous CY (meaning this and last calendar year). The start and end dates are populated automatically.

Now let's add a field filter based on the status.

5. Click Add.
6. Create this filter.

Status equals Open - Approved, Closed - Filled

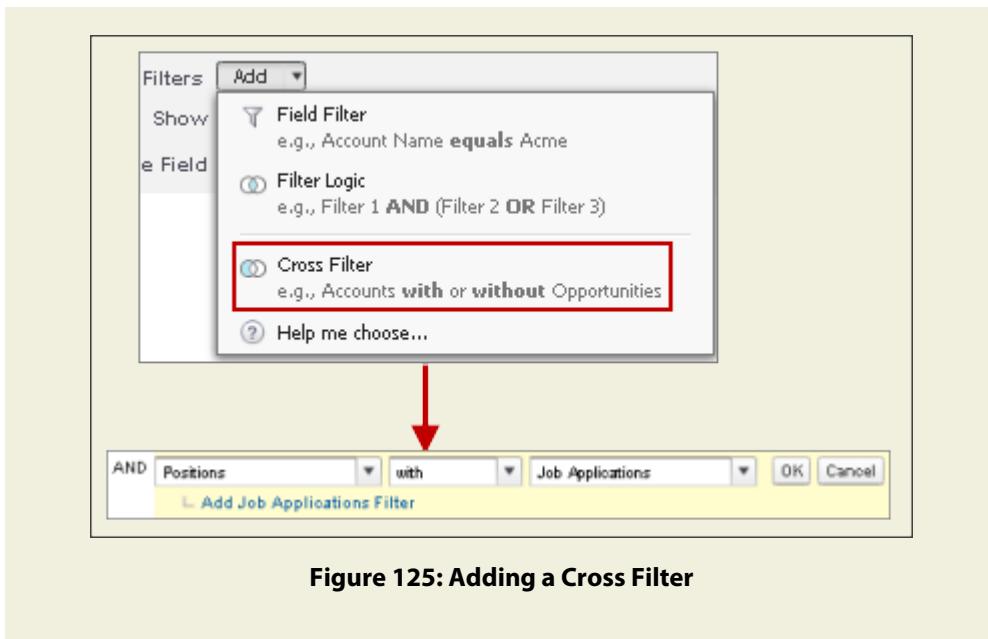
7. Click OK.



Figure 124: Filtering the Matrix Report

Beyond the Basics

Cross filters let you filter on a report's child objects using a straightforward WITH or WITHOUT condition. For example, you only want to see data for positions that have job applications. You can add a **Cross Filter** from the Add drop-down on the Fields pane like this: Positions with Job Applications. You can sub-filter the Job Applications object to refine results further.

**Figure 125: Adding a Cross Filter**

Try It Out: Add a Chart and Conditional Highlighting

We're almost done. Now, in addition to creating a horizontal bar chart that shows the average number of days open, recruiters, and whether the position requires travel, we also want to conditionally highlight data to help us quickly analyze which recruiters are performing well and which need to work on filling their positions faster.

1. Click **Add Chart**.
2. Select the Vertical Bar Chart type.
3. In the Y-Axis drop-down list, choose **Average Days Open**.
4. In the X-Axis drop-down list, choose **Position: Owner Name**.
5. In the Group-By drop-down list, choose **Travel Required** and keep the side-by-side grouping format.
6. Leave the Plot additional values checkbox empty.

A *combination chart* plots multiple sets of data on a single chart. Each set of data is based on a different field, so values are easy to compare. You can also combine certain chart types to present data in different ways in a single chart. The report we're building doesn't need a combination chart, but they are useful when comparing data, charting trends, and so forth.

7. Click the **Formatting** tab.

8. In the Chart Title field, enter Avg Days to Hire With and Without Travel.
9. Click **OK**.

All three of our summary fields are available to highlight, but we just want to emphasize one: Average Days Open. That's because we want to highlight which recruiters are closing positions in less than 30 days, less than 60 days, or more than 60 days.

10. Click the **Show** drop-down list and select **Conditional Highlighting**.



Figure 126: Adding Conditional Highlighting to Show Changes in Data

11. In the first row, set Select Field to Average Days Open.
12. In the first color picker, select a shade of green. This is the low color.
13. In the first text field, enter 30. This is the low breakpoint.
14. In the second text field, enter 60. This is the high breakpoint.
15. In the third color picker, select a shade of red. This is the high color.
16. Click **OK**.
17. Click **Run Report**.

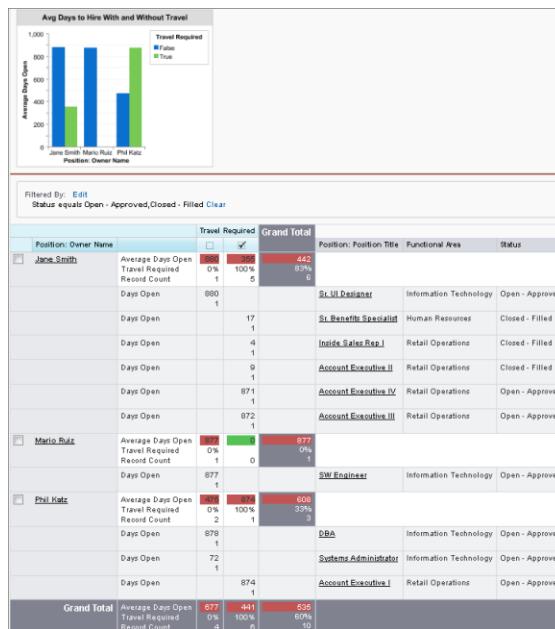


Figure 127: Viewing the Results of the Matrix Report

Our report shows at a glance how well our recruiters fill positions and how long, on average, positions stay open. Conditional highlighting shows which positions are taking longer to fill—generally those requiring travel. Let's quickly save this report before moving on.

18. Click **Customize** to return to the report builder.
 19. Near the top of the report, click **Save**.
 20. In the Report Name field, enter **Avg Days to Hire With and Without Travel**.
- The Report Unique Name field is automatically populated.
21. In the Report Description field, enter **On average, how many days does it take each recruiter to fill a position with or without required travel?**
 22. From the Report Folder drop-down list, select **Recruiting Reports**.
 23. Click **Save**.
 24. Click **Close**, and then click **Save & Close** to return to the Reports tab.



[other]: Did you know you can add charts to more than just reports and dashboards? You can give users valuable information directly on the pages they visit often. To do that, just embed report charts in detail pages for standard or custom objects. When

users see charts on pages, they can make decisions based on data they see in the context of the page without going elsewhere to look for it.

For more information about embedding charts into page layouts, see “Adding a Report Chart to a Page Layout” in the Salesforce Help.

As we've seen, custom reports can provide a lot of interesting data, giving insight into the challenges that an organization faces. However, unless a user visits these reports often, much of their benefit remains untapped. How can we give users a way of keeping tabs on the information in reports without wasting their time? The answer, as we'll see next, lies with dashboards.

Introducing Dashboards

A *dashboard* shows data from source reports as visual components, which can be charts, gauges, tables, metrics, or Visualforce pages. The components provide a snapshot of key metrics and performance indicators for your organization. Each dashboard can have up to 20 components. Users can view any dashboard available in a public folder in their organization, such as Company Dashboards, and can select a favorite, whose first three components display on the Home tab.

To put it mildly, users *love* the summarized views they get with dashboards, and no good Force.com app is complete without at least one.

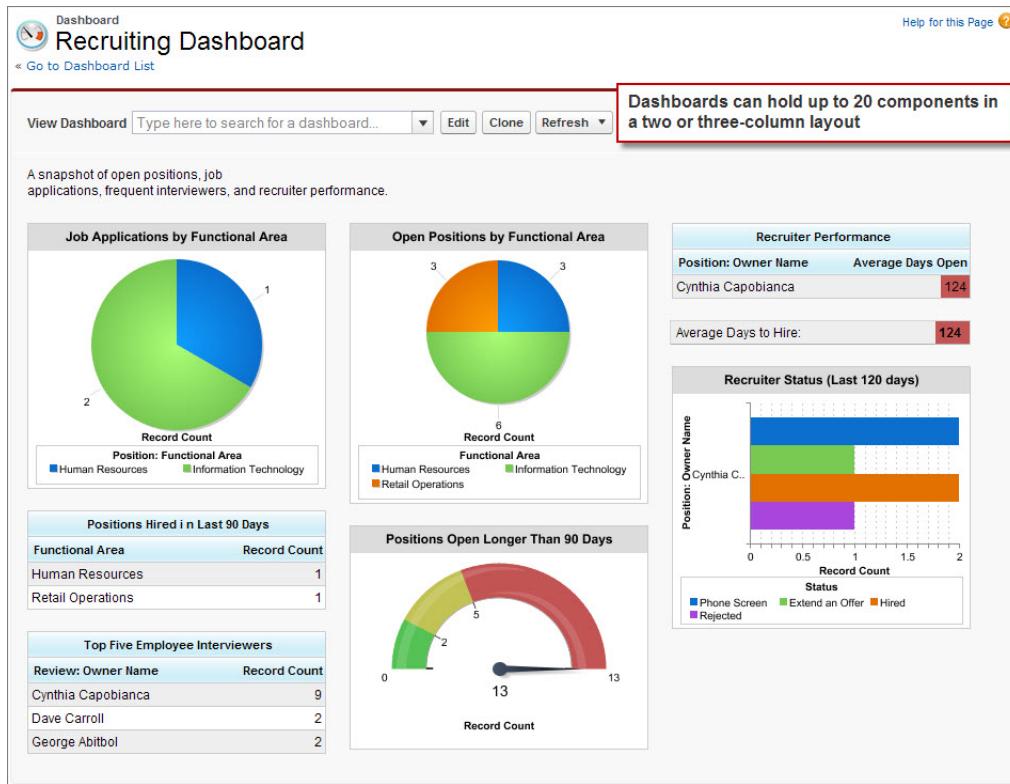


Figure 128: A Sample Recruiting Dashboard

Try It Out: Create Additional Reports

We'll be creating a small-scale recruiting dashboard in this chapter, but before we do, let's use our new report-building skills to create a few more reports. Because we're already familiar with how report builder works, we'll just outline the specifics of a few reports in the following table—you can either create them on your own, or just familiarize yourself with the options.



Tip: Want to click along with our dashboard instructions but don't want to spend your time creating all these new reports? Just create the Positions Open Longer Than 90 Days report in the first row. However, if you're interested in recreating the sample dashboard displayed here, you'll need to create the other four as well.

Table 45: Additional Recruiting Report Specifications

Report Name	Question	Report Type	Options
Positions Open Longer Than 90 Days	<i>Which positions have been open for more than 90 days?</i>	Positions	<p>Format: Summary Report</p> <p>Summarize information by: Location and then by Functional Area</p> <p>Columns: Position: Position Title, Position: Owner Name, Status, Open Date, Hire By, Days Open</p> <p>Filters: All Positions; Days Open greater or equal 90</p> <p>Chart Type: Pie</p> <p>Chart Wedges: Functional Area</p> <p>Chart Title: Positions Open Longer Than 90 Days</p>
Job Applications by Functional Area	<i>Which positions are getting the most candidates?</i>	Job Applications with Position	<p>Format: Summary Report</p> <p>Summarize information by: Position: Functional Area and then by Position: Position Title</p> <p>Columns: Job Application Number, Job Application Status</p> <p>Filters: All job applications; Position: Status equals Open - Approved</p> <p>Chart Type: Vertical Column</p> <p>X-Axis: Position: Functional Area</p> <p>Chart Title: Job Applications by Functional Area</p>

Report Name	Question	Report Type	Options
Employee Interviewers	<i>Which employees conduct the most interviews?</i>	Job Applications with Reviews	<p>Format: Summary Report</p> <p>Summarize information by: Review: Created By</p> <p>Columns: Job Application: Job Application Number, Job Application: Position, Job Application: Status, Review: Created Date</p> <p>Filters: All job applications</p> <p>Chart Type: Pie</p> <p>Chart Title: Employee Interviewers</p>
Recruiter Status	<i>What does the job application pipeline look like for each recruiter and open position?</i>	Job Applications with Position	<p>Format: Matrix Report</p> <p>Subtotal Rows by: Position: Owner Name and then by Position: Position Title</p> <p>Subtotal Columns by: Job Application Status</p> <p>Columns: Job Application: Job Application Number</p> <p>Filters: All job applications; Job Application: Last Modified Date Last 120 Days; Position: Status equals Open - Approved, Closed - Filled</p>
Positions Hired in Last 90 Days	<i>Who have we hired in the last 90 days?</i>	Positions	<p>Format: Summary Report</p> <p>Summarize information by: Functional Area</p> <p>Columns: Position: Position Title, Position: Owner Name,</p>

Report Name	Question	Report Type	Options
			Hiring Manager, Job Level, Location, Close Date
			Filters: All positions; Close Date Last 90 Days; Status equals Closed - Filled

Try It Out: Create a Dashboard

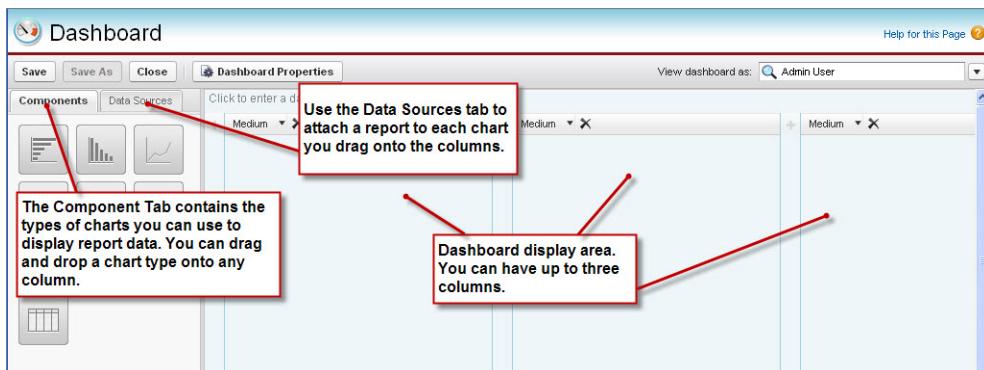
Now that we've got a set of reports to reference, we're ready to create a small Recruiting dashboard. To do so, we'll be working in the Reports tab.

First we need to create a folder to hold our dashboards. We'll use the same steps that we used to create a folder to hold our reports.

1. In the Reports tab, click  next to the Folders pane and choose **New Dashboard Folder**.
2. In Dashboard Folder Label, enter Recruiting Dashboards. The Folder Unique Name field automatically populates with Recruiting_Dashboards.
3. Click **Save**.
4. Next to the Recruiting Dashboards folder, click  and select **Share**.
5. At the top of the dialog, click **Roles and Subordinates**.
6. Next to CEO, click **Share**.
7. Make sure the level selected in the Access column is **Viewer**. This allows all users in your company to view this folder and the reports in it, but allows only administrators to modify the reports inside the folder or add new reports to it.
8. Click **Done** to save our settings, and then click **Close**.

Now we'll create a dashboard.

1. On the Reports & Dashboards page, click **New Dashboard**.

**Figure 129: The Dashboard Edit Page**

Once we specify the dashboard properties, we can add components.

2. Click **Dashboard Properties**.
3. In the Title field, enter Recruiting Dashboard.
4. The Dashboard Unique Name field autopopulates with Recruiting_Dashboard.
5. Select the Recruiting Dashboards folder to save it in.
6. Click **OK**.
7. For the dashboard description—the editable field near the top of the page—enter A snapshot of open positions, job applications, frequent interviewers, and recruiter performance.

Each dashboard has a running user, whose security settings determine which data to display in a dashboard. All users with access to the folder see the same data, regardless of their own personal security settings.

The running user's security settings only apply to the dashboard view. Once a user drills down into a source report or detail page off the dashboard, the user will view the data based on his or her normal security settings.

For example, suppose a system administrator with the “Modify All Data” permission is the running user for our recruiting dashboard. In this case, every recruiting-related record is counted in all of the report totals on our dashboard, including users who'd normally be restricted from viewing certain records (like those assigned to the Standard Employee profile). Although those users would be able to see the summary data for all records in the dashboard, if they navigated to the source reports, they'd see just the records they have access to.

When you're designing a dashboard, keep the dashboard's audience in mind. Ask whether any of the information is sensitive and how much you want them to see. If you do give a user access to dashboards that include more data than he or she normally has permission to view, be sure to communicate that they might see different values when they click through the dashboard.

to view the associated reports. And if you need to restrict a dashboard from certain users, just save it to a restricted-access folder.

Beyond the Basics

Did you know you can set up a *dynamic dashboard* that shows users data according to their own security settings?

Say you want to show the same set of dashboard components to different sets of users, each with a different level of visibility. You'd potentially have to set up dozens of dashboards with the right running user for each, and store them in separate folders. With dynamic dashboards, administrators can accomplish the same thing without having to create and maintain all those extra dashboards and folders. A single dynamic dashboard can display a standard set of metrics across all levels of your organization.

To find out more, see “Provide Individualized Views of a Dashboard” in the Salesforce Help.

For our recruiting dashboard, the data that we'll be showing in the dashboard isn't particularly sensitive. Consequently, we'll choose a system administrator as the running user, and save the dashboard to a public folder.

8. In the View dashboard as field in the upper right of the screen, enter the name of your user, since you have system administrator privileges. This sets the running user for the dashboard.

We now have an empty dashboard that's ready to be filled with components.

Adding Dashboard Components

We haven't yet defined any components, but it's easy to add and reorder them in dashboard builder.

Components come in five varieties.

Icon	Type	Description
------	------	-------------

	<i>Charts</i>	Displays a bar, column, line, pie, donut, or funnel chart—or any chart contained in a report.
	<i>Tables</i>	Displays a table that contains values and totals from columns in the report.
	<i>Metrics</i>	Displays the grand total from a report, along with a label that you enter.
	<i>Gauges</i>	Shows the grand total of a report as a point on a “fuel-tank” type of scale.
	<i>Visualforce Pages</i>	Displays any Visualforce dashboard component in your organization.

Try It Out: Add a Chart Component

Let's start by adding a chart that shows the number of open positions by functional area:

1. Drag a pie chart component onto the left column of your dashboard.
2. Click **Edit Title**, and enter Open Positions by Functional Area.
3. Click the Data Sources tab and find and select the Open Positions by Functional Area report.
4. Drag the report and drop it onto the pie chart component.



Tip: Click on the pie to open the component editor. On the Component Data tab, notice that Values and Wedges for the pie are autofilled. This is because record count and the Functional Area field are used in the source report chart. On the other hand, if the source report didn't have a chart, Values and Wedges would automatically pick up record count and the first grouping in the report.

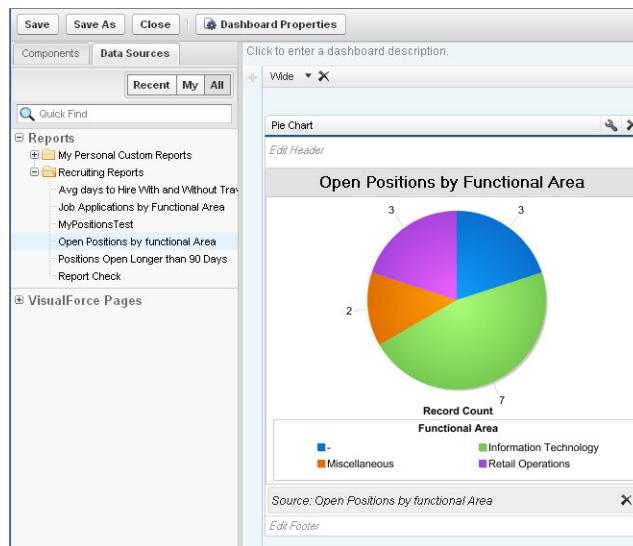


Figure 130: The Dashboard Component Edit Page

Ta-da! We now have a pie chart in our dashboard! If a user clicks on the chart, they're taken to the report from which the chart was generated.

Try It Out: Add a Gauge Component

Now let's create a gauge component that shows us how we're doing with positions that have been open for longer than 90 days.

1. Click the Components tab.
2. Drag a gauge component onto the middle column of your dashboard.
3. Click **Edit Title**, and enter **Positions Open Longer Than 90 Days**.
4. Click the Data Sources tab and find and select the **Positions Open Longer Than 90 Days** report.
5. Drag the report and drop it onto the gauge component.

Now, let's change how our gauge looks. Just like the conditional highlighting in our matrix report, this gauge can display different colors depending on the total count of positions that have been open too long. We want a green color if there are fewer than two positions, yellow if there are between two and five, and red if the value is over five.

6. Click on the gauge to open the component editor.
7. Click the **Formatting** tab and set the following fields.

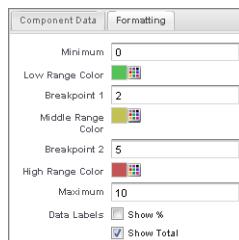


Figure 131: Formatting the Gauge Component

- For Minimum, enter 0.
- For Low Range Color, pick a shade of green.
- For Breakpoint 1, enter 2.
- For Middle Range Color, leave the shade of yellow selected.
- For Breakpoint 2, enter 5.
- For High Range Color, pick a shade of red.
- For Maximum, enter 10.

8. Click OK.

Perfect! Our recruiting dashboard now contains two components.

Try It Out: Add a Table Component

Now let's create a table component that shows us the average number of days it takes a recruiter to fill a position with or without travel.

1. Click the Components tab.
2. Drag a table component onto the right column of your dashboard.
3. Click **Edit Title**, and enter **Recruiter Performance**.
4. Click the Data Sources tab, and find and select the Avg Days to Hire With and Without Travel report.
5. Drag the report and drop it onto the gauge component.
6. Click  on the table to open the component editor.
7. Click the Formatting tab.

Make sure **Show Chatter Photos** is selected. This displays each recruiter's Chatter profile picture in the table.

Just like its underlying source report, we can add conditional highlighting to our table component to highlight recruiter performance levels. We want a green color if the recruiter

needs fewer than 45 days, yellow if he or she needs between 45 and 75 days, and red if the value is over 75.

8. Set the following fields for conditional highlighting.
 - For Low Range Color, pick a shade of green.
 - For Breakpoint 1, enter 45.
 - For Middle Range Color, leave the shade of yellow selected.
 - For Breakpoint 2, enter 75.
 - For High Range Color, pick a shade of red.
9. Click OK.

The screenshot shows a 'Table' component with the following data:

Position	Owner Name	Average Days Open
	Jane Smith	443
	Mario Ruiz	878
	Phil Katz	609

Source: Avg Days to Hire With and Without Travel

Figure 132: Table Component

Try It Out: Add a Metric Component

Finally, let's create a metric component that shows us the average number of days it takes all recruiters to fill a position.

1. Click the Components tab.
2. Drag a metric component onto the right column of your dashboard and drop it below the table we just created.
3. Click the Data Sources tab and find and select the Avg Days to Hire With and Without Travel report.
4. Drag the report and drop it onto the metric.

Because metric components consist of a single value, they don't need a title. Instead, we give them a label much like any other field that you see in the platform.

5. In the label field, enter Average Days to Hire.



Note: Did you notice that we're using the same report that we used for our table? This metric is just another visualization of the data in that report.

6. Click  on the metric to open the component editor.
7. Click the Component Data tab. Notice that the metric value is autopopulated with the column summary total used in the chart of the source matrix report.

Finally, let's add more conditional highlighting to showcase values.

8. Click the Formatting tab and set the following fields.
 - For Low Range Color, pick a shade of green.
 - For Breakpoint 1, enter 45.
 - For Middle Range Color, leave the shade of yellow selected.
 - For Breakpoint 2, enter 75.
 - For High Range Color, pick a shade of red.
9. Click **OK**.

Beyond the Basics

Did you know you can filter components across the dashboard for multiple views of data?

Dashboard filters give you the flexibility of directly manipulating dashboard information on the fly instead of filtering each underlying report. Click **Add Filter** in the dashboard builder to create a dashboard filter and its values. A dashboard can have up to three filters. In this dashboard, for example, you can create a filter called **Function** on the Functional Area field. When viewing the dashboard, users can pick different filter values like Finance or Human Resources to see data for each job function across the dashboard. To learn more, search “Add a Dashboard Filter” in the Salesforce Help.

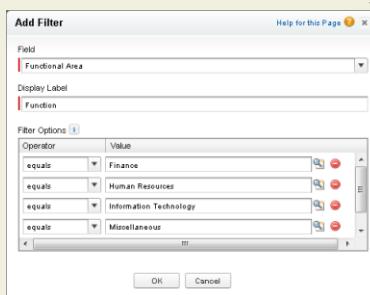


Figure 133: Adding a Dashboard Filter

We've now got a simple, four-component dashboard for our Recruiting app! (Your dashboard might look slightly different.) Let's save our dashboard.

10. Click **Close**, then click **Save & Close**. You can also click **Save** if you want to update the title or description, or change the folder.

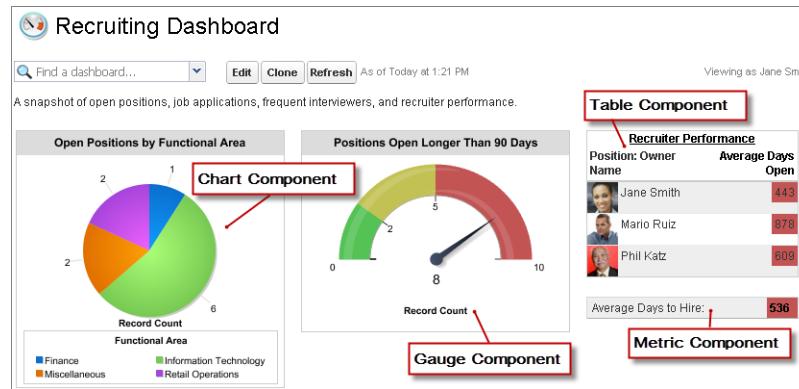


Figure 134: Four Components on the Recruiting Dashboard

If you click the Home tab, you can add the dashboard's first row to your home page. Be sure to add the dashboard section to your Home tab layout and then select the dashboard you want to appear in that section: the Recruiting Dashboard you just created.

1. From Setup, click **Customize > Home > Home Page Layouts**.
2. Select **Dashboard Snapshot**, and click **Next**.
3. Leave the component in their default order, and click **Save**.
4. On the Home tab, click **Customize Page** in the upper right corner of the Dashboard component.
5. Select **Recruiting Dashboard** from the Dashboard Snapshot drop-down list.
6. Click **Save**.

And because we saved the dashboard in a public folder, any user can add it to his or her Home tab, too.

As you can see, once we created the reports for our Recruiting app, adding them to a dashboard was a piece of cake. It's so easy, that we'll leave the remainder of the components as an exercise for you to try on your own—see how close you can come to recreating [A Sample Recruiting Dashboard](#) on page 312.

Refreshing Dashboards

Dashboards reflect a snapshot of your data at a specific time. On the Home tab, that time is indicated in the upper left corner on the Dashboard component; on the Reports tab, it's indicated in the upper right corner. You can refresh your dashboards on either tab by clicking **Refresh**.

If you are using Enterprise, Unlimited, or Performance Edition, you can schedule dashboards to refresh automatically at specific times, and upon completion, receive an email notification that includes the refreshed dashboard.

Scheduling a dashboard refresh is easy. On the Reports tab, simply click the down arrow on the **Refresh** button and select **Schedule Refresh...**, then, indicate who should receive the notification email and the time you want the refresh to occur.

Introducing Mobile Dashboards

The information we've packed into our Recruiting Dashboard can be useful to a lot of people—even recruiters away from their desks. Before we get into Salesforce1 again, we need to make sure dashboards are enabled for mobile. If Dashboards aren't in the navigation menu, users won't see them at all. Let's take a quick look at the configuration for our mobile navigation.

1. From Setup, click **Mobile Administration > Mobile Navigation**.

This is the page that dictates what the navigation menu in Salesforce1 looks like. The first item in the list becomes our users' landing page in Salesforce1, and since this configuration is the same for all of our users, we want the first item to be something useful for everyone. The usefulness principle extends throughout the configuration: we want to put the items that users want most at the top.

The *Today* element corresponds to an app that helps users plan for and manage their day by integrating calendar events from their mobile device with their Salesforce tasks, contacts, and accounts. Available in the Salesforce1 downloadable apps only.

The *Smart Search Items* element, which becomes a dynamic list of recently used objects, can expand into a set of eight or more menu items in the mobile experience, and it might end up pushing other elements below the scroll point if you put it near the top of the menu. Anything you put above the Smart Search Items element appears in the unlabeled first section of the navigation menu. Anything you put below the Smart Search Items element appears in the Apps section of the navigation menu.

2. Arrange the items in the Selected area using the **Up** or **Down** arrows like so:

- Today
- Tasks
- Feed
- Smart Search Items
- Dashboards

Now that we're sure dashboards appear in Salesforce1 for our organization, let's see how dashboards work on a mobile device.

1. Launch Salesforce1.
2. From the navigation menu, tap **Dashboards**.
3. From the list of recent dashboards, tap **Recruiting Dashboard**.

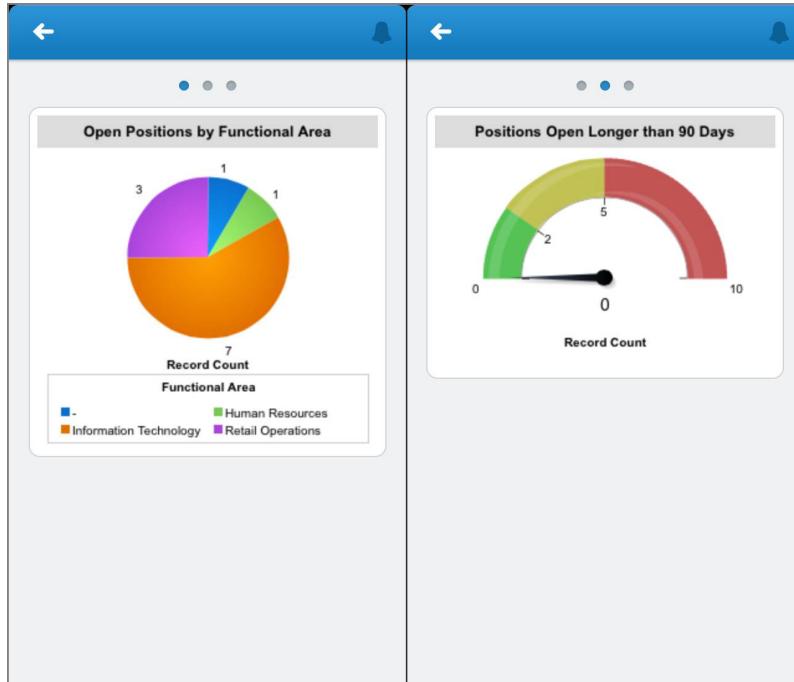


Figure 135: The Recruiting Dashboard in Salesforce1

Our dashboard looks a little different in a mobile context. Instead of seeing all three columns in one view, we see all of each column in a single view. To see other columns, we can swipe left or right. To see the details for a component, we can tap on one. In this component view, we can tap on data points to see their values highlighted.

Introducing Custom Report Types

While dashboards are an excellent way of rendering data, many users will need information that's more granular and unique to their job function, so they'll need to create their own reports. You'll want to control which data they can access for their reports, and make it easy for them to create reports that are useful. You can do both of these by creating custom report types.

Custom report types define the criteria from which your users can run and create reports. When you create a report type, you specify the objects, relationships, and fields that users can select for their reports.

How are custom report types useful in our Recruiting app? Well, our recruiters will appreciate it if we give them an easy way to scan for positions to which candidates have applied. In addition, the recruiters will probably want to see which of those job applications have reviews. That way, they'll know if any positions are on the verge of closing.

Try It Out: Create a Report Type

We've spent most of this chapter on the Reports tabs. Now it's time to return to the Setup menu.

1. From Setup, click **Create > Report Types**.
2. If you see an introductory splash page, just click **Continue**.
3. Click **New Custom Report Type**.

The custom report type that we're creating will include data from three different objects: Position, Job Application, and Review. Positions will be the focus of the recruiters, though, so let's make Position the primary object in this report type.

4. In the **Primary Object** drop-down list, select **Positions**.

Next, we'll give this report type an intuitive name and categorize it so it's easy for users to find it. We'll also enter a description so users who select the report type will know its function.

5. In the **Report Type Label** field, enter **Positions with Reviewed Job Applications**.
6. In the **Report Type Name** field, enter **Positions_with_Reviewed_Job Applications** if it is not there already.
7. In the **Description** field, enter **Which positions have job applications that have been reviewed?**
8. In the **Store in Category** drop-down list, select **Other Reports**.

When creating a report type, set its status to **In Development** if you want to test it before making it available to all your users; however, the report type we're creating does not require much testing, so let's deploy it.

9. Select **Deployed**.
10. Click **Next**.

The platform uses a graphical hierarchy and set diagrams (also called Venn diagrams) to let us easily specify which related records from other objects we want to include in the report results.

11. Click the white box under box A (Positions). Box B appears.
12. On box B, select Job Applications from the drop-down list, and leave Each "A" record must have at least one related "B" record selected.

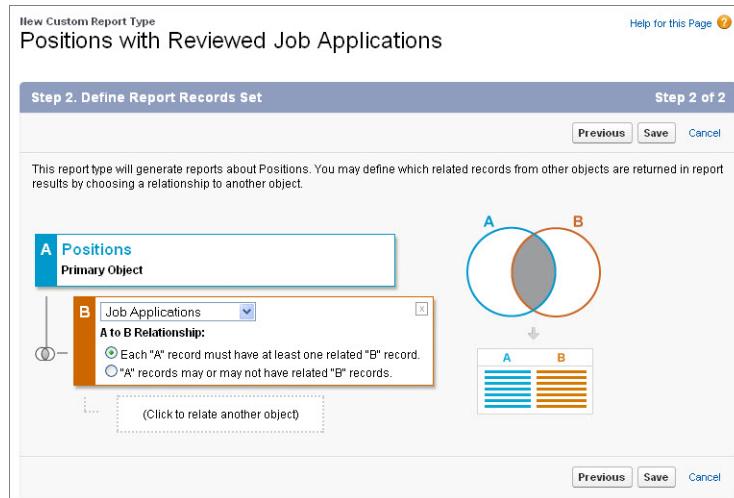


Figure 136: Report Type Hierarchy and Set Diagram for Positions and Job Applications

By leaving this option selected, we've indicated that we want this report type to only include position records for which there are job applications. Notice how the set diagrams on the right change to reflect our selection.

13. Click the white box under box B (Job Applications). Box C appears.
14. On box C, select Reviews from the drop-down list, and leave Each "B" record must have at least one related "C" record selected.



Figure 137: Report Type Hierarchy and Set Diagram for Positions, Job Applications, and Reviews

We've further narrowed the scope of our report to only include job applications that have reviews.

15. Click Save.

Our custom report type is nearly finished. In fact, we could technically say it's done now, but there's something we can do to make it even more convenient for our users: we can reorganize how the fields display in the Fields pane of the report builder.

This report type incorporates three objects (Position, Job Application, and Review), each containing many fields. A user creating a report using this custom report type will likely be overwhelmed by all of those fields, so let's remove the ones they won't need, and move the important ones to the top. We can also specify which ones are selected by default.

16. On the Custom Report Type detail page, scroll down to the Fields Available for Reports related list and click **Edit Layout**.

The page that appears is similar to the page layout editor we used in [Enhancing the Simple App with Advanced Fields, Data Validation, and Page Layouts](#) on page 59. You can reorder fields by dragging them, create and delete sections, and so forth. You can also double-click the fields to change their label and specify whether they should be checked by default.



Important: If a field isn't in a section, it won't be available to users when they generate reports from this report type.

Let's reorganize the page.

17. Create a new section called Position, Job Application, and Review Fields.
18. In the Positions section, change the label of the following fields by double-clicking the field name and editing it in the dialog that opens.
 - Created By to Position Created By
 - Created Date to Position Created Date
 - Status to Position Status
19. In the Job Applications section, change the label of the following fields by double-clicking the field name and editing it in the dialog that opens.
 - Created By to Job Application Created By
 - Created Date to Job Application Created Date
 - Status to Job Application Status
20. In the Reviews section, change the label of the following fields by double-clicking the field name and editing it in the dialog that opens.
 - Created By to Review Created By
 - Created Date to Review Created Date
21. Move the following fields from the Positions section into the Position, Job Application, and Review Fields section.
 - Position Title
 - Created By
 - Created Date
 - Days Open
 - Functional Area
 - Hire By
 - Hiring Manager
 - Open Date
 - Status
 - Travel Required
22. Move the following fields from the Job Applications section into the Position, Job Application, and Review Fields section.

- Job Application Number
- Average Rating
- Created By
- Created Date
- Number of Reviews
- Status

Notice that we didn't include the Candidate field. We left it out because this report type is available to all users, including hiring managers. As mentioned in the previous chapter, a hiring manager might try to poach candidates that apply for other jobs, so it's best not to reveal candidate names in reports.

23. Move the following fields from the Reviews section into the Position, Job Application, and Review Fields section.

- Review Number
- Created By
- Created Date
- Rating

24. Make the following fields checked by default.

- Days Open
- Hiring Manager
- Job Application Number
- Open Date
- Position Title
- Review Number

25. Delete the individual Positions, Job Applications, and Reviews sections.

26. Click **Save**.

Your custom report type is ready! To try it out, go to the Reports tab, click **New Report**, and select the Other Reports report type category. The Positions with Reviewed Job Applications report type is in the list below.

Look At What We've Done

Check out our Recruiting app now! We've met almost all of the requirements we talked about at the beginning of the book, but we're not there yet. In the next chapter, we're going to move beyond the platform's point-and-click tools, like security and workflow, and introduce

Visualforce and the SOAP API. These features provide the key to incorporating functionality from all over the Web and will help us create a truly powerful application in the cloud. In fact, once you've mastered the tools available in the platform, these tools will be the way that you can let your creativity soar—the functionality of any app you build on the platform will be limited only by the Web itself!

Chapter 11

Moving Beyond Point-and-Click App Development

In this chapter ...

- Introducing Mash-Ups and Web Services
- Introducing Visualforce
- Implementing the Candidate Map
- Implementing the Mass Update Status Button

Up to this point, we've built a compelling app using various parts of the platform. We've created a data model to store our recruiting information, put workflow and approval logic in place to help manage the data, and built reports and a dashboard to help share the data. The fact that we were able to quickly put all of these pieces together without writing any code is a testament to the power of the Force.com platform.

A tremendous amount of research and thought has gone into the design of the platform. Salesforce.com has strived to anticipate the various business application needs of 21st century companies, and has addressed many of those needs with simple yet powerful declarative, point-and-click tools that nontechnical users can use to achieve unique business goals. However, it is impossible for one company to provide a single solution that's a perfect fit for everyone. That's why salesforce.com has made it easy for developers to write code that builds upon the Force.com platform's point-and-click functionality. Once you learn how to program for the Force.com platform, you'll find that you can create apps for the Cloud that do just about anything you can dream up. The sky's the limit!

"Programming-phobia" is common for people without computer science backgrounds, and it's likely that many readers will want to put this book down as soon as they see the words "code" and "variable." Relax! When you read

this chapter, you'll discover just how fun and easy programming for the Force.com platform can be. Also, bear in mind that the intent of this chapter isn't to make you a programmer (although it's a great place to start). Instead, this chapter will just give you a taste of what it's like to enhance your app with some very simple programming. If you don't feel like typing any code yourself, just copy and paste the code samples from the files included in the `RecruitingApp-7_0.zip` file, which you downloaded in [Expanding the Simple App Using Relationships](#) on page 101.

With the sample code and a few mouse clicks, we'll be able to swiftly enhance our app by adding:

- Candidate Map—An interactive map that shows the locations of the candidates that have applied for a particular position
- Mass Update Status—The ability to update the Status field on multiple job applications at the same time

Let's begin!

Introducing Mash-Ups and Web Services

If we revisit the requirements of our Recruiting app, we'll see that we still need to implement an interactive map that shows the locations of the candidates that have applied for a particular position. Clearly no such functionality is available by default in the platform, and we certainly don't have time to build our own mapping engine. Is this type of functionality even possible?

Of course it's possible! Because the Force.com platform runs on the Web, we can leverage the power of other websites to implement features that would never be available just through our platform alone. This means that with a little code, we can *mash up* our own recruiting data with an interactive map website, such as Yahoo! maps, and place this functionality in our own app.

To implement a mash-up, we'll first need to understand a little about the technology that makes it possible: Web services. A *Web service* is the mechanism by which two applications that run on different platforms, that were written in different languages, and that are geographically remote from each other, can exchange data using the Internet. Web services makes data exchange between two such applications as straightforward as two processes exchanging data on a single computer.

The way that data is exchanged between two Web services is similar to the way data is exchanged between a Web browser like Microsoft Internet Explorer and a Web server. Just as a Web browser uses a common network protocol (HTTP over TCP/IP) to download HTML files hosted on a Web server, a Web service can also use this same network protocol to download data from another Web service. The key difference is the actual data that is sent and received—Web services use XML instead of HTML.

The online world has a vast array of Web services, many of which are free. For our Candidate Map feature, we'll utilize the free Yahoo! Maps Web Services, which let you easily embed interactive maps in your apps. If we can find a way to pass candidate addresses from our app to the Yahoo! Maps Web Services, Yahoo! will take care of all the mapping functionality, saving us from worrying about how our app will render an interactive map. We'll just need to figure out how to pull that rendered map into our app.



Note: The Force.com platform also has its own powerful Web services API, which includes the SOAP API. With the SOAP API, you can customize and integrate your Salesforce organization using the language and platform of your choice. The SOAP API defines a Web service that enables full, reliable access to all of the data in your organization, including the ability to read, create, update, and delete records.

Because the SOAP API is only used behind the scenes for our Candidate Map feature, this book does not go into detail about it; however, you can learn about it in the *Web*

Services API Developer's Guide, at
www.salesforce.com/us/developer/docs/api/index.htm.

Introducing Visualforce

So how do we pass our candidate's addresses to the Yahoo! Maps Web Services? And after Yahoo! Maps Web Services renders an interactive map that plots those addresses, how do we pull that map into our app?

These requirements may seem intimidating, but they're actually quite easy to meet, thanks to Visualforce. Visualforce is a powerful and flexible framework for customizing your app's user interface far beyond what's available using the platform's point-and-click tools. It's the most efficient way to combine data from multiple Force.com objects, blend data from Web services into your apps, or customize the logic that dictates the behavior of your app's user interface. When you use Visualforce, you'll see your productivity increase, and you'll find that you can create just about any type of browser-based user interface you can imagine.

The Visualforce framework consists of a tag-based markup language, similar to HTML. In the Visualforce markup language, each Visualforce tag corresponds to a user interface component. Need a related list? Simply add the `<apex:relatedList>` component tag. Want to display a record's details? Just use the `<apex:detail>` tag.

The following graphic shows a few of the most commonly used Visualforce tags and how they correspond to user interface components. Over 125 tags exist, ranging from large components, such as a detail section of a standard page, to small components, like a single field or link. You can learn about them all in the *Visualforce Developer's Guide*, at
www.salesforce.com/us/developer/docs/pages/index.htm.

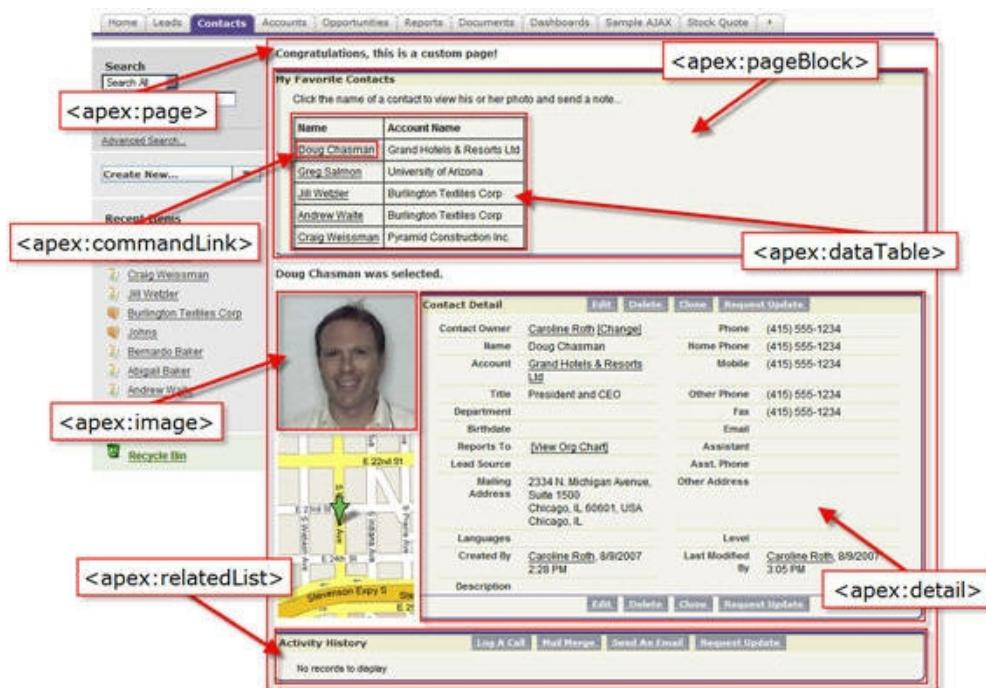


Figure 138: Sample Visualforce Components and Their Corresponding Tags

The behavior of Visualforce components can either be controlled by the same logic that is used in standard Salesforce pages, or you can associate your own logic written in Apex. Apex is salesforce.com's programming language that runs in the cloud on Force.com servers.

Don't panic! You won't need to learn how to write Apex to create any of the features described in this book. Visualforce comes with a rich component library that allows you to quickly build pages without having to code a lot of functionality yourself. And because Visualforce markup is ultimately rendered into HTML, you can use Visualforce tags alongside standard HTML, JavaScript, Flash, AJAX, or any other code that executes within an HTML page. This means that we can create our Candidate Map by simply creating a Visualforce page that uses some basic Visualforce markup and JavaScript to pass our candidate addresses to Yahoo! Maps Web services.



Note: To learn more about Apex, see the *Force.com Apex Code Developer's Guide*, at www.salesforce.com/us/developer/docs/apexcode/index.htm.

Introducing Visualforce Development Mode

Creating Visualforce pages is quick and easy, and there are two ways to do it: from Setup click **Develop > Pages**, or enable Visualforce development mode and navigate to a “blank” page.

In this book, we'll use Visualforce development mode to create and edit our Visualforce pages because it has several features that are quite handy. One of those is the special development footer on every Visualforce page. The footer lets you access a page markup editor that includes tools you can use to search for values, jump to a certain line in your code, and undo and redo changes. The page editor also offers highlighting and auto-suggest for component tags and attributes, and has a link to the component reference documentation, which includes descriptions and examples for every Visualforce component.

While you're in Visualforce development mode, you can create a new page just by entering a unique URL in your browser's address bar. And as you add code to your Visualforce page, you'll be able to save it and see your changes instantly rendered in your browser!

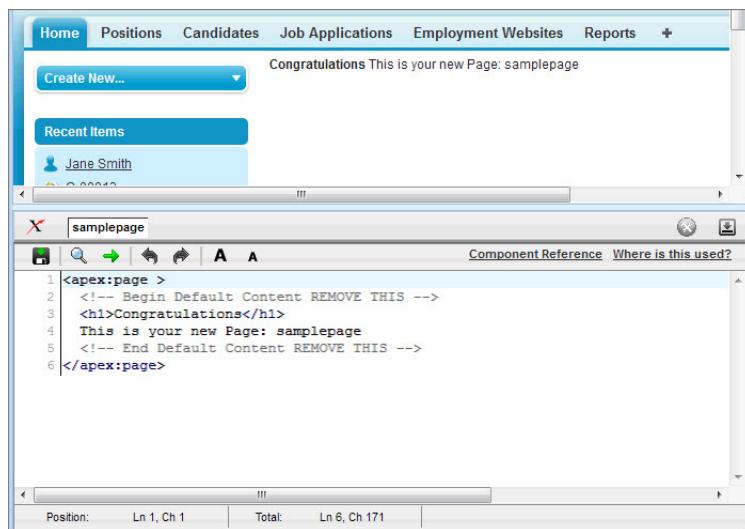


Figure 139: Visualforce Development Mode

Try It Out: Enabling Visualforce Development Mode

1. At the top of any Salesforce page, click the down arrow next to your name. From the menu under your name, select **My Settings** or **Setup**—whichever one appears.
2. From the left pane, select one of the following:
 - If you clicked **My Settings**, select **Personal > Advanced User Details**.
 - If you clicked **Setup**, select **My Personal Information > Personal Information**.
3. Click **Edit**.
4. Select the **Development Mode** checkbox.
5. Click **Save**.

Implementing the Candidate Map

Now that we've been introduced to Web services and Visualforce, we're ready to implement the mash-up piece for our Recruiting app: the Candidate Map. Our requirements state that we need to generate a map for all the candidates that have applied for a particular position so that we can better understand potential relocation costs associated with a new hire. Since Universal Containers has offices all over the country, this map will also help us assign candidates to an office if a particular position is open in more than one location.

Try It Out: Create a Visualforce Page

Now that we're in development mode, let's create a Visualforce page called CandidateMap by simply modifying the URL in our browser.

Salesforce URLs typically look something like this: <https://na1.salesforce.com/001/o>. You can create a new Visualforce page by removing everything to the right of the `salesforce.com/` part of the URL and replacing it with `apex/` followed by the name of the page you want to create.

1. In the address bar of your browser, replace everything to the right of `salesforce.com/` with `apex/CandidateMap`.



Warning: Don't change anything to the left of `salesforce.com/`, as this information is specific to the instance of the Force.com platform that

you're using, and changing it will prevent you from creating the Visualforce page.

The resulting URL should look something like this:

<https://na1.salesforce.com/apex/CandidateMap>. Note that your URL may have an instance name other than na1 preceding the salesforce.com/ part. That's okay.

2. Press Enter.

The following Visualforce error page appears indicating that the page doesn't exist yet. Again, that's okay—this gives us a chance to exercise one of the other handy features of development mode, the *quick fix*. A quick fix is a way of creating something on the fly, right when we need it. In this case, even though the CandidateMap page doesn't exist yet, development mode gives us a quick fix link to create it on the fly. Clicking the link is the equivalent of going to Setup, navigating to the Visualforce page section, clicking **New**, entering the name of the page, and clicking **Save**.



Figure 140: Visualforce Error Page

3. Click the **Create Page CandidateMap** link.



Figure 141: CandidateMap Visualforce Page

Congratulations! You've created your first Visualforce page! Now it's time to add some Visualforce markup so it displays our candidate map.

Try It Out: Write Visualforce Markup

In the footer at the bottom of your new Visualforce page, click **CandidateMap** to display the Visualforce development mode page editor. This editor displays all the markup for the page you're currently viewing.

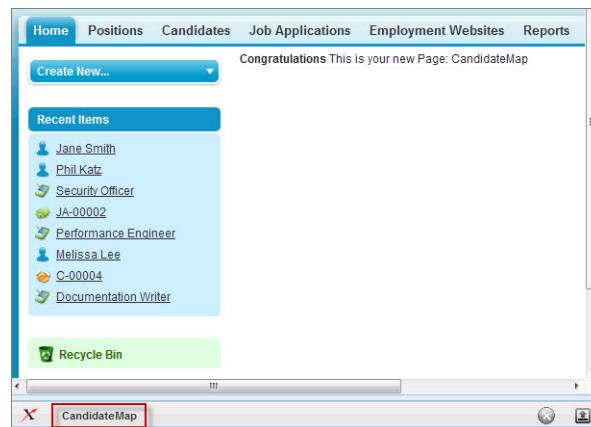


Figure 142: Visualforce Development Mode

You'll notice that the page editor has default content.

```
<apex:page >
<!-- Begin Default Content REMOVE THIS -->
<h1>Congratulations</h1>
This is your new Page: CandidateMap
<!-- End Default Content REMOVE THIS -->
</apex:page>
```

The default content contains the Visualforce component tag `<apex:page>` on the first line and the closing tag, `</apex:page>`, on the last line. Just like elements in other markup languages, Visualforce component tags have a start tag, such as `<apex:page>`, and an end tag that is identical to the start tag except that it has a forward slash, such as `</apex:page>`.

The `<apex:page>` tag represents a single Visualforce page. All of the other content you want displayed on a page must be wrapped inside the start and end `<apex:page>` tags. As discussed earlier, content can be other Visualforce tags, plain text, merge fields, HTML, JavaScript, and so forth. For example, in the default content there are comments marked by the `<!--` and `-->` symbols, the HTML `<h1>` header tag, and plain text.

Let's change the look and feel of the page so it matches the style of the Position object, the object that's most closely tied to our candidate map. We can do this just by setting an attribute on the `<apex:page>` tag. As with HTML tags, attributes on Visualforce tags configure the style or behavior of what the tag represents.

The attribute we need to set is `standardcontroller`. In Visualforce, controllers determine the style of the page, how the page acts when a user clicks a button, and the data that should be displayed in a page. Simply by setting the value of the `standardcontroller` attribute to the Position object, we're configuring our page to look and behave like the position pages, and display position data.

1. Place your cursor just inside the closing bracket of the `<apex:page>` tag, press the spacebar, and type `standardcontroller="Position__c"`. The result should look like:

```
<apex:page standardcontroller="Position__c">
```



Tip: You can develop your own controllers, but the Force.com platform also includes a standard controller for every object, including custom objects that you create. It's another one of the benefits of Force.com!

Note that the format for setting an attribute is the name of the attribute followed by the equals sign (=), then the value of the attribute enclosed in quotes. Also, remember that the unique API names of custom objects have two underscores (__) and the letter *c* at the end.

Let's save our work so we can see our changes applied.

2. Click the save icon () on the page editor, or press CTRL+S.

When you save your markup, the Force.com platform checks to make sure it's valid and lets you know if there are errors. If the markup is valid, the new version of your Visualforce page is saved and rendered in your browser.

Can you see how your page is different from before? Setting the `standardcontroller` attribute changed the look and feel of the default Visualforce page so that the Positions tab is selected.

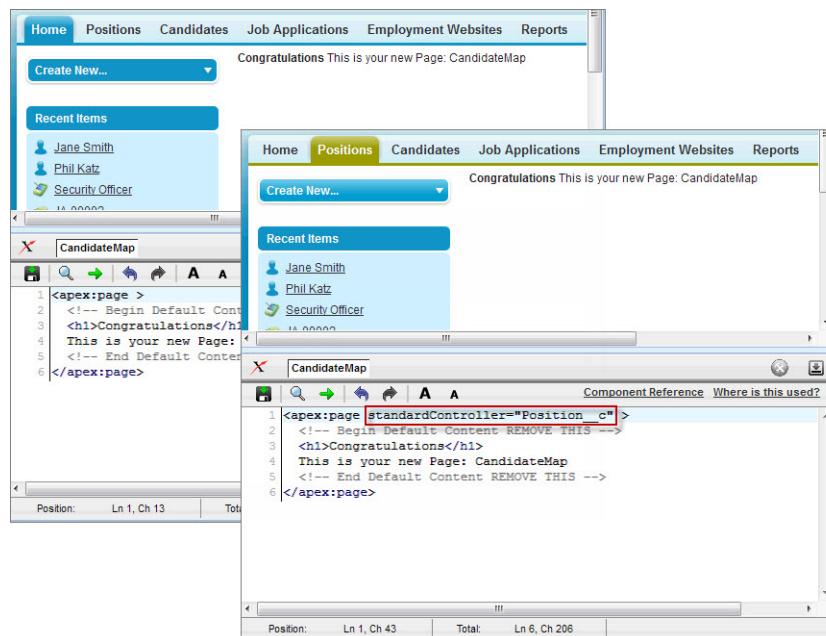


Figure 143: Before and After Setting the `standardcontroller` Attribute

Next, let's remove the default HTML on our Visualforce page and replace it with something relevant to our Candidate Map, such as a brief description of the page just in case the purpose of the map isn't immediately obvious to users.

3. Delete the following markup:

```

<!-- Begin Default Content REMOVE THIS -->
<h1>Congratulations</h1>
This is your new Page: CandidateMap
<!-- End Default Content REMOVE THIS -->

```

- Enter the following markup between the start and end `<apex:page>` tags.

This map shows the locations of candidates who have applied for the `{!Position__c.Name}` position.

The result should look like:

```
<apex:page standardController="Position__c">
This map shows the locations of candidates who have applied for the
<b>{!Position__c.Name}</b> position.
</apex:page>
```

The description includes the `{!Position__c.Name}` merge field enclosed in the `` HTML tag. We've used merge fields quite a bit while building our app. They were in our email template and some of our formulas. Now, we're using them once again, this time side by side with HTML and Visualforce component tags.

- Click the save icon () on the page editor.

Right now, our merge field isn't displaying because the Candidate Map is out of *context*, that is, there's no specific position record from which it can grab the data. Don't worry about that for now—we'll learn how to set context later. For now just trust that the `{!Position__c.Name}` merge field will render the position name, and the `` HTML tag will make it bold.

Our Visualforce page is now ready for us to add our interactive map!

Try It Out: Add the Map to Our Visualforce Page

The interactive map functionality that is essential to our Candidate Map feature can be achieved with a blend of Visualforce markup and JavaScript that accesses the Yahoo! Maps Web Services. As promised, you don't have to learn JavaScript to get the Candidate Map working. Instead, we'll use the sample code in the `RecruitingApp-7_0.zip` file you downloaded from Developer Force in [Expanding the Simple App Using Relationships](#) on page 101.

- In the `RecruitingApp-7_0.zip` file, locate the file `CandidateMapSample` and open it in your favorite text editor.



Important: Make sure that Word Wrap or any feature that might add line breaks to the code is turned off in your text editor. You must preserve the original line breaks in the code sample. New line breaks caused by word wrapping features in text editors can break the code and prevent the code sample from working correctly.

Also, be aware that copying code from Adobe PDF files can also cause code to break, so avoid copying code from PDF versions of this book.

2. Select the entire content of the file, and copy and paste it into the page editor at the bottom of your CandidateMap Visualforce page. The CandidateMapSample file contains the Visualforce markup you added in the steps above, so just replace everything in the page editor with the entire sample in the file.
3. Click the save icon () on the page editor.

The interactive map should appear on your CandidateMap Visualforce page, but with an error message and without plots. This is because the Candidate Map is still out of context and the page can't figure out which candidates to show. We can fix this by simply adding the CandidateMap Visualforce page to our position page layouts.

Try It Out: Add the Candidate Map to Position Page Layouts

Adding Visualforce pages to page layouts is as simple as adding fields or sections to page layouts. And once we add the CandidateMap Visualforce page to our position page layouts, the map will automatically plot the locations of the candidates who apply to each position. It'll work like magic!

We have two page layouts for the Position object and we'll want the map to appear on both. Let's start by adding the page to the original position page layout (Position Layout).

If you have any standard position records that use the Position Layout, navigate to one of those positions and click the **Edit Page Layout** link in the upper right corner of the record. If you don't have any standard position records:

1. From Setup, click **Create > Objects**.
2. Click **Position**.
3. In the Page Layouts related list, click **Edit** next to Position Layout.

The Position Layout is ready to edit. Let's create a section on the page layout for the CandidateMap Visualforce page.

4. In the palette, select the Fields category.
5. Drag the Section user interface element from the palette to just below the Description section on the page layout. The Layout Properties popup window appears.
6. In the Section Name text box, enter Candidate Map.

7. In the Display Section On Header area, select both the `Detail Page` and `Edit Page` checkboxes.
8. In the `Layout` drop-down list, choose `1-Column`.
9. Click **Ok**.

Now let's move the CandidateMap Visualforce page into our new section.

10. Select the Visualforce Pages category on the palette.

Notice that the palette lists our CandidateMap Visualforce page as a user interface element.

11. Drag the CandidateMap user interface element from the palette to the Candidate Map section on the page layout.

The Candidate Map JavaScript generates a map that is 400 pixels high and spans the width of the screen. This is just large enough to be useful without consuming too much room on the screen. The default properties of the Visualforce page user interface element need to be adjusted to accommodate the map. Otherwise, there might be odd spacing around the map and distracting scrollbars.

Let's fix the Visualforce page user interface element properties to accommodate the size of the generated map, as well as the text we added to the top of the CandidateMap Visualforce page. (In case you don't remember, the text is "This map shows the locations of candidates who have applied for the `{!Position__c.Name}` position.")

12. Double-click the CandidateMap element to access its properties.
13. Set the width to `100%`.
14. Set the height to `405`.

The height is always in pixels, while the width can be specified either in pixels or as a percentage. Setting the height to 405 pixels allows 400 pixels for the map and five more pixels for the text. Perfect!

15. Leave the `Show scrollbars` and `Show label` checkboxes deselected.
16. Click **OK** to exit the user element properties.
17. Click **Save** on the page layout.

Repeat all of the above steps for your other Position object page layout, the IT Position Layout.

Try It Out: Enable the Candidate Map for Mobile

One last thing before we test out the map. Let's make sure the map will show up for our users, whether they're accessing a position record from the full site or from a mobile device. On the

detail page for each Visualforce page, there's a checkbox that enables it for Salesforce mobile apps.

1. From Setup, click **Develop > Pages**.
2. Click **CandidateMap**. You can click the link under either the Label or Name columns. Both will go to the associated detail page.
3. Click **Edit**.
4. Select Available for Salesforce mobile apps, and click **Save**.

Once you finish, it's time to test the Candidate Map!

Try It Out: Test the Candidate Map

Navigate to any position record with one or more candidate applications. (If you haven't created any job applications in your app, now would be a good time.) After you bring up a position record, scroll down to see the Candidate Map in action!

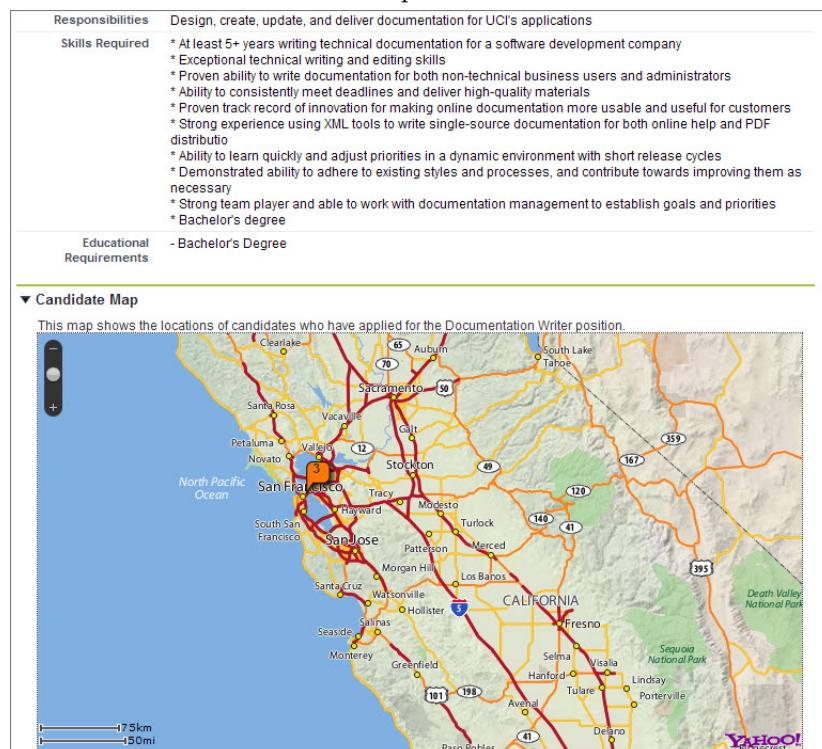


Figure 144: Our Working Candidate Map

Launch Salesforce1 to see how the Candidate Map looks mobile. When you bring up a position record, swipe to the record detail view and scroll down to see the map. We can't interact with the map on the record details page. To do so, tap the map to open it in another page. Everything looks in order!

Notice how the Candidate Map Visualforce page is embedded within our Recruiting app just like the other functionality we built using the platform's declarative, point-and-click tools. Also notice that the map automatically displays only candidates who applied to this position.

With very little programming and a few clicks, we've mashed up Yahoo Maps Web Services with Force.com and made the result look as if it were made expressly for our Recruiting app. Couple SOAP API with the thousands of Web services that are available on the Internet today, and the possibilities are limited only by our imaginations!

Implementing the Mass Update Status Button

The Candidate Map feature we just added is both useful and flashy. It'll help recruiters do their jobs more efficiently while adding an eye-catching graphic to an otherwise plain collection of data. The next feature we're going to implement is not as aesthetically appealing, but is much more useful and likely to save your users an incredible amount of time.

Picture yourself as a recruiter at Universal Containers. You're working on filling a highly-coveted position that's garnered hundreds of job applications and you've finally zeroed in on the three top candidates. However, before you can go further you need to reject the job applications submitted by all of the other candidates for the position—a task that could take hours if you have to open every one of those job application records and set the `Status` to rejected. What can you do?

Fortunately, creating tools that perform mass actions on data is yet another of the innumerable ways you can build upon the platform's functionality. With a few lines of Visualforce and the platform's point-and-click tools, we can enhance the Recruiting app in a way that will dramatically increase our users' productivity. When we're done, the daunting task of updating the `Status` field on multiple job applications will be reduced from hours of tedium to a few seconds of easy mouse clicking.

Planning the Mass Update Status Feature

The objective is simple: create a way to update the `Status` field on multiple job applications in a single operation. We just need to work out a few logistics to make sure the implementation goes smoothly. For example, where in our app will users go to access the Mass Update Status functionality? And how will they perform the actual update?

When designing a new feature, it's important to consider the context in which users will access it. Since the purpose of the Mass Update Status feature is to update the `Status` field on multiple job applications for a single position, it's most likely that users will want to perform this operation while viewing a position record. Therefore, it makes the most sense to provide access to the Mass Update Status feature from position records.

So where exactly on a position record should we provide access to the feature? Well, back in [Expanding the Simple App Using Relationships](#) on page 101, we added a Job Applications related list to our position records that made it easy for users to quickly identify all of the job applications submitted for a position. We could leverage that list by adding a checkbox next to each job application so that users can select the group of job applications they want to update. Then we could add an **Update Status** custom list button that lets users update the `Status` fields on all of the selected job applications in one fell swoop.

Once we're done, the feature will work something like this.

1. Open a position record and scroll down to the Job Applications related list.
2. In the Job Applications related list, select the checkboxes next to the job applications you want to update.

Action	Job Application Number	Candidate	Status	Created Date	Owner First Name	Owner Last Name		
	Edit	Del	JA-00002	C-00008	Rejected	2/4/2010	Cynthia	Capobianca
	Edit	Del	JA-00008	C-00003	New	6/10/2010	Cynthia	Capobianca
	Edit	Del	JA-00009	C-00008	Schedule Interviews	6/10/2010	Cynthia	Capobianca

Figure 145: Job Applications Related List

3. Click the **Update Status** button.

The Mass Update Status page appears.

Job Application Number	Position Title	Candidate Name	Status
JA-00008	Documentation Writer	Chris McGuire	New
JA-00009	Documentation Writer	George Schnell	Schedule Interviews
JA-00002	Documentation Writer	George Schnell	Rejected

Figure 146: Mass Update Status Page

4. Choose a value for the **Status** field.
5. Click **Save**.

It may sound like this will take an astounding effort to implement, but it's really quite simple. All you need to do is create the Mass Update Status page with some basic Visualforce markup, and add a custom list button to the Job Applications related list on position records. You'll be done before you know it!

Try It Out: Create the Mass Update Status Page

We'll begin implementing the Mass Update Status feature by creating the Visualforce page that lets users choose the value with which the **Status** field is updated. To make this page even more usable, we'll include a table that shows the **Job Application Number**, **Position Title**, **Candidate Name**, and **Status** of each selected job application.

1. In the address bar of your browser, replace everything to the right of `salesforce.com/` with `apex/MassUpdateStatus`.

The resulting URL should look something like this:

`https://na1.salesforce.com/apex/MassUpdateStatus`. Remember to only modify the part of the URL after `salesforce.com/`.

2. Press **Enter**.
3. Click the **Create Page MassUpdateStatus** link.

We now have a new Visualforce page called `MassUpdateStatus`. Next, we'll add the Visualforce markup that implements the Mass Update Status functionality.

To enter our markup, we'll use the Visualforce development mode page editor just as we did before. But this time around, we won't need any JavaScript; Visualforce will be able to do it all!

4. In the footer at the bottom of the MassUpdateStatus Visualforce page, click **MassUpdateStatus** to display the Visualforce development mode page editor.
5. Delete all of the default markup in the Visualforce development mode page editor and replace it with the following markup. Remember that instead of typing, it's easiest to copy and paste the code from the `MassUpdateStatusSample` file located in the `RecruitingApp-7_0.zip` file you downloaded from https://developer.salesforce.com/page/Force_Platform_Fundamentals.

```
<apex:page standardController="Job_Application__c"
    recordSetVar="applications">
    <apex:sectionHeader title="Mass Update the Status
        of Job Applications"/>
    <apex:form>
        <apex:pageBlock>
            <apex:pageMessages />
            <apex:pageBlockButtons>
                <apex:commandButton value="Save"
                    action="{!!save}"/>
                <apex:commandButton value="Cancel"
                    action="{!!cancel}"/>
            </apex:pageBlockButtons>
            <apex:pageBlockSection title="Status Update"
                collapsible="false">
                <apex:inputField value=
                    "{!Job_Application__c.Status__c}"/>
            </apex:pageBlockSection>
            <apex:pageBlockSection title="Selected Job
                Applications" columns="1">
                <apex:pageBlockTable value="{!!selected}"
                    var="application">
                    <apex:column value="{!!application.name}"/>
                    <apex:column value=
                        "{!application.position__r.name}"/>
                    <apex:column headerValue="Candidate Name">
                        <apex:outputText value=
                            "{!application.candidate__r.
                                First_Name__c & ' ' & application.
                                candidate__r.Last_Name__c}"/>
                    </apex:column>
                    <apex:column value=
                        "{!application.Status__c}"/>
                </apex:pageBlockTable>
            </apex:pageBlockSection>
        </apex:pageBlock>
    </apex:form>
</apex:page>
```



Tip: In this sample code, notice that some components don't have close tags. If there are no other components nested within a component, you can "close" the tag by putting a forward slash at the end of the start tag, like: `<apex:sectionHeader/>`.

6. Click .

Understanding the MassUpdateStatus Visualforce Markup

Let's take a moment to discuss the main Visualforce tags we just added to our MassUpdateStatus page. Although we won't go into all of the use cases for each component or discuss every attribute in depth, you'll get a better understanding of how Visualforce works.



Tip: To see general descriptions and examples for all of the Visualforce components and their attributes, click the **Component Reference** link in the upper right corner of the Visualforce development mode page editor.

`<apex:page>`

As with all Visualforce pages, the MassUpdateStatus page must begin with an `<apex:page>` component. Notice the tag has the same `standardController` attribute used in our interactive Candidate Map feature, although this time it is set to the Job Application object (`Job_Application__c`). This makes sense because the Mass Update Status feature updates a field on job application records, not position records.

The component also has a `recordSetVar` attribute. We use this attribute to change the `standardcontroller` so that it accommodates a set of records rather than a single record.

`<apex:sectionHeader>`

The `<apex:sectionHeader>` component adds a header to the top of the page. The component's `title` attribute determines the text in the header.

`<apex:form>`

The `<apex:form>` component establishes a section on the page in which users can enter data and submit it by clicking a button or link. It's like an invisible container, similar to a `<form>` element in HTML.

<apex:pageBlock>

The `<apex:pageBlock>` component designates an outlined area on the page similar to the areas on detail pages that contain sections.

<apex:pageMessages>

The `<apex:pageMessages>` component allocates space for standard system messages (such as those that notify users when a file is being saved) and validation rule errors. These messages already exist in the Force.com platform, so you don't have to create them—you just have to use this component to make room for them in case the platform needs to display them.

<apex:pageBlockButtons>

The `<apex:pageBlockButtons>` component allocates space for a set of buttons on the page. Its subcomponents specify what the buttons do and how they are labeled.

<apex:commandButton>

Each `<apex:commandButton>` component creates an individual button inside the `<apex:pageBlockButtons>` component. The Mass Update Status page uses two `<apex:commandButton>` components: one to create a **Save** button and a second to create a **Cancel** button. The buttons are styled like standard Salesforce buttons.

The `value` attribute on the `<apex:commandButton>` component determines the words that appear on the button (such as “Save” or “Cancel”), while the `action` attribute determines the operation that occurs when the button is clicked. When setting the `action` attribute, you must use merge field syntax. For example, to configure the button to save the data entered on the page, set the `action` attribute to `{!save}`.

Each button appears twice on our `MassUpdateStatus` page—once at the top of the area allocated by the `<apex:pageBlock>` component and once at the bottom. This is a precautionary measure built into the `<apex:pageBlockButtons>` component to ensure that the button functionality is apparent to users, even if the page block is large.

<apex:pageBlockSection>

The `<apex:pageBlockSection>` component can be used within `<apex:pageBlock>` components to create a section on a page similar to the sections found on page layouts. On this page, the `<apex:pageBlockSection>` component is used twice.

The first instance of the `<apex:pageBlockSection>` component has a `title` attribute that's set to “Status Update.” This text will appear at the top of the section. It also has a `collapsible` attribute that determines whether users can collapse and expand the section by clicking an arrow to the left of the title. We don't want users to accidentally collapse this page block section, so the attribute is set to “false.”

The second `<apex:pageBlockSection>` component creates a section that has a table showing the job applications selected for updating. Its `title` attribute is set to “Selected Job Applications.” Also, its `columns` attribute is set to “1.”



Tip: Unlike page layouts, a section on a Visualforce page can have more than two columns. However, the platform's stylesheets are optimized to accommodate one or two columns, so it's best not to exceed that limit.

`<apex:inputField>`

The `<apex:inputField>` component renders the `Status` field from the Job Application object on our page. Use `<apex:inputField>` components to create HTML input elements for any Salesforce field. All you need to do is set the component's `value` attribute to the API name of the Salesforce object and field.

`<apex:pageBlockTable>`

The `<apex:pageBlockTable>` component renders a table containing field values from multiple records of a specific object. For our feature, we need to set two of this component's attributes: `value` and `var`.

The `value` attribute tells the table which set of records contains the values to display. In this instance, we set the attribute to the expression `{!selected}` to enable the table to display values from the selected job applications.

The second attribute, `var`, creates a name that components within the table can use to reference individual records in the record set without actually referring to each record by name.

`<apex:column>`

The `<apex:column>` components inside the `<apex:pageBlockTable>` determine the columns of the table and the job application fields each column displays. For three of the four `<apex:column>` components, we just need to set the `value` attribute to an expression that references the field using the value of the `<apex:pageBlockTable>` component's `var` attribute followed by the API name of the field. For example, the following expression displays the values of the Job Application Number field:

```
{!application.name}
```

For the Candidate Name field, though, we need to do a bit more because the field is actually a combination of the First Name and Last Name fields from the Candidate object. To combine these fields, we use an `<apex:outputText>` component inside an `<apex:column>` component and set its `value` attribute to an expression that combines the First Name and Last Name fields from the Candidate object.

```
<apex:column headerValue="Candidate Name">
    <apex:outputText value="{!!application.
```

```

candidate__r.First_Name__c & ' ' &
application.candidate__r.Last_Name__c}"/>
</apex:column>
```

When you generate column fields in this manner, the `value` attribute on the `<apex:column>` component is not set, so the table doesn't know what to use as the column header. Rectify this by setting the `headerValue` attribute on this `<apex:column>` component.

Beyond the Basics

Did you know you can add a Chatter feed to a Visualforce page?

Say you want to add the Chatter feed for a position to its detail page. You can simply use the `<chatter:feed>` standard component:

```

<apex:page standardController="Position__c">
  <chatter:feed entityId="${!Position__c.id}">
    <apex:detail />
  </apex:page>
```

To find out more, see the [Visualforce Developer's Guide](#).

Try It Out: Create a Custom List Button

Now that our Mass Update Status Visualforce page is complete, we're ready to create the button that users will click to access it.

The platform gives us the option of creating two types of buttons.

Detail Page Buttons

Buttons that appear on detail pages in the Button Section of the page layout.

List Buttons

Buttons that appear in list views, search result layouts, or related lists.

We need a button that users can click in the Job Applications related list on position records, so let's create a list button.

1. From Setup, click **Create > Objects**.
2. Click **Job Application**.

You might be wondering why we chose the **Job Application** object instead of the **Position** object, given that the button will appear on position records. The reason is that you create list buttons on the object that is being listed.

3. In the Custom Buttons and Links related list, click **New Button or Link**.

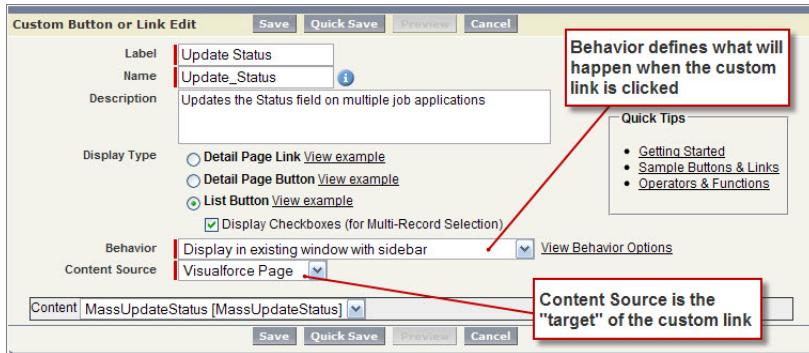


Figure 147: Custom Button Edit Page

The custom button edit page should look familiar, since it closely resembles the formula editor that we saw previously.

4. In the Label text box, enter Update Status.
5. In the Name text box, accept the default value of Update_Status.
6. In the Description text box, enter Updates the Status field on multiple job applications.

We now have the option to specify whether we are creating a detail page link, detail page button, or list button. We've already decided to create a list button, but keep these other options in mind for future apps.

7. Select List Button as the Display Type.

When we selected the List Button option, did you notice the Display Checkboxes (for Multi-Record Selection) checkbox that appeared beneath it? By leaving this option selected, the platform knows to put checkboxes next to the records in the related list.

8. Leave the Display Checkboxes (for Multi-Record Selection) checkbox selected.

Next, the Behavior picklist lets you choose what happens when a user clicks the button. We know we want the button to open the Mass Update Status page, but we can specify whether the page opens in a new window or in the existing window, and whether or not it has a sidebar and header. You can even configure the button to execute some JavaScript if necessary. For our app, it makes the most sense to configure the button to open the Mass Update Page in the existing window, and to leave the sidebar and header there as well.

9. In the Behavior picklist, select Display in existing window with sidebar.

Now we need to specify the content we want to display. To do this, we'll first need to indicate the type of content we want to display in the Content Source picklist.

10. In the Content Source picklist, select Visualforce Page.

When you select the Visualforce Page option, the bottom section of the custom list button edit page displays a Content picklist. The picklist contains the Visualforce pages in your organization that have a standard controller set to the object for which you are creating the button.

11. In the Content drop-down list, select MassUpdateStatus [MassUpdateStatus].
12. Click Save.

After clicking **Save**, you are reminded that no users will be able to access the button until it is added to a page layout. This is because creating a custom button is similar to adding a custom field to an object—even if it's defined in the database, nobody will be able to see it until you explicitly add it to a page layout.

Try It Out: Add a Custom List Button to a Page Layout

Let's finish up our Mass Update Status feature by adding the Update Status list button to our Position page layouts.

1. From Setup, click **Create > Objects**.
2. Click **Position**.
3. In the Page Layouts related list, click **Edit** next to the page layout you want to edit first.
4. Click the wrench icon () in the Job Application related list to edit its properties.
5. In the Related List Properties window, click the **Buttons** bar at the bottom to expand the Buttons section.

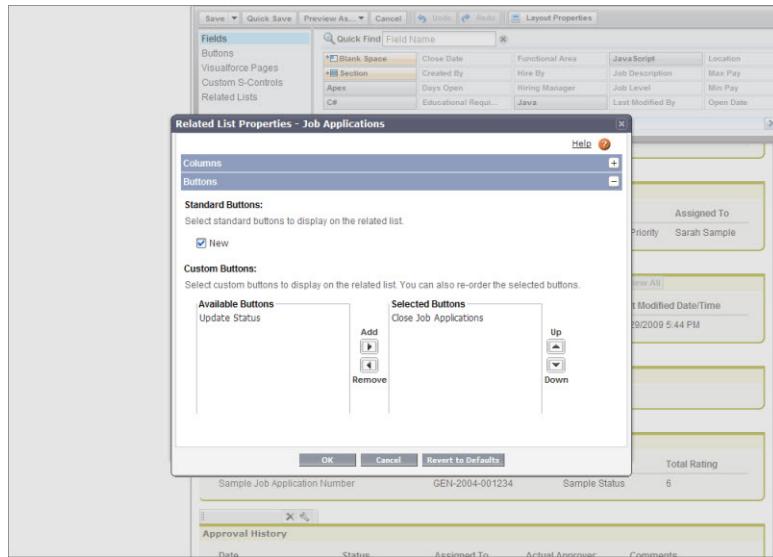


Figure 148: Custom Button Edit Page

Here we can specify the standard and custom buttons that the related list displays. The Update Status button we just created should appear in the Available Buttons list.

6. Select the Update Status button and click **Add** to move it to the Selected Buttons list.
7. Click **OK** to exit the Related List properties window.
8. Click **Save**.

Repeat the above procedure for the other Position page layout.



Note: We're not going to enable this Visualforce page for Salesforce mobile apps. Since Salesforce1's related lists don't display buttons, our users won't be able to access the Mass Update Status page from a mobile device.

Once that's done, the Mass Update Status feature is ready to test!

Try It Out: Test the Mass Update Status Feature

To test the Mass Update Status feature, navigate to a position record to which multiple candidates have applied, and scroll down to the Job Applications related list. Notice that the **Update Status** button is there, and checkboxes appear next to the job application numbers, just as we planned.

Now select a few job applications and click the **Update Status** button. Our Mass Update Status Visualforce page appears. Notice that the lower half of the page lists the job applications we selected on the previous page.

The screenshot shows a Visualforce page titled "Mass Update the Status of Job Applications". At the top, there are "Save" and "Cancel" buttons. Below them is a "Change" section with a "Status" picklist set to "-None--". A red box highlights the "Selected Applications" section, which contains a table with two rows:

Job Application Number	Position Title	Candidate Name	Status
JA-00008	Documentation Writer	Chris McGuire	New
JA-00009	Documentation Writer	George Schnell	Schedule Interviews

At the bottom of the page are "Save" and "Cancel" buttons.

Figure 149: Mass Update Status Page Displaying Selected Applications

In the **Status** picklist, choose the new status for the selected records, and click **Save**. Salesforce updates all of the selected records with the new value.

The feature is a success!

Chapter 12

Learning More

In this chapter ...

- [Developer Force](#)
- [Help and Training Options](#)
- [Multimedia](#)
- [AppExchange Partner Program](#)
- [What Do You Think?](#)

This book has introduced some of the native technologies associated with the Force.com platform. We've created a fully functional Recruiting app, and we've introduced Visualforce and the SOAP API to show you how it can be used to build composite apps. But there's only so much we can cover in a single book—we skipped over many other powerful tools and options, and didn't talk about how you can share your own apps with others on the AppExchange. Indeed, we'd be surprised if you didn't have more questions about how you can take advantage of all that the platform has to offer!

Fortunately there are a number of ways you can learn more about the platform.

Developer Force

Developer Force is salesforce.com's free developer program for the Force.com platform. The Developer Force website is a developer community where you can learn, access key resources, and discuss a diverse set of topics related to Force.com, Database.com, Heroku, and other related salesforce.com platforms with other developers in the community. Application development topics include Apex, Visualforce, integration APIs, database topics, packaging and distribution of your applications, and much more.

There are many ways to use and contribute to Developer Force, including:

- Read and contribute technical articles that explain development topics.
- Download and contribute sample code.
- Read our blogs, subscribe to our RSS feeds, or become a blogger yourself.
- Read and contribute to the Developer Force Discussion Boards.
- Read the monthly Force.com Developer News email newsletter.
- Register for an event in our event calendar or watch and listen to archived multimedia events.
- Participate in special programs such as developer previews to get a first hand look at what's coming.
- Watch technical webinars that help you get up to speed with new features.

Help and Training Options

In addition to the Developer Force website, the platform itself offers lots of help and training options:

- **Find answers to your questions.** Click **Help** at the top of any page in the application. Enter your keywords in the Search box and press Enter. The search returns online help topics, knowledge base solutions, and recommended training classes that match the keywords you entered.
- **Take online training.** Select the Training tab of the Help & Training window, choose your role and geographic location, and click **View Classes!** to find free online training classes. More than fifteen online training classes are available to you on-demand, 24/7!
- **Attend a class.** A number of examples in this book have been provided by Salesforce.com Training & Certification and are drawn from the expert-led training courses available around the world. Salesforce.com training courses provide an opportunity to get hands-on experience with the Force.com platform and Salesforce applications, and prepare you to

become Salesforce Certified. To learn more or register for a class, visit www.salesforce.com/training.

- **Download tip sheets and best practice guides.** Select the Help tab of the Help & Training window and click **Tips** in the task bar to view and download tip sheets, implementation guides, and best practices for specific features.

Multimedia

Thanks to the hard work of our colleagues on the Salesforce.com Community and Force.com websites, we have an impressive number of podcasts and videos available. Our podcasts and videos keep the Force.com platform community connected by providing free access to a wide range of best practices, case studies, and product- and platform-focused digital audio content.

Find podcasts on our iTunes channel by searching for “salesforce” in the iTunes Music Store. To find our videos, go to the <https://developer.salesforce.com/content/type/Tech+Talk/> on the Developer Force website.

Access to expert Force.com platform and CRM-related luminary interviews, thought-leadership presentations, roundtable discussions, and best practices are just a click away. Happy listening and watching!

AppExchange Partner Program

With the emergence of The Business WebTM, companies can offer their services and applications to businesses over the Internet as easily as retailers and auctioneers can connect with online consumers. As AppExchange partners, more than 150 companies are already participating in this new chapter of computing by making their offerings available on The Business Web via the AppExchange. The AppExchange partner program makes it easy for both new and established businesses to join this growing community of cloud computing providers. Visit the Partner Program website at www.salesforce.com/partners/ and join the Force.com AppExchange partner program today!

What Do You Think?

Well that about sums it up. Did you like what you've read? Has it inspired you to create your own on-demand apps and enter the world of cloud computing? We certainly hope so! We welcome any comments you might have—indeed, we count on your feedback and ideas. Go

to the Developer Force discussion boards at

community.salesforce.com/sforce?category.id=developers or email us at developerforce@salesforce.com and let us know what you think!

Glossary

[A](#) | [B](#) | [C](#) | [D](#) | [E](#) | [F](#) | [G](#) | [H](#) | [I](#) | [J](#) | [K](#) | [L](#) | [M](#) | [N](#) | [P](#) | [O](#) | [Q](#) | [R](#) | [S](#) | [T](#) | [U](#) | [V](#) | [W](#) | [X](#)
| [Y](#) | [Z](#)

A

Activity (Calendar Events/Tasks)

Planned task or event, optionally related to another type of record such as an account, contact, lead, opportunity, or case.

Administrator (System Administrator)

One or more individuals in your organization who can configure and customize the application. Users assigned to the System Administrator profile have administrator privileges.

Advanced Function

A formula function designed for use in custom buttons, links, and s-controls. For example, the `INCLUDE` advanced function returns the content from an s-control snippet.

Analytic Snapshot

An analytic snapshot lets you report on historical data. Authorized users can save tabular or summary report results to fields on a custom object, then map those fields to corresponding fields on a target object. They can then schedule when to run the report to load the custom object's fields with the report's data.

Analytic Snapshot Running User

The user whose security settings determine the source report's level of access to data. This bypasses all security settings, giving all users who can view the results of the source report in the target object access to data they might not be able to see otherwise.

Analytic Snapshot Source Report

The custom report scheduled to run and load data as records into a custom object.

Analytic Snapshot Target Object

The custom object that receives the results of the source report as records.

Apex

Apex is a strongly typed, object-oriented programming language that allows developers to execute flow and transaction control statements on the Force.com platform server in conjunction with calls to the Force.com API. Using syntax that looks like Java and acts like database stored procedures, Apex enables developers to add business logic to most system events, including button clicks, related record updates, and Visualforce pages. Apex code can be initiated by Web service requests and from triggers on objects.

Apex Controller

See Controller, Visualforce.

Apex Page

See Visualforce Page.

App

Short for “application.” A collection of components such as tabs, reports, dashboards, and Visualforce pages that address a specific business need. Salesforce provides standard apps such as Sales and Call Center. You can customize the standard apps to match the way you work. In addition, you can package an app and upload it to the AppExchange along with related components such as custom fields, custom tabs, and custom objects. Then, you can make the app available to other Salesforce users from the AppExchange.

App Menu

See Force.com App Menu.

AppExchange

The AppExchange is a sharing interface from salesforce.com that allows you to browse and share apps and services for the Force.com platform.

Application Programming Interface (API)

The interface that a computer system, library, or application provides to allow other computer programs to request services from it and exchange data.

Approval Action

See Workflow and Approval Actions.

Approval Process

An approval process is an automated process your organization can use to approve records in Salesforce. An approval process specifies the steps necessary for a record to be approved

and who must approve it at each step. A step can apply to all records included in the process, or just records that meet certain administrator-defined criteria. An approval process also specifies the actions to take when a record is approved, rejected, recalled, or first submitted for approval.

Auto Number

A custom field type that automatically adds a unique sequential number to each record. These fields are read only.

B

Boolean Operators

You can use Boolean operators in report filters to specify the logical relationship between two values. For example, the AND operator between two values yields search results that include both values. Likewise, the OR operator between two values yields search results that include either value.

C

Class, Apex

A template or blueprint from which Apex objects are created. Classes consist of other classes, user-defined methods, variables, exception types, and static initialization code. In most cases, Apex classes are modeled on their counterparts in Java.

Clone

Clone is the name of a button or link that allows you to create a new item by copying the information from an existing item, for example, a contact or opportunity.

Cloud Computing

A model for software development and distribution based on the Internet. The technology infrastructure for a service, including data, is hosted on the Internet. This allows consumers to develop and use services with browsers or other thin clients instead of investing in hardware, software, or maintenance.

Combination Chart

A combination chart plots multiple sets of data on a single chart. Each set of data is based on a different field, so values are easy to compare. You can also combine certain chart types to present data in different ways on a single chart.

Component, Visualforce

Something that can be added to a Visualforce page with a set of tags, for example, `<apex:detail>`. Visualforce includes a number of standard components, or you can create your own custom components.

Component Reference, Visualforce

A description of the standard and custom Visualforce components that are available in your organization. You can access the component library from the development footer of any Visualforce page or the *Visualforce Developer's Guide*.

Controller, Visualforce

An Apex class that provides a Visualforce page with the data and business logic it needs to run. Visualforce pages can use the standard controllers that come by default with every standard or custom object, or they can use custom controllers.

Controller Extension

A controller extension is an Apex class that extends the functionality of a standard or custom controller.

Controlling Field

Any standard or custom picklist or checkbox field whose values control the available values in one or more corresponding dependent fields.

Custom App

See App.

Custom Controller

A custom controller is an Apex class that implements all of the logic for a page without leveraging a standard controller. Use custom controllers when you want your Visualforce page to run entirely in system mode, which does not enforce the permissions and field-level security of the current user.

Custom Field

A field that can be added in addition to the standard fields to customize Salesforce for your organization's needs.

Custom Help

Custom text administrators create to provide users with on-screen information specific to a standard field, custom field, or custom object.

Custom Links

Custom links are URLs defined by administrators to integrate your Salesforce data with external websites and back-office systems. Formerly known as Web links.

Custom Object

Custom records that allow you to store information unique to your organization.

Custom Report Type

See Report Type.

Custom Settings

Custom settings are similar to custom objects and enable application developers to create custom sets of data, as well as create and associate custom data for an organization, profile, or specific user. All custom settings data is exposed in the application cache, which enables efficient access without the cost of repeated queries to the database. This data can then be used by formula fields, validation rules, Apex, and the SOAP API.

See also Hierarchy Custom Settings and List Custom Settings.

Custom View

A display feature that lets you see a specific set of records for a particular object.

D

Dashboard

A *dashboard* shows data from source reports as visual components, which can be charts, gauges, tables, metrics, or Visualforce pages. The components provide a snapshot of key metrics and performance indicators for your organization. Each dashboard can have up to 20 components.

Database

An organized collection of information. The underlying architecture of the Force.com platform includes a database where your data is stored.

Database Table

A list of information, presented with rows and columns, about the person, thing, or concept you want to track. See also Object.

Data Loader

A Force.com platform tool used to import and export data from your Salesforce organization.

Decimal Places

Parameter for number, currency, and percent custom fields that indicates the total number of digits you can enter to the right of a decimal point, for example, 4.98 for an entry of 2. Note that the system rounds the decimal numbers you enter, if necessary. For example, if you enter 4.986 in a field with Decimal Places of 2, the number rounds to 4.99. Salesforce uses the round half-up rounding algorithm. Half-way values are always rounded up. For example, 1.45 is rounded to 1.5. -1.45 is rounded to -1.5.

Delegated Administration

A security model in which a group of non-administrator users perform administrative tasks.

Delegated Authentication

A security process where an external authority is used to authenticate Force.com platform users.

Dependency

A relationship where one object's existence depends on that of another. There are a number of different kinds of dependencies including mandatory fields, dependent objects (parent-child), file inclusion (referenced images, for example), and ordering dependencies (when one object must be deployed before another object).

Dependent Field

Any custom picklist or multi-select picklist field that displays available values based on the value selected in its corresponding controlling field.

Detail

A page that displays information about a single object record. The detail page of a record allows you to view the information, whereas the edit page allows you to modify it.

A term used in reports to distinguish between summary information and inclusion of all column data for all information in a report. You can toggle the **Show Details/Hide Details** button to view and hide report detail information.

Developer Edition

A free, fully-functional Salesforce organization designed for developers to extend, integrate, and develop with the Force.com platform. Developer Edition accounts are available on developer.salesforce.com.

Development Environment

A Salesforce organization where you can make configuration changes that will not affect users on the production organization. There are two kinds of development environments, sandboxes and Developer Edition organizations.

Developer Force

The Developer Force website at developer.salesforce.com provides a full range of resources for platform developers, including sample code, toolkits, an online developer community, and the ability to obtain limited Force.com platform environments.

Document Library

A place to store documents without attaching them to accounts, contacts, opportunities, or other records.

E

Email Alert

Email alerts are workflow and approval actions that are generated using an email template by a workflow rule or approval process and sent to designated recipients, either Salesforce users or others.

Email Template

A form email that communicates a standard message, such as a welcome letter to new employees or an acknowledgement that a customer service request has been received. Email templates can be personalized with merge fields, and can be written in text, HTML, or custom format.

Enterprise Application

An application that is designed to support functionality for an organization as a whole, rather than solving a specific problem.

Enterprise Edition

A Salesforce edition designed for larger, more complex businesses.

Entity Relationship Diagram (ERD)

A data modeling tool that helps you organize your data into entities (or objects, as they are called in the Force.com platform) and define the relationships between them. ERD diagrams for key Salesforce objects are published in the *SOAP API Developer's Guide*.

F

Field

A part of an object that holds a specific piece of information, such as a text or currency value.

Field-Level Security

Settings that determine whether fields are hidden, visible, read only, or editable for users. Available in Enterprise, Unlimited, Performance, and Developer Editions only.

Field Dependency

A filter that allows you to change the contents of a picklist based on the value of another field.

Field Update

Field updates are workflow and approval actions that specify the field you want updated and the new value for it. Depending on the type of field, you can choose to apply a specific value, make the value blank, or calculate a value based on a formula you create.

Filter Condition/Criteria

Condition on particular fields that qualifies items to be included in a list view or report, such as “State equals California.”

Folder

A *folder* is a place where you can store reports, dashboards, documents, or email templates. Folders can be public, hidden, or shared, and can be set to read-only or read/write. You control who has access to its contents based on roles, permissions, public groups, and license types. You can make a folder available to your entire organization, or make it private so that only the owner has access.

Force.com

The salesforce.com platform for building applications in the cloud. Force.com combines a powerful user interface, operating system, and database to allow you to customize and deploy applications in the cloud for your entire enterprise.

Force.com App Menu

A menu that enables users to switch between customizable applications (or “apps”) with a single click. The Force.com app menu displays at the top of every page in the user interface.

Force.com IDE

An Eclipse plug-in that allows developers to manage, author, debug and deploy Force.com applications in the Eclipse development environment.

Web Services API

A Web services application programming interface that provides access to your Salesforce organization's information. See also SOAP API and Bulk API.

Foreign Key

A field whose value is the same as the primary key of another table. You can think of a foreign key as a copy of a primary key from another table. A relationship is made between two tables by matching the values of the foreign key in one table with the values of the primary key in another.

Formula Field

A type of custom field. Formula fields automatically calculate their values based on the values of merge fields, expressions, or other values.

Function

Built-in formulas that you can customize with input parameters. For example, the DATE function creates a date field type from a given year, month, and day.

G

Global Variable

A special merge field that you can use to reference data in your organization.

A method access modifier for any method that needs to be referenced outside of the application, either in the SOAP API or by other Apex code.

Group

A groups is a set of users. Groups can contain individual users, other groups, or the users in a role. Groups can be used to help define sharing access to data or to specify which data to synchronize when using Connect for Outlook or Connect for Lotus Notes.

Users can define their own personal groups. Administrators can create public groups for use by everyone in the organization.

Group Edition

A product designed for small businesses and workgroups with a limited number of users.

H

Hierarchy Custom Settings

A type of custom setting that uses a built-in hierarchical logic that lets you “personalize” settings for specific profiles or users. The hierarchy logic checks the organization, profile, and user settings for the current user and returns the most specific, or “lowest,” value. In the hierarchy, settings for an organization are overridden by profile settings, which, in turn, are overridden by user settings.

Home Tab

Starting page from which users can choose sidebar shortcuts and options, view current tasks and activities, or select another tab.

Hover Detail

Hover details display an interactive overlay containing detailed information about a record when users hover the mouse over a link to that record in the Recent Items list on the sidebar or in a lookup field on a record detail page. Users can quickly view information about a record before clicking **View** for the record's detail page or **Edit** for the edit page. The fields displayed in the hover details are determined by the record's mini page layout. The fields that display in document hover details are not customizable.

I

ID

See Salesforce Record ID.

Integrated Development Environment (IDE)

A software application that provides comprehensive facilities for software developers including a source code editor, testing and debugging tools, and integration with source code control systems.

Immediate Action

A workflow action that executes instantly when the conditions of a workflow rule are met.

Import Wizard

A tool for importing data into your Salesforce organization, accessible from Setup.

Instance

The cluster of software and hardware represented as a single logical server that hosts an organization's data and runs their applications. The Force.com platform runs on multiple instances, but data for any single organization is always consolidated on a single instance.

J

Junction Object

A custom object with two master-detail relationships. Using a custom junction object, you can model a “many-to-many” relationship between two objects. For example, you may have a custom object called “Bug” that relates to the standard case object such that a bug could be related to multiple cases and a case could also be related to multiple bugs.

K

No Glossary items for this entry.

L

Layout

See Page Layout.

Length

Parameter for custom text fields that specifies the maximum number of characters (up to 255) that a user can enter in the field.

Parameter for number, currency, and percent fields that specifies the number of digits you can enter to the left of the decimal point, for example, 123.98 for an entry of 3.

Letterhead

Determines the basic attributes of an HTML email template. Users can create a letterhead that includes attributes like background color, logo, font size, and font color.

List View

A list display of items (for example, accounts or contacts) based on specific criteria. Salesforce provides some predefined views.

In the Agent console, the list view is the top frame that displays a list view of records based on specific criteria. The list views you can select to display in the console are the same list views defined on the tabs of other objects. You cannot create a list view within the console.

Locale

The country or geographic region in which the user is located. The setting affects the format of date and number fields, for example, dates in the English (United States) locale display as 06/30/2000 and as 30/06/2000 in the English (United Kingdom) locale.

In Professional, Enterprise, Unlimited, Performance, and Developer Edition organizations, a user's individual `Locale` setting overrides the organization's `Default Locale` setting. In Personal and Group Editions, the organization-level locale field is called `Locale`, not `Default Locale`.

Long Text Area

Data type of custom field that allows entry of up to 32,000 characters on separate lines.

Lookup Dialog

Popup dialog available for some fields that allows you to search for a new item, such as a contact, account, or user.

Lookup Field

A type of field that contains a linkable value to another record. You can display lookup fields on page layouts where the object has a lookup or master-detail relationship with another object. For example, cases have a lookup relationship with assets that allows users to select an asset using a lookup dialog from the case edit page and click the name of the asset from the case detail page.

Lookup Relationship

A relationship between two records so you can associate records with each other. For example, cases have a lookup relationship with assets that lets you associate a particular asset with a case. On one side of the relationship, a lookup field allows users to click a lookup icon and select another record from a popup window. On the associated record, you can then display a related list to show all of the records that have been linked to it. If a lookup field references a record that has been deleted, by default Salesforce clears

the lookup field. Alternatively, you can prevent records from being deleted if they're in a lookup relationship.

M

Manual Sharing

Record-level access rules that allow record owners to give read and edit permissions to other users who might not have access to the record any other way.

Many-to-Many Relationship

A relationship where each side of the relationship can have many children on the other side. Many-to-many relationships are implemented through the use of junction objects.

Master-Detail Relationship

A relationship between two different types of records that associates the records with each other. For example, accounts have a master-detail relationship with opportunities. This type of relationship affects record deletion, security, and makes the lookup relationship field required on the page layout.

Master Picklist

A complete list of picklist values available for a record type or business process.

Matrix Report

Matrix reports are similar to summary reports but allow you to group and summarize data by both rows and columns. They can be used as the source report for dashboard components. Use this type for comparing related totals, especially if you have large amounts of data to summarize and you need to compare values in several different fields, or you want to look at data by date *and* by product, person, or geography.

Merge Field

A merge field is a field you can put in an email template, mail merge template, custom link, or formula to incorporate values from a record. For example, Dear { !Contact.FirstName }, uses a contact merge field to obtain the value of a contact record's First Name field to address an email recipient by his or her first name.

Metadata

Information about the structure, appearance, and functionality of an organization and any of its parts. Force.com uses XML to describe metadata.

Mini Page Layout

A subset of the items in a record's existing page layout that administrators choose to display in the Agent console's Mini View and in Hover Details. Mini page layouts inherit record type and profile associations, related lists, fields, and field access settings from the page layout.

Multitenancy

An application model where all users and apps share a single, common infrastructure and code base.

N

Notes

Miscellaneous information pertaining to a specific record.

O

Object

An object allows you to store information in your Salesforce organization. The object is the overall definition of the type of information you are storing. For example, the case object allow you to store information regarding customer inquiries. For each object, your organization will have multiple records that store the information about specific instances of that type of data. For example, you might have a case record to store the information about Joe Smith's training inquiry and another case record to store the information about Mary Johnson's configuration issue.

Object-Level Help

Custom help text that you can provide for any custom object. It displays on custom object record home (overview), detail, and edit pages, as well as list views and related lists.

Object-Level Security

Settings that allow an administrator to hide whole objects from users so that they don't know that type of data exists. Object-level security is specified with object permissions.

One-to-Many Relationship

A relationship in which a single object is related to many other objects. For example, an account may have one or more related contacts.

Organization

A deployment of Salesforce with a defined set of licensed users. An organization is the virtual space provided to an individual customer of salesforce.com. Your organization includes all of your data and applications, and is separate from all other organizations.

Organization-Wide Defaults

Settings that allow you to specify the baseline level of data access that a user has in your organization. For example, you can set organization-wide defaults so that any user can see any record of a particular object that is enabled via their object permissions, but they need extra permissions to edit one.

Outbound Message

An outbound message is a workflow, approval, or milestone action that sends the information you specify to an endpoint you designate, such as an external service. An outbound message sends the data in the specified fields in the form of a SOAP message to the endpoint. Outbound messaging is configured in the Salesforce setup menu. Then you must configure the external endpoint. You can create a listener for the messages using the SOAP API.

Overlay

An overlay displays additional information when you hover your mouse over certain user interface elements. Depending on the overlay, it will close when you move your mouse away, click outside of the overlay, or click a close button.

Owner

Individual user to which a record (for example, a contact or case) is assigned.

P

Page Layout

Page layout is the organization of fields, custom links, and related lists on a record detail or edit page. Use page layouts primarily for organizing pages for your users. In Enterprise, Unlimited, Performance, and Developer Editions, use field-level security to restrict users' access to specific fields.

Picklist

Selection list of options available for specific fields in a Salesforce object, for example, the `Industry` field for accounts. Users can choose a single value from a list of options rather than make an entry directly in the field. See also Master Picklist.

Picklist Values

Selections displayed in drop-down lists for particular fields. Some values come predefined, and other values can be changed or defined by an administrator.

Platform as a Service (PaaS)

An environment where developers use programming tools offered by a service provider to create applications and deploy them in a cloud. The application is hosted as a service and provided to customers via the Internet. The PaaS vendor provides an API for creating and extending specialized applications. The PaaS vendor also takes responsibility for the daily maintenance, operation, and support of the deployed application and each customer's data. The service alleviates the need for programmers to install, configure, and maintain the applications on their own hardware, software, and related IT resources. Services can be delivered using the PaaS environment to any market segment.

Platform Edition

A Salesforce edition based on Enterprise, Unlimited, or Performance Edition that does not include any of the standard Salesforce CRM apps, such as Sales or Service & Support.

Primary Key

A relational database concept. Each table in a relational database has a field in which the data value uniquely identifies the record. This field is called the primary key. The relationship is made between two tables by matching the values of the foreign key in one table with the values of the primary key in another.

Printable View

An option that displays a page in a print-ready format.

Private Sharing

Private sharing is the process of sharing an uploaded package by using the URL you receive from Salesforce. This URL is not listed in the AppExchange. Using the unlisted URL allows you to share a package without going through the listing process or making it public.

Process Visualizer

A tool that displays a graphical version of an approval process. The view-only diagram is presented as a flowchart. The diagram and an informational sidebar panel can help you visualize and understand the defined steps, rule criteria, and actions that comprise your approval process.

Production Organization

A Salesforce organization that has live users accessing data.

Professional Edition

A Salesforce edition designed for businesses who need full-featured CRM functionality.

Profile

Defines a user's permission to perform different functions within Salesforce. For example, the Solution Manager profile gives a user access to create, edit, and delete solutions.

Q**Queue**

A holding area for items before they are processed. Salesforce uses queues in a number of different features and technologies.

R

Read Only

One of the standard profiles to which a user can be assigned. Read Only users can view and report on information based on their role in the organization. (That is, if the Read Only user is the CEO, they can view all data in the system. If the Read Only user has the role of Western Rep, they can view all data for their role and any role below them in the hierarchy.)

Recent Items

List of links in the sidebar for most recently accessed records. Note that not all types of records are listed in the recent items.

Record

A single instance of a Salesforce object. For example, “John Jones” might be the name of a contact record.

Record ID

See Salesforce Record ID.

Record-Level Security

A method of controlling data in which you can allow a particular user to view and edit an object, but then restrict the records that the user is allowed to see.

Record Name

A standard field on all Salesforce objects. Whenever a record name is displayed in a Force.com application, the value is represented as a link to a detail view of the record. A record name can be either free-form text or an autonumber field. Record Name does not have to be a unique value.

Record Type

A record type is a field available for certain records that can include some or all of the standard and custom picklist values for that record. You can associate record types with profiles to make only the included picklist values available to users with that profile.

Recycle Bin

A page that lets you view and restore deleted information. Access the Recycle Bin by using the link in the sidebar.

Related List

A section of a record or other detail page that lists items related to that record. For example, the Stage History related list of an opportunity or the Open Activities related list of a case.

Related List Hover Links

A type of link that allows you to quickly view information on a detail page about related lists, by hovering your mouse over the link. Your administrator must enable the display of hover links. The displayed text contains the corresponding related list and its number of records. You can also click this type of link to jump to the content of the related list without having to scroll down the page.

Related Object

Objects chosen by an administrator to display in the Agent console's mini view when records of a particular type are shown in the console's detail view. For example, when a case is in the detail view, an administrator can choose to display an associated account, contact, or asset in the mini view.

Relationship

A connection between two objects, used to create related lists in page layouts and detail levels in reports. Matching values in a specified field in both objects are used to link related data; for example, if one object stores data about companies and another object stores data about people, a relationship allows you to find out which people work at the company.

Report

A *report* returns a set of records that meets certain criteria, and displays it in organized rows and columns. Report data can be filtered, grouped, and displayed graphically as a chart. Reports are stored in folders, which control who has access. See Tabular Report, Summary Report, and Matrix Report.

Report Type

A *report type* defines the set of records and fields available to a report based on the relationships between a primary object and its related objects. Reports display only records that meet the criteria defined in the report type. Salesforce provides a set of pre-defined standard report types; administrators can create custom report types as well.

Role Hierarchy

A record-level security setting that defines different levels of users such that users at higher levels can view and edit information owned by or shared with users beneath them in the role hierarchy, regardless of the organization-wide sharing model settings.

Roll-Up Summary Field

A field type that automatically provides aggregate values from child records in a master-detail relationship.

Running User

Each dashboard has a *running user*, whose security settings determine which data to display in a dashboard. If the running user is a specific user, all dashboard viewers see data based on the security settings of that user—regardless of their own personal security

settings. For dynamic dashboards, you can set the running user to be the logged-in user, so that each user sees the dashboard according to his or her own access level.

S

SaaS

See Software as a Service (SaaS).

Salesforce Record ID

A unique 15- or 18-character alphanumeric string that identifies a single record in Salesforce.

Sandbox Organization

A nearly identical copy of a Salesforce production organization. You can create multiple sandboxes in separate environments for a variety of purposes, such as testing and training, without compromising the data and applications in your production environment.

Save As

Option on any standard, public, or custom report to save the parameters of the report without altering the original report. It creates a new custom report with your saved changes.

Save & New

Alternative “save” on most pages with which you can save your current changes and create a new entry.

Search

Feature that lets you search for information that matches specified keywords. If you have sidebar search, enter search terms in the Search section of the sidebar or click **Advanced Search...** for more search options. If you have global search, enter search terms in the search box in the header.

Search Layout

The organization of fields included in search results, in lookup dialogs, and in the key lists on tab home pages.

Setup

A menu where administrators can customize and define organization settings and Force.com apps. Depending on your organization’s user interface settings, Setup may be a link in the user interface header or in the drop-down list under your name.

Sharing

Allowing other users to view or edit information you own. There are different ways to share data:

- Sharing Model—defines the default organization-wide access levels that users have to each other's information and whether to use the hierarchies when determining access to data.
- Role Hierarchy—defines different levels of users such that users at higher levels can view and edit information owned by or shared with users beneath them in the role hierarchy, regardless of the organization-wide sharing model settings.
- Sharing Rules—allow an administrator to specify that all information created by users within a given group or role is automatically shared to the members of another group or role.
- Manual Sharing—allows individual users to share records with other users or groups.
- Apex-Managed Sharing—enables developers to programmatically manipulate sharing to support their application's behavior. See [Apex-Managed Sharing](#).

Sharing Model

Behavior defined by your administrator that determines default access by users to different types of records.

Sharing Rule

Type of default sharing created by administrators. Allows users in a specified group or role to have access to all information created by users within a given group or role.

Show/Hide Details

Option available for reports that lets you show/hide the details of individual column values in report results.

Sidebar

Column appearing on the left side of each page that provides links to recent items and other resources.

SOAP (Simple Object Access Protocol)

A protocol that defines a uniform way of passing XML-encoded data.

Software as a Service (SaaS)

A delivery model where a software application is hosted as a service and provided to customers via the Internet. The SaaS vendor takes responsibility for the daily maintenance, operation, and support of the application and each customer's data. The service alleviates the need for customers to install, configure, and maintain applications with their own hardware, software, and related IT resources. Services can be delivered using the SaaS model to any market segment.

Source Report

A custom report scheduled to run and load data as records into a target object for an analytic snapshot.

Standard Object

A built-in object included with the Force.com platform. You can also build custom objects to store information that is unique to your app.

Summary Report

Summary reports are similar to tabular reports, but also allow users to group rows of data, view subtotals, and create charts. They can be used as the source report for dashboard components. Use this type for a report to show subtotals based on the value of a particular field or when you want to create a hierarchical list, such as all opportunities for your team, subtotalled by Stage and Owner.

System Administrator

See Administrator (System Administrator).

T

Tab

A tab is an interface component that allows you to navigate around an app. A tab serves as the starting point for viewing, editing, and entering information for a particular object. When you click a tab at the top of the page, the corresponding tab home page for that object appears. A tab can be associated with an object, a Web page, or a Visualforce page.

Tabular Report

Tabular reports are the simplest and fastest way to look at data. Similar to a spreadsheet, they consist simply of an ordered set of fields in columns, with each matching record listed in a row. Tabular reports are best for creating lists of records or a list with a single grand total. They can't be used to create groups of data or charts, and can't be used in dashboards unless rows are limited. Examples include contact mailing lists and activity reports.

Task

Assigns a task to a user you specify. You can specify the Subject, Status, Priority, and Due Date of the task. Tasks are workflow and approval actions that are triggered by workflow rules or approval processes.

For Calender-related tasks, see Activity (Calendar Events/Tasks).

Text

Data type of a custom field that allows entry of any combination of letters, numbers, or symbols, up to a maximum length of 255 characters.

Text Area

A custom field data type that allows entry of up to 255 characters on separate lines.

Text Area (Long)

See Long Text Area.

Time-Dependent Workflow Action

A workflow action that executes when the conditions of a workflow rule and an associated time trigger are met.

Time Trigger

An event that starts according to a specified time threshold, such as seven days before an opportunity close date. For example, you might define a time-based workflow action that sends email to the account manager when a scheduled milestone will occur in seven days.

U**Unlimited Edition**

Unlimited Edition is salesforce.com's solution for maximizing CRM success and extending that success across the entire enterprise through the Force.com platform.

URL (Uniform Resource Locator)

The global address of a website, document, or other resource on the Internet. For example, <http://www.salesforce.com>.

User Interface

The layouts that specify how a data model should be displayed.

V**Validation Rule**

A rule that prevents a record from being saved if it does not meet the standards that are specified.

Visualforce

A simple, tag-based markup language that allows developers to easily define custom pages and components for apps built on the platform. Each tag corresponds to a coarse or fine-grained component, such as a section of a page, a related list, or a field. The components can either be controlled by the same logic that is used in standard Salesforce pages, or developers can associate their own logic with a controller written in Apex.

Visualforce Controller

See Controller, Visualforce.

Visualforce Page

A web page created using Visualforce. Typically, Visualforce pages present information relevant to your organization, but they can also modify or capture data. They can be rendered in several ways, such as a PDF document or an email attachment, and can be associated with a CSS style.

W

Web Links

See Custom Links.

Web Service

A mechanism by which two applications can easily exchange data over the Internet, even if they run on different platforms, are written in different languages, or are geographically remote from each other.

Web Tab

A custom tab that allows your users to use external websites from within the application.

Wizard

A user interface that leads a user through a complex task in multiple steps.

Workflow and Approval Actions

Workflow and approval actions, such as email alerts, tasks, field updates, and outbound messages, can be triggered by a workflow rule or approval process.

Workflow Action

A workflow action, such as an email alert, field update, outbound message, or task, fires when the conditions of a workflow rule are met.

Workflow Email Alert

A workflow action that sends an email when a workflow rule is triggered. Unlike workflow tasks, which can only be assigned to application users, workflow alerts can be sent to any user or contact, as long as they have a valid email address.

Workflow Field Update

A workflow action that changes the value of a particular field on a record when a workflow rule is triggered.

Workflow Outbound Message

A workflow action that sends data to an external Web service, such as another cloud computing application. Outbound messages are used primarily with composite apps.

Workflow Queue

A list of workflow actions that are scheduled to fire based on workflow rules that have one or more time-dependent workflow actions.

Workflow Rule

A workflow rule sets workflow actions into motion when its designated conditions are met. You can configure workflow actions to execute immediately when a record meets the conditions in your workflow rule, or set time triggers that execute the workflow actions on a specific day.

Workflow Task

A workflow action that assigns a task to an application user when a workflow rule is triggered.

X**XML (Extensible Markup Language)**

A markup language that enables the sharing and transportation of structured data. All Force.com components that are retrieved or deployed through the Metadata API are represented by XML definitions.

Y

No Glossary items for this entry.

Z**Zip File**

A data compression and archive format.

A collection of files retrieved or deployed by the Metadata API. See also Local Project.

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