

EXT JS

IN ACTION

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MANNING

Ext JS in Action

JESUS GARCIA



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Greenwich
(74° w. long.)

brief contents

PART 1	INTRODUCTION TO EXT JS.....	1
1	■ A framework apart	3
2	■ Back to the basics	30
3	■ Events, Components, and Containers	46
PART 2	EXT JS COMPONENTS.....	69
4	■ A place for Components	71
5	■ Organizing Components	92
6	■ Ext JS takes form	121
PART 3	DATA-DRIVEN COMPONENTS.....	151
7	■ The venerable GridPanel	153
8	■ The EditorGridPanel	176
9	■ DataView and ListView	204
10	■ Charts	225
11	■ Taking root with trees	250
12	■ Menus, Buttons, and Toolbars	270

PART 4 ADVANCED EXT	297
13 ■ Drag-and-drop basics	299
14 ■ Drag and drop with widgets	320
15 ■ Extensions and plug-ins	350
PART 5 BUILDING APPLICATIONS	375
16 ■ Developing for reusability	377
17 ■ The application stack	426

contents

preface xv
acknowledgments xx
about the cover illustration xxii

PART 1 INTRODUCTION TO EXT JS 1

1 A framework apart 3

1.1 Looking at Ext JS 4

Integration with existing sites 5 • *Rich API documentation* 5
Rapid development with prebuilt widgets 7 • *Works with Prototype, jQuery, and YUI, and inside AIR* 7

1.2 What you need to know 8

1.3 A bird's-eye view of the framework 8

Containers and layouts at a glance 10 • *Other Containers in action* 11 • *Grids, DataView, and ListView* 12 • *Make like a TreePanel and leaf* 13 • *Form input fields* 14
Other widgets 16

1.4 New Ext JS 3.0 goodies 17

Ext JS does remoting with Direct 18 • *Data class* 18
Meet the new layouts 18 • *Grid ColumnModel enhancements* 19 • *ListView, like GridPanel on a diet* 20
Charts come to Ext JS 21

1.5	Downloading and configuring	21
	<i>Looking at the SDK contents</i>	22
	<i>Setting up Ext JS for the first time</i>	23
	<i>Configuring Ext JS for use with others</i>	23
	<i>Configuring BLANK_IMAGE_URL</i>	25
1.6	Take it for a test drive	25
1.7	Summary	28

2 *Back to the basics* 30

2.1	Starting off the right way	31
	<i>Fire only when ready!</i>	31
	<i>Let Ext JS pull the trigger</i>	31
2.2	The Ext.Element class	33
	<i>The heart of the framework</i>	33
	<i>Using Ext.Element for the first time</i>	33
	<i>Creating child nodes</i>	35
	<i>Removing child nodes</i>	37
	<i>Using Ajax with Ext.Element</i>	39
2.3	Using Templates and XTemplates	40
	<i>Exercising templates</i>	40
	<i>Looping with XTemplates</i>	42
	<i>Advanced XTemplate usage</i>	43
2.4	Summary	45

3 *Events, Components, and Containers* 46

3.1	Managing events with Observable	47
	<i>Taking a step back</i>	47
	<i>DOM-based events</i>	47
	<i>Event flow in the DOM</i>	48
	<i>Burst the bubble</i>	50
	<i>Software-driven events</i>	51
	<i>Registration of events and event listeners</i>	52
3.2	The Component model	54
	<i>XTypes and Component Manager</i>	54
	<i>Component rendering</i>	57
3.3	The Component lifecycle	58
	<i>Initialization</i>	58
	<i>Render</i>	60
	<i>Destruction</i>	62
3.4	Containers	63
	<i>Learning to tame children</i>	64
	<i>Querying the Container hierarchy</i>	66
	<i>The Viewport Container</i>	67
3.5	Summary	68

PART 2 EXT JS COMPONENTS 69

4 *A place for Components* 71

4.1	The Panel	72
	<i>Building a complex Panel</i>	72

4.2	Popping up Windows	76
	<i>Further Window configuration exploration</i>	78
	<i>Replacing alert and prompt with MessageBox</i>	79
	<i>Advanced MessageBox techniques</i>	81
	<i>Showing an animated wait MessageBox</i>	82
4.3	Components can live in tab panels too	84
	<i>Remember these two options</i>	84
	<i>Building our first TabPanel</i>	86
	<i>Tab management methods you should know</i>	87
	<i>Caveats and drawbacks</i>	88
4.4	Summary	91

5 *Organizing Components* 92

5.1	The simple ContainerLayout	93
5.2	The AnchorLayout	95
5.3	The FormLayout	98
5.4	The AbsoluteLayout	100
5.5	Making components fit	101
5.6	The AccordionLayout	102
5.7	The CardLayout	104
5.8	The ColumnLayout	107
5.9	The HBox and VBox layouts	109
5.10	The TableLayout	112
5.11	The BorderLayout	115
5.12	Summary	120

6 *Ext JS takes form* 121

6.1	The TextField	122
	<i>Password and file select fields</i>	125
	<i>Building a TextArea</i>	126
	<i>The convenient NumberField</i>	126
6.2	TypeAhead with the ComboBox	127
	<i>Building a local ComboBox</i>	128
	<i>Implementing a remote ComboBox</i>	129
	<i>The ComboBox deconstructed</i>	132
	<i>Customizing our ComboBox</i>	132
	<i>Finding the time</i>	134
6.3	WYSIWWhat?	134
	<i>Constructing our first HtmlEditor</i>	134
	<i>Dealing with lack of validation</i>	135
6.4	Selecting a date	136
6.5	Checkboxes and Radios	136
6.6	The FormPanel	138

6.7	Data submission and loading	145
	<i>Submitting the good old way</i>	145
	<i>Submitting via Ajax</i>	145
	<i>Loading data into our form</i>	146
6.8	Summary	148

PART 3 DATA-DRIVEN COMPONENTS 151

7 *The venerable GridPanel* 153

7.1	Introducing GridPanel	154
	<i>Looking under the hood</i>	154
7.2	The data Store at a glance	156
	<i>How data Stores work</i>	156
7.3	Building a simple GridPanel	159
	<i>Setting up an ArrayStore</i>	159
	<i>Completing our first GridPanel</i>	161
7.4	Advanced GridPanel construction	163
	<i>What we're building</i>	163
	<i>Creating the store using shortcuts</i>	163
	<i>Building a ColumnModel with custom renderers</i>	166
	<i>Configuring our advanced GridPanel</i>	168
	<i>Configuring a Container for our GridPanel</i>	169
	<i>Applying event handlers for interaction</i>	171
7.5	Summary	175

8 *The EditorGridPanel* 176

8.1	A close look at the EditorGridPanel	177
8.2	Building your first EditorGridPanel	178
8.3	Navigating our EditorGridPanel	182
8.4	Getting the CRUD in	183
	<i>Adding save and reject logic</i>	184
	<i>Saving or rejecting your changes</i>	187
	<i>Adding create and delete</i>	189
	<i>Using create and delete</i>	192
8.5	Using Ext.data.DataWriter	196
	<i>Enter Ext.data.DataWriter</i>	196
	<i>Adding DataWriter to our JsonStore</i>	197
	<i>Using DataWriter</i>	200
	<i>An automated writing store</i>	203
8.6	Summary	203

9 *DataView and ListView* 204

9.1	What is the DataView?	205
-----	-----------------------	-----

- 9.2 Constructing a DataView 206
 - Building the Store and XTemplate* 207 ▪ *Building the DataView and Viewport* 211
- 9.3 Enter the ListView 214
 - Binding the DataView to the ListView* 216
- 9.4 Bringing it all together 218
 - Configuring the FormPanel* 219 ▪ *Applying the final bindings* 221
- 9.5 Summary 224

10 *Charts* 225

- 10.1 Defining the four charts 226
- 10.2 Charts deconstructed 227
- 10.3 Building a LineChart 230
 - Customizing the ToolTip* 232 ▪ *Adding titles to the x- and y-axes* 232 ▪ *Styling the Chart body* 234
- 10.4 Adding multiple Series 235
 - Adding legends* 238
- 10.5 Constructing ColumnCharts 239
 - Stacking columns* 240 ▪ *Mixing a line with columns* 241
- 10.6 Constructing BarCharts 243
 - Configuring a BarChart* 245
- 10.7 A slice of PieChart 245
 - Custom tipRenderer* 248
- 10.8 Summary 249

11 *Taking root with trees* 250

- 11.1 What is a tree (TreePanel)? 251
 - Looking under the roots* 251
- 11.2 Planting our first TreePanel 252
- 11.3 Dynamic TreePanels grow 254
 - Fertilizing the TreePanel* 255
- 11.4 CRUD on a TreePanel 257
 - Adding context menus to a TreePanel* 257 ▪ *Wiring up the Edit logic* 261 ▪ *Tackling delete* 264 ▪ *Creating nodes for our TreePanel* 266
- 11.5 Summary 269

12 Menus, Buttons, and Toolbars 270

12.1 Menus at a glance 271

- Building a menu 272 ■ Obtaining and using Icons 273*
- Taming the icon madness 274 ■ Adding a submenu 275*
- Adding a Separator and TextItem 276 ■ Picking a color and choosing a date 278 ■ Put that menu Item in check 280*
- Select only one item at a time 281*

12.2 Users know how to push your Buttons 283

- Building Buttons 284 ■ Attaching a Menu to a Button 284*
- Do a split (SplitButton) 286 ■ Customizing the layout of your Button 287*

12.3 Grouping your Buttons 287

12.4 Toolbars 290

12.5 Read, set, Ext.Action! 293

12.6 Summary 295

PART 4 ADVANCED EXT 297

13 Drag-and-drop basics 299

13.1 Taking a good look at drag and drop 300

- The drag-and-drop lifecycle 300 ■ A top-down view of the drag-and-drop classes 301 ■ It's all in the overrides! 303*
- Drag and drop always work in groups 304*

13.2 Starting out simple 305

- Creating a small workspace 305 ■ Configuring items to be draggable 306 ■ Analyzing the Ext.dd.DD DOM changes 307*
- Adding the pool and hot tub drop targets 309*

13.3 Finishing our drag-and-drop implementation 310

- Adding the drop invitation 310 ■ Adding valid drop 313*
- Implementing invalid drop 314*

13.4 Using the DDProxy 316

- Implementing DDProxy and drop invitation 316*

13.5 Summary 319

14 Drag and drop with widgets 320

14.1 A quick review of the drag-and-drop classes 321

14.2 Drag and drop with DataViews 322

- Constructing the DataViews 322 ■ Adding drag gestures 326*
- Applying drop 330*

14.3	Drag and drop with GridPanels	332
	<i>Constructing the GridPanels</i>	333
	<i>Enabling drag</i>	335
	<i>Better drop invitation</i>	337
	<i>Adding drop</i>	337
14.4	Drag and drop with TreePanels	342
	<i>Constructing the TreePanels</i>	342
	<i>Enabling drag and drop</i>	343
	<i>Employing flexible constraints</i>	345
14.5	Summary	349

15 *Extensions and plug-ins* 350

15.1	Inheritance with Ext JS	351
	<i>Inheritance with JavaScript</i>	352
	<i>Extending with Ext JS</i>	354
15.2	Extending Ext JS Components	357
	<i>Thinking about what we're building</i>	358
	<i>Extending GridPanel</i>	359
	<i>Our extension in action</i>	363
	<i>Identifying the limitations of extensions</i>	365
15.3	Plug-ins to the rescue	366
	<i>A robust plug-in design pattern</i>	367
	<i>Developing a plug-in</i>	368
	<i>Our plug-in in action</i>	370
15.4	Summary	373

PART 5 BUILDING APPLICATIONS 375

16 *Developing for reusability* 377

16.1	Developing for the future	378
	<i>Namespaces</i>	378
	<i>Namespace segmentation</i>	379
	<i>Namespace segmentation for large applications</i>	381
16.2	Analyzing the application requirements	381
	<i>Abstracting reusability</i>	382
	<i>The Dashboard screen</i>	382
	<i>The Manage Departments screen</i>	384
	<i>The Manage Employees screen</i>	387
16.3	Constructing the ChartPanel components	389
	<i>The ChartPanelBaseCls</i>	389
	<i>The CompanySnapshot class</i>	392
	<i>The DepartmentBreakdown class</i>	394
16.4	Constructing the listpanel components	396
	<i>The ListPanelBaseCls</i>	396
	<i>The DepartmentsListView and EmployeeList classes</i>	397
16.5	Constructing the EmployeeGridPanel class	399

- 16.6 The EmployeeAssociationWindow class 402
- 16.7 The form namespace 406
 - The FormPanelBaseCls class 406 • The DepartmentForm class 407 • The EmployeeForm class 415*
- 16.8 Summary 424

17 *The application stack 426*

- 17.1 Developing the application namespace 427
 - Reviewing the application screens 427 • Designing the application namespace 429*
- 17.2 Building the Dashboard screen 429
- 17.3 The Manage Employees screen 431
 - Discussing the workflow 431 • Constructing EmployeeManager 433*
- 17.4 The Manage Departments screen 443
 - The navigation and department CRUD workflows 443 Employee CRUD workflows 446 • Employee association workflow 449*
- 17.5 Piecing it all together 451
 - The workspace workflows 451 • Constructing the workspace singleton 452*
- 17.6 Summary 459
 - index 461*

****preface****

It was early 2006, and I was spending many frustrating hours testing and learning many of the frameworks and libraries on the internet. Seemingly, out of nowhere, I stumbled upon an extension to YUI or YUI-ext, developed by an unknown at the time, Jack Slocum.

At last! An Ajax library that was easy to use and well-documented. All of this work was for a small web application that I was developing during a six-month contract. Keep in mind that Enterprise Web 2.0 apps were nonexistent, so I knew I was venturing into uncharted territory.

By late 2006, the project had come to a close, as did the contract, forcing me to reassess my career goals. I had a strong feeling that the Enterprise Rich Intranet Application was going to be very popular, so I decided to become as active as I could in the YUI-ext community, focusing my efforts on learning, implementing, and extending the framework. You could say that I became an evangelist of sorts.

Flash forward to the summer of 2008, when Michael Stephens at Manning Publications contacted me regarding the development of a book for their *In Action* series. Becoming an author of a book was something that I had never dreamed of.

Before the challenge of this book was presented to me, I had already spent countless hours on the Ext JS forums helping developers like you and me solve a myriad of problems. This was in addition to authoring articles published on various blogs, e-magazine articles, and online video tutorials, some of which are longer in duration than most shows on television! So, when Michael Stephens contacted me, I was immediately excited to explore this avenue of knowledge transfer.

After about a year and a half of work, I can reflect on the late nights and sacrificed weekends spent trying to figure out ways to explain complex concepts so that any developer could understand them. During that time, I did my best to interface with the MEAP (Manning Early Access Program) readers and Ext JS community, processing feedback to make this book what it is.

I hope this book is helpful to you. Please feel free to visit us at the Manning Author Online forum and provide your thoughts, comments, and suggestions.

About this book

Ext (pronounced *Eee-ecks-tee*) JS 3.0 is an extremely powerful cross-browser UI framework for building rich and robust applications, originally developed by Jack Slocum in 2006. Since then, Ext JS has endured explosive growth because it addresses the need for web developers to have a true UI framework, complete with a component and event model. That makes it still unique in the growing competitive space of Web 2.0 libraries.

Written by a member of the Ext JS community, this book walks you through the framework in great detail, from the perspective of a peer-to-peer conversation. It uses examples both small and large to demonstrate how to use Ext JS effectively. It also includes many custom illustrations to help accelerate learning of the material.

Ext JS is an extremely large framework and continues to grow with every release. Because of the size of the framework, this book focuses on the core concepts that all developers need to know to be effective when developing Ext JS apps. Such concepts include the Component lifecycle, each of the layouts, creating extensions and plug-ins, and so much more.

This book does not cover parts of the framework or modules such as state and cookie management, Direct, and Designer. Cookie and state management were passed up in favor of covering other key principle topics, such as developing applications. Ext Direct is a way to remotely call the client side from the server side and also allows for seamless communication between the client and server side, but isn't included because it requires specific knowledge of server-side languages and thus is too broad a concept for this publication. The Ext Designer application rapidly creates rich interfaces for Ext JS, but isn't covered because it wasn't available during the development of this book.

Who should read this book?

This book is designed for anyone who wants to learn Ext JS *and use it well*. Instead of just being a container for recipes, this book tries to give the reader a deep understanding of how Ext JS works from the inside out and how to apply it in their application development efforts. The examples are written so that novice and expert JavaScript developers alike find them useful.

Some skills are required to be able to understand the material in this book, however. You need to be fairly experienced with JavaScript, HTML, and CSS, though you

needn't be an expert in these technologies. If you're charged with developing the server-side code, you should be up to speed on how to use your server-side language of choice to communicate from the web server to your database of choice.

Roadmap

This book is divided into five major parts, each progressively increasing in complexity.

Part 1, “Introduction to Ext JS,” gets your feet wet and lays the foundation for the rest of the book. The goal of this part is to understand the core concepts of how to use the framework well, because they’re essential for the comprehension of later parts of the book. By the end of this section, you’ll know intricacies of the framework that you can carry well beyond this book.

Chapter 1 begins with a tour of the framework. In this tour, we take a brief look at some of the underlying machinery. This chapter concludes with a “Hello world” example.

Chapter 2 is meant to be more of an Ext JS boot camp, where essential topics, such as how to initialize Ext JS widgets properly, are covered. In this chapter, we also cover DOM manipulation and how to use the framework’s template engines.

Chapter 3 closes part 1 by covering four key topics that drive the framework. These topics include event management, the Component model and lifecycle, and how Ext JS widgets manage other widgets, known as Containers.

In part 2, “Ext JS Components,” we begin to exercise the various widgets in the framework that are not driven by a data model. We start off by exploring TabPanels and Windows and then show how to properly implement each of the layouts. This part closes with a comprehensive walk-through of the various form input fields.

Chapter 4 continues the momentum from chapter 3’s concepts, exploring how TabPanels, Windows, and Ext JS MessageBox dialog boxes are used.

Chapter 5 springboards off the knowledge gained from chapter 4 and walks you through implementations of the various layout managers in the framework.

Chapter 6 is somewhat of a show-and-tell chapter, walking through each of the form input fields that the framework provides and explaining how to submit data via Ajax. In the end, it uses the layout concepts learned from chapter 5 to construct a complex multitab FormPanel.

In part 3, “Data-driven Components,” you learn the intricacies of the data-driven widgets, such as the GridPanel, EditorGridPanel, DataViews, Charts, and TreePanels. The goal of this part is to get you familiar with these complex widgets and their underlying data model components.

Chapter 7 is a detailed analysis of the way data Store GridPanels function and explains how each of their supporting classes work together.

Chapter 8 teaches you how to use the EditorGridPanel widget and introduces key concepts for creating, updating, and deleting data.

Chapter 9 leverages what you know about the data Store to implement DataViews and ListView widgets. You also learn more about the XTemplate utility along the way.

Chapter 10 is all about Charts. You get an inside look at how to implement and customize them.

Chapter 11 walks you through implementing TreePanels and explains how the data for the TreePanel needs to be arranged.

Chapter 12 is all about Toolbars, Menus, and Buttons, and you'll learn how to create things such as custom Menus and ButtonGroups.

Part 4, "Advanced Ext," teaches you some of the more complex areas of the framework, such as drag and drop and how to create extensions and plug-ins. Drag and drop covers a lot of material, so it's divided into two chapters.

Chapter 13 is designed to ease you into the world of drag and drop, where you learn about the classes that make drag and drop possible with the framework. Here we implement basic drag and drop with DOM elements on the page.

Chapter 14 continues the momentum, focusing on drag and drop with the Ext JS DataView, GridPanel, and TreePanel widgets.

Chapter 15 explains how extensions and plug-ins work in the framework.

Part 5, "Building applications," focuses on piecing together what you've learned thus far and constructing a small web application. In this part, you'll learn essential concepts, such as how to organize your classes via namespaces and on your filesystem. You'll also learn how to create reusable components that are implemented in your application.

Chapter 16 teaches you application basics by walking you through the paces of understanding requirements and abstracting and creating the reusable components.

Chapter 17 ties together all of the reusable components that you created in chapter 16. Here you learn how to combine user interactions using events, providing full CRUD functionality for data Records.

Code conventions

The following typographical conventions are used throughout the book:

- Courier typeface is used in all code listings.
- Courier typeface is used within text for certain code words.
- *Italics* are used for emphasis and to introduce new terms.
- Code annotations are used in place of inline comments in the code. These highlight important concepts or areas of the code. Some annotations appear with numbered bullets like this ① that are referenced later in the text.

Code downloads

You can download the examples for chapters 1 through 15 of this book via <http://extjsinaction.com/examples.zip> and can view and exercise them online via <http://examples.extjsinaction.com/>. The source code downloads are also available from the publisher's website at www.manning.com/ExtJSinAction.

Author Online

The purchase of *Ext JS in Action* includes free access to a private forum run by Manning Publications where you can make comments about the book, ask technical questions, and receive help from the author and other users. You can access and subscribe to the forum at www.manning.com/ExtJSinAction. This page provides information on how to get on the forum once you're registered, what kind of help is available, and the rules of conduct in the forum.

Manning's commitment to our readers is to provide a venue where a meaningful dialogue among individual readers and between readers and the author can take place. It's not a commitment to any specific amount of participation on the part of the author, whose contribution to the book's forum remains voluntary (and unpaid). We suggest you try asking the author some challenging questions, lest his interest stray!

The Author Online forum and the archives of previous discussions will be accessible from the publisher's website as long as the book is in print. Finally, additions to the content will be added to the author's online blog for the book, located at <http://extjsinaction.com>.

About the title

By combining introductions, overviews, and how-to examples, the *In Action* books are designed to help learning and remembering. According to research in cognitive science, the things people remember are things they discover during self-motivated exploration.

Although no one at Manning is a cognitive scientist, we are convinced that for learning to become permanent, it must pass through stages of exploration, play, and, interestingly, retelling of what is being learned. People understand and remember new things, which is to say they master them, only after actively exploring them. Humans learn in action. An essential part of an *In Action* book is that it is example driven. It encourages the reader to try things out, to play with new code, and to explore new ideas.

There is another, more mundane reason for the title of this book: our readers are busy. They use books to do a job or solve a problem. They need books that allow them to jump in and jump out easily and learn just what they want, just when they want it. They need books that aid them in action. The books in this series are designed for such readers.

acknowledgments

This book is dedicated to my wife, Erika, and our two boys, Takeshi and Kenji. Because of you, I have the motivation to do what I do.

Erika, thank you for supporting me during the production of this book. Your dedication to taking care of our two very active boys and family matters allowed me to focus on this book. I am both grateful and lucky to have you in my life. I love you!

Takeshi and Kenji, thank you for always keeping me on my toes and for those five-minute slices of time. My hope is that this little accomplishment can serve as an inspiration to you someday to achieve what it is that you set your mind to.

Many thanks to Abe Elias, Aaron Conran, Tommy Maintz, and the rest of the Ext JS development team. Having the ability to interface directly with you and your team has allowed me to get the answers I needed to make some of this material possible.

This book exists because of the people at Manning. Sebastian Stirling, my development editor, spent many hours taking the seemingly mindless ramblings of this Ext JS developer and arranging them so they were understandable. Thank you, Sebastian, for helping to make this book what it is. Also, huge thanks to the production team, including Mary Piergies, Linda Recktenwald, Katie Tennant, and Dottie Marsico. My gratitude also goes out to Mitchell Simoens, a shining star in the Ext JS community, for technically reviewing the manuscript shortly before it went to press. Finally, to Michael Stephens and Marjan Bace: thank you very much for extending to me the opportunity of becoming a book author. This was a very personal experience for me, and I'm indebted to you for your support throughout this project.

Last, but not least, many thanks to all who contributed to the manuscript along the way. To Manning's Early Access readers and the Ext JS community for your support

and unparalleled dedication to providing feedback: I cannot begin to express my gratitude for the time taken out of your busy lives to interact with me during the writing of this book. And many thanks to the following peer reviewers who read the manuscript at different stages of its development and provided invaluable insights: Robert Anderson, Robby O'Connor, Amos Bannister, Paul Holser, Anthony Topper, Orhan Alkan, Ric Peller, Dan McKinnon, Jeroen Benckhuijsen, Christopher Haupt, Patrick Dennis, Costantino Cerbo, Greg Vaughn, Nhoel Sangalang, Bernard Farrell, Chuck Hudson, George Jempty, and Rama Vavilala.

about the cover illustration

The figure on the cover of *Ext JS in Action* is captioned “Le voyageur,” which means a traveling salesman. The illustration is taken from a 19th-century edition of Sylvain Maréchal’s four-volume compendium of regional dress customs published in France. Each illustration is finely drawn and colored by hand. The rich variety of this collection reminds us vividly of how culturally apart the world’s towns and regions were just 200 years ago. Isolated from each other, people spoke different dialects and languages. In the streets or in the countryside, it was easy to identify where they lived and what their trade or station in life was just by their dress.

Dress codes have changed since then and the diversity by region, so rich at the time, has faded away. It is now hard to tell apart the inhabitants of different continents, let alone different towns or regions. Perhaps we have traded cultural diversity for a more varied personal life—certainly for a more varied and fast-paced technological life.

At a time when it is hard to tell one computer book from another, Manning celebrates the inventiveness and initiative of the computer business with book covers based on the rich diversity of regional life of two centuries ago, brought back to life by illustrations from collections such as this one.

Part 1

Introduction to Ext JS

W

elcome to *Ext JS in Action*, an in-depth guide into the world of Ext JS. In this book, in addition to learning how to get things done using the Ext JS Framework, you’re going to learn how the different components and widgets that comprise the framework work and operate.

Chapters 1 through 3 are designed to give you the essential knowledge to understand many of the fundamental aspects of the framework. Your journey begins with chapter 1, where you’ll learn the very basics of the framework. Chapter 2 is our “boot camp” chapter and is where you’ll learn key items to bootstrap your applications properly. Chapter 3 covers some of the internal machinery of the framework, such as the Component and Container models.

After reading this part, you’ll be ready to explore the many widgets that compose Ext JS.

1

A framework apart

This chapter covers

- A holistic view of Ext JS
- Learning about what's new in 3.0
- Downloading and unpacking the framework source code
- Exploring an Ajax-based "Hello world" example

Envision a scenario where you're tasked to develop an application with many of the typical UI (user interface) widgets such as menus, tabs, data grids, dynamic forms, and styled pop-up windows. You want something that allows you to programmatically control the position of widgets, which means it has to have layout controls. You also desire detailed and organized centralized documentation to ease your learning curve with the framework. Finally, this application needs to look mature and go into beta phase as quickly as possible, which means you don't have a lot of time to toy with HTML and CSS. Before entering the first line of code for the prototype, you need to decide on an approach for developing the frontend. What are your choices?

You do some recon on the common popular libraries on the market and quickly learn that all of them can manipulate the DOM, but only two of them have a mature UI library, YUI (Yahoo! User Interface) and Ext JS.

At first glance of YUI, you might think you need not look any further. You toy with the examples and notice that they look mature but are not exactly professional quality, which means you'll need to modify CSS. No way. Next, you look at the documentation at <http://developer.yahoo.com/yui/docs>. It's centralized and technically accurate, but it's far from user friendly. You look at all of the scrolling required to locate a method or class. Some classes are even cut off because the left navigation pane is too small. What about Ext JS? Surely it has to be better, right? What alternatives do we have?

In this chapter, we'll take a good look at Ext JS, and you'll learn about some of the widgets that compose the framework. After we finish the overview, you'll download Ext JS and take it for a test drive.

1.1 **Looking at Ext JS**

Having to develop an RIA with a set of rich UI controls, you turn to Ext JS and find that, out of the proverbial box, Ext JS provides a rich set of DOM utilities and widgets. Although you can get excited about what you see in the examples page, it's what is under the hood that's most exciting. Ext JS comes with a full suite of layout management tools to give you full control over organizing and manipulating the UI as requirements dictate. One layer down exists what's known as the Component model and Container model, each playing an important role in managing how the UIs are constructed.

Component and Container models

The Component and Container models play a key role in managing UIs with Ext JS and are part of the reason Ext JS stands out from the rest of the Ajax libraries and frameworks. The Component model dictates how UI widgets are instantiated, rendered, and destroyed in what's known as the component lifecycle. The Container model controls how widgets can manage (or *contain*) other child widgets. These are two key areas for understanding the framework, which is why we'll be spending a lot of time on these two topics in chapter 3.

Almost all UI widgets in the framework are highly customizable, affording you the option to enable and disable features, override functions, and use custom extensions and plug-ins. One example of a web application that takes full advantage of Ext JS is Conjoon. Figure 1.1 shows a screenshot of Conjoon in action.

Conjoon is an open source personal information manager and can be considered the epitome of web applications developed with Ext JS. It uses just about all of the framework's native UI widgets and demonstrates how well the framework can integrate with custom extensions such as YouTubePlayer, LiveGrid, and ToastWindow. You can get a copy of Conjoon by visiting <http://conjoon.org>.

You've learned how Ext JS can be used to create a full-page web application. But what if you have an application that's already in production? Next, you'll learn how Ext JS can be integrated into existing applications or websites.



Figure 1.1 Conjoon is an open source personal information manager that's a great example of a web application that uses the framework to manage a UI that leverages 100 percent of the browser's viewport. You can download it at <http://conjoon.org/>.

1.1.1 Integration with existing sites

Any combination of widgets can be embedded inside an existing web page and or site with relative ease, giving your users the best of both worlds. An example of a public-facing site that contains Ext JS is the Dow Jones Indexes site, <http://djindexes.com>. Figure 1.2 shows Ext JS integrated with a page at djindexes.com.

This Dow Jones Indexes web page gives its visitors rich interactive views of data by utilizing a few of the Ext JS widgets such as the TabPanel, GridPanel, and Window (not shown). Its visitors can easily customize the view of the stocks by selecting a row in the main GridPanel, which invokes an Ajax request to the server, resulting in an updated graph below the grid. The non-Ext JS graph view can be modified as well by clicking one of the time period buttons below it.

You now know that Ext JS can be leveraged to build single-page applications or can be integrated into existing multipage applications. But we still haven't satisfied the requirement of API documentation. How does Ext JS solve this?

1.1.2 Rich API documentation

When opening the API documentation for the first time (figure 1.2), you get a sense of the polish that the framework has. Unlike competing frameworks, the Ext JS API Documentation leverages its own framework to present a clean and easy-to-use documentation tool that uses Ajax to provide the documentation.

The screenshot shows the Dow Jones AIG Commodity Indexes page. On the left is a sidebar with links to various Dow Jones products. The main content area has several sections: 'Index Information' with a table of data, 'Recent Press Releases' with a grid of news items, and a 'Chart' section showing a line graph of the Dow Jones Wilshire 5000 Composite Index from March 12, 2009. Red ovals highlight specific components: a 'TabPanel' at the top right, a 'GridPanel' below it, and a 'FormPanel' containing a chart.

Figure 1.2 The Dow Jones Indexes website, <http://djindexes.com>, is one example of Ext JS embedded in a traditional Web 1.0 site.

We'll explore all of the features of the API and talk about some of the components used in this documentation tool. Figure 1.3 illustrates some of the components used in the Ext JS API Documentation application.

The API Documentation tool is chock-full of gooey GUI goodness and uses six of the most commonly used widgets, which include the Viewport, TreePanel, Toolbar with an embedded TextField and Toolbar Buttons, and TabPanel. I'm sure you're wondering what all of these are and what they do. Let's take a moment to discuss these widgets before we move on.

This screenshot shows the Ext JS 3.2 API Documentation interface. It features a sidebar with a tree view of API documentation. The main area is a 'BorderLayout' container with a 'TabPanel' at the top. Below the tabs is a 'Toolbar with buttons'. The central content area is a 'Viewport' containing a 'Content loaded via Ajax' panel. Red ovals point to each of these components: BorderLayout, TabPanel, Toolbar with buttons, Viewport, TreePanel, and Content loaded via Ajax.

Figure 1.3 The Ext JS API Documentation contains a wealth of information and is a great resource for learning more about components and widgets. It contains most of what you need to know about the API, including constructor configuration options, methods, properties, component hierarchy, and more.

Looking from the outside in, the `Viewport` is a class that leverages all of the browser viewing space to provide an Ext JS–managed canvas for UI widgets. It's the foundation from which an entire Ext JS application is built upon. The `BorderLayout` layout manager is usually used, which divides the `Viewport` (or any container) into five regions. In this example three are used: North (top) for the page title, link, and Toolbar; West (left), which contains the `TreePanel`; and the Center (right) region, which contains the `TabPanel` to display documentation.

The `Toolbar` class provides a means to present commonly used UI components such as Buttons and Menus, but it can also contain, as in this case, any of the `Ext.form.field` subclasses. I like to think of the `Toolbar` as the common file-edit-view menus that you see in popular operating systems and desktop applications. The `TreePanel` widget displays hierarchical data visually in the form of a tree much like Windows Explorer displays your hard drive's folders. The `TabPanel` provides a means to have multiple documents or components on the canvas but allows only one to be active at a time.

Using the API is a cinch. To view a document, click the class node on the tree. This will invoke an Ajax request to fetch the documentation for the desired class. Each document for the classes is an HTML fragment (not a full HTML page). With the `TextField` in the `Toolbar`, you can easily filter out the class tree with a few strokes on the keyboard. If you're connected to the internet, you can search for API documentation in the API Home tab.

So the documentation is thorough. But what about rapid application development? Can Ext JS accelerate your development cycles?

1.1.3 Rapid development with prebuilt widgets

Ext JS can help you jump from conception to prototype because it offers many of the required UI elements already built and ready for integration. Having these UI widgets prebuilt, instead of having to engineer them, means that you save a lot of time. In many cases, the UI controls are highly customizable and can be modified to your application needs.

1.1.4 Works with Prototype, jQuery, and YUI, and inside AIR

Even though we discussed how Ext JS stands apart from other libraries such as YUI, it can easily be configured to leverage these frameworks as a base. This means if you're using these other libraries, you don't have to give them up to enjoy Ext JS UI goodness.

Although we won't cover development of Ext JS applications in Adobe AIR, it's worth noting that the framework has a complete set of utility classes to help with the integration of AIR. These utility classes include items like sound management, a video player panel, and access to the desktop clipboard. We won't go into AIR in this book, but we'll cover many of the important parts of the framework you'll need to know when developing with Ext JS in Adobe AIR.

NOTE Because Adobe AIR is a development environment with features such as a sandbox, we won't be discussing how to develop applications with it. To learn more about Adobe AIR, visit <http://www.adobe.com/devnet/air/>.

Before we talk any more about Ext JS, we should set the playing field and discuss what types of skills are necessary to utilize the framework.

1.2 **What you need to know**

Although being an expert in web application development isn't required to develop with Ext JS, developers should have some core competencies before attempting to write code with the framework.

The first of these skills is a basic understanding of Hypertext Markup Language (HTML) and Cascading Style Sheets (CSS). It's important to have some experience with these technologies because Ext JS, like any other JavaScript UI library, uses HTML and CSS to build its UI controls and widgets. Although its widgets may look like and mimic typical modern operating system controls, it all boils down to HTML and CSS in the browser.

Because JavaScript is the glue that holds Ajax together, a solid foundation in JavaScript programming is suggested. Again, you need not be an expert, but you should have a good grasp of key concepts such as arrays, reference, and scope. It's a plus if you're familiar with object-oriented JavaScript fundamentals such as objects, classes, and prototypal inheritance. If you're new to JavaScript, you're in luck. JavaScript has existed since nearly the dawn of the internet. An excellent place to start is W3Schools.com, which offers a lot of free online tutorials and even has sandboxes for you to play with JavaScript online. You can visit them at <http://w3schools.com/JS/>.

If you're required to develop code for the server side, you're going to need a server-side solution for Ext JS to interact with as well as a way to store data. To persist data, you'll need to know how to interact with a database or filesystem with your server-side language of choice.

Naturally, the range of solutions available is quite large. For this book, we won't focus on a specific language. Instead, we'll use online resources at <http://extjsinaction.com>, where I've done the server-side work for you. This way, all you have to focus on is learning Ext JS.

We'll begin our exploration of Ext JS with a bird's-eye view of the framework, where you'll learn about the categories of functionality.

1.3 **A bird's-eye view of the framework**

The Ext JS framework not only provides UI widgets but also contains a host of other features. These fall into six major areas of purpose: Core, UI components, web remoting, data services, drag and drop, and general utilities. Figure 1.4 illustrates the six areas of purpose.

Knowing what the different areas of purpose are and what they do will give you an edge when developing applications, so we'll take a moment to discuss them.

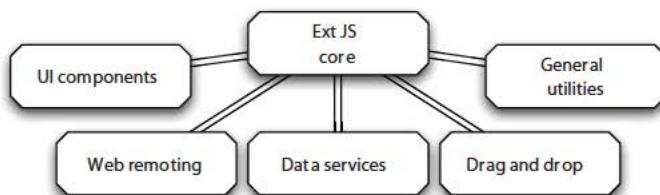


Figure 1.4 The six areas of purpose for Ext JS classes: Ext JS Core, UI components, web remoting, data services, drag and drop, and general utilities

CORE

The first feature set is the Ext JS Core, which comprises of many of the basic features such as Ajax communication, DOM manipulation, and event management. Everything else is dependent on the Core of the framework, but the Core isn't dependent on anything else.

Learn more about Ext Core

Ext Core is a library, which is a subset of the Ext JS base functionality and can be considered on par with jQuery, Prototype, and Scriptaculous. To learn more about Ext Core, visit <http://extjs.com/products/core/>.

UI COMPONENTS

The UI components contain all of the widgets that interface with the user.

WEB REMOTING

Web remoting is a means for JavaScript to (remotely) execute method calls that are defined and exposed on the server, which is commonly known as a Remote Procedure Call, or RPC. It's convenient for development environments where you'd like to expose your server-side methods to the client and not worry about all of the fuss of Ajax method management.

Learn more about Ext JS Direct

Because Direct is a server-side-focused product, we won't be covering it in this book. Ext JS has many online resources where you can learn about Direct, including examples for many of the popular server-side solutions. To learn more about Direct, visit <http://extjs.com/products/direct/>.

DATA SERVICES

The data services section takes care of all of your data needs, which include fetching, parsing, and loading information into stores. With the Ext JS data services classes, you can read Array, XML, and JSON (JavaScript Serialized Object Notation), which is a data format that's quickly becoming the standard for client-to-server communication. Stores typically feed UI components.

DRAG AND DROP

Drag and drop is like a mini framework inside Ext JS, where you can apply drag-and-drop capabilities to an Ext JS component or any HTML element on the page. It includes all of the necessary members to manage the entire gamut of all drag-and-drop operations. Drag and drop is a complex topic. We'll spend the entirety of chapters 13 and 14 on this subject alone.

UTILITIES

The utilities section comprises cool utility classes that help you perform some of your routine tasks easier. An example would be `Ext.util.Format`, which allows you to format or transform data easily. Another neat utility is the CSS singleton, which allows you to create, update, swap, and remove stylesheets as well as request the browser to update its rule cache.

Now that you have a general understanding of the framework's major areas of functionality, let's take some time to look at some of the more commonly used UI widgets that Ext JS has to offer.

1.3.1 **Containers and layouts at a glance**

Even though we'll cover these topics in detail in chapter 3, we should spend a little time here talking about containers and layouts. The terms *container* and *layout* are used extensively throughout this book, and I want to make sure you have at least a basic understanding of them before we continue. Afterwards, we'll begin our exploration of visual components of the UI library.

CONTAINERS

Containers are widgets that can manage one or more child items. A child item is generally any widget or component that's managed by a container or parent, thus the parent-child paradigm. You've already seen this in action in the API. The `TabPanel` is a container that manages one or more child items, which can be accessed via tabs. Please remember this term, because you'll be using it a lot when you start to learn more about how to use the UI portion of the framework.

LAYOUTS

Layouts are implemented by a container to visually organize the child items in the container's content body. Ext JS has 12 layouts from which to choose, which we'll go into in great detail in chapter 5 and shows the ins and outs of each layout. Now that you have a high level of understanding of containers and layouts, let's look at some containers in action.

In the figure 1.5, you see two subclasses of Container, `Panel` and `Window`, each engaged in parent-child relationships.

The `Panel` (left) and `Window` (right) in figure 1.5 each manage two child items. Child `Panel 1` of each parent container *contains* HTML, whereas the children with the title `Child Panel 2` manage one child panel each using the simple `ContainerLayout`, which is the base class for all other layouts. This parent-child relationship is the crux

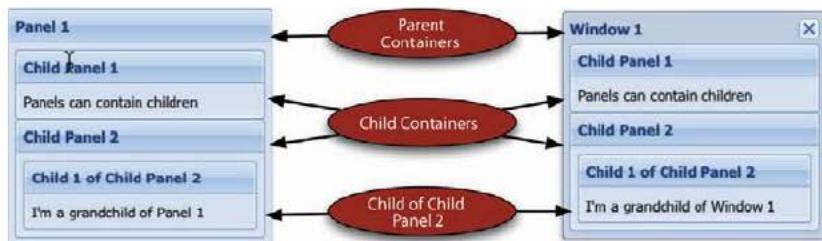


Figure 1.5 Here, you see two parent Containers, Panel (left) and Window (right), managing child items, which include nested children.

of all of the UI management of Ext JS and will be reinforced and referenced repeatedly throughout this book.

You learned that Containers manage child items and use layouts to visually organize them. Now that you have these important concepts down, we'll move on to see and discuss other Containers in action.

1.3.2 Other Containers in action

You saw Panel and Window being used when you learned about Containers. Figure 1.6 shows some other commonly used subclasses of Container.

In figure 1.6, you see the FormPanel, TabPanel, FieldSet, and QuickTip widgets. The FormPanel works with the BasicForm class to wrap fields and other child items with a form element.

Looking at this from a parent-child perspective, the FormPanel is being used to manage three child items: two instances of FieldSet and one instance of TabPanel.

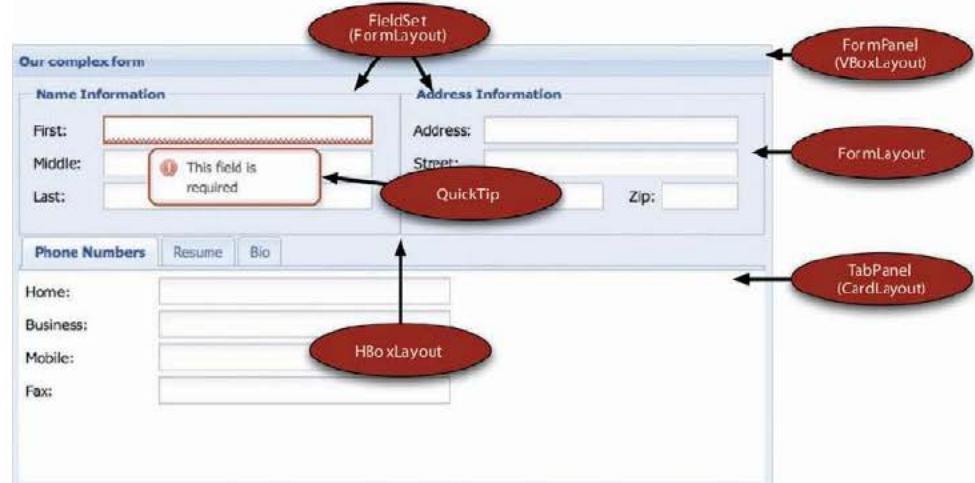


Figure 1.6 Commonly used subclasses of Container—FormPanel, TabPanel, FieldSet, and QuickTip—and the layouts used to compose this UI Panel. We'll build this in chapter 6, where you learn about forms.

FieldSets are generally used to display fields in a form much like a typical FieldSet tag does in HTML. These two FieldSets are managing child items, which are text fields. The TabPanel here is managing three direct children (tabs); in the first tab (Phone Numbers) it's managing many children, which are text fields. The QuickTip, which is used to display helpful text when the mouse is hovering over an element, is being displayed, but it isn't a child of any Ext JS component.

We'll spend some time building this complex UI in chapter 6, where you'll learn more about FormPanels. For now, let's move on to see what data presentation widgets the framework has to offer.

1.3.3 Grids, DataView, and ListView

You've already learned that the Data Services portion of the framework is responsible for the loading and parsing of data. The main consumers of the data that the data store manages are the GridPanel and the DataView and its subclass, the ListView. Figure 1.7 is a screenshot of the Ext JS GridPanel in action.

The GridPanel is a subclass of Panel and presents data in a table-like format, but its functionality extends far beyond that of a traditional table, offering sortable, resizable, and movable column headers and selection models such as RowSelectionModel and CellSelectionModel. You can customize its look and feel as you desire and couple it with a PagingToolbar to allow large datasets to be segmented and displayed in pages. It also has subclasses such as the EditorGridPanel, which allows you to create a grid where users can edit data on the grid itself, leveraging any of the Ext JS form data input widgets.

The grid is great for displaying data but is somewhat computationally expensive because of the many DOM elements that each row contains. To combat this, you can

ExtJS.com - Browse Forums			
Topic	Replies	Last Post	
[DONE]Ext.isSafari4 + related code savings Ext: Feature Requests Forum	16	Mar 24, 2009, 12:47 pm by mystix	
adding a label after the combo box Ext: Help Forum	0	Mar 24, 2009, 12:47 pm by rjanos	
extjs newbie stupid question Ext: Help Forum	0	Mar 24, 2009, 12:44 pm by SantaBarbarian	
Masking a grid with a panel Ext: Help Forum	2	Mar 24, 2009, 12:44 pm by Deeeem	
German umlauts UTF-8 problem Ext: Help Forum	14	Mar 24, 2009, 12:43 pm by makefile	
Ext JS Newbie Needs Help with Grids Ext: Help Forum	8	Mar 24, 2009, 12:26 pm by Bill@PAR	
complex JSON problem Ext: Help Forum	3	Mar 24, 2009, 12:24 pm by Deeeem	
Confusion using alignTo in a viewport based on Ext.example.msg (plz move--> Ext: Help Forum	5	Mar 24, 2009, 12:22 pm by Animal	

Page 1 of 2087 ▶ Show Preview Displaying topics 1 - 25 of 51672

Figure 1.7 The GridPanel as seen in the Buffered Grid example in the Ext JS SDK

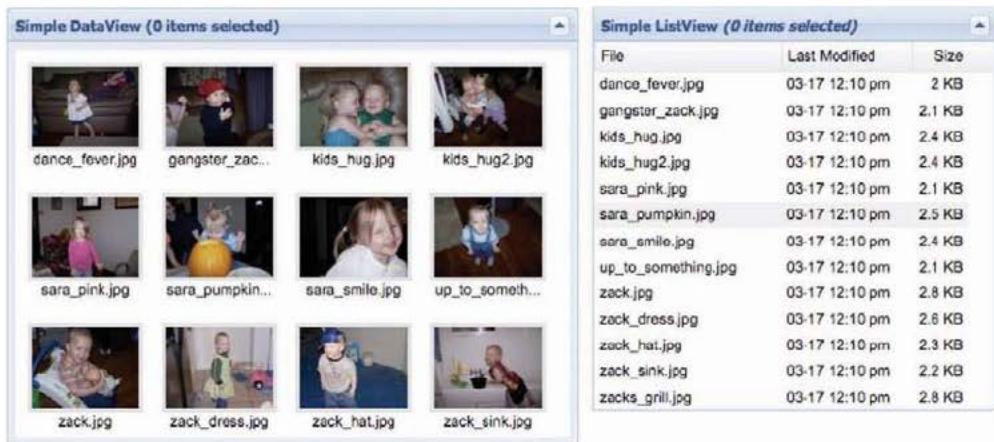


Figure 1.8 The DataView (left) and ListView (right) as shown in the Ext JS SDK examples

couple the GridPanel with a PagingToolbar or use one of the lighter-weight widgets to display data from a store, including the DataView and its subclass, the ListView, as shown in figure 1.8.

The DataView class consumes data from a store, paints it onscreen using a Template, and provides a simple selection model. An Ext JS Template is a DOM utility that allows you to create a *template*, with placeholders for data elements, which can be filled in by individual records in a store and stamped out on the DOM. In figure 1.8, the DataView (left) is displaying data from a store, which includes references to images. It uses a predefined template, which contains image tags, where the individual records are leveraged to fill in the location of the images. The Template then stamps out an image tag for each individual record, resulting in a nice collage of photos. The DataView can be used to display anything in a data store.

The ListView, as pictured in figure 1.8 (right), is displaying data from a store in a grid-like fashion but is a subclass of DataView. It's a great way to display data in a tabular format without the weight of the GridPanel if you're not looking to use some of the GridPanel features like sortable and resizable columns.

The Grid Panel and DataView are essential tools for painting data onscreen, but they do have one major limitation. They can only show lists of records. They can't display hierarchical data. This is where the TreePanel fills the gap.

1.3.4 Make like a TreePanel and leaf

The TreePanel widget is an exception to the list of UI widgets that consume data, in that it doesn't consume data from a data store. Instead, it consumes hierarchical data via the usage of the data.Tree class. Figure 1.9 shows an example of an Ext JS TreePanel widget.

In figure 1.9, the TreePanel is being used to display the parent-child data inside the directory of an installation of the framework. The TreePanel can leverage a

TreeLoader to fetch data remotely via Ajax or can be configured to use data stored on the browser. It can also be configured to use drag and drop and has its own selection model.

You already saw TextFields in a form when we discussed containers a short while ago. Next, we'll look at some of the other input fields that the framework has to offer.

1.3.5 Form input fields

Ext JS has a palette of eight input fields. They range from simple TextFields, as you've already seen, to complex fields such as the ComboBox and the HtmlEditor. Figure 1.10 is an illustration of some of the available Ext JS form field widgets that come out of the box.

As you can see in figure 1.10, some of the form input fields look like stylized versions of their native HTML counterparts. The similarities end here, however. With the Ext JS form fields, there's much more than meets the eye!

Each of the Ext JS fields (minus the HtmlEditor) includes a suite of utilities to perform actions like get and set values, mark the field as invalid, reset, and perform validations against the field. You can apply custom validation to the field via regex or custom validation methods, allowing you complete control over the data being

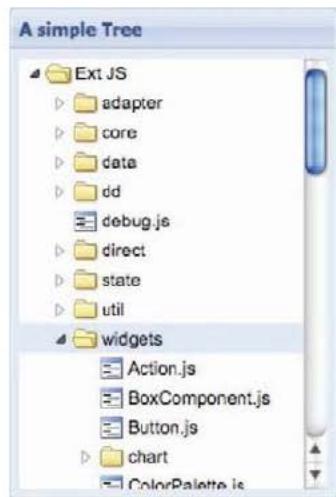


Figure 1.9 An Ext JS Tree, which is an example from the Ext JS SDK

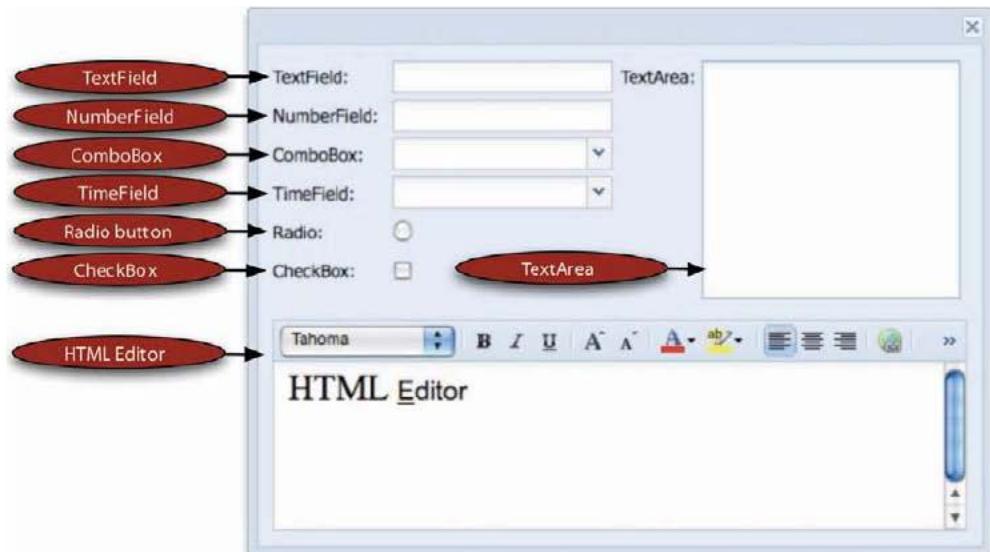


Figure 1.10 All of the out-of-the-box form elements displayed in an encapsulating Window

entered into the form. The fields can validate data as it's being entered, providing live feedback to the user.

TEXTFIELD AND TEXTAREA

The `TextField` and `TextArea` classes can be considered extensions of their generic HTML counterparts. `NumberField`, however, is a subclass of the `TextField` and is a convenience class, which utilizes regular expressions to ensure users can enter only numbers. With `NumberField`, you can configure decimal precision as well as specify the range of the value entered. The `ComboBox` and `TimeField` classes require a little extra time relative to the other fields, so we'll skip these two for now and jump back to them in a bit.

RADIO AND CHECKBOX

Like `TextField`, the `Radio` and `Checkbox` input fields are extensions of the plain old `Radio` and `Checkbox` but include all of the Ext JS Element management goodness and have convenience classes to assist with the creation of `Checkbox` and `RadioGroups` with automatic layout management. Figure 1.11 shows a small sample of how the Ext JS `Checkbox` and `RadioGroup` classes can be configured with complex layouts.

See all of the Radio and Checkbox examples

To see the entire set of examples, visit <http://extjs.com/deploy/dev/examples/form/check-radio.html>.

HTMLEDITOR

The `HTMLEditor` editor is WYSIWYG, like the `TextArea` on steroids. The `HTMLEditor` leverages existing browser HTML editing capabilities and can be considered somewhat of a black sheep when it comes to fields. Because of its inherent complexities (using `IFrames` and the like), it doesn't have a lot of the abilities like validation and can't be marked as invalid. There's much more to discuss about this field, which we're going to save for chapter 6. But for now, let's circle back to the `ComboBox` and its subclass, the `TimeField`.

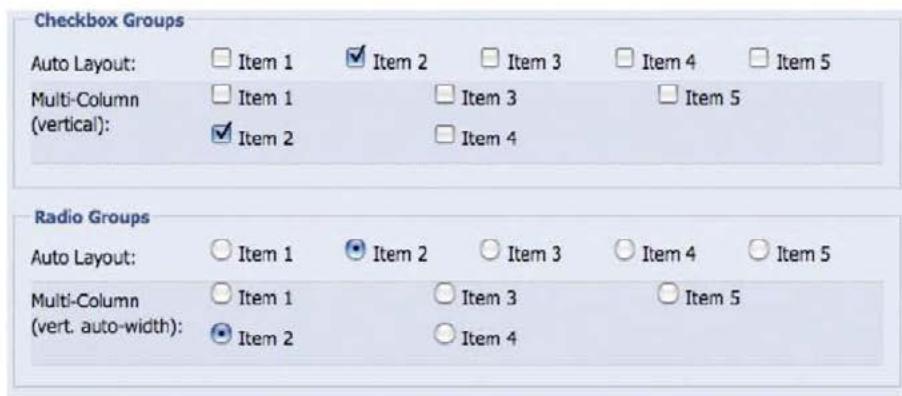


Figure 1.11 An example of the `Checkbox` and `RadioGroup` convenience classes in action with automatic layouts.



Figure 1.12 A custom ComboBox, which includes an integrated paging toolbar, as shown in the downloadable Ext JS examples

COMBOBOX AND TIMEFIELD

The ComboBox is easily the most complex and configurable form input field. It can mimic traditional option drop-down boxes or can be configured to use remote data sets via the data store. It can be configured to autocomplete text, known as *type-ahead*, entered by the user and perform remote or local filtering of data. It can also be configured to use your own instance of an Ext JS Template to display a custom list in the drop-down area, known as the ListBox. Figure 1.12 is an example of a custom ComboBox in action.

In figure 1.12, a custom combo box is being leveraged to search the Ext JS forums. The ComboBox here shows information like the post title, date, author, and a snippet of the post in the list box. Because some of the dataset ranges are so large, it's configured to use a paging toolbar, allowing users to page through the resulting data. Because the ComboBox is so configurable, we could also include image references to the resulting dataset, which can be applied to the resulting rendered data.

Here we are, on the last stop of our UI tour. Now we'll take a peek at some of the other UI components that work anywhere.

1.3.6 Other widgets

A bunch of UI controls stand out, which aren't major components but play supporting roles in a grander scheme of a UI. Look at the illustration in figure 1.13, and follow along as we discuss what these items are and what they do.

Here's a breakdown of the various widgets.

TOOLBAR

The Toolbar is a widget that allows you to place in it just about any widget that fits. Generally, developers place menus and buttons in it. When we discussed the custom ComboBox, you saw the Toolbar's subclass, the PagingToolbar. Panels and just about any subclass thereof can use these toolbars on the top or bottom of their content body. The Button widget is a stylized version of the generic HTML button, which can include icons as well as text.

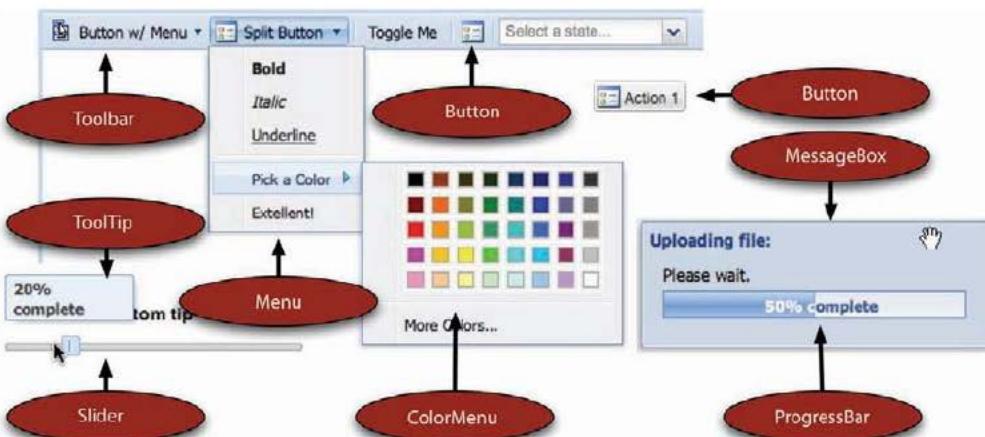


Figure 1.13 Miscellaneous UI widgets and controls

MENU

Menus can be displayed by clicking a button on the toolbar or shown on demand at any X and Y coordinates on screen. Although they typically contain menu items, such as the items shown and the color menu item, they can contain widgets such as ComboBoxes.

MESSAGEBOX

The MessageBox is a utility class, which allows you to easily provide feedback to the user without having to craft up an instance of Ext.Window. In this illustration, it's using an animated ProgressBar to display the status of an upload to the user.

SLIDER

The Slider is a widget that leverages drag and drop to allow users to change a value by repositioning the knob. Sliders can be styled with images and CSS to create your own custom look. The movement of the knob can be restricted so it moves only in increments. In this example, the slider has a ToolTip above the knob, displaying the value of the slider as the user moves it. In addition to the default horizontal orientation, Sliders can be configured as vertical.

You've learned how Ext JS can help you get the job done through a large palette of widgets. You've learned that you could elect to use Ext JS to build an application without touching an ounce of HTML or integrate it with existing sites. You also got a top-down view of the framework, which included a UI tour. All of the material discussed thus far existed for Ext JS 2.0. Let's take a moment to discuss what's new in Ext JS 3.0.

1.4 New Ext JS 3.0 goodies

Ext JS 2.0 introduced some radical changes, which made upgrading from 1.0 rather difficult. This was mainly because of the introduction to the more modern layout manager and a new, robust component hierarchy, which broke most of the user-developed Ext JS 1.x code. Thankfully, due to the great engineering of Ext JS 2.0, the migration from Ext JS 2.0 to 3.0 is much easier. Although the additions to Ext JS 3.0

aren't as drastic, there's excitement about this latest release, and it's certainly worthwhile to discuss some of the additions.

1.4.1 Ext JS does remoting with Direct

Web remoting is a means for JavaScript to easily execute method calls that are defined on the server side. It's convenient for development environments where you'd like to expose your server-side methods to the client and not have to worry about all of the muck with Ajax connection handling. Ext.Direct takes care of this for us by managing Ajax requests and acts as a bridge between the client-side JavaScript and any server-side language.

This functionality has great advantages, which include method management in a single location as well as unification of methods. Having this technology inside the framework will ensure consistency across the consumers, such as the data classes. Speaking of which, let's look at how the addition of Ext.Direct brings new classes to the data classes.

1.4.2 Data class

The Ext.data class is the nerve center for just about all data handling in the framework. The data classes manage every aspect of data management, including fetching, reading, and parsing data to create records, which are loaded into a store. With the addition of Direct, Ext JS has added additional convenience Data classes, DirectProxy and DirectStore, to facilitate ease of integration with your web remoting needs.

Now that we've reviewed some of the behind-the-scenes changes and additions to the framework, take a gander at some of the UI widgets that have been added.

1.4.3 Meet the new layouts

A total of six new layouts make their way into the Ext JS 3.0 framework, including AutoLayout, MenuLayout, ToolbarLayout, BoxLayout, VBoxLayout, and HBoxLayout. MenuLayout is an improvement on the way menu items were organized in the 2.0 version of the framework. Similarly, ToolbarLayout adds important features to the Toolbar, like overflow management, as illustrated in figure 1.14. Neither of these two layouts is designed to be implemented by their intended widgets, and neither is for end-developer use.

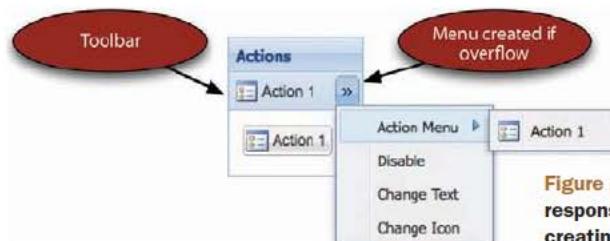


Figure 1.14 The new ToolbarLayout is responsible for detecting the toolbar's size and creating menu stubs if menu items overflow.

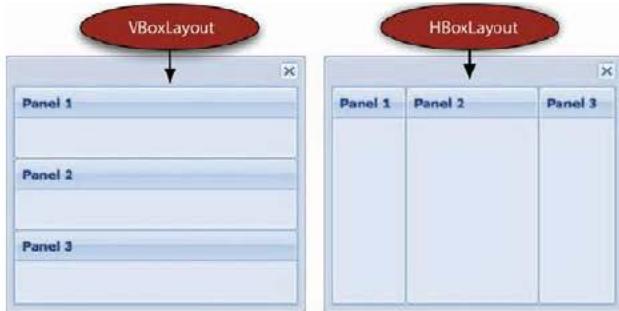


Figure 1.15 An example of the **VBox** and **HBox** layouts in action

As shown in figure 1.14, **ToolbarLayout** will detect the overflow of toolbar items in a toolbar and will automatically create a menu that lists and contains the rest of the items. The changes to **MenuLayout** help support this effort.

The **BoxLayout** class is an abstract class that's meant to provide base functionality for the **VBoxLayout** and **HBoxLayout** classes and is not designed for end-developer use. The **VBoxLayout** and **HBoxLayout** are great additions to the list of end-developer-useable layouts. The **HBoxLayout** allows you to divide a container's content body into horizontal slices, whereas the **VBoxLayout** does the same except vertically, as illustrated in figure 1.15.

Many experienced Ext JS developers might think that the **HBoxLayout** looks like the **ColumnLayout** in practice. Although it does provide similar functionality, it extends way beyond the **ColumnLayout**'s capabilities, where it will vertically and horizontally stretch children based on weights, which is known as **flex**. In contrast to the **ColumnLayout**, however, child items will never wrap around inside the Container's content body. These two layouts usher in a whole new era of layout capabilities within the framework.

In addition to the layout changes, the **ColumnModel**, a supporting class for the **GridPanel**, has undergone some fundamental changes. Let's look at some of these changes and see why they're going to help us in our development efforts.

1.4.4 Grid ColumnModel enhancements

The grid **ColumnModel** is a class that models how the columns are organized, sized, and displayed for the **GridPanel** widget. Prior to Ext JS 3.0, individual columns were generally configured as a list of configuration objects in an array, which is consumed by **ColumnModel**.

For each column in the **ColumnModel**, you could enhance or modify the way the data is displayed by creating a custom renderer, which is a method that's called for each data point for

Configuration objects

Many of the Ext JS constructors and some methods accept parameters listed in a configuration object. These configuration objects are nothing more than plain objects that contain a set of key-value pair parameters that will influence how a widget is rendered onscreen or how a method behaves.

that column and returns the desired formatted data or HTML. This means that if you wanted, let's say, a date to be formatted or displayed a certain way, you had to configure it, which many people found themselves doing a lot. In this release, the `ColumnModel` changed somewhat to make our jobs that much easier.

The individual `Column` has been abstracted from the `ColumnModel` and an entirely new class created called the `grid.Column`. From here, many convenience `Column` subclasses have been created, which include `NumberColumn`, `BooleanColumn`, `TemplateColumn`, and `DateColumn`, each of which allows you to display your data as you desire. To display formatted dates, you could use the `DateColumn` and specify a format in which the dates are to be displayed. The `TemplateColumn` is another welcome change because it allows you to leverage `XTemplates` and display them in a `GridPanel`, which are convenience methods to create and stamp out HTML fragments based on data. To use any of these `Column` subclasses, no custom renderers are required, though you can use them if you wish.

Many applications require data to be displayed in tabular format. Although the `GridPanel` is a great solution, it's computationally expensive for generic data displays that require little or no user interaction. This is where `ListView`, an extension of `DataView`, comes to the rescue.

1.4.5 ***ListView, like GridPanel on a diet***

With this new addition to the framework, you can now display more data in a grid-like format without sacrificing performance. Figure 1.16 shows the `ListView` in action. Although it looks similar to the `GridPanel`, in order to achieve better performance, we sacrifice features such as drag-and-drop column reordering as well as keyboard navigation. This is mainly because the `ListView` doesn't have any of the elaborate, feature-rich supporting classes, such as the `ColumnModel` we discussed a moment ago.

Using `ListView` to display your data will ensure that you have faster response from DOM manipulation, but remember that it doesn't have all of the features of the `GridPanel`. Choosing which one to use will depend on your application requirements.

Simple ListView (1 item selected)		
File	Last Modified	Size
dance_fever.jpg	03-17 12:10 pm	2 KB
gangster_zack.jpg	03-17 12:10 pm	2.1 KB
kids_hug.jpg	03-17 12:10 pm	2.4 KB
kids_hug2.jpg	03-17 12:10 pm	2.4 KB
sara_pink.jpg	03-17 12:10 pm	2.1 KB
sara_pumpkin.jpg	03-17 12:10 pm	2.5 KB
sara_smile.jpg	03-17 12:10 pm	2.4 KB
up_to_something.jpg	03-17 12:10 pm	2.1 KB
zack.jpg	03-17 12:10 pm	2.8 KB
zack_dress.jpg	03-17 12:10 pm	2.6 KB

Figure 1.16 The new `Ext.ListView` class, which is like a lightweight `DataGrid`



Figure 1.17 These charts now bring rich graphical views of trend data to the framework. It's important to note that this new widget requires Flash.

Ext JS has always been excellent at displaying textual data on screen, but it lacked a graphical means of data representation. Let's take a quick look at how this has changed with Ext JS 3.0.

1.4.6 Charts come to Ext JS

One thing that was missing in the 2.0 version of Ext JS was charts. Thankfully, the development team listened to the community and introduced them for version 3.0. These are a great addition, which adheres to the Ext JS layout models.

Use of these charts, however, requires Adobe Flash to be installed for the browser you're using, which you can download at <http://get.adobe.com/flashplayer/>. In addition to the Line and Column charts shown in figure 1.17, the framework has Bar, Pie, and Cartesian charts available for your data visualization needs.

You now have just about everything you need to lay down some code. Before you start on your path to becoming Ext JS Jedis, you must first download and set up the framework, and we'll have a discussion about development.

1.5 Downloading and configuring

Even though downloading Ext JS is a simple process, configuring a page to include Ext JS isn't as simple as referencing a single file in HTML. In addition to configuration, you'll learn about the folder hierarchy and what folders are and what they do.

The first thing you need to do is get the source code. Visit the following link: <http://extjs.com/products/extjs/download.php>.

The downloaded file will be the SDK in a zip file, which weighs in at over 6 MB in size. I'll explain why this file is so large in a bit. Now, extract the file in a place where you serve JavaScript. In order to leverage Ajax, you're going to need a web server. I typically use Apache configured locally on my computer, which is free and cross-platform, but IIS for Windows will do. Let's peek at what you just extracted.

1.5.1 Looking at the SDK contents

If you're like me, you probably checked the size of the files extracted from the downloaded SDK zip file. If your jaw dropped, feel free to pick it back up. Yes, over 30 MB is rather large for a JavaScript framework. Pay no attention to the size for now; figure 1.18 shows what was extracted.

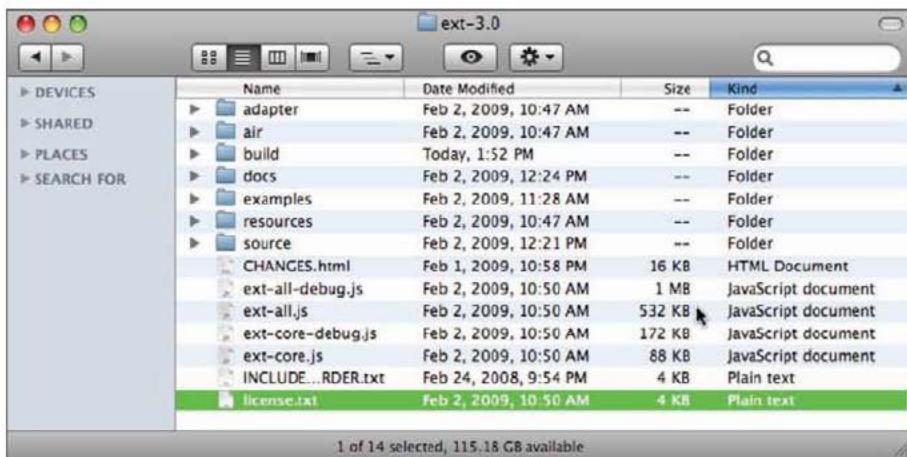


Figure 1.18 A view of the Ext JS SDK contents

Looking at the contents of the SDK, you see a lot of stuff. The reason there are so many folders and files is that the downloadable package contains a few copies of the entire code base and CSS. It's this way because you get the freedom to build or use Ext JS any way you see fit. Table 1.1 explains what each of the folders is and what it does.

Table 1.1 The contents of the Ext JS SDK

Folder	What it does
adapter	Contains the ext-base.js, which is the base Ext JS library, which is used for an all-Ext setup. It also contains necessary adapters and supported versions of Prototype, jQuery, or YUI libraries if you want to use any of those as a base.
air	Contains all of the required libraries to integrate Ext JS with Adobe AIR.
build	Has each of the files that compose the Ext JS framework with all of the unnecessary whitespace removed. It's a deflated version of the source directory.
docs	Holds the full API documentation.
examples	Holds all of the example source code, which is great source to learn by example (no pun intended).
resources	Contains all of the necessary images and CSS required to use the UI widgets. It contains all of the CSS files broken down by widget and an ext-all.css, which is a concatenation of all the framework's CSS.

Table 1.1 The contents of the Ext JS SDK (continued)

Folder	What it does
src	Holds the entire framework, including all of the comments.
ext-all.js	This is a minified version of the framework, which is intended for production applications.
ext-core.js	If you wanted to use the core library, which means none of the UI controls, you'd set up your page with ext-core.js.
*debug.js	Anything with <i>debug</i> in the name means that the comments are stripped to reduce file space, but the necessary indentation remains intact. When we develop, we're going to use ext-all-debug.js.

Although there are quite a few files and folders in the distribution, you need only a few of them to get the framework running in your browser. Now is a good time to talk about how to set up Ext JS for use.

1.5.2 Setting up Ext JS for the first time

In order to get Ext JS running in your browser, you need to include at least two required JavaScript files and at least one CSS file:

```
<link rel="stylesheet" type="text/css"
      href="extjs/resources/css/ext-all.css" />

<script type="text/javascript" src="extjs/adapter/ext/ext-base-debug.js">
</script>

<script type="text/javascript" src="extjs/ext-all-debug.js">
</script>
```

Here we're linking the three core files for an all-Ext JS configuration. The first thing we do is link to the ext-all.css file, which is all of the CSS for the framework in one file. Next, we include ext-base-debug.js, which is the underlying base of the framework. Last, we include ext-all-debug.js, which we'll use for development. When setting up your initial page, be sure to replace extjs in your path with wherever you plan to reference the framework on your development web server.

What if you want to use any of the other base frameworks? How do you include those?

1.5.3 Configuring Ext JS for use with others

In order for Ext JS to work with the previously mentioned frameworks, an *adapter* must be loaded after the external base framework. The adapter maps ext-base methods to the external library of choice, which is crucial. You can use the following patterns to use any of the other three base frameworks in addition to Ext JS:

First up, the Prototype library:

```
<link rel="stylesheet" type="text/css"
      href="extjs/resources/css/ext-all.css" />
```

```

<script type="text/javascript"
       src="extjs/adapter/prototype/prototype.js">
</script>

<script type="text/javascript"
       src="extjs/adapter/prototype/scriptaculous.js?load=effects.js">
</script>

<script type="text/javascript"
       src="extjs/adapter/prototype/ext-prototype-adapter-debug.js">
</script>

<script type="text/javascript"
       src="extjs/ext-all-debug.js"></script>

```

As you can see, this is like the generic Ext JS setup with two additional JS files. The Prototype and Scriptaculous libraries take the place of ext-base, and ext-prototype-adapter.js maps the external library methods to Ext. Note that we're still loading ext-all-debug.js. We'll continue to do so for the other two cases.

Next is jQuery:

```

<link rel="stylesheet" type="text/css"
      href="extjs/resources/css/ext-all.css" />

<script type="text/javascript"
       src="extjs/adapter/jquery/jquery.js">
</script>

<script type="text/javascript"
       src="extjs/adapter/jquery/ext-jquery-adapter-debug.js">
</script>

<script type="text/javascript"
       src="extjs/ext-all-debug.js"></script>

```

Configuring jQuery is similar to the Prototype setup. The YUI configuration will be similar, the difference being that we're loading different base library and adapter files.

Lastly, YUI:

```

<link rel="stylesheet" type="text/css"
      href="extjs/resources/css/ext-all.css" />

<script type="text/javascript"
       src="extjs/adapter/yui/yui-utilities.js">
</script>

<script type="text/javascript"
       src="extjs/adapter/yui/ext-yui-adapter-debug.js">
</script>

<script type="text/javascript"
       src="extjs/ext-all-debug.js"></script>

```

And there you have it, the recipes for an Ext-all setup and the other three supported base JS libraries. Moving forward, we'll be using the Ext-all configuration, but you're free to use whichever base library you wish. Before we move on to coding, we need to talk about one final crucial step to setting up Ext, and that's configuring the reference for s.gif.

Place BLANK_IMAGE_URL configuration wisely

It's recommended that you set this parameter immediately after the inclusion of the Ext JS files or immediately before your application code is parsed. I'll show you an example of where to place it when we take Ext JS for a test drive.

1.5.4 Configuring BLANK_IMAGE_URL

The configuration of the Ext.BLANK_IMAGE_URL is one of those steps that developers often overlook and may lead to issues with the way the UI renders for your application. The BLANK_IMAGE_URL property specifies a location for the 1x1-pixel clear s.gif graphic (known as a spacer), which is an essential piece of the UI portion of the framework and is used to create items like icons. Out of the box, BLANK_IMAGE_URL points to <http://extjs.com/s.gif>. For most users, that's okay, but if you're in an area where extjs.com isn't accessible, this will become an issue. This also becomes a problem if you're using SSL, where s.gif is being requested via HTTP instead of HTTPS, which will invoke security warnings in browsers. In order to prevent these issues, set Ext.BLANK_IMAGE_URL to s.gif locally on your web server, like this:

```
Ext.BLANK_IMAGE_URL = 'extjs/resources/images/default/s.gif';
```

If you're like me, after all of this discussion, you're probably itching to start using Ext JS. So, what are you waiting for? Go ahead and dive in.

1.6 Take it for a test drive

For this exercise, you'll create an Ext JS window, and you'll use Ajax to request an HTML file for presentation in the content body of the Window. You'll start by creating the main HTML file, from which you'll source all of your JavaScript files.

Listing 1.1 Creating our helloWorld.html

```
<link rel="stylesheet" type="text/css"
      href="/extjs/resources/css/ext-all.css" /> ① Include ext-all.css
<script type="text/javascript"
       src="/extjs/adapter/ext/ext-base-debug.js">
</script>

<script type="text/javascript"
       src="/extjs/ext-all-debug.js"></script>
② Load ext-base.js and ext-all-debug.js

<script type="text/javascript">
    Ext.BLANK_IMAGE_URL = '/extjs/resources/images/default/s.gif';
</script>

<script type="text/javascript" src='helloWorld.js'>
</script> ④ The soon-to-be-created helloWorld.js
```

Listing 1.1 includes the HTML markup for a typical Ext-only setup, which includes the concatenated CSS file, ext-all-css ① and the two required JavaScript files, ext-base.js

and ext-all-debug.js ②. Next, you create a JavaScript block ③, where you set the ever-important Ext.BLANK_IMAGE_URL property. Last, you include our soon-to-be-created helloWorld.js file ④.

If you haven't noticed it, we're using /extjs as the absolute path to our framework code. Be sure to change it if your path is different. Next, you create our helloWorld.js file, which will contain your main JavaScript code.

Listing 1.2 Creating helloWorld.js

```
function buildWindow() {
    var win = new Ext.Window({
        id      : 'myWindow',
        title   : 'My first Ext JS Window',
        width   : 300,
        height  : 150,
        layout   : 'fit',
        autoLoad : {
            url     : 'sayHi.html',
            scripts : true
        }
    });
    win.show();
}

Ext.onReady(buildWindow);
```

1 A new instance of Ext.Window
2 An autoLoad configuration object
3 Calling upon our window to show()
4 Passing buildWindow to Ext.onReady

In listing 1.2, you create the function buildWindow, which will be passed to Ext.onReady for later execution. Inside this buildWindow, you create a new instance of Ext.Window and set up a reference to it called win ①. You pass a single configuration object to Ext.Window, which has all of the properties required to configure the instance you're instantiating.

In the configuration object, you specify an id of 'myWindow', which will be used in the future to look up the window using the Ext.getCmp convenience method. You then specify a title for the window, which will appear as blue text on the topmost portion of the window, known as the title bar. Next, you specify the height and width of the window. You then go on to set the layout as 'fit', which ensures that whatever child item is managed by your window is stretched to the dimensions of its Content-Body. You then move on to specify an autoLoad configuration object ②, which will instruct the window to automatically fetch an HTML fragment (specified via the url property) and execute a JavaScript if found (specified via scripts : true).

This ends the configuration object for your instance of Ext.Window. Next, you call on win.show ③, which renders your window. This is where you find the conclusion of the buildWindow method. The last thing you do is call Ext.onReady ④ and

HTML fragments

An HTML fragment is HTML that isn't enclosed by head and body tags and isn't considered a full page. Ext JS loads fragments because only one HEAD and BODY tag can exist in a page.

pass your method, `buildWindow`, as a reference. This ensures that `buildWindow` is executed at the right time, which is when the DOM is fully built and before any images are fetched. Let's see how your window renders. Go ahead and request `helloWorld.html` in your browser. If you coded everything properly, you'll see a window similar to the one in figure 1.19, with a spinning icon next to the "Loading..." text, known as a loading indicator.

Why do you see this message? Because you haven't created `sayHi.html`, which you referenced in the `url` property of the `autoLoad` configuration object. Essentially, you instructed Ext JS to load something that wasn't on the web server. Next, you'll construct `sayHi.html`, where you'll create an HTML fragment, which will include some JavaScript.

Listing 1.3 Creating sayHi.html

```
<div>Hello from the <b>world</b> of Ajax!</div>           ← 1 "Hello world" DIV tag
<script type='text/javascript'>
    function highlightWindow() {
        var win      = Ext.getCmp('myWindow');
        var winBody = win.body;
        winBody.highlight();
    }
    highlightWindow.defer(1000);
</script>
```

← 2 Highlight body
of window

← 3 Delay execution
by one second

In listing 1.3, you create an HTML fragment file, `sayHi.html`. It contains a `div` ① from which we have our "Hello world" message. After that, you have a `script` tag with some JavaScript, which will get executed after this fragment is loaded by the browser. In our code, we create a new function called `highlightWindow` ②, which will be executed after a delay of one second. Inside that function, you perform a highlight effect on the content body of the window. The execution of `highlightWindow` is delayed by one second ③. Here's how this method works.

You start by creating a reference to the `Window` you created in our `helloWorld.js` file by using a utility method called `Ext.getCmp`, which looks up an Ext JS component by `id`. When you created your window, you assigned it an `id` of '`myWindow`', which is what you're passing to `Ext.getCmp`. This works because all components (widgets) are registered with the `ComponentMgr` upon instantiation. `Ext.getCmp` is a way to retrieve a reference by `id` from any context within your application.

After you get the reference of your `Window`, you create a reference, `winBody`, to its content body via the `body` property. You then call its `highlight` method, which will



Figure 1.19 Our first Ext JS window attempting to load content via Ajax



Figure 1.20 Our Ext JS Window loading the our HTML fragment (left) and the highlight effect performed on the Window's content body (right)

perform the highlight (fade from yellow to white) operation on the element. This is where you conclude the `highlightWindow` method.

The last thing you do in this JavaScript block is call `highlightWindow.defer` and pass a value of 1000, which defers the execution of `highlightWindow` by one thousand milliseconds (or one second).

If you've never heard of `defer` in the JavaScript language, that's because you're using an Ext-introduced method. Ext JS leverages JavaScript's extensibility to add convenience methods to important core language classes, such as `Array`, `Date`, `Function`, `Number`, and `String`. This means every instance of any of those classes has the new convenience methods. In this case, you're using `defer`, which is an extension of `Function`. If you're an old-timer, you're probably asking, "Why not use `setTimeout`?" The first reason is because of ease of use. Call `.defer` on any method and pass the length of time to defer its operation. That's it. Another reason to use it is because it allows us to control the scope from which the deferred method is being executed and pass custom parameters, which `setTimeout` lacks.

You then end your HTML fragment, which can now be fetched by your `Window`. Refresh `helloWorld.html` and you should see something like figure 1.20.

If you did everything correctly, your results should be exactly like those shown in figure 1.20, where the content body is being populated with the HTML fragment (left), and exactly one second later, the content body of the window highlights yellow (right). Pretty cool, huh? I suggest that you take some time to modify the example and use the API to do things like changing the color of the highlight effect. Here's a hint: Look under Ext JS > Fx for the list of effects and their parameters.

1.7

Summary

In this introduction to Ext JS, you learned how it can be used to build robust web applications or integrated into existing websites. You also learned how it measures up against other popular frameworks on the market and that it's the only UI-based framework to contain UI-centric support classes such as the `Component`, `Container`, and `Layout` models. Remember that Ext JS can ride on top of jQuery, Prototype, and YUI.

We explored many of the core UI widgets that the framework provides and showed that the number of prebuilt widgets helps rapid application development efforts. In

doing that, we talked about some of the changes that Ext JS 3.0 has brought forth, such as Flash charts.

Last, we discussed where to download and how to set up the framework with each individual base framework. We created a “Hello world” example of how to use an Ext JS Window to retrieve an HTML fragment via Ajax with a few simple lines of JavaScript.

In the chapters to follow, we’ll explore how Ext JS works from the inside out. This knowledge will empower you to make the best decisions when building well-constructed UIs and better enable you to leverage the framework effectively. This will be a fun journey.



Back to the basics

This chapter covers

- Learning how to bootstrap your JavaScript code properly
- Managing DOM elements with `Ext.Element`
- Loading HTML fragments via Ajax
- Exercising a simple highlight effect on an HTML element
- Implementing `Templates` and `xTemplates`

When working on applications, I often think metaphorically, which helps me develop parallels for concepts in my mind. I like to think of the timing of an application's launch as similar to that of the space shuttle's launch, where timing can mean the difference between a successful launch and inevitable frustration. Knowing when to initialize your JavaScript is one of the most critical things when dealing with anything that manipulates the DOM. In this chapter you'll learn how to launch your JavaScript using Ext to ensure your application code initializes at the right time on each browser. We can then begin our discussion on using `Ext.Element` to manipulate the DOM.

As you know, DOM manipulation is one of the tasks that web developers are required to code for most of the time. Whether it's addition or removal of elements, I'm sure you've felt the pain of performing these tasks with the out-of-the-

box JavaScript methods. After all, DHTML has been at the center of dynamic web pages for ages now.

We'll look at the heart of Ext, known as the `Ext.Element` class, which is a robust cross-browser DOM element-management suite. You'll learn to use `Ext.Element` to add and remove nodes from the DOM, and you'll see how it makes this task easier.

Once you're familiar with the `Ext.Element` class, you'll learn how to use templates to stamp out HTML fragments into the DOM. We'll also dive deep into the use of the `XTemplate`, which descends from `Template`, and you'll learn how to use it to easily loop through data and inject behavior-modification logic while you're at it. This is going to be a fun chapter. Before you can begin coding, however, you must learn the proper way of launching your code.

2.1 **Starting off the right way**

Since the early days, when most developers wanted to initialize their JavaScript, they typically would add an `onLoad` attribute to the `<body>` tag of the HTML page that's loading:

```
<body onLoad='initMyApp() ; '>
```

Although this method of invoking JavaScript works, it's not ideal for Ajax-enabled Web 2.0 sites or applications because the `onLoad` code is generally fired at different times for different browsers. For instance, some browsers fire this when the DOM is ready and all content has been loaded and rendered by the browser. For Web 2.0, this isn't a good thing, because the code generally wants to start managing and manipulating DOM elements when the DOM is ready but before any images are loaded. This is where you can achieve the right balance of timing and performance. I like to call this the "sweet spot" in the page-loading cycle.

Like many things in the world of browser development, each browser generally has its own way of knowing when its DOM nodes can be manipulated.

2.1.1 **Fire only when ready!**

There are native browser solutions for detecting that the DOM is ready, but they aren't implemented uniformly across each browser. For instance, Firefox and Opera fire the `DOMContentLoaded` event. Internet Explorer requires a script tag to be placed in the document with a `defer` attribute, which fires when its DOM is ready. WebKit fires no event but sets the `document.readyState` property to `complete`, so a loop must be executed to check for that property and fire off a custom event to tell your code that the DOM is ready. Boy, what a mess!

2.1.2 **Let Ext JS pull the trigger**

Luckily, you have `Ext.onReady`, which solves the timing issues and serves as the base from which to launch your application-specific code. Ext JS achieves cross-browser compatibility by detecting which browser the code is executing on and manages the detection of the DOM ready state, executing your code at just the right time.

Ext.onReady is a reference to Ext.EventManager.onDocumentReady and accepts three parameters: the method to invoke, the scope from which to call the method, and any options to pass to the method. The second parameter, scope, is used when you're calling an initialization method that requires execution within a specific scope.

Getting a handle on scope

The concept of scope is something that many JavaScript developers wrestle with early in their career. It's a concept that I think every JavaScript developer should master. A great resource to learn about scope can be found at http://www.digital-web.com/articles/scope_in_javascript/.d.

All of your Ext-based JavaScript code can be anywhere below (after) the inclusion of Ext JS script. This is important because JavaScript files are requested and loaded synchronously. Trying to call any Ext methods before Ext is defined in the namespace will cause an exception, and your code will fail to launch. Here's a simple example of using Ext.onReady to fire up an Ext MessageBox alert window:

```
Ext.onReady(function() {
    Ext.MessageBox.alert('Hello', 'The DOM is ready!');
});
```

In the preceding example, we pass what's known as an anonymous function to Ext.onReady as the only parameter, which will be executed when the DOM is ready to be manipulated. Our anonymous function contains a line of code to invoke an Ext MessageBox, as shown in figure 2.1.

An anonymous function is any function that has no variable reference to it or key reference in an object. Ext.onReady registers our anonymous function, which is to be executed when the internal docReadyEvent event is fired. In short, an event is like a message that something has occurred. A listener is a method that's registered to be executed, or called, when that event occurs, or fires.

Ext fires this docReadyEvent event when it finds *exactly* the right time (remember the sweet spot) in the page-loading cycle to execute our anonymous method and any other registered listeners. If the concept of events sounds a bit confusing, don't be alarmed. Event management is a complex topic, and we'll cover it later, in chapter 3.

I can't stress enough the importance of using Ext.onReady. All of our example code (and eventually your application code) *has to be launched* this way. Moving forward, if Ext.onReady isn't explicitly detailed in the examples, please assume that you must launch the code with it and wrap the example code in the following manner:

```
Ext.onReady(function() {
    // ... Some code here ...
});
```



Figure 2.1 The result of our Ext.onReady call, an Ext.MessageBox window

Now that you're comfortable with using `Ext.onReady` to launch your code, we should spend some time exploring the `Ext.Element` class, which is known as the heart of the framework. This is one of those essential topics that's used everywhere in the framework where DOM manipulation occurs.

2.2 The Ext.Element class

All JavaScript-based web applications revolve around a nucleus, which is the HTML Element. JavaScript's access to the DOM nodes gives us the power and flexibility to perform any action against the DOM we wish. These could include adding, deleting, styling, or changing the contents of any node in the document. The traditional method to reference a DOM node by ID is

```
var myDiv = document.getElementById('someDivId');
```

The `getElementById` method works well to allow you to perform some basic tasks such as changing the `innerHTML` or styling and assigning a CSS class. But what if you wanted to do more with the node, such as manage its events, apply a style on mouse click, or replace a single CSS class? You'd have to manage all of your own code and constantly update to make sure your code is fully cross-browser compatible. I honestly can't think of another thing that I wouldn't want to spend my time on than this. Thankfully, Ext takes care of this for you.

2.2.1 The heart of the framework

Let's turn to the `Ext.Element` class, which is known to many in the Ext JS community as the heart of Ext JS because it plays a role in every UI widget in the framework and can be generally accessed by the `getEl()` method or the `e1` property.

The `Ext.Element` class is a full DOM element-management suite, which includes a treasure chest of utilities, enabling the framework to work its magic on the DOM and provide the robust UI that we've come to enjoy. This toolset and all of its power are available to us, the end developers.

Because of its design, its capabilities aren't relegated to simple management of DOM elements but rather to performing complex tasks such as managing dimensions, alignments, and coordinates with relative ease. You can also easily update an element via Ajax, manage child nodes, animate, enjoy full event management, and so much more.

2.2.2 Using Ext.Element for the first time

Using `Ext.Element` is easy and makes some of the hardest tasks simple. In order to exercise `Ext.Element`, you need to set up a base page. Set up a page where you include the Ext JavaScript and CSS, as we discussed in chapter 1. Next, include the following CSS and HTML:

```
<style type="text/css">
.myDiv {
    border: 1px solid #AAAAAA;
```

```
width: 200px;  
height: 35px;  
cursor: pointer;  
padding: 2px 2px 2px 2px;  
margin: 2px 2px 2px 2px;  
}  
</style>  
  
<div id='div1' class='myDiv'> </div>
```

What we're doing here is setting the stage for our examples by ensuring our target div tags have specific dimensions and a border so we can clearly see them on the page. We include one div with the id of 'div1', which we'll use as a target. If you set up your page correctly, the stylized div should be clearly visible, as shown in figure 2.2. This figure shows our generic HTML box, which we'll use to exercise the fundamental Ext.Element methods.

NOTE All of our Ext.Element example code will reference the base page we just set up. If you're interested in watching changes to the DOM occur live, I suggest using the multiline Firebug text editor inside of Firefox with these examples. If you're unfamiliar with Firebug, you can learn all about it via http://getfirebug.com/wiki/index.php/Main_Page. Conversely, you can place these examples inside generic script blocks. Just be sure to use Ext.onReady().

According to the CSS, any div with the class myDiv is set to 35 pixels high and 200 pixels wide and looks a bit odd. Let's make that element perfectly square by setting the height to 200 pixels:

```
var myDiv1 = Ext.get('div1');  
myDiv1.setHeight(200);
```

The execution of the previous two lines is pretty important. The first line uses Ext.get, which we pass the string 'div1', and returns an instance of Ext.Element referenced by the variable myDiv1. Ext.get uses document.getElementById and wraps it with the Ext element-management methods.

You leverage your newly referenced instance of Ext.Element, myDiv1, and call its setHeight method, passing it an integer value of 200, which grows the box to 200 pixels tall. Conversely, you could use its setWidth method to change the width of the element, but we'll skip that and jump to something more fun.

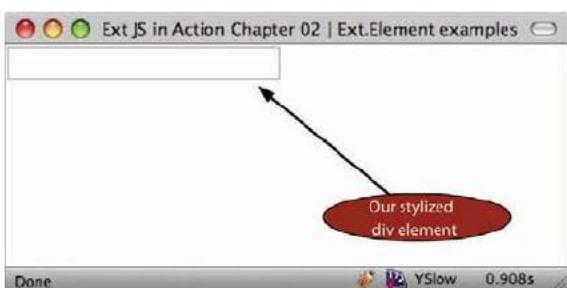


Figure 2.2 Our base page with our stylized div ready for some Ext Element action

"It now looks like a perfect square. Big deal!" you say. Well, let's change dimensions again; this time we'll use `setSize`. Let's make the width and height 350 pixels. We'll leverage the already created reference, `myDiv1`:

```
myDiv1.setSize(350, 350, {duration: 1, easing:'bounceOut'});
```

What happens when you execute this line of code? Does it animate and have a bouncing effect? That's better!

Essentially, the `setSize` method is the composite of `setHeight` and `setWidth`. For this method, you passed the target width and height and an object with two properties, `duration` and `easing`. A third property, if defined, will make `setSize` animate the size transition of the element. If you don't care for animation, omit the third argument, and the box will change size instantly, much like when you set the height.

Setting dimensions is a single facet of the many sides of element management with the `Element` class. Some of `Ext.Element`'s greatest power comes from its ease of use for full CRUD (create, read, update, and delete) of elements.

2.2.3 Creating child nodes

One of the great uses of JavaScript is the ability to manipulate the DOM, which includes the creation of DOM nodes. JavaScript provides many methods natively that give you this power. Ext JS conveniently wraps many of these methods with the `Ext.Element` class. Let's have some fun creating child nodes.

To create a child node, you use `Element`'s `createChild` method:

```
var myDiv1 = Ext.get('div1');
myDiv1.createChild('Child from a string');
```

This code adds a string node to the `innerHTML` of your target div. What if you wanted to create an element? Easy as pie:

```
myDiv1.createChild('<div>Element from a string</div>');
```

This usage of `createChild` will append a child div with the string '`Element from a string`' to the `innerHTML` of `div1`. I don't like to append children this way because I find the string representation of elements to be messy. Ext helps me with this problem by accepting a configuration object instead of a string:

```
myDiv1.createChild({
    tag : 'div',
    html : 'Child from a config object'
});
```

Here, we're creating a child element by using a configuration object. We specify the `tag` property as '`div`' and the `html` as a string. This technically does the same thing as the prior `createChild` implementation but can be considered cleaner and self-documenting. What if you wanted to inject nested tags? With the configuration object approach, you can easily achieve this:

```
myDiv1.createChild({
    tag      : 'div',
    id       : 'nestedDiv',
```

```

        style : 'border: 1px dashed; padding: 5px;',
        children : [
            tag : 'div',
            html : '...a nested div',
            style : 'color: #EE0000; border: 1px solid'
        ]
    );
}

```

In this code, you're creating one last child, which has an id, a bit of styling applied, and a child element, which is a div with some more styling. Figure 2.3 illustrates what the changes to the div look like.

In this illustration, you see all of the additions to `myDiv1`, including the live DOM view from Firebug, showing that you added a string node and three child divs, one of which has its own child div.

If you wanted to inject a child at the top of the list, you'd use the convenience method `insertFirst`, for instance:

```

myDiv1.insertFirst({
    tag : 'div',
    html : 'Child inserted as node 0 of myDiv1'
});

```

`Element.insertFirst` will always insert a new element at position zero, even when no child elements exist in the DOM structure.

If you want to target the insertion of a child node at a specific index, the `createChild` method can take care of that task. All you need to do is pass it the reference of where to inject the newly created node, for instance:

```

myDiv1.createChild({
    tag : 'div',
    id : 'removeMeLater',
    html : 'Child inserted as node 2 of myDiv1'
}, myDiv1.dom.childNodes[3]);

```

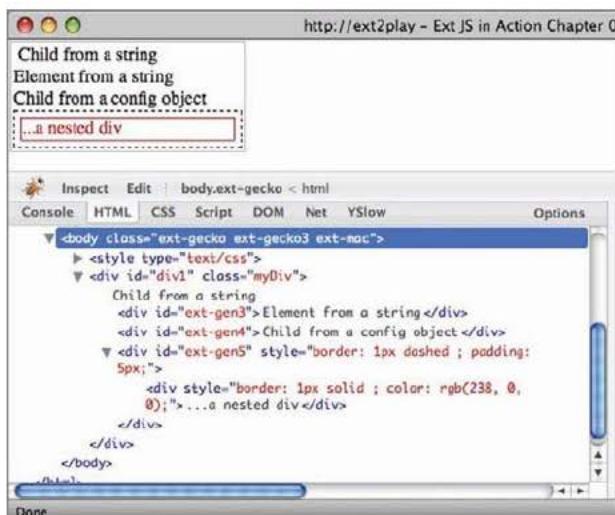


Figure 2.3 A composite of the element additions using `myDiv1.createChild()`

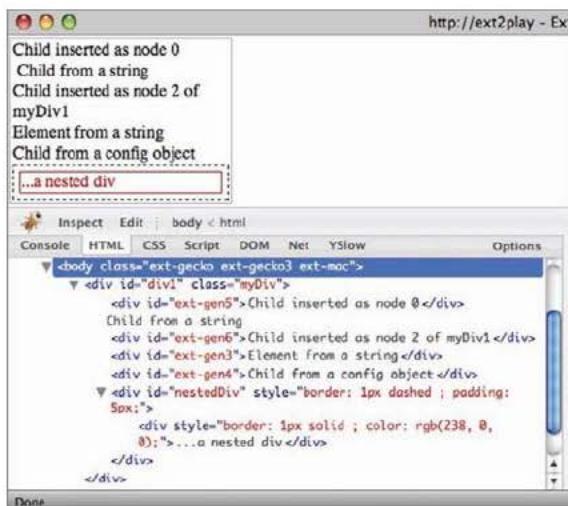


Figure 2.4 The results of our targeted DOM element insertions with `createChild()` using an index and `insertFirst()`

In this code, you’re passing two arguments to `createChild`. The first is the configuration object representation of the newly created DOM element, and the second is the DOM reference of the target child node that `createChild` will use as the target to *inject* the newly created node. Please keep in mind the id that you set for this newly created item; you’ll use this in a bit.

Notice that we’re using `myDiv1.dom.childNodes`. `Ext.Element` gives you the opportunity to leverage all of the generic browser element-management goodness by means of the `dom` property.

NOTE The `Element.dom` property is the same DOM object reference as returned by `document.getElementById()`.

Figure 2.4 shows what the inserted nodes look like in both the page view and the DOM hierarchy using the Firebug DOM inspection tool. As you can see in this figure, the node insertions functioned as we wanted them to. We used `insertFirst` to inject a new node at the top of the list and `createChild` to inject a node *above* child node 3. Remember to always count child nodes starting with the number 0 instead of 1.

Adding is something that we do often as web developers. After all, this is part of what DHTML is all about. But removing is equally important to know. Let’s see how to remove some of the child elements using `Ext.Element`.

2.2.4 Removing child nodes

Removing nodes could be considered much easier than adding. All you need to do is locate the node with `Ext` and call its `remove` method. To exercise removal of child nodes, we’re going to start with a clean and controlled slate. Create a new page with the following HTML:

```
<div id='div1' class="myDiv">
    <div id='child1'>Child 1</div>
    <div class='child2'>Child 2</div>
    <div class='child3'>Child 3</div>
    <div id='child4' class='sameClass'>
        <div id="nestedChild1" class='sameClass'>Nest Child 1</div>
    </div>
    <div>Child 5</div>
</div>
```

Examining this HTML, you find a parent div with the id of 'div1'. It has five direct descendants, the first of which has the id of 'child1'. The second and third children have no ids but have CSS classes of 'child2' and 'child3'. The fourth child element has an id of 'child4' and a CSS class of 'sameClass'. Likewise, it has a direct child with an id of "nestedChild1" and the same CSS class as its parent. The last child of div1 has no id or CSS class. The reason we have all this stuff going on is that we're going to start using CSS selectors as well as target directly the ids of the elements.

In the examples where we added child nodes, we always referenced the parent div (`id='div1'`) by wrapping it in an `Ext.Element` class and leveraging its `create` methods. To remove a child node, the approach is different because we need to target specifically the node that's to be removed. Using the new DOM structure, we'll practice a few ways of doing this.

The first approach we'll examine is removing a child node for an already wrapped DOM element. We'll create an instance of `Ext.Element` wrapping `div1` and then use it to find its first child node using a CSS selector:

```
var myDiv1 = Ext.get('div1');
var firstChild = myDiv1.down('div:first-child');
firstChild.remove();
```

In this example, we create a reference to `div1` using `Ext.get`. We then create another reference, `firstChild`, to the first child using the `Element.down` method and pass a pseudo class selector, which causes Ext to query the DOM tree within the context of `div1` for the first child, which is a `div`, and wrap it within an instance of `Ext.Element`.

The `Element.down` method queries the first-level DOM nodes for any given `Ext.Element`. It so happens that the element that's found is the one with the `div` id of 'child1'. We then call `firstChild.remove`, which removes that node from the DOM.

Here's how you could remove the last child from the list using selectors:

```
var myDiv1 = Ext.get('div1');
var lastChild = myDiv1.down('div:last-child');
lastChild.remove();
```

This example works similarly to the prior one. The biggest difference is that you use the selector '`div:last-child`', which locates the last `childNodes` for `div1` and wraps it in an instance of `Ext.Element`. After that, you call `lastChild.remove`, and it's gone.

NOTE CSS selectors are a powerful way of querying the DOM for items. Ext JS supports the CSS3 selector specification. If you're new to CSS selectors, I highly advise visiting the following W3C page, which has a plethora of information on selectors: <http://www.w3.org/TR/2005/WD-css3-selectors-20051215/#selectors>.

What if you want to target an element by an `id`? You can use `Ext.get` to do your dirty work. This time, you'll create no reference and use *chaining* to take care of the job:

```
Ext.get('child4').remove();
```

Executing this code removes the child node with the `id` of 'child4' and its child node. Always remember that removing a node with children will also remove its child nodes.

NOTE If you'd like to read more about chaining, Dustin Diaz, an industry-leading developer, has an excellent article on his site: <http://www.dustindiaz.com/javascript-chaining/>.

The last thing we'll look at is using `Ext.Element` to perform an Ajax request to load remote HTML fragments from the server and inject them into the DOM.

2.2.5 Using Ajax with Ext.Element

The `Ext.Element` class has the ability to perform an Ajax call to retrieve remote HTML fragments and inject those fragments into its `innerHTML`. To exercise this, you'll need to first write an HTML snippet to load:

```
<div>
    Hello there! This is an HTML fragment.
    <script type="text/javascript">
        Ext.getBody().highlight();
    </script>
</div>
```

In this HTML fragment, you have a simple `div` with an embedded `script` tag, which performs an `Ext.getBody` call and uses chaining to execute the results of that call to execute its `highlight` method. `Ext.getBody` is a convenience method to get a reference to the `document.body` wrapped by `Ext.Element`. Save this file as `htmlFragment.html`.

Next, you'll perform the load of this snippet:

```
Ext.getBody().load({
    url      : 'htmlFragment.html',
    scripts  : true
});
```

In this snippet, you call the `load` method of the result of the `Ext.getBody` call and pass a configuration object specifying the `url` to fetch, which is the `htmlFragment.html` file, and set `scripts` to `true`. What happens when you execute this code? See figure 2.5.



Figure 2.5 Loading an HTML fragment into the document body

When you execute this code snippet, you'll see that the document body performs an Ajax request to retrieve your `htmlFragment.html` file. While the file is being retrieved, it shows a loading indicator. Once the request is complete, the HTML fragment is injected into the DOM. You then see the entire body element highlighted in yellow, which is an indication that your JavaScript was executed. Now you see that using the `Ext.Element.load` utility method is a great convenience over having to manually code an `Ext.Ajax.request` call.

And there you have it. Adding and removing elements to and from the DOM is a cinch when using `Ext.Element`. Ext has another way to make adding elements even simpler, especially if you have repeatable DOM structures to be placed in the DOM. These are the `Template` and `XTemplate` utility classes.

2.3 Using Templates and XTemplates

The `Ext.Template` class is a powerful core utility that allows you to create an entire DOM hierarchy with slots that later can be filled in with data. Once you define a template, you can then use it to replicate one or more of the predefined DOM structures, with your data filling in the slots. Mastering templates will help you master UI widgets that use templates, such as the `GridPanel`, `DataView`, and `ComboBox`.

2.3.1 Exercising templates

You'll start out by creating an extremely simple template, and then you'll move on to create one that's much more complex:

```
var myTpl = new Ext.Template("<div>Hello {0}</div>");

myTpl.append(document.body, ['Marjan']);
myTpl.append(document.body, ['Michael']);
myTpl.append(document.body, ['Sebastian']);
```

In this example, you create an instance of `Ext.Template` and pass it a string representation of a `div` with a slot, which is marked in curly braces, and store a reference in the variable `myTpl`. You then call `myTpl.append` and pass it a target element, `document.body`, and data to fill in the slots, which in this case happens to be a single element array that contains a first name.

You do this three consecutive times, which results in three `div`s being appended to the DOM, with each different first name filling in a slot. Figure 2.6 shows the result from our `append` calls.

As you can see, three divs were appended to the document body, each with a different name. The benefits of using templates should now be clear. You set the template once and apply it to the DOM with different values.

In the prior example, the slots were integers in curly braces, and you passed in single-item arrays. Templates can also map object key/values from plain objects. The following listing shows how to create a template that uses such syntax.

Listing 2.1 Creating a complex template

```
var myTpl = new Ext.Template(
    '<div style="background-color: {color}; margin: 10px;">',
    '    <b> Name :</b> {name}<br />',
    '    <b> Age :</b> {age}<br />',
    '    <b> DOB :</b> {dob}<br />',
    '</div>'
);
myTpl.compile();
myTpl.append(document.body, {
    color : "#E9E9FF",
    name : 'John Smith',
    age : 20,
    dob : '10/20/89'
});
myTpl.append(document.body, {
    color : "#FFE9E9",
    name : 'Naomi White',
    age : 25,
    dob : '03/17/84'
});
```

When creating our complex Template ①, the first thing you'll probably notice is that you pass in quite a few arguments. You do this because when creating a template, it's much easier to view the pseudo HTML in a tab-delimited format rather than a long string. The Ext developers were keen on this idea, so they programmed the Template constructor to read all of the *arguments* being passed, no matter how many.

In the Template pseudo HTML are slots for four data points. The first is color, which will be used to style the background of the element. The three other data points are name, age, and dob, which will be directly visible when the template is appended.

You then compile ② our template, which speeds up the Template by eliminating regular expression overhead. For these two operations you *technically* don't need to compile it because you wouldn't see the speed benefits, but for larger applications, where



Figure 2.6 Using our first template to append nodes to the DOM, shown in the exploded view in Firebug

many templates are stamped out, compiling has a clear benefit. To be safe, I always compile templates after instantiating them.

Last, you perform two append calls ③, where you pass in the reference element and a data object. Instead of passing an array as you did when in your first exploration of templates, you pass in a data object, which has keys that match the template slots. Figure 2.7 shows the result of the complex template with a DOM view in Firebug.

By using the template, you were able to get two differently styled elements in the DOM without being displayed. What if you had an *array* of objects? For instance, what if an Ajax request returned an array of data objects, and you needed to apply a template for each data object? One approach could be looping through the array, which is easily done with a generic for loop or the more robust Ext.each utility method. I say nay to that approach. I'd use XTemplate instead, which makes the code much cleaner.

2.3.2 Looping with XTemplates

XTemplates can *technically* be used for single data objects, but they can make life much easier when you have to deal with looping through arrayed data to stamp out HTML fragments onscreen. XTemplates extends Templates and offers much more functionality. We'll start our exploration by creating an array of data objects and then create an XTemplate, which you'll use to stamp out HTML fragments, as in the following listing.

Listing 2.2 Using an XTemplate to loop through data

```
var tplData = [
    color : "#FFE9E9",
    name : 'Naomi White',
    age : 25,
    dob : '03/17/84',
    cars : ['Jetta', 'Camry', 'S2000']
], {
    color : "#E9E9FF",
    name : 'John Smith',
    age : 20,
    dob : '10/20/89',
    cars : ['Civic', 'Accord', 'Camry']
];
var myTpl = new Ext.XTemplate(
```

1 Data for XTemplate

2 Instantiate new XTemplate

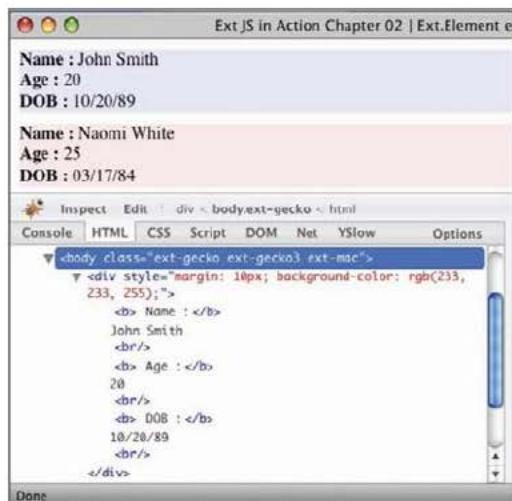


Figure 2.7 The result of our complex template with a DOM view in Firebug

```

'<tpl for=".">' ,
  '<div style="background-color: {color}; margin: 10px;">',
    '<b> Name :</b> {name}<br />',
    '<b> Age :</b> {age}<br />',
    '<b> DOB :</b> {dob}<br />',
  '</div>',
'</tpl>'
);

myTpl.compile();

myTpl.append(document.body, tplData);

```

Append HTML
fragments to DOM

3

In listing 2.2 you first set up an array of data objects ①, which are like the data objects you used in your last Template exploration, with the addition of a cars array, which you'll use in the next example.

Next, you instantiate an instance of XTemplate ②, which looks much like the last Template configuration, except you encapsulate the div container with a custom tpl element with the attribute for, which contains the value ".." ③. The tpl tag is like a logic or behavior *modifier* for the template and has two operators, for and if, which alter the way the XTemplate generates the HTML fragments. In this case, the value of ".." instructs the XTemplate to loop through the root of the array for which it's passed and construct the fragment based on the pseudo HTML encapsulated inside the tpl element. When you look at the rendered HTML, you'll see no tpl tags rendered to the DOM. The results of your efforts are identical to the Template example, as shown in figure 2.8.

Remember, the advantage of using XTemplates in this case is not having to write code to loop through the array of objects. You let the framework do the dirty work for you. The capabilities of XTemplates extend far beyond merely looping through arrays, which increase its usability exponentially.

2.3.3 Advanced XTemplate usage

You can configure XTemplates to loop through arrays within arrays and even have conditional logic. The example in the next listing will flex some XTemplate muscle and demonstrate many of these advanced concepts. Some of the syntax you're about to see will be foreign to you. Don't get discouraged. I'll explain every bit.

Listing 2.3 Advanced XTemplate usage

```

var myTpl = new Ext.XTemplate(
  '<tpl for=".">' ,
    '<div style="background-color: {color}; margin: 10px;">',

```

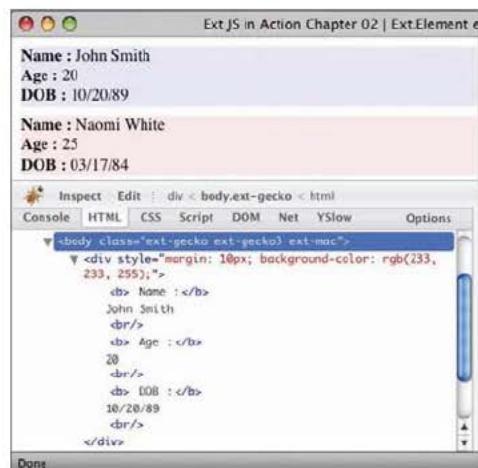


Figure 2.8 The result of using XTemplate with an exploded DOM view from Firebug

```

'<b> Name :</b> {name}<br />',
'<b> Age :</b> {age}<br />',
'<b> DOB :</b> {dob}<br />',
'<b> Cars : </b>',
'<tpl for="cars">',
    '{.}',
    '<tpl if="this.isCamry(values)">',
        '<b> (same car)</b>',
    '</tpl>',
    '{[ (xindex < xcount) ? ", " : "" ]}',
    '</tpl>',
    '<br />',
    '</div>',
'</tpl>',
{
    isCamry : function(car) {
        return car === 'Camry';
    }
};

myTpl.compile();
myTpl.append(document.body, tplData);

```

The diagram illustrates five numbered steps corresponding to annotations in the XTemplate code:

- 1 Loop through cars data**: Points to the `for="cars"` attribute.
- 2 Display all data in array**: Points to the `{.}` placeholder.
- 3 Execute this.isCamry method**: Points to the `if="this.isCamry(values)"` condition.
- 4 Test for end of array**: Points to the `xindex < xcount` comparison.
- 5 Object containing one method**: Points to the `isCamry` method definition.

This usage of XTemplate exercises quite a few advanced concepts, the first of which is looping within a loop ①. Remember, the `for` attribute instructs the XTemplate to loop through a list of values. In this case, the `for` attribute has the value of `'cars'`, which differs from the value that's set for the first `for` attribute, `".."`. This instructs the XTemplate to loop through this block of pseudo HTML for each individual car. Remember that `cars` is an array of strings.

Inside this loop is a string with {.} ②, which instructs XTemplate to place the value of the array at the current index of the loop. In simple terms, the name of a car will be rendered at this position.

Next, you see a `tpl` behavior modifier with an `if` attribute ③, which executes `this.isCamry` and passes `values`. The `this.isCamry` method is generated at the end of the XTemplate ⑤. We'll speak more about this in a bit. The `if` attribute is more like an *if condition*, where the XTemplate will generate HTML fragments *if* the condition is met. In this case, `this.isCamry` must return `true` for the fragment that's encapsulated inside this `tpl` flag to be generated.

The `values` property is an internal reference of the values for the array you're looping through. Because you're looping through an array of strings, it references a single string, which is the name of a car.

In the next line, you're arbitrarily executing JavaScript code ④. Anything encapsulated in curly braces and brackets `{[... JS code ...]}` will be interpreted as generic JavaScript; it has access to some local variables that are provided by XTemplate and can change with each iteration of the loop. In this case, you're checking to see if the current index (`xindex`) is less than the number of items in the array (`xcount`) and returning either a comma with a space or an empty string. Performing this test inline will ensure that commas are placed exactly between the names of cars.

The last item of interest is the object that contains your `isCamry` method ⑤. Including an object (or reference to an object) with a set of members with the passing arguments to the XTemplate constructor will result in those members being applied directly to the instance of XTemplate itself. This is why you called `this.isCamry` directly in the `if` condition of one of the `tpl` behavior modifier pseudo elements. All of these member methods are called within the scope of the instance of the XTemplate for which they're being passed. This concept is extremely powerful but can be dangerous because you can override an existing XTemplate member, so please try to make your methods or properties unique. The `isCamry` method uses JavaScript shorthand to test whether the passed string, `car`, is equal to "Camry" and will return `true` if it is; otherwise, it will return `false`. Figure 2.9 shows the results of the advanced XTemplate exercise.

The results of the advanced XTemplate exercise show that all of our behavior injections worked as planned. All of the cars are listed, including proper comma placement. You can tell that our arbitrary JavaScript injection worked because the string "(same car)" is placed to the right of the Camry name.

As you can see, Templates and XTemplates have myriad benefits over generic DOM injections using `Ext.Element` to stamp out HTML fragments with data. I encourage you to look over the Template and XTemplate API pages for more details and examples of how to use these utilities. Your next exposure to Templates will be when you learn how to create a custom ComboBox.

2.4 Summary

In this chapter we discussed how JavaScript application logic was launched in the olden days with the `onLoad` handler of the `<body>` element. Remember that browsers typically have their own way of publishing when the DOM is ready for manipulation, which causes a code-management nightmare. In exercising `Ext.onReady`, you learned that it takes care of launching your application code at just the right time for each browser, so you can concentrate on the important stuff, application logic.

We then took an in-depth look the `Ext.Element` class, which wraps and provides end-to-end management for DOM nodes. We exercised a few of the management utilities for DOM nodes by adding and removing elements. All UI widgets use the `Ext.Element`, making it one of the most used components of the core framework. Each widget's element can be accessed via the (public) `getEl` method or the (private) `e1` property, but only after it has been rendered.

Last, you learned about using the `Template` class to inject HTML fragments into the DOM. We also jumped into advanced techniques with XTemplates and showed how to embed behavioral modifying logic into the template definition itself, producing results depending on the data that provided.

Looking forward, we're going to focus on the UI side of the framework, where we'll jump right into the core concepts and models that drive the framework.

Name : Naomi White
Age : 25
DOB : 03/17/84
Cars : Jetta, Camry (same car), S2000, M3
Name : John Smith
Age : 20
DOB : 10/20/89
Cars : Civic, Accord, Camry (same car)

Figure 2.9 The results from the advanced XTemplate exercise

3

Events, Components, and Containers

This chapter covers

- Learning about software-driven events with observable
- Getting to know the Component model and lifecycle
- Exploring the Ext JS Container model
- Managing parent-child relationship of widgets
- Implementing the Container model utility methods

I recall my early days with the Ext framework, when I started learning by toying with the examples and reading the API documentation. I spent many hours on some of the most important core UI concepts, such as adding user interaction, the reusability of widgets, and how one widget can contain or control another. For instance, how would I make the click of an anchor tag display an Ext Window? Sure, there's a generic JavaScript way of attaching an event handler, but I wanted to use Ext JS. Likewise, I needed to know how to get widgets to communicate with each other. For example, how would I reload a GridPanel when a row of another GridPanel is clicked? Also, how would I add and remove items dynamically from a Panel? Or how could I find a particular field within a form panel based on the type field?

This chapter is designed to cover these core concepts, which are essential to building rich and interactive user interfaces with the framework. Because we just covered Ext.Element in chapter 2, we'll leverage this information to set up native click handlers on DOM elements and learn how events flow in the DOM. We'll also touch on how widget events work from registration to firing the event.

We'll also explore the deep caverns of the fundamental UI building block, the Component class, and learn how it serves as the central model for all UI widgets by implementing a template for standard behaviors known as the Component lifecycle.

Last, we'll take some time discussing the Container class, where you'll get an in-depth understanding of how widgets can manage child items. You'll learn how to dynamically add and remove items to and from widgets like the Panel, which can be used as a building block for dynamically updating UIs.

3.1 **Managing events with Observable**

For me, one of the most fun tasks in developing web applications is coding to manage events. An event can be thought of as a signal that's sent by some source when something occurs that could require action. Understanding events is one of the key core concepts you must become familiar with, because this will aid you in developing user interfaces, which provide truly rich user interaction. For instance, what if you wanted to display a context menu on a GridPanel when a user right-clicks a row? You'd set up an event handler for the rowcontextmenu event, which will create and display the context menu.

Likewise, knowing how Ext Components communicate with each other via events is equally important. This section will give you the fundamental knowledge that you'll need.

3.1.1 **Taking a step back**

Although you may not have realized it, you use an event-driven operating system every day. All modern user interfaces are driven by events, which on a high level generally come from inputs such as a mouse or keyboard but can be synthesized by software. Events that are sent are dispatched, or fired. Methods that take actions on these events are listeners and are sometimes called handlers.

Like modern operating systems, the browser too has an event model, where it fires events because of user input. This powerful model allows us to leverage that input and perform complex tasks, such as refreshing a grid or applying a filter. Just about every interaction that's performed with the browser fires events that can be leveraged. These are known as DOM-based events.

3.1.2 **DOM-based events**

Recall that events can come from user input or be synthesized by software. We need to first explore DOM-based events, which are initiated by user input, before we can have fun with software-based events. A lot of old-school web developers attached listeners directly to HTML elements, such as the onclick attribute:

```
<div id="myDiv" onclick="alert(this.id + ' was clicked');">Click me</div>
```

This method of adding event handlers was standardized by Netscape many years ago and is considered to be ancient practice by most modern JavaScript developers. This is because it adds a dependency for embedded JavaScript in HTML and leads to a code-management nightmare in addition to memory leaks by some browsers. I suggest avoiding this method at all costs.

The way events are managed across browsers is added to our ever-growing list of cross-browser incompatibilities. Luckily for us, Ext JS takes care of that and presents a unified interface for us to leverage:

```
var el = Ext.get('myDiv');
el.on('click', doSomething);
```

Here, we use the utility method, `Ext.get`, which allows Ext to wrap its element management class, `Ext.Element`, around a referenced element, giving us the power to do pretty much anything we want with that element. Embedded with each instance of `Ext.Element` is the usage of the Ext event-management engine, `Ext.util.Observable`. It's important to remember that all event management with Ext stems from `Ext.util.Observable`, which serves as a base for all DOM elements and Components that need to manage events.

Next, we attach a listener by calling `el.on` and pass the native event to be handled and a method to perform an action on the event. Ext takes event listener registration a step further by allowing you to pass a reference to the scope from which the event handler is to be called and any parameters:

```
var el = Ext.get('myDiv');
el.on('click', doSomething, scopeRef, [opt1, opt2]);
```

It's important to note that the default scope is always the object from which the handler is being defined. If `scope` were not explicitly passed, the method `doSomething` would be called within the scope of the object `el`, which is an instantiation of `Ext.Element`.

Now that you've learned and exercised simple event handling on an `Element`, we'll take a quick glance at how events flow in the DOM.

3.1.3 **Event flow in the DOM**

In the early days of the internet, Netscape and Microsoft had two completely separate approaches with regard to event flow direction. In the Netscape model, events flowed downward from the document body to the source, which is known as *event capture*. The Microsoft model, known as *bubbling*, was exactly the inverse of capture, where the event is generated from the node from which the user action is performed and *bubbles up* to the document object, which performs a default action based on what type of node was clicked. Thankfully, the W3C model, shown in figure 3.1, combined these two models and is what we use now.

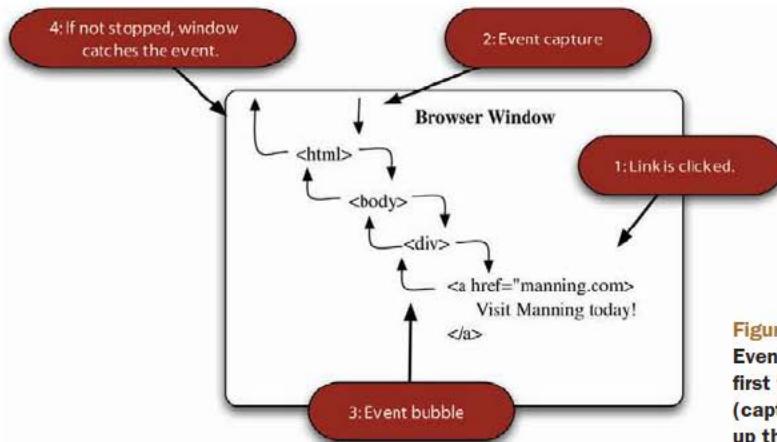


Figure 3.1 The W3C Event model, where events first flow downward (capture) and then return up the tree (bubbling)

As you can see, the user clicking the anchor tag generates a DOM-level click event. This causes the event-capture phase to occur, which cascades the event down the DOM tree, where it eventually lands at the target node, the anchor tag. If the event isn't stopped, it'll bubble back up to the browser window, where it'll cause the browser's location to change.

NOTE If you're new to DOM events and want to learn more about the inner workings, Peter-Paul Koch has an excellent article on his site, in which he explains events in browsers in much greater detail than what is covered in this book. Here's the direct link: http://www.quirksmode.org/js/events_order.html.

Most of the time when you're developing event handlers for DOM events, you have to worry about bubbling. To demonstrate why this is important, we'll need to set up some HTML and attach event handlers to the node. We'll use the Firebug console to echo out messages. If you don't wish to use Firebug, the generic JavaScript alert box will work.

Suppose you have the following HTML, and you want to apply separate click listeners to both the div and the anchor tags:

```
<div id="myDiv">
  MyDiv Text
  <a href="#" id="myHref">
    My Href
  </a>
</div>
```

You'll register a click handler to the outermost element, myDiv, and use chaining so you don't have to set a static reference to the result of the Ext.get method call. You'll also pass an anonymous function as the second parameter instead of passing a reference to an existing function:

```
Ext.get('myDiv').on('click', function(eventObj, elRef) {
  console.log('myDiv click Handler, source element ID: ' + elRef.id);
});
```

After rendering the page, expand Firebug and click the anchor tag. You'll see a Firebug console message indicating that you clicked the `myHref` tag. Hold the phone—you only assigned a listener to the anchor's parent element, '`myDiv`'. How could this be?

This is event bubbling in action. Remember that the `click` event generated from the anchor tag bubbled upward to the `Container` div, where you attached the `click` handler. That bubbled event triggered the event handler, causing its execution, thus the console message.

Next, attach a `click` handler to the anchor tag:

```
Ext.get('myHref').on('click', function(eventObj, elRef) {
    console.log('myHref click handler, source element ID: ' + elRef.id);
});
```

Refresh your page and click the anchor again; you'll see two events fired, as shown in figure 3.2.

Having both event listeners fire could be troublesome and considered a waste of resources, especially if only one is needed. In order to stop this from happening, you need to stop the bubbling (propagation) of the `click` event in the anchor. Only then can you have separation from the anchor and the `div` element `click` event handlers.



Figure 3.2 The results of our `click` event handlers in the Firebug console

3.1.4 Burst the bubble

To prevent both event handlers from triggering, you'll have to modify the anchor `click` event handler to include a `stopEvent` call on the instance of `Ext.EventObject` (`eventObj`) passed to the handler:

```
Ext.get('myHref').on('click', function(eventObj, elRef) {
    eventObj.stopEvent();
    console.log('myHref click handler, source element ID: ' + elRef.id);
});
```

Refresh the page and click the anchor again. This time, you'll see only one Firebug console message per click, indicating that you've clicked the anchor tag. Likewise, clicking the `div` element will produce a message stating that you clicked the `div`.

The `eventObj.stopEvent` method call stops the event bubbling in its tracks. This is important to remember because there are other interactions for which you may want to cancel event propagation, such as `contextmenu`, where you'd want to show your own context menu instead of the browser's default menu.

We'll modify our example to listen to `listento` the `contextmenu` event to perform this task:

```
Ext.get('myDiv').on('contextmenu', function(eventObj, elRef) {
    console.log('myDiv contextmenu Handler, source el ID: ' + elRef.id);
});

Ext.get('myHref').on('contextmenu', function(eventObj, elRef) {
```

```

eventObj.stopEvent();
console.log('myHref contextmenu Handler, source el ID: ' + elRef.id);

if (!this.ctxMenu) {
    this.ctxMenu = new Ext.menu.Menu({
        items : [
            {text : "This is"},
            {text : "our custom"},
            {text : "context menu"}
        ]
    });
}
this.ctxMenu.show(elRef);

});

```

In this example, we change the registered event from `click` to `contextmenu` for both the `div` and `anchor` elements. For the `div` event handler, we echo out a `console` message, providing an indication that the handler was triggered. For the `anchor` event handler, we stop the event propagation, log the event trigger in the Firebug console, create a new `Ext` menu, and display it below the anchor element.

If you right-click the `div`, you'll see the default browser context menu. But if you right-click the `anchor` (figure 3.3), you'll see your own custom menu because you halted the propagation of the `contextmenu` event, preventing it from bubbling back up to the browser.

As you can see, the registration of event handlers on DOM nodes is a simple task, but knowing whether you have to stop an event from bubbling up can be tricky. Certainly the `contextmenu` event is the only event that comes to mind that always needs to be stopped to prevent default browser behavior.

Next, we'll focus our attention on software-driven events, which is another key concept of the framework because inter-Component events are used extensively in the framework.

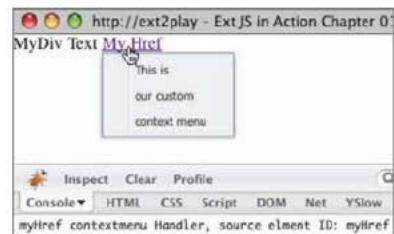


Figure 3.3 Displaying our custom context menu by means of a `contextmenu` event handler

3.1.5 Software-driven events

Almost every `Ext` widget or Component has custom events that it fires when it deems necessary. For instance, when a widget is finished rendering in the DOM, it fires a `render` event.

This is because just about everything extends `Ext.util.Observable`, which gives widgets the ability to exhibit similar behavior to complex UI environments such as your desktop UI. Events from widgets and Components can include DOM-based events that are bubbled up, such as `click` and `keyup` or `Ext` internal events such as `beforerender` and `datachanged`.

The API is a great place to read about events for a particular subclass of Observable. The last section of each API page is dedicated to public events from which other components can register listeners and take action.

3.1.6 ***Registration of events and event listeners***

Before an Ext-based event can be fired, it must be added to the list of events for that instance of Observable. This is typically done with the addEvent method, which stems from the Observable class. Let's instantiate a new instance of Observable and add a custom event:

```
var myObservable = new Ext.util.Observable();
myObservable.addEvents('sayHello');
myObservable.addEvents('sayGoodbye');
```

If you want to register more than one event, you can pass one event label per argument:

```
myObservable.addEvents('sayHello', 'sayGoodbye');
```

Alternatively, you can pass in a configuration object that has a list of event labels and whether they should be enabled by default:

```
myObservable.addEvents({
    'sayHello' : true,
    'sayGoodbye' : true
});
```

Now that you have your events registered, you need to register an event handler. This should look familiar:

```
myObservable.on('sayHello', function() {
    console.log('Hello stranger');
});
```

Here, you're providing an event handler for your custom event, sayHello. Notice that this is exactly how you registered events on the DOM. The handler will log a console message in Firebug as an indication that it was executed. Because you have your custom event defined and you have a listener registered, you need to fire the event so that you can watch the event handler get called:

```
myObservable.fireEvent('sayHello');
```

You can see in figure 3.4 that firing the event causes the handler to execute, resulting in a Firebug console message being displayed.

Many events from the framework pass parameters when firing; among the parameters is a reference to the component firing the event. Create an event handler for a custom sayGoodbye event so that it accepts two parameters, firstName and lastName:

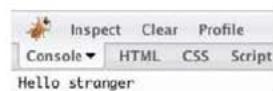


Figure 3.4 A Firebug console message being displayed, indicating that the registered handler for the sayHello event was triggered

```
var sayGoodbyeFn = function(firstName, lastName) {
    console.log('Goodbye ' + firstName + ' ' + lastName + '!');
};

myObservable.on('sayGoodbye', sayGoodbyeFn);
```

Here, you define a method named `sayGoodbyeFn`, which accepts the two parameters. You then call `myObservable.on`, which is shorthand for `myObservable.addListener`, to register the event handler `sayGoodbyeFn`.

Next, fire the 'sayGoodbye' event and pass first and last names:

```
myObservable.fireEvent('sayGoodbye', 'John', 'Smith');
```

When calling `fireEvent`, the only required parameter is the first one, which is the event name. Parameters passed on thereafter are relayed to the event handler. The result of the 'sayGoodbye' event being fired with the `firstName` and `lastName` parameters passed should appear in your Firebug console, as shown in figure 3.5.

Remember that if you register an event handler without specifying scope, it will be called within the scope of the component that's firing the event. As we continue our journey into the Ext JS world, we'll revisit events again because we'll use them to "wire" widgets together.

Just as the registration of event handlers is important to completing tasks, deregistration of event handlers is equally important to ensure proper cleanup when an event handler is no longer required. Fortunately, the method call to do so is extremely simple:

```
myObservable.removeListener('sayGoodbye', sayGoodbyeFn);
```

Here, we call `myObservable.removeListener`, passing in the event from which the listener is to be deregistered and the listener method to deregister. The shorthand for `removeListener` is `un` (opposite of `on`) and is commonly used in the framework and application code. The preceding code looks like this in shorthand:

```
myObservable.un('sayGoodbye', sayGoodbyeFn);
```

Managing events and event listeners is as straightforward as described. Using anonymous functions won't work with this approach because you have to specify which function you want to remove from the listener. Always remember to deregister event handlers when they're no longer needed. This will help reduce the memory footprint of your application and help ensure that no exceptions occur because of an event handler being triggered when it shouldn't be.

You're now familiar with registering events to DOM elements and have glanced at software-driven events; we can start to gravitate toward the UI portion of the framework. Before we dive into configuring and constructing widgets, we need to look at the Component model, which serves as the base model for all UI widgets. Having a solid grasp of how the Component model works in Ext JS 3.0 will allow you to better utilize the UI portion of framework, especially when managing child items of a Container.



Figure 3.5 A Firebug console message displays as the result of the firing of the `sayGoodbye` event.

3.2 The Component model

The Ext Component model is a centralized model that provides many of the essential Component-related tasks, which include a set of rules dictating how the Component instantiates, renders, and is destroyed, known as the Component lifecycle.

All UI widgets are subclasses of `Ext.Component`, which means that all of the widgets conform to the rules dictated by the model. Figure 3.6 partially depicts how many items subclass `Component`, directly or indirectly.

Knowing how each UI widget is going to behave introduces stability and predictability into the framework, which I enjoy. The Component model also supports direct instantiation of classes or deferred instantiation, known as XTypes. Knowing which to use when can enhance the responsiveness of your application.

3.2.1 XTypes and Component Manager

Ext 2.0 introduced a radical new concept known as an XType, which allows for lazy instantiation of Components, which can speed up complex user interfaces and can clean up our code quite a bit.

In short, an XType is nothing more than a plain JavaScript object, which generally contains an `xtype` property with a string value denoting which class the XType is for. Here's a quick example of an XType in action:

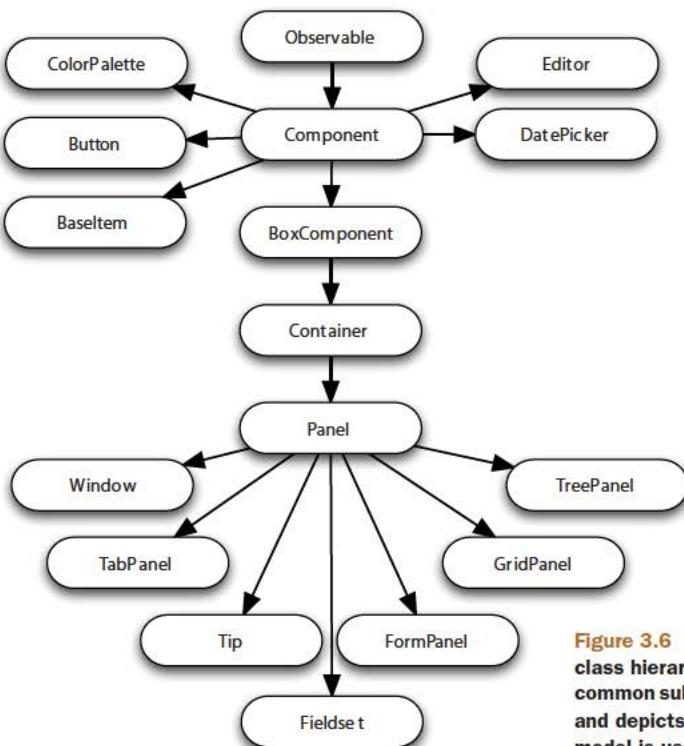


Figure 3.6 This illustration of the Ext class hierarchy focuses on some of the common subclasses of `Ext.Component` and depicts how widely the Component model is used in the framework.

```
var myPanel = {
    xtype     : 'panel',
    height    : 100,
    width    : 100,
    html      : 'Hello!'
};
```

In this configuration object, `myPanel` is an XType configuration object that would be used to configure an `Ext.Panel` widget. This works because just about every widget is registered to the `Ext.ComponentMgr` class with a unique string key and a reference to that class, which is then referred to as an XType. At the tail end of each Ext UI widget class, you'll find the registration of that widget in the `Ext.ComponentMgr`.

Registration of a Component is simple:

```
Ext.reg ('myCustomComponent', myApp.customClass);
```

The act of registering a Component to the `ComponentMgr` appends or replaces the new Component to the internal reference map of the `ComponentMgr` singleton. Once registration is complete, you can specify your custom Component as an XType:

```
new Ext.Panel({
    ...
    items : {
        xtype : 'myCustomComponent',
        ...
    }
});
```

When a visual Component, which can contain children, is initialized, it looks to see if it has `this.items` and will inspect `this.items` for XType configuration objects. If any are found, it will attempt to create an instance of that Component using `ComponentMgr.create`. If the `xtype` property isn't defined in the configuration object, the visual Component will use its `defaultType` property when calling `ComponentMgr.create`.

I realize that this may sound a tad confusing at first. I think you can better understand this concept if we demonstrate it. To do this, we'll create a window with an accordion layout that includes two children, one of which won't contain an `xtype` property. First, let's create our configuration objects for two of the children:

```
var panel1 = {
    xtype : 'panel',
    title : 'Plain Panel',
    html  : 'Panel with an xtype specified'
};

var panel2 = {
    title : 'Plain Panel 2',
    html  : 'Panel with <b>no</b> xtype specified'
};
```

Notice that `panel1` has an explicit `xtype` value of '`panel`', which in turn will be used to create an instance of `Ext.Panel`. Objects `panel1` and `panel2` are similar but have two distinct differences. Object `panel1` has an `xtype` specified, whereas `panel2` doesn't. Next, we'll create our window, which will use these xtypes:

```

new Ext.Window({
    width      : 200,
    height     : 150,
    title      : 'Accordion window',
    layout     : 'accordion',
    border     : false,
    layoutConfig : {
        animate : true
    },
    items : [
        panel1,
        panel2
    ]
}).show();

```

In our new instantiation of `Ext.Window`, we pass `items`, which are an array of references to the two configuration objects we created earlier. The rendered window should appear as illustrated in figure 3.7. Clicking a collapsed panel will expand and collapse any other expanded panels, and clicking an expanded panel will collapse it.

One of the lesser-known advantages of using XTypes is developing somewhat cleaner code. Because you can use plain object notation, you can specify all of your XType child items inline, resulting in cleaner and more streamlined code. Here is the previous example reformatted to include all of its children inline:

```

new Ext.Window({
    width      : 200,
    height     : 150,
    title      : 'Accordion window',
    layout     : 'accordion',
    border     : false,
    layoutConfig : {
        animate : true
    },
    items : [
        {
            xtype : 'panel',
            title : 'Plain Panel',
            html  : 'Panel with an xtype specified'
        },
        {
            title : 'Plain Panel 2',
            html  : 'Panel with <b>no</b> xtype specified'
        }
    ]
}).show();

```

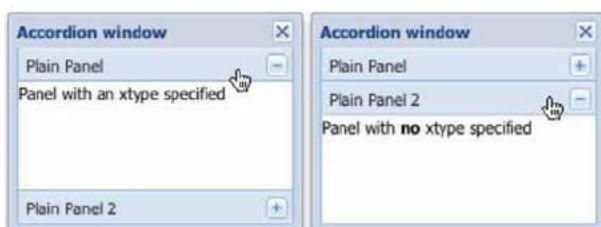


Figure 3.7 The results of our XType exercise: an `Ext Window`, which has two child panels derived from XType configuration objects

As you can see, we've included all of the child configuration items inline with the Window configuration object. The performance enhancements with using XTypes can't be seen with such a simple example. The biggest XType-based performance gains come in bigger applications, where there are a rather large number of Components to be instantiated.

Components also contain another performance-enhancing feature, lazy rendering. This means a Component is rendered only when necessary.

3.2.2 Component rendering

The Ext.Component class supports both direct and lazy (on-demand) render models. Direct rendering can happen when a subclass of Component is instantiated with either the renderTo or applyTo attribute, where renderTo points to a reference from which the Component renders itself and applyTo references an element that has HTML that's structured in such a way that allows the Component to create its own child elements based on the referenced HTML. You'd typically use these parameters when you wanted a Component to be rendered upon instantiation, for instance:

```
var myPanel = new Ext.Panel({
    renderTo : document.body,
    height   : 50,
    width    : 150,
    title    : 'Lazy rendered Panel',
    frame    : true
});
```

The result of this code would be the immediate render of the Ext.Panel, which sometimes is favorable and other times not. The times where it's not favorable can be when you want to *defer* rendering to another time in code execution or the Component is a child of another.

If you want to defer the rendering of the Component, omit the renderTo and applyTo attributes and call the Components render method when you (or your code) deem it necessary:

```
var myPanel = new Ext.Panel({
    height : 50,
    width  : 150,
    title  : 'Lazy rendered Panel',
    frame  : true
});
// ... some business logic...
myPanel.render(document.body);
```

In this example, you instantiate an instance of Ext.Panel and create a reference to it, myPanel. After some hypothetic application logic, you call myPanel.render and pass a reference to document.body, which renders the panel to the document body.

You could also pass an ID of an element to the render method:

```
myPanel.render('someDivId');
```

When passing an element ID to the render method, Component will use that ID with Ext.get to manage that element, which gets stored in its local el property. If this rings a bell, you may recall the conversation we had in the last chapter, when we were discussing Ext.Element, where you learned that you can access a widget's el property or use its *accessor* method, getEl, to get obtain the reference.

There's one major exception to this rule, however. You *never* specify applyTo or renderTo when the Component is a child of another. Components that *contain* other Components have a parent-child relationship, which is known as the Container model. If a Component is a child of another Component, it's specified in the items attribute of the configuration object, and its parent will manage the call to its render method when required. This is known as lazy or deferred rendering.

We'll investigate containers later in this chapter, where you'll learn more about the parent-child relationship Components can have. But first, you need to understand the component lifecycle, which details how Components are created, rendered, and eventually destroyed. Learning how each phase works will better prepare you for building robust and dynamic interfaces and can assist in troubleshooting issues.

3.3 The Component lifecycle

Ext Components, like everything in the real world, have a lifecycle where they're created, used, and destroyed. This lifecycle is broken up into three major phases: initialization, render, and destruction, as diagrammed in figure 3.8.

To better utilize the framework, you must understand in finer detail how the lifecycle works. This is especially important if you'll be building extensions, plug-ins, or composite Components. Quite a few steps take place at each phase of the lifecycle, which is controlled by the base class, Ext.Component.

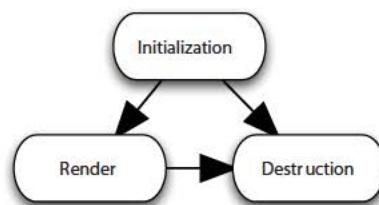


Figure 3.8 The Ext Component lifecycle always starts with initialization and always ends with destruction. The Component need not enter the render phase to be destroyed.

3.3.1 Initialization

The initialization phase is when a Component is born. All of the necessary configuration settings, event registration, and pre-render processes take place in this phase, as illustrated in figure 3.9.

Let's explore each step of the initialization phase:

- 1 *The configuration is applied*—When instantiating an instance of a Component, you pass a configuration object, which contains all of the necessary parameters and references to allow the Component to do what it's designed to do. This is done within the first few lines of the Ext.Component base class.
- 2 *Registration of the base Component events*—Per the Component model, each subclass of Ext.Component has, by default, a set of core events that are fired from the base class. These are fired before and after some behaviors occur: enable/

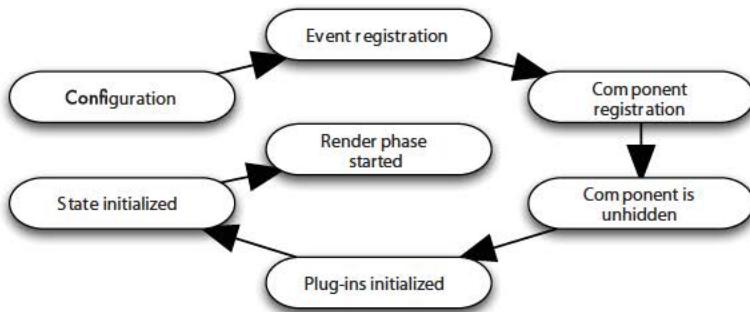


Figure 3.9 The initialization phase of the Component lifecycle executes important steps such as event and Component registration as well as the calling of the `initComponent` method. It's important to remember that a Component can be instantiated but may not be rendered.

disable, show, hide, render, destroy, state restore, state save. The before events are fired and tested for a successful return of a registered event handler and will cancel the behavior before any real action has taken place. For instance, when `myPanel.show` is called, it fires the `beforeshow` event, which will execute any methods registered for that event. If the `beforeshow` event handler returns `false`, `myPanel` doesn't show.

- 3 *ComponentMgr registration*—Each component that's instantiated is registered with the `ComponentMgr` class with a unique Ext-generated string ID. You can choose to override the Ext-generated ID by passing an `id` parameter in the configuration object passed to a constructor. The main caveat is that if a registration request occurs with a non-unique registration ID, the newest registration will override the previous one. Be careful to use unique IDs if you plan to use your own ID scheme.
- 4 *initComponent is executed*—The `initComponent` method is where a lot of work occurs for subclasses of `Component`, like registration of subclass-specific events, references to data stores, and creation of child Components. `initComponent` is used as a supplement to the constructor and is used as the main point to extending `Component` or any subclass thereof. We'll elaborate on extending with `initComponent` later on.
- 5 *Plug-ins are initialized*—If plug-ins are passed in the configuration object to the constructor, their `init` method is called, with the parent Component passed as a reference. It's important to remember that the plug-ins are called upon in the order in which they're referenced.
- 6 *State is initialized*—If the Component is state aware, it will register its state with the global `StateManager` class. Many Ext widgets are state aware.
- 7 *Component is rendered*—If the `renderTo` or `applyTo` parameter is passed into the constructor, the render phase begins at this time; otherwise, the Component then lies dormant, awaiting its `render` method to be called.

This phase of a Component's life is usually the fastest because all of the work is done in JavaScript. It's particularly important to remember that the Component doesn't have to be rendered to be destroyed.

3.3.2 Render

The render phase is the one where you get visual feedback that a Component has been successfully initialized. If the initialization phase fails for whatever reason, the Component may not render correctly or at all. For complex Components, this is where a lot of CPU cycles get eaten up, where the browser is required to paint the screen and computations take place to allow all of the items for the Component to be properly laid out and sized. Figure 3.10 illustrates the steps of the render phase.

If `renderTo` or `applyTo` isn't specified, a call to the `render` method must be made, which triggers this phase. If the Component is not a child of another Ext Component, your code must call the `render` method, passing a reference of the DOM element:

```
someComponent.render('someDivId');
```

If the Component is a child of another Component, its `render` method will be called by the parent Component. Let's explore the different steps of the render phase:

- 1 *beforeRender is fired*—The Component fires the `beforeRender` event and checks the return of any of the registered event handlers. If a registered event handler returns `false`, the Component halts the rendering behavior. Recall that step 2 of the initialization phase registers core events for subclasses of `Component` and that “before” events can halt execution behaviors.
- 2 *The Container is set*—A Component needs a place to live, and that place is known as its Container. If you specify a `renderTo` reference to an element, the Component adds a single child `div` element to the referenced element, known as its Container, and renders the Component inside that newly appended child. If an `applyTo` element is specified, the element referenced in the `applyTo`

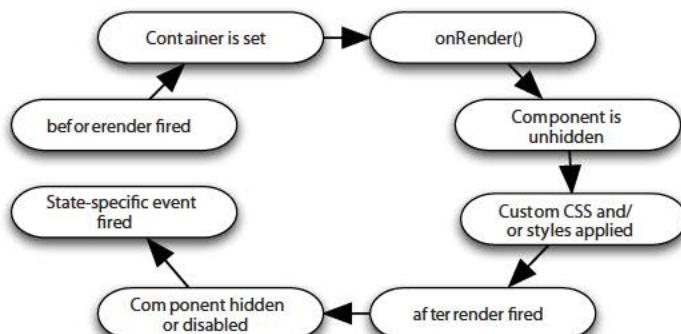


Figure 3.10 The render phase of the a Component's life can utilize a lot of CPU because it requires elements to be added to the DOM and calculations to be performed to properly size and manage them.

parameter becomes the Component's Container, and the Component appends only those items to the referenced element that are required to render it. The DOM element referenced in `applyTo` will then be fully managed by the Component. You generally pass neither when the Component is a child of another Component, in which the container is the parent Component. It's important to note that you should pass only `renderTo` or `applyTo`, not both. We'll explore `renderTo` and `applyTo` later on, when you learn more about widgets.

- 3 *onRender is executed*—This is a crucial step for subclasses of Component, where all of the DOM elements are inserted to get the Component rendered and painted onscreen. Each subclass is expected to call its superclass `.onRender` first when extending `Ext.Component` or any subclass thereafter, which ensures that the `Ext.Component` base class can insert the core DOM elements needed to render a Component.
- 4 *The Component is unhidden*—Many Components are rendered hidden using the default Ext CSS class, like '`x-hidden`'. If the `autoShow` property is set, any Ext CSS classes that are used for hiding Components are removed. It's important to note that this step doesn't fire the `show` event, so any listeners for that event won't be fired.
- 5 *Custom CSS classes or styles are applied*—Custom CSS classes and styles can be specified upon Component instantiation by means of the `cls` and `style` parameters. If these parameters are set, they're applied to the Container for the Component. It's suggested that you use `cls` instead of `style`, because CSS inheritance rules can be applied to the Component's children.
- 6 *The render event is fired*—At this point, all necessary elements have been injected into the DOM and styles applied. The `render` event is fired, triggering any registered event handlers for this event.
- 7 *afterRender is executed*—The `afterRender` event is a crucial post-render method that's automatically called by the `render` method within the Component base class and can be used to set sizes for the Container or perform any other post-render functions. All subclasses of Component are expected to call their superclass `.afterRender` method.
- 8 *The Component is hidden and/or disabled*—If either `hidden` or `disabled` is specified as true in the configuration object, the `hide` or `disable` method is called, which fires its respective `before<action>` event, which is cancelable. If both are true, and the `before<action>` registered event handlers don't return `false`, the Component is both hidden and disabled.
- 9 *State-specific events are fired*—If the Component is state aware, it will initialize its state-specific events with its `Observable` and register the `this.saveEvent` internal method as the handler for each of those state events.
- 10 Once the render phase is complete, unless the Component is disabled or hidden, it's ready for user interaction. It stays alive until its `destroy` method is called, in which it then starts its destruction phase.

The render phase is generally where a Component spends most of its life until it meets its demise with the destruction phase.

3.3.3 Destruction

As in real life, the death of a Component is a crucial phase in its life. Destruction of a Component performs critical tasks, such as removing itself and any children from the DOM tree, deregistration of the Component from ComponentMgr, and deregistration of event listeners, as depicted in figure 3.11.

The Component's `destroy` method could be called by a parent Container or by your code. Here are the steps in this final phase of a Component's life:

- 1 *beforedestroy is fired*—This, like many before<action> events, is a cancelable event, preventing the Component's destruction if its event handler returns `false`.
- 2 *beforeDestroy is called*—This method is first to be called within the Component's `destroy` method and is the perfect opportunity to remove any non-Component items, such as toolbars or buttons. Any subclass of Component is expected to call its superclass `.beforeDestroy`.
- 3 *Element and Element listeners are purged*—If a Component has been rendered, any handlers registered to its Element are removed and the Element is removed from the DOM.
- 4 *onDestroy is called*—Although the Component class itself doesn't perform any actions within the `onDestroy` method, subclasses are expected to use this to perform any post-destruction actions, such as removal of data stores. The Container class, which subclasses Component indirectly, manages the destruction of all registered children by the `onDestroy` method, alleviating the end developer of this task.
- 5 *Component is unregistered from ComponentMgr*—The reference for this Component in the ComponentMgr class is removed.

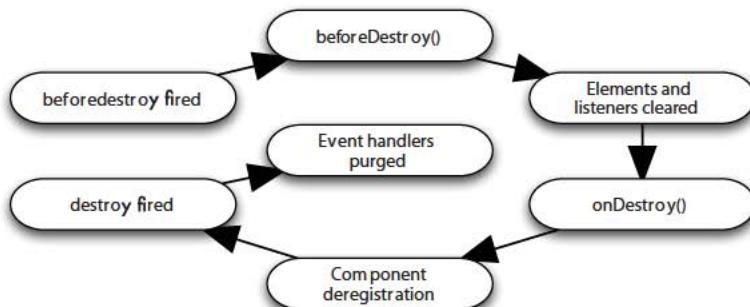


Figure 3.11 The destruction portion of a Component's life is equally as important as its initialization because event listeners and DOM elements must be deregistered and removed, reducing overall memory usage.

- 6 *The destroy event is fired*—Any registered event handlers are triggered by this event, which signals that the Component is no longer in the DOM.
- 7 *Component's event handlers are purged*—All event handlers are deregistered from the Component.

And there you have it, an in-depth look at the Component lifecycle, which is one of the features of the Ext framework that makes it so powerful and successful.

Be sure to not dismiss the destruction portion of a Component's lifecycle if you plan on developing your own custom Components. Many developers have gotten into trouble when they've ignored this crucial step and have code that has left artifacts such as data Stores that continuously poll web servers; or event listeners that are expecting an Element to be in the DOM were not cleaned properly and cause exceptions and the halt of execution of a crucial branch of logic.

Next, we'll look at the Container class, which is a subclass of Component and gives Components the ability to manage other Components in a parent-child relationship.

3.4 Containers

The Container model is a behind-the-curtains class that provides a foundation for Components to manage their child items, and is often overlooked by developers. This class provides a suite of utilities, which includes add, insert, and remove methods along with some child query, bubble, and cascade utility methods. These methods are used by most of the subclasses, including Panel, Viewport, and Window.

In order for you to learn how these tools work, we need to build a Container with some child items for us to use. The following listing is rather long and involved, but stay with me on this. The reward is just around the corner.

Listing 3.1 Building our first Container

```
var panel1 = {  
    html : 'I am Panel1',  
    id   : 'panel1',  
    frame: true,  
    height: 100  
};  
  
var panel2 = {  
    html : '<b>I am Panel2</b>',  
    id   : 'panel2',  
    frame: true  
};  
  
var myWin = new Ext.Window({  
    id     : 'myWin',  
    height: 400,  
    width  : 400,  
    items  : [  
        panel1,  
        panel2  
    ]  
});  
// myWin.show();
```





Figure 3.12 The rendered Container UI from listing 3.1

Take a gander at listing 3.1. The first thing you do is create two vanilla panels ①, and then you create myWin ②, an instance of Ext.Window that *contains* the previously defined panels. The rendered UI should look like the one in figure 3.12.

We left some room at the bottom of myWin, which will come in handy when we add items. Each Container stores references to its children via an `items` property, which can be accessed via `someContainer.items` and is an instance of `Ext.util.MixedCollection`.

`MixedCollection` is a utility that allows the framework to store and index a mixed collection of data, which includes strings, arrays, and objects and provides a nice collection of handy utility methods. I like to think of it as the `Array` on steroids.

Now that we've rendered our Container, let's start to implement the addition of children to a container.

3.4.1 Learning to tame children

In the real world, learning to tame children can lead to frustration and many gray hairs, so we must learn to use the tools that are available to us. Mastering these utility methods will enable you to dynamically update your UI, which is in the spirit of Ajax web pages.

Adding Components is a simple task, in which we're provided two methods: `add` and `insert`. The `add` method only *appends* a child to the Container's hierarchy, whereas `insert` allows us to inject an item into the Container at a particular index.

Let's add to the Container that you created in listing 3.1. For this, we'll use our handy Firebug JavaScript console:

```
Ext.getCmp('myWin').add({  
    title : 'Appended Panel',  
    id    : 'addedPanel',  
    html  : 'Hello there!'  
});
```

Running the preceding code adds the item to the Container. Wait a cotton-picking second! Why didn't the new panel appear? Why does the Container still look like figure 3.1? It didn't show up because we didn't call the `doLayout` method for the Container. Let's see what happens when we call `doLayout`:

```
Ext.getCmp('myWin').doLayout();
```

Ah-ha! It showed up, but why? Well, the `doLayout` method forces the recalculation of the Container and its children and will render any unrendered children. The only reason you wouldn't need to call it is if the Container isn't rendered. We went down this path of pain so that you can learn the valuable lesson of calling `doLayout` when you add items to a Container at runtime.

Appending children is handy, but sometimes you need to be able to insert items at a specific index. Using the `insert` method and calling `doLayout` afterwards easily accomplishes this task:

```
Ext.getCmp('myWin').insert(1, {  
    title : 'Inserted Panel',  
    id    : 'insertedPanel',  
    html   : 'It is cool here!'  
});  
  
Ext.getCmp('myWin').doLayout();
```

You insert a new Panel at index 1, which is right under `Panel1`. Because you call the `doLayout` method immediately after you do an insertion, you'll see the newly inserted panel in the Window instantaneously. The changes should look like figure 3.13.

As you can see, adding and inserting child Components is a cinch. Removing items is just as easy; it requires two arguments, the first of which is a reference to the Component or the Component ID from which you want the child to be removed. The second parameter, however, specifies whether or not the `destroy` method should be called for that Component, which gives you incredible flexibility, allowing you to move Components from one Container to another if you so desire. Here's how you'd remove one of the child panels that you recently added using your handy Firebug console:

```
var panel = Ext.getCmp('addedPanel');  
Ext.getCmp('myWin').remove(panel);
```

After you execute this code, you'll notice that the panel immediately disappears. This is because you didn't specify the second parameter, which is by default true. You can override this default parameter by setting `autoDestroy` to false on a parent Container. Also, you don't need to call the parent's `doLayout` method, because the



Figure 3.13 The rendered results of our dynamically added and inserted child panels

removed Component's `destroy` method is called, initiating its destruction phase and deleting its DOM element.

If you wanted to move a child to a different Container, you'd specify `false` as the `remove`'s second parameter and then add or insert it into the parent, like this:

```
var panel = Ext.getCmp('insertedPanel');
Ext.getCmp('myWin').remove(panel, false);
Ext.getCmp('otherParent').add(panel);
Ext.getCmp('otherParent').doLayout();
```

The preceding code snippet assumes that you already have another parent Container instantiated with the ID of '`otherParent`'. You create a reference to our previously inserted panel and perform a nondestructive removal from its parent. Next, you add it to its new parent and call its `doLayout` method to perform the DOM-level move operation of the child's element into the new parent's content body element.

The utilities offered by the `Container` class extend beyond the addition and removal of child items. They provide you the ability to descend deep into the Container's hierarchy to search for child Components, which becomes useful if you want to gather a list of child items of a specific type or that meet special criteria and perform an operation on them.

3.4.2 Querying the Container hierarchy

Of all of the query utility methods, the easiest is `findByType`, which is used to descend into the Container hierarchy to find items of a specific XType and return a list of items that it finds. For instance, here's how to find all of the text input fields for a given Container:

```
var fields = Ext.getCmp('myForm').findByType('field');
```

Executing the preceding code against a Container with the Component ID of '`myForm`' will result in a list of all input fields at any level in its hierarchy. `findByType` leverages the Container's `findBy` method, which you can use as well. We're going to explore how `findBy` works. Please stay with me on this, because it may not make sense at first.

The `findBy` method accepts two parameters: a custom method that you use to test for your search criteria and the scope from which to call your custom method. For each of the custom Containers, your custom method gets called and is passed the reference of the child Component from which it's being called. If the custom search criteria are met, the custom method *needs to* return `true`, which instructs `findBy` to add that recently referenced Component to a list. Once all Components are exhausted, `findBy` returns the list, which contains any Components that met your criteria.

Okay, with that out of the way, let's explore this concept through code. For argument's sake, let's say you wanted to find all child items that are hidden. You could use `findBy` in the following way to do so:

```
var findHidden = function(comp) {
    if (! comp.isVisible()) {
        return true;
```

```

        }
    }
var panels = Ext.getCmp('myContainer').findBy(findHidden);

```

In this rather simplistic `findHidden` query method, you're testing if the Component is *not* visible. If the Component's `isVisible` method returns anything but true, your `findHidden` method returns true. You then call `findBy` on the Container with the ID of 'myContainer' and pass it your custom `findHidden` method, with the results being stored in the panel's reference.

By now, you have the core knowledge necessary to manage child items. Let's shift focus to flexing some Ext-UI muscle by exploring some of the commonly used subclasses of Containers. You'll see how we can use Ext to create a UI using all of the browser's available viewing space.

3.4.3 **The Viewport Container**

The `Viewport` class is the foundation from which all web applications that depend solely on Ext are built by managing 100 percent of the browser's—you guessed it—viewport or display area. Weighing in at a tad over 20 lines, this class is extremely lightweight and efficient. Because it's a direct subclass of the `Container` class, all of the child management and layout usage is available to you. To leverage the `viewport`, you can use the following example code:

```

new Ext.Viewport({
    layout : 'border',
    items  : [
        {
            height : 75,
            region : 'north',
            title  : 'Does Santa live here?'
        },
        {
            width  : 150,
            region : 'west',
            title  : 'The west region rules'
        },
        {
            region : 'center',
            title  : 'No, this region rules!'
        }
    ]
});

```

The rendered `Viewport` from the code utilizes the entire browser's viewport and displays three panels organized by the border layout. If you resize the browser window, you'll notice that the center panel is resized automatically, which demonstrates how the `Viewport` listens and responds to the browser's `window resize` event (see figure 3.14).

The `Viewport` class provides the foundation for all Ext-based applications that leverage the framework as a complete web-based UI solution for their RIAs.

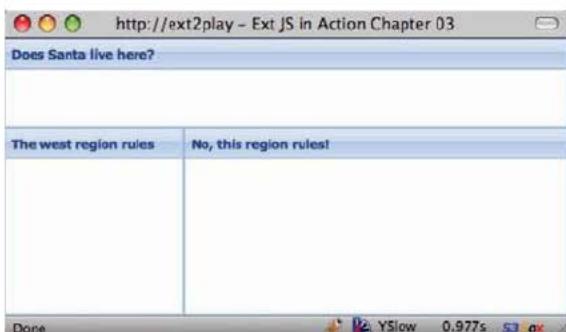


Figure 3.14 Our first Viewport, which takes up 100 percent of the browser's available viewing space

Many developers run into a brick wall when they attempt to create more than one Viewport in a fully managed Ext JS page to display more than one screen. To get around this, you can use the card layout with the viewport and flip through different application screens, which are resized to fit the viewport. We'll dive into layouts in chapter 5, where you'll get to understand key terms like *fit* and *flip* in the context of layouts.

We've covered quite a few important core topics, which help you manage child items in a Container. You also learned how to use the Viewport to help manage all of the browser's viewing space to lay out Ext UI widgets.

3.5 Summary

In this chapter we took a deep look at three fundamental areas of Ext JS. In doing so, you learned about managing the DOM level, where you exercised the registration of event listeners for DOM elements and learned how to stop them from bubbling up the DOM hierarchy. We also glanced at Component-level events and showed how to register an event and fire that event.

We took a real in-depth look at the Component model, which gives the Ext framework a unified method of managing instances of Components. The Component lifecycle is one of the most important concepts for the UI portion of the framework, which is why we covered it before we went too deep into learning about the many widgets.

Last, we explored the world of Containers and showed how they're used to manage child Components. In doing so, you also learned about the Viewport class and how it's the foundation for web applications that are based entirely on Ext JS.

You now have the foundation that will help propel you forward as you start to exercise the framework's UI machinery. Next, we'll explore the Panel, which is the most commonly used UI widget to display content.

Part 2

Ext JS Components

At this point, you've gained core knowledge that's vital to leveraging the framework properly. In this part, you'll begin the exploration of the Ext JS Components that are not driven by data models and take an in-depth walk through the various layout managers.

We kick off this part with chapter 4, where you learn about Containers, leveraging what you learned from chapter 3. Chapter 5 is all about Layouts and how to use them effectively. We close out this part with a walk through the FormPanel and various input items in chapter 6.

By the end of this part, you'll have a solid understanding of many of the widgets and layout managers that Ext JS has to offer.

A place for Components



This chapter covers

- Exploring the Panel
- Implementing the many Panel content areas
- Displaying an Ext.Window
- Using Ext.MessageBox
- Learning about and creating TabPanels

When developers start to experiment or build applications with Ext, they often start by copying examples from the downloadable SDK. Although this approach is good for learning how a particular layout was accomplished, it falls short in explaining how the stuff works, which leads to those throbbing forehead arteries. In this chapter, I'll explain some of the core topics, which are some of the building blocks to developing a successful UI deployment.

Here we'll cover Containers, which provide the management of child items and are one of the most important concepts in the Ext framework. We'll also dive into how the Panel works and explore the areas where it can display content and UI widgets. We'll then explore Windows and the MessageBox, which float above all other content on the page. Toward the end, we'll dive into using TabPanels and explore some of the usability issues that may occur when working with this widget.

Upon completion of this chapter, you'll have the ability to manage the full CRUD (create, read, update, and delete) lifecycle for Containers and their child items, which you'll depend on as you develop your applications.

4.1 The Panel

The Panel, a direct descendant of Container, is considered another workhorse of the framework because it's what many developers use to present UI widgets. A fully loaded panel is divided into six areas for content, as shown in figure 4.1. Recall that Panel is also a descendant of Component, which means that it follows the Component lifecycle. Moving forward, I'll use the term *Container* to describe any descendent of Container. This is because I want to reinforce the notion that the UI widget in context is a descendant of Container.

The Panel's title bar is a busy place that offers both visual and interactive content for the end user. As in Microsoft Windows, you can place an icon at the top left of the Panel, offering your users a visual queue as to what type of Panel they're seeing. In addition to the icon, you can display a title on the Panel.

On the right-most area of the title bar is a section for tools, which is where miniature icons can be displayed that will invoke a handler when clicked. Ext provides many icons for tools, which include many common user-related functions like help, print, and save. To view all of the available tools, visit the Panel API.

Of the six content areas, the Panel body is arguably the most important, which is where the main content or child items are housed. As dictated by the Container class, a layout must be specified upon instantiation. If a layout isn't specified, the ContainerLayout is used by default. One important attribute about layouts is that they can't be swapped for another layout dynamically.

Let's build a complex panel with top and bottom Toolbars, with two Buttons each.

4.1.1 Building a complex Panel

Because the Toolbar will have Buttons, you need a method to be called when they're clicked:

```
var myBtnHandler = function(btn) {
    Ext.MessageBox.alert('You Clicked', btn.text);
}
```



Figure 4.1 An example of a fully loaded Panel, which has a title bar with an icon and tools, top and bottom Toolbars, and a button bar on the bottom

This method will be called when a Button on any Toolbar is clicked. The Toolbar Buttons will call handlers, passing themselves as a reference, called `btn`. Next, let's define your toolbars; see the following listing.

Listing 4.1 Building Toolbars for use in a Panel

```

var myBtnHandler = function(btn) {
    Ext.MessageBox.alert('You Clicked', btn.text);
}

var fileBtn = new Ext.Button({
    text      : 'File',
    handler   : myBtnHandler
});

var editBtn = new Ext.Button({
    text      : 'Edit',
    handler   : myBtnHandler
});

var tbFill = new Ext.Toolbar.Fill();

var myTopToolbar = new Ext.Toolbar({
    items : [
        fileBtn,
        tbFill,
        editBtn
    ]
});

var myBottomToolbar = [
    {
        text      : 'Save',
        handler   : myBtnHandler
    },
    '-',
    {
        text      : 'Cancel',
        handler   : myBtnHandler
    },
    '->',
    '<b>Items open: 1</b>',
];

```

1 Button click handler method

2 File Button

3 Edit Button

4 “Greedy” Toolbar fill

5 Top Toolbar instantiation

6 Bottom Toolbar array configuration

In the preceding code example, you do quite a lot and display two different ways of defining a Toolbar and its child Components. First, you define `myBtnHandler` ①. By default, each Button's handler is called with two arguments, the Button itself and the browser event wrapped in an `Ext.Event` object. You use the passed Button reference (`btn`) and pass that text to `Ext.MessageBox.alert` to provide the visual confirmation that a Button was clicked.

Next, you instantiate the File ② and Edit ③ Buttons and the “greedy” toolbar spacer ④, which will push all toolbar items after it to the right. You assign `myTopToolbar` to a new instance of `Ext.Toolbar` ⑤, referencing the previously created Buttons and spacer as elements in the new toolbar's `items` array.



Figure 4.2 The rendered results of listing 4.1, where you create a complex collapsible Panel with top and bottom Toolbars that each contain Buttons

That was a lot of work for a relatively simple Toolbar. I had you do it this way to “feel the pain” of doing things the old way and to better appreciate how much time (and end developer code) the Ext shortcuts and XTypes save. The `myBottomToolbar` ⑥ reference is a simple array of objects and strings, which Ext translates into the appropriate objects when its parent container deems it necessary to do so. To get references to the top Toolbar, you can use `myPanel.getTopToolbar()` and, inversely, to get a reference to the bottom, `myPanel.getBottomToolbar()`. You’d use these two methods to add or remove items dynamically to or from either Toolbar. We’ll cover Toolbars in much greater detail later. Next, you’ll create your Panel body:

```
var myPanel = new Ext.Panel({
    width      : 200,
    height     : 150,
    title      : 'Ext Panels rock!',
    collapsible: true,
    renderTo   : Ext.getBody(),
    tbar       : myTopToolbar,
    bbar       : myBottomToolbar,
    html       : 'My first Toolbar Panel!'
});
```

You’ve created Panels before, so just about everything here should look familiar except for the `tbar` and `bbar` properties, which reference the newly created Toolbars. Also, there’s a `collapsible` attribute; when `collapsible` is set to `true`, the Panel creates a toggle Button on the top right of the title bar. Rendered, the Panel should look like the one in figure 4.2. Remember, clicking any of the Toolbar Buttons will result in an `Ext.MessageBox` displaying the Button’s text, giving you visual confirmation that the click handler was called.

Toolbars are great places to put content, Buttons, or Menus that are outside the Panel body. There are two areas you still need to explore, Buttons and tools. To do this, you’ll add to the `myPanel` example in the next listing, but you’ll do it using the Ext shortcuts with XTypes inline with all of the other configuration options.

Listing 4.2 Adding Buttons and tools to your existing Panel

```
var myPanel = new Ext.Panel({
    ...
    buttons   : [
        {
            ...
        }
    ]
});
```

① Properties from previous example

② buttons array begins

```
        text      : 'Press me!',          ← 3 'Press me!' button
        handler   : myBtnHandler
    }
},
tools     : [
{
    id      : 'gear',
    handler : function(evt, toolEl, panel) {
        var toolClassNames = toolEl.dom.className.split(' ');
        var toolClass      = toolClassNames[1];
        var toolId         = toolClass.split('-')[2];

        Ext.MessageBox.alert('You Clicked', 'Tool ' + toolId);
    }
},
{
    id      : 'help',
    handler : function() {
        Ext.MessageBox.alert('You Clicked', 'The help tool');
    }
}
]
} );
```

4 tools array begins

5 'gear' tool and inline click handler

6 'help' tool and inline click handler

In listing 4.2, you added to the previous set of config options ① and included two shortcut arrays, one for buttons and the other for tools. Because you specified a buttons array ②, when the Panel renders, it will create a footer div, a new instance of Ext.Toolbar with a special CSS class x-panel-fbar, and render it to the newly created footer div. The ‘Press me!’ Button ③ will be rendered in the newly created footer Toolbar, and when clicked it will invoke your previously defined myBtnHandler method.

If you look at the `myBottomToolbar` shortcut array in listing 4.1 and the `buttons` shortcut array in listing 4.2, you'll see some similarities. This is because all of the Panel Toolbars (`tbar`, `bbar`, and `buttons`) can be defined using the same shortcut syntax because they will all get translated into instances of `Ext.Toolbar` and rendered to their appropriate position in the `Panel`.

You also specified a `tools` array **④** configuration object, which is somewhat different than the way you define the Toolbars. Here, to set the icon for the tool, you must specify the `id` of the tool, such as '`'gear'`' **⑤** or '`'help'`' **⑥**. For every tool that's specified in the array, an icon will be created in the `tools` `Panel` will assign a click event handler to each tool, which will invoke the handler specified in that tool's configuration object. The rendered version of the newly modified `myPanel` should look like the one in figure 4.3.

The preceding example is meant to display all of the items that can be utilized on a Panel, but it isn't the best example of elegant and efficient user interface design. Although it may be tempting to load up your Panels with Buttons and Toolbars, you must be careful not to overload a Panel with too much onscreen gadgetry, which could overwhelm your user and take up valuable screen real estate.



Figure 4.3 The rendered results from listing 4.2, which add a Button in the button bar as well as tools to the title bar

Now that you have some experience with the `Panel` class, let's look at one of its close descendants, the `Window`, which you can use to float content above everything else on the screen and to replace the traditionally lame browser-based pop-up.

4.2 Popping up Windows

The `Window` UI widget builds upon the `Panel`, providing you the ability to float UI Components above all of the other content on the page. With `Windows`, you can provide a modal dialog box, which masks the entire page, forcing the user to focus on the dialog box, and prevents any mouse-based interaction with anything else on the page. Figure 4.4 is a perfect example of how you can leverage this class to focus the user's attention and request input.

Working with the `Window` class is a lot like working with the `Panel` class, except you have to consider issues like whether you want to disable resizing or want the `Window` to be constrained within the boundaries of the browser's viewport. Let's look into how you can build a window. For this, you'll need a vanilla Ext Page with no widgets loaded, as shown in the following listing.

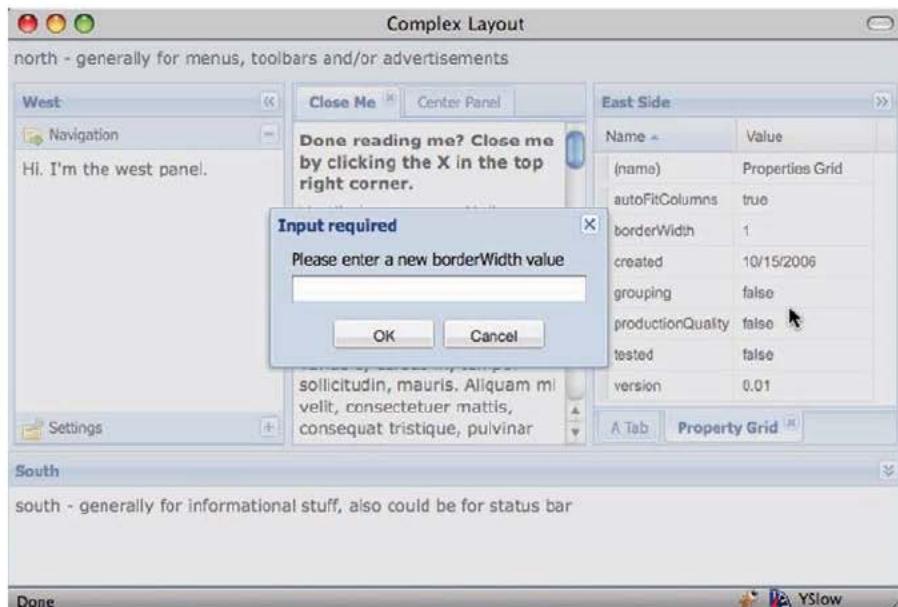


Figure 4.4 An Ext modal Window, which masks the browser's viewport

Listing 4.3 Building an animated Window

```

var win;
var newWindow = function(btn) {
    if (!win) {
        win = new Ext.Window({
            animateTarget : btn.el,
            html          : 'My first vanilla Window',
            closeAction   : 'hide',
            id            : 'myWin',
            height        : 200,
            width         : 300,
            constrain     : true
        });
    }
    win.show();
}

new Ext.Button({
    renderTo : Ext.getBody(),
    text     : 'Open my Window',
    style    : 'margin: 100px',
    handler  : newWindow
});

```

1 Handler creates new Window

2 Instantiate new Window

3 Prevent destruction on close

4 Constrain Window to browser's viewport

5 Create Button that launches Window

In listing 4.3, you do things a little differently in order to see the animation for your Window's close and hide method calls. The first thing you do is create a global variable, `win`, for which you'll reference the soon-to-be-created Window. You create a method, `newWindow`, ① that will be the handler for your future Button and is responsible for creating the new Window ②.

Let's take a moment to examine some of the configuration options for your Window. One of the ways you can instruct the Window to animate upon show and hide method calls is to specify an `animateEl` property, which is a reference to some element in the DOM or the element ID. If you don't specify the element in the configuration options, you can specify it when you call the `show` or `hide` methods, which take the exact same arguments. In this case, you're launching the Button's element. Another important configuration option is `closeAction` ③, which defaults to `close` and destroys the Window when the close tool is clicked. You don't want that in this instance, so you set it to `hide`, which instructs the close tool to call the `hide` method instead of `close`. You also set the `constrain` ④ parameter to `true`, which instructs the Window's drag-and-drop handlers to prevent the Window from being moved from outside the browser's viewport.

Last, you create a Button ⑤ that, when clicked, will call your `newWindow` method, resulting in the window animating from the Button's element. Clicking the (x) close tool will result in the window hiding. The rendered results will look like figure 4.5.

Because you don't destroy the Window when the close tool is clicked, you can show and hide the Window as many times as you wish, which is ideal for Windows that you plan to reuse. Whenever you deem that it's necessary to destroy the Window, you can call its `destroy` or `close` method. Now that you have experience in creating a reusable



Figure 4.5 The rendered results from listing 4.3, where you create a Window that animates from the Button's element when clicked

Window, you can begin exploring other configuration options to further alter the behavior of the Window.

4.2.1 Further Window configuration exploration

There are times when you need to make a Window behave to meet requirements of your application. In this section, you'll learn about some of the commonly used configuration options.

Sometimes you need to produce a Window that's modal and rigid. To do this, you need to set a few configuration options, as shown in the next listing.

Listing 4.4 Creating a rigid modal Window

```
var win = new Ext.Window({
    height      : 75,
    width       : 200,
    modal       : true,           ① Ensure page
    title       : 'This is one rigid window',
    html        : 'Try to move or resize me. I dare you.',
    plain       : true,
    border      : false,
    resizable   : false,
    draggable   : false,
    closable    : false,
    buttonAlign : 'center',
    buttons     : [
        {
            text      : 'I give up!',
            handler   : function() {
                win.close();
            }
        }
    ]
})
win.show();
```

② Prevent
resizing ③ Disable Window
movement

④ Prevent Window
closure

In listing 4.4, you create an extremely strict modal Window. To do this, you have to set quite a few options. The first of these, `modal ①`, instructs the Window to mask the rest of the page with a semitransparent div. Next, you set `resizable ②` to false, which



Figure 4.6 Our first strict modal Window rendered in the Ext SDK feed viewer example

prevents the Window from being resized via mouse actions. To prevent the Window from being moved around the page, you set `draggable` ③ to false. You want only a single center Button to close the Window, so `closable` ④ is set to false, which hides the close tool. Last, you set some cosmetic parameters, `plain`, `border`, and `buttonAlign`. Setting `plain` to true will make the content body background transparent. When coupled with setting the `border` to false, the Window appears to be one unified cell. Because you want to have the single Button centered, you specify the `buttonAlign` property as such. The rendered example should look like figure 4.6.

Other times you want to relax the restrictions on the Window. For instance, there are situations where you need a Window to be resizable, but not less than specific dimensions. For this, you allow `resizable` and specify `minWidth` and `minHeight` parameters. Unfortunately, there's no easy way to set boundaries as to how large a Window can grow.

Although there are many reasons for creating your own Windows, there are times when you need something quick and dirty, for instance, to display a message or prompt for user data. The `Window` class has a stepchild known as the `MessageBox` to fill this need.

4.2.2 Replacing alert and prompt with MessageBox

The `MessageBox` class is a reusable, yet versatile, singleton class that gives you the ability to replace some of the common browser-based message boxes such as `alert` and `prompt` with a simple method call. The most important thing to know about the `MessageBox` class is that it *does not* stop JavaScript execution like traditional alerts or prompts do, which I consider an advantage. While the user is digesting or entering information, your code can perform Ajax queries or even manipulate the UI. If specified, the `MessageBox` will execute a callback method when the Window is dismissed.

Before you start to use the MessageBox class, let's create a callback method. You'll need this later on.

```
var myCallback = function(btn, text) {
    console.info('You pressed ' + btn);
    if (text) {
        console.info('You entered : ' + text)
    }
}
```

Your `myCallback` method will leverage Firebug's `console` to echo out the Button that was pressed and the text you entered, if any. The `MessageBox` will pass only two parameters to the callback method: the Button ID and any entered text. Now that you have your callback, let's launch an alert message box:

```
var msg = 'Your document was saved successfully';
var title = 'Save status:';
Ext.MessageBox.alert(title, msg);
```

Here, you call the `MessageBox.alert` method, which will generate a Window, which will look like figure 4.7 (left) and will dismiss when OK is clicked. If you want `myCallback` to get executed upon dismissal, add it as the third parameter. Now that we've looked at alerts, let's see how you can request user input with the `MessageBox.prompt` method:

```
var msg = 'Please enter your email address.';
var title = 'Input Required'
Ext.MessageBox.prompt(title, msg, myCallback);
```

You call the `MessageBox.prompt` method, which you pass the reference of your callback method; it will look like figure 4.7 (right). Enter some text and click Cancel. In the Firebug console, you'll see the Button ID pressed and the text entered.

And there you have it, `MessageBox` alert and prompt at a glance. I find these handy, because I don't have to create my own singleton to provide these UI widgets. Remember them when you're looking to implement a `Window` class to meet a requirement.

I have to confess a little secret. The alert and prompt methods are actually shortcut methods for the much larger and highly configurable `MessageBox.show` method. Next up is an example of how you can use the `show` method to display an icon with a multiline `TextArea` input box.



Figure 4.7 The `MessageBox`'s alert (left) and prompt (right) modal dialog Windows

4.2.3 Advanced MessageBox techniques

The `MessageBox.show` method provides an interface to display the `MessageBox` using any combination of the 24 available options. Unlike the previously explored shortcut methods, `show` accepts the typical configuration object as a parameter. Let's display a multiline `TextArea` input box along with an icon:

```
Ext.Msg.show({
    title      : 'Input required',
    msg        : 'Please tell us a little about yourself',
    width      : 300,
    buttons    : Ext.MessageBox.OKCANCEL,
    multiline   : true,
    fn         : myCallback,
    icon       : Ext.MessageBox.INFO
});
```

When the preceding example is rendered, it will display a modal dialog box like the one in figure 4.8 (left). Next, let's see how to create an alert box that contains an icon and three Buttons.

```
Ext.Msg.show({
    title      : 'Hold on there cowboy!',
    msg        : 'Are you sure you want to reboot the internet?',
    width      : 300,
    buttons    : Ext.MessageBox.YESNOCANCEL,
    fn         : myCallback,
    icon       : Ext.MessageBox.ERROR
})
```

The preceding code example will display your tri-button modal alert dialog window, like the one in figure 4.8 (right).

Although everything in our two custom `MessageBox` examples should be self-explanatory, I think it's important to highlight two of the configuration options, which pass references to `MessageBox` public properties.

The `buttons` parameter is used as a guide for the singleton to know which Buttons to display. Although you pass a reference to an existing property, `Ext.MessageBox.OKCANCEL`, you can display no Buttons by setting `buttons` to an empty object, such as `{}`. Otherwise, you can customize which Buttons you want to display. To display Yes and Cancel Buttons, pass `{ yes : true, cancel : true }` and so on. The singleton



Figure 4.8 A multiline input box with an icon (left) and a tri-button icon alert box (right)

already has a set of predefined popular combinations, which are CANCEL, OK, OKCANCEL, YESNO, and YESNOCANCEL.

The icon parameter works in the same way as the button parameter, except it's a reference to a string. The MessageBox class has three predefined values: INFO, QUESTION, and WARNING. These are references to strings that are CSS classes. If you wish to display your own icon, create your own CSS class and pass the name of your custom CSS class as the icon property. Here's an example of a custom CSS class:

```
.icon-add {  
    background-image: url(/path/to/add.png) !important;  
}
```

Now that you have your feet wet with some advanced MessageBox techniques, we can explore how to leverage the MessageBox to display an animated dialog box, which you can use to offer the user live and updated information regarding a particular process.

4.2.4 Showing an animated wait MessageBox

When you need to stop a particular workflow, you must display some sort of modal message box, which can be as simple and *boring* as a modal dialog box with a "Please wait" message. I prefer to introduce some spice into the application and provide an animated "wait" dialog box. With the MessageBox class, you can create a seemingly effortless and infinitely looping progress bar:

```
Ext.MessageBox.wait("We're doing something...", 'Hold on...');
```

This will produce a wait box like the one shown in figure 4.9. If the syntax seems a little strange, it's because the first parameter is the message body text, with the second parameter being the title. It's exactly opposite of the alert or prompt calls. Let's say you want to display text in the body of the animating progress bar itself. You could pass a third parameter with a single text property, such as {text: 'loading your items'}. Figure 4.9 (right) also shows what it would be like if you added progress bar text to your dummy wait dialog box.

Although this may seem cool at first, it's not interactive because the text is static and you're not controlling the progress bar status. You can customize the wait dialog box by using the handy show method and passing in some parameters. Using this method, you now have the leeway to update the progress bar's advancement as you see fit. In order to create an auto-updating wait box, you need to create a rather involved loop (shown in the following listing), so please stay with me on this.



Figure 4.9 A simple animated MessageBox wait dialog where the ProgressBar is looping infinitely at a predetermined fixed interval (left) and a similar message box with text in the progress bar (right)

Listing 4.5 Building a dynamically updating ProgressBar

```
Ext.MessageBox.show({
    title      : 'Hold on there cowboy!',
    msg        : "We're doing something...",
    progressText : 'Initializing...',
    width      : 300,
    progress    : true,
    closable    : false
});
```

1 Show ProgressBar

```
var updateFn = function(num) {
    return function(){
        if(num == 6){
            Ext.MessageBox.updateProgress(100,
                'All Items saved!');
            Ext.MessageBox.hide.defer(1500,
                Ext.MessageBox);
        }
        else{
            var i = num/6;
            var pct = Math.round(100 * i);
            Ext.MessageBox.updateProgress(i,
                pct + '% completed');
        }
    };
};

for (var i = 1; i < 7; i++){
    setTimeout(updateFn(i), i * 500);
}
```

2 Update progress text

3 Update percentage and text

4 Defer MessageBox dismissal

5 Update progress if limit not met

6 Looping .5 second timeout

In listing 4.5, you show a MessageBox, with the progress option ① set to true, which will show your progress bar. Next, you define a rather involved updater function, aptly named updateFn ②, which is called at a predefined interval. In that function, if the number passed equals your limit of 6, you update the progress bar to 100 percent wide and show the completion text ③. You also defer the dismissal of the message box by one and a half seconds ④. Otherwise, you'll calculate a percentage completed and update the progress bar width and text accordingly ⑤. Last, you create a loop that calls setTimeout ⑥ six consecutive times, which delays your calls of updateFn by the iteration times one-half second. The results of this rather lengthy example will look like figure 4.10.



Figure 4.10 Your automatically updating wait MessageBox (left) with the final update (right) before automatic dismissal

With some effort you can dynamically update your users with a status of operations that are taking place before they can move further.

In this section, you learned how to create both flexible and extremely rigid windows to get the user's attention. We also explored a few different ways of using one of Ext's super singletons, the Ext MessageBox class. Let's now shift focus to the TabPanel class, which provides a means to allow a UI to contain many screens but display them only one at a time.

4.3 Components can live in tab panels too

The Ext.TabPanel class builds on Panel to create a robust tabbed interface, which gives the user the ability to select any screen or UI control associated with a particular tab. Tabs within the TabPanel can be unclosable, closable, disabled, and even hidden, as illustrated in figure 4.11.

Unlike other tab interfaces, the Ext.TabPanel supports only a top or bottom tab strip configuration. This is mainly because most modern browsers don't support CSS version 4.0, where vertical text is possible. Although configuring a TabPanel may seem straightforward by looking at the API, there are two options that if not understood could cause bleeping to occur in the office.

4.3.1 Remember these two options

It's amazing that just two of these options could cause developers pain and fill up the office expletive jars, providing free lunch or coffee for fellow team members. Exploring these may help keep those jars empty and your wallets fuller. Before you build your TabPanel, I think it's important to lay these out first, so you can get on to the fun!

One of the reasons that the CardLayout is so darn fast is because it makes use of a common technique called lazy or deferred rendering for its child Components. This is controlled by the deferredRender parameter, which is set to true by default. *Deferred render* means that only cards that get activated are rendered. It's fairly common for TabPanels to have multiple children that have complex UI controls, such as the one in figure 4.12, which can require a significant amount of CPU time to render. Deferring

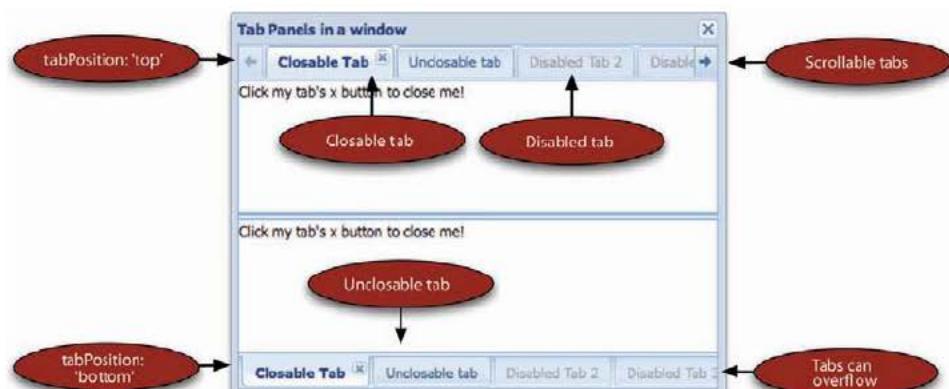


Figure 4.11 Exploring top- and bottom-positioned tabs

The screenshot shows a window titled "Apply for job: Ext Developer". It features a TabPanel with two tabs: "Personal Information" (selected) and "Education Details". Under "Personal Information", there are four input fields: "First Name", "Last Name", "Phone Number", and "Email". Below these are three more input fields: "College/University Name", "Address", and "City". At the bottom are "Save" and "Cancel" buttons.

Figure 4.12 A TabPanel with children that have complex layouts

the render of each child until it's activated accelerates the TabPanel's initial rendering and gives the user a better-responding widget.

There's one major disadvantage to allowing `deferredRender` to be true, and it has to do with the way form panels work. The form's `setValues` method doesn't apply values across any of the unrendered member fields, which means that if you plan on populating forms with tabs, be sure to set `deferredRender` to false; otherwise you might be adding to the jar!

Another configuration option that fellow developers often overlook is `layoutOnTabChange`, which forces a `doLayout` method call on child items when that tab is activated. This is important because in deeply nested layouts, sometimes the parent's resize event may not cascade down properly, forcing a recalculation on child items that are supposed to conform to the parent's content body. If your UI starts to look funky, like the one in figure 4.13, I suggest setting this configuration option to true, and the issue will be solved.

This screenshot is identical to Figure 4.12, but the "Education Details" tab is now active. The content for "Education Details" is displayed, while the "Personal Information" tab's content is hidden. The Save and Cancel buttons remain at the bottom.

Figure 4.13 A child Panel whose layout has not been properly recalculated after a parent's resize

I suggest setting `layoutOnTabChange` to `true` only when you have problems. The `doLayout` method forces calculations that in extremely nested layouts can require a considerable amount of CPU time, causing your web app to jitter or stutter. Now that we've covered some of the `TabPanel` basics, let's move on to build our first `TabPanel`.

4.3.2 Building our first `TabPanel`

The `TabPanel` is a direct descendant of `Panel` and makes clever use of the `CardLayout`. `TabPanel`'s main job is managing tabs in the tab strip. This is because child management is performed by the `Container` class and the layout management is performed by the `CardLayout`. Let's build out our first `TabPanel`, as shown in the following listing.

Listing 4.6 Exploring a `TabPanel`

```
var disabledTab = {
    title      : 'Disabled tab',
    id         : 'disabledTab',
    html       : 'Peekaboo!',
    disabled   : true,
    closable   : true
}

var closableTab = {
    title      : 'I am closable',
    html       : 'Please close when done reading.',
    closable   : true
}

var disabledTab = {
    title      : 'Disabled tab',
    id         : 'disabledTab',
    html       : 'Peekaboo!',
    disabled   : true,
    closable   : true
}

var tabPanel = new Ext.TabPanel({
    activeTab      : 0,
    id             : 'myTPanel',
    enableTabScroll : true,
    items          : [
        simpleTab,
        closableTab,
        disabledTab,
    ]
});

new Ext.Window({
    height : 300,
    width  : 400,
    layout  : 'fit',
    items   : tabPanel
}).show();
```

1 A simple, static tab

2 A simple, closable tab

3 A closable yet disabled tab

4 Our TabPanel

5 Container for our TabPanel

Although you could have defined all of the items in this code in a single large object, I thought it would be best to break it up so things are readily apparent. The first three variables define your TabPanel's children in generic object form, with the assumption that the defaultType (xType) for the TabPanel class is Panel. The first child is a simple and nonclosable tab ①. One thing to note here is that all tabs are nonclosable by default. This is why your second tab ② has closable set to true. Next, you have a closable and disabled tab.

You then go on to instantiate your TabPanel ③. You set the activeTab parameter to 0. You do this because you want the first tab to be activated after the TabPanel ④ is rendered. You can specify any index number in the TabPanel's item's mixed collection. Because the mixed collection is an array, the first item always starts with 0. You also set enableTabScroll to true, which instructs the TabPanel class to scroll your tab strip if the sum of the tab widths exceeds that of the viewable tab strip. Last, your TabPanel's items array has your three tabs specified.

Next, you create a Container for your TabPanel, an instance of Ext.Window ⑤. You specify a Fit layout for the Window and set the tabPanel reference as its single item. The rendered code should look like the TabPanel shown in figure 4.14.

Now that you have your first TabPanel rendered, you can start to have fun with it. You've probably closed the "I am closable" tab, which is okay. If you haven't done so, feel free to explore the rendered UI control and close out the only closable tab when you're comfortable doing so, which will leave only two tabs available, "My first tab" and "Disabled tab."



Figure 4.14 Your first TabPanel rendered inside a Window

4.3.3 Tab management methods you should know

Because the TabPanel class is a descendant of Container, all of the common child-management methods are available to utilize. These include add, remove, and insert. There are a few other methods, however, that you'll need to know in order to take full advantage of the TabPanel.

The first of these is setActiveTab, which activates a tab, as if the user had selected the item on the tab strip, and accepts either the index of the tab or the Component ID:

```
var tPanel = Ext.getCmp('myTPanel');

tPanel.add({
    title : 'New tab',
    id    : 'myNewTab'
});

tPanel.setActiveTab('myNewTab');
```

Executing the prior code will result in a new tab with the title of “New closable tab,” which gets activated automatically. Calling `setActiveTab` after an `add` operation is akin to calling `doLayout` on a generic container. You also have the capability to enable and disable tabs at runtime, but this requires a different approach than simply calling a method on the `TabPanel`.

The `TabPanel` doesn’t have enable or disable methods, so in order to enable or disable a child, you need to call those methods of the child items themselves. You can leverage listing 4.6 to enable our disabled tab.

```
Ext.getCmp('disabledTab').enable();
```

Yes, that’s all there is to it. The tab strip item (tab UI control) now reflects that the item is no longer disabled. This happens because the `TabPanel` subscribes to the child item’s—you guessed it—`enable` and `disable` events to manage the associated tab strip items.

In addition to enabling and disabling tabs, you can also hide them. To hide a tab, however, the `TabPanel` does have a utility method, `hideTabStripItem`. This method accepts a single parameter but three possible data values: the tab index number, the tab Component ID, or a reference to the `Component` instance itself. In your case, you’ll use the ID because that’s a known:

```
Ext.getCmp('myTPanel').hideTabStripItem('disabledTab');
```

The inverse of this is `unhideTabStripItem`:

```
Ext.getCmp('myTPanel').unhideTabStripItem('disabledTab');
```

There you have it, managing tab items. Although there are many advantages to using the `TabPanel` in your web application, we should explore some of the usability problems that you may encounter. After all, you need to keep that swear jar as empty as possible.

4.3.4 Caveats and drawbacks

Although the `TabPanel` opened new doors for UI control, it does have some limitations that we should explore. Two of these are related to the size of the tabs and the width of the bounding area for which the `TabPanel` is being displayed. If the sum of the widths of the tabs is greater than the viewport, the tabs can be pushed offscreen. This can happen because the tab widths are too large or the total number of tabs exceeds the allowable viewing space. When this issue occurs, the usability of the `TabPanel` is somewhat reduced.

To offer some relief of these shortcomings, the `TabPanel` can be configured to resize tabs automatically or even scroll them if they go beyond the viewport. Although these features help ease the problem, they don’t solve them.

In order for you to fully understand these issues, we should explore them further. Let’s start out with a `TabPanel` inside a `Viewport`, shown in the following listing.

Listing 4.7 Exploring scrollable tabs

```
Ext.QuickTips.init();
new Ext.Viewport({
    layout : 'fit',
    title  : 'Exercising scrollable tabs',
    items  : [
        {
            xtype      : 'tabpanel',
            activeTab : 0,
            id        : 'myTPanel',
            enableTabScroll : true,
            items      : [
                {
                    title : 'our first tab'
                }
            ]
        }
    );
(function (num) {
    for (var i = 1; i <= 30; i++) {
        var title = 'Long Title Tab #' + i;
        Ext.getCmp('myTPanel').add({
            title   : title,
            html    : 'Hi, I am tab #' + i,
            tabTip  : title,
            closable : true
        });
    }
}).defer(500);

```

① Ext Viewport with embedded TabPanel

② Deferred anonymous function execution

In listing 4.7, you create a viewport with your TabPanel ①, which contains a single child. Next, you create an anonymous function ② and defer its execution by half a second. You specify 30 as the number of dynamic tabs to create dynamically in the for loop. For each new tab that you create, you include the tab number in the tab title, html, and tabTip. The rendered code should look like the tab panel in figure 4.15.

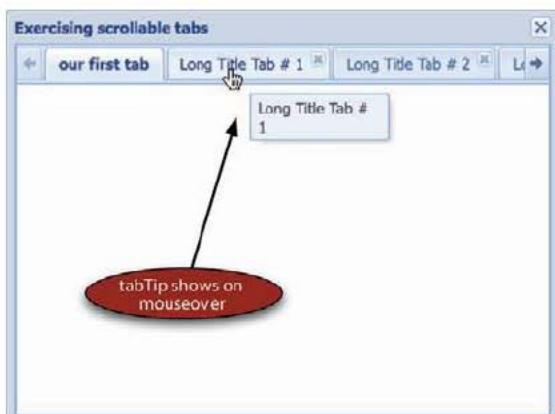


Figure 4.15 A TabPanel with a scrolling tab strip, which includes mouseover tooltips for the dynamic tabs

Now that you have your TabPanel rendered, scroll over to find “Long Title Tab # 14.” Took a while, huh? Even with an extra-wide display, the tabs will still scroll. One way to remedy this situation is to set a minimum tab width. Let’s modify our example by adding the following configuration parameters to the TabPanel XType configuration:

```
resizeTabs : true,  
minTabWidth : 75,
```

Refreshing the newly modified TabPanel in figure 4.16 (bottom) results in tabs that are either unusable or hard to use. Specifying resizeTabs as true instructs the TabPanel to reduce the width of a tab as much as it needs to in order to display the tabs without scrolling. Autosizing a tab works if the tab title doesn’t get truncated or hidden. This is where the diminishing usability of TabPanels becomes apparent. If the tab title isn’t completely visible, the user must activate each tab in order to find the correct one. Otherwise, if the tab tooltips are enabled, the user must mouseover each tab in order to locate the one they wish to activate. As you can see in figure 4.16, the tooltips can enhance the speed of the tab search but don’t remedy the issue completely.

No matter which route you choose for implementing the TabPanel, always keep in mind that too many tabs could lead to trouble by reducing usability or even reducing performance of the web application.

In exploring the TabPanel, you learned how to create tabs that could be static, controlled, disabled, or even hidden and to programmatically control them. You also learned of two of the configuration options, deferredRender and layoutOnTabChange, that could cause some of your hair to fall out. We exercised some of the common tab-management methods and discussed some of the caveats for using this UI control.

There you have it. You have now seen how easy it is to create a scrolling TabPanel. Always remember to enabling scrolling when the number of tabs can increase beyond the width of the TabPanel.

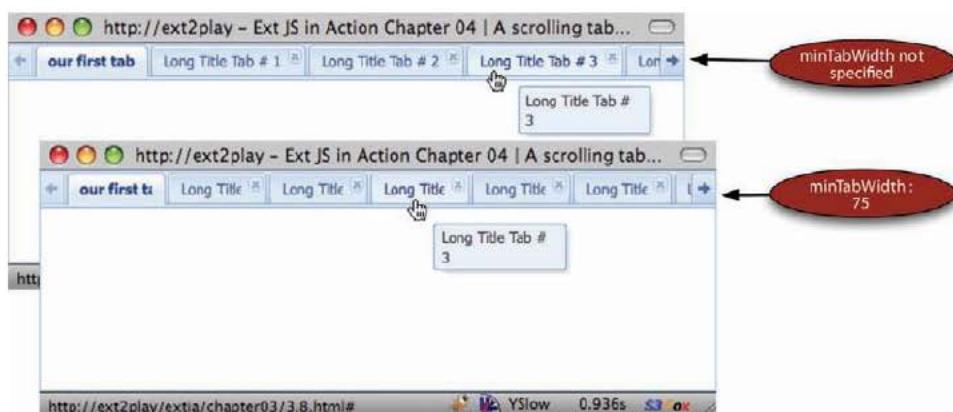


Figure 4.16 A TabPanel that has no minimum tab width (top) specified and a TabPanel (bottom) that has a minimum tab width of 75 specified

4.4 **Summary**

We covered a lot of material about the Swiss army knife of UI display widgets, the `Panel`, which is enough to make just about any developer's head spin. In exploring the `Panel` class, you saw how it provides a plethora of options to display user interactive content, including Toolbars, Buttons, title bar icons, and miniature tools.

You used the `Window` class as a general container and mastered the art of adding and removing children dynamically, providing you the ability to dynamically and drastically change an entire UI or a single widget or control.

In exercising the `Window` class and its cousin, the `MessageBox`, you learned how you could replace the generic alert and prompt dialog boxes to get the user's attention to display or request user input. You also had some fun fooling with the animated wait `MessageBox`.

Finally, we examined the `TabPanels`, showing how to dynamically manage tab items, as well as a few of the usability pitfalls that the UI control brings.

In the next chapter, we'll explore the many Ext Layout schemes, where you'll learn the common uses and pitfalls of these controls.



Organizing Components

This chapter covers

- Learning the various layout systems
- Exploring the `Layout` class inheritance model
- Exercising programmatic management of the `CardLayout`

When building an application, many developers struggle with how to organize their UI and which tools to use to get the job done. In this chapter, you'll gain the necessary experience to be able to make these decisions in a more educated manner. We'll explore all of the numerous layout models and identify some of the best practices and common issues that you'll encounter.

The layout management schemes are responsible for the visual organization of widgets onscreen. They include simple layout schemes such as Fit, where a single child item of a Container will be sized to fit the Container's body, or complex layouts such as a `BorderLayout`, which splits a Container's content body into five manageable slices, or regions.

When exploring some of the layouts, we'll hit upon examples that are verbose, and thus lengthy, and can serve as a great springboard or starting point for your layout endeavors. We'll start our journey with taking a look at the `ContainerLayout`, which is the nucleus of the entire layout hierarchy.

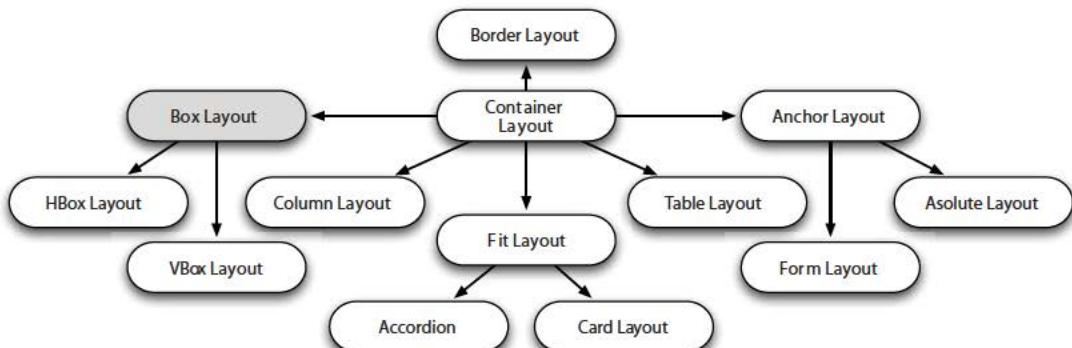


Figure 5.1 The layout class hierarchy, where layouts are subclasses of the ContainerLayout

5.1 The simple ContainerLayout

As you may recall, the ContainerLayout is the *default* layout for any instance of Container and places items on the screen, one on top of another. I like to think of it as the Lincoln Logs of the Ext layouts.

Though the ContainerLayout doesn't explicitly resize child items, a child's width may conform to the Container's content body if it isn't constrained. It also serves as the base class for all other layouts, providing much of the base functionality for the subclass layouts. Figure 5.1 illustrates the Ext.layout class hierarchy.

A ContainerLayout is the easiest to implement, requiring only that you add and remove child items. In order to see this, you need to set up a dynamic example, using quite a few components, as shown in the following listing.

Listing 5.1 Implementing the ContainerLayout

```

var childPnl1 = {
    frame : true,
    height : 50,
    html   : 'My First Child Panel',
    title  : 'First children are fun'
};

var childPnl2 = {
    width : 150,
    html   : 'Second child',
    title  : 'Second children have all the fun!'
};

var myWin = new Ext.Window({
    height      : 300,
    width       : 300,
    title       : 'A window with a container layout',
    autoScroll  : true,
    items       : [
        childPnl1,
        childPnl2
    ],
}
  
```

① First child item,
a Panel

② Third child item,
another Panel

③ Window with
two child items

④ Allow content
body to scroll

⑤ Child items are
referenced

```

tbar : [
    {
        text      : 'Add child',
        handler   : function() {
            var numItems = myWin.items.getCount() + 1;
            myWin.add({
                title      : 'Child number ' + numItems,
                height     : 60,
                frame      : true,
                collapsible: true,
                collapsed  : true,
                html       : 'Yay, another child!'
            });
            myWin.doLayout();
        }
    }
];
}
);

```

6 Toolbar with add child Button

In listing 5.1, you do quite a lot to exercise the ContainerLayout because I want you to be able to see how the items stack and don't resize.

The first thing you do is instantiate object references using XTypes for the two child items that will be managed by a Window: childPnl1 ① and childPnl2 ②. These two child items are static.

Next, you begin your myWin ③ reference, which is an instance of Ext.Window. You also set the autoScroll property ④ to true. This tells the Container to add the CSS attributes overflow-x and overflow-y to auto, which instructs the browser to show the scroll bars only when it needs to.

Notice that you set the child items ⑤ property to an array. The items property for any container can be an instance of an array used to list multiple children or an object reference for a single child. The Window contains a toolbar ⑥ that has a single Button that, when clicked, adds a dynamic item to the Window. The rendered Window should look like the one in figure 5.2.



Figure 5.2 The results of our first implementation of the ContainerLayout

Although the ContainerLayout provides little to manage the size of child items, it's not completely useless. It's lightweight relative to its subclasses, which makes it ideal if you want to display child items that have fixed dimensions. There are times, however, when you'll want to have the child items dynamically resize to fit the container's content body. This is where the AnchorLayout can be useful.

5.2 The AnchorLayout

The AnchorLayout is similar to the ContainerLayout, in that it stacks child items one on top of another, except it adds dynamic sizing into the mix using an anchor parameter specified on each child. This anchor parameter is used to calculate the size of the child item relative to the parent's content body size and is specified as a percentage, an offset, which is an integer. The anchor parameter is a string, using the following format:

```
anchor : "width, height" // or "width height"
```

In the following listing you take your first stab at implementing an anchor layout using percentages.

Listing 5.2 The AnchorLayout using percentages

```
var myWin = new Ext.Window({
    height      : 300,
    width       : 300,
    layout      : 'anchor',
    border      : false,
    anchorSize  : '400',
    items       : [
        {
            title  : 'Panel1',
            anchor : '100%, 25%',
            frame   : true
        },
        {
            title  : 'Panel2',
            anchor : '0, 50%',
            frame   : true
        },
        {
            title  : 'Panel3',
            anchor : '50%, 25%',
            frame   : true
        }
    ]
});  
myWin.show();
```

1 The parent container, myWin

2 layout set to 'anchor'

3 100% width, 25% of parent's height

4 100% width, 50% of parent's height

5 50% width, 25% of parent's height

In listing 5.2, you instantiate a myWin ①, an instance of Ext.Window, specifying the layout as 'anchor' ②. The first of the child items, Panel1, has its anchor parameters ③ specified as 100 percent of the parent's width and 25 percent of the parent's height. Panel2 has its anchor parameters ④ specified a little differently, where the width

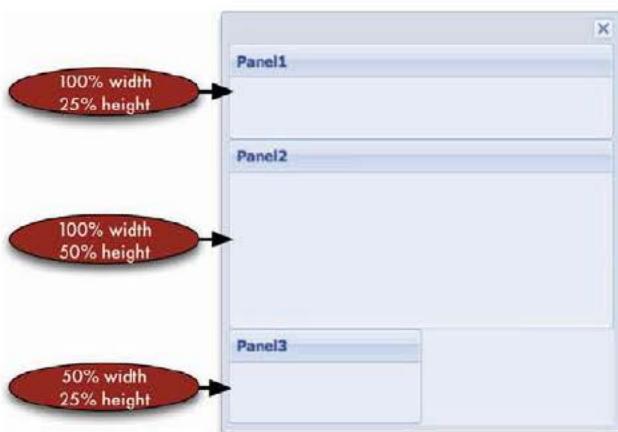


Figure 5.3 The rendered results of our first implementation of the `AnchorLayout`

parameter is 0, which is shorthand for 100 percent. You set `Panel2`'s height to 50 percent. `Panel3`'s anchor parameters ⑤ are set to 50 percent relative width and 25 percent relative height. The rendered item should look like figure 5.3.

Relative sizing with percentages is great, but you also have the option to specify an offset, which allows greater flexibility with the `Anchor` layout.

Offsets are calculated as the content body dimension plus the offset. In general, offsets are specified as negative numbers to keep the child item in view. Let's put on our algebra hats on for a second and remember that adding a negative integer is exactly the same as subtracting an absolute integer. Specifying a positive offset would make the child's dimensions greater than the content body's, requiring a scroll bar.

We'll explore offsets by using the previous example, modifying only the child item `XTypes` from listing 5.2:

```
items : [
  {
    title      : 'Panel1',
    anchor     : '-50, -150',
    frame      : true
  },
  {
    title      : 'Panel2',
    anchor     : '-10, -150',
    frame      : true
  }
]
```

The rendered `Panel` from the preceding layout modification should look like figure 5.4. We reduced the number of child items to two to more easily explain how offsets work and how they can cause you a lot of trouble.

It's important to dissect what's going on, which will require us to do a little math. Through inspecting the DOM with Firebug, I learned that the Window's content body is 285 pixels high and 288 pixels wide. Using simple math, we can determine what the dimensions of `Panel1` and `Panel2` should be:

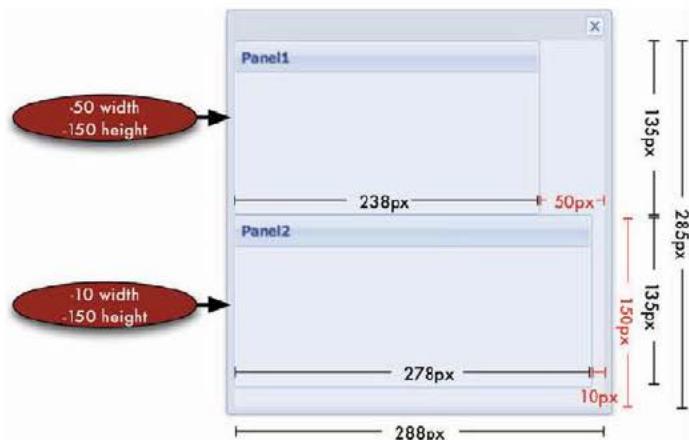


Figure 5.4 Using offsets with an `AnchorLayout` with sizing calculations

$$\text{Panel1 Width} = 288\text{px} - 50\text{px} = 238\text{px}$$

$$\text{Panel1 Height} = 285\text{px} - 150\text{px} = 135\text{px}$$

$$\text{Panel2 Width} = 288\text{px} - 10\text{px} = 278\text{px}$$

$$\text{Panel2 Height} = 285\text{px} - 150\text{px} = 135\text{px}$$

You can easily see that both child Panels fit perfectly within the Window. If you add the height of both Panels, you see that they fit, with a total of only 270 px. But what happens if you resize the Window vertically? Notice anything strange? Increasing the Window's height by any more than 15 pixels results in Panel2 being pushed offscreen and scroll bars appearing in the windowBody.

Recall that with this layout, the child dimensions are relative to the parent's content body minus a *constant*, which is the offset. To combat this problem, you can mix anchor offsets with fixed dimensions. To explore this concept, you'll only need to modify Panel2's anchor parameters and add a fixed height:

```
{
    title      : 'Panel2',
    height     : '150',
    anchor     : '-10',
    frame      : true
}
```

This modification makes Panel2's height a fixed 150 pixels. The newly rendered Window can now be resized to virtually any size, and Panel1 will grow to Window content body minus 150 pixels, which leaves just enough vertical room for Panel2 to stay onscreen. One neat thing about this is that Panel2 still has the relative width.

Anchors are used for a multitude of layout tasks. A sibling of the `AnchorLayout`, the `FormLayout`, is leveraged by the `Ext.form.FormPanel` class by default, but it can be used by any Container or subclass that can contain other child items, such as `Panel` or `Window`.

5.3 The FormLayout

The FormLayout, shown in listing 5.3, is just like the AnchorLayout, except it wraps each child element in a div with the class x-form-item, which makes each item stack vertically like an outline. It adds a label element in front of each of the child items, using the element's for attribute, which when clicked focuses on the child item.

Listing 5.3 The FormLayout

```
var myWin = new Ext.Window({
    height      : 240,
    width       : 200,
    bodyStyle   : 'padding: 5px',
    layout      : 'form',
    labelWidth  : 50,
    defaultType : 'textfield',
    items       : [
        {
            fieldLabel : 'Name',
            width     : 110
        },
        {
            fieldLabel : 'Age',
            width     : 25
        },
        {
            xtype      : 'combo',
            fieldLabel : 'Location',
            width     : 120,
            store     : [ 'Here', 'There', 'Anywhere' ]
        },
        {
            xtype      : 'textarea',
            fieldLabel : 'Bio'
        },
        {
            xtype      : 'panel',
            fieldLabel : '',
            labelSeparator : '',
            frame     : true,
            title     : 'Instructions',
            html      : 'Please fill in the form',
            height    : 55
        }
    ]
}) ;

myWin.show();
```

There is a heck of a lot that you're doing here to achieve a fairly complex form layout. Like all of the other layouts, you set the Window's layout ① to 'form'. You set a layout-specific attribute, labelWidth ②, to 50 pixels. Remember the label element we discussed earlier? This attribute sets the width of that element. Next, you specify the default XType by setting the 'defaultType' ③ attribute to 'field', which is used for

the first ④ and second child items and which automatically creates an instance of Ext.form.Field. The third child item ⑤ is an xtype definition of a static combination autocomplete and drop-down box, known as a combo box or Ext.form.ComboBox. The fourth child item ⑥ is a simple xtype for a text area, whereas the last child item ⑦ is a fairly complex xtype object, specifying a Panel.

In order to keep the field label element but show no text, you must set the fieldLabel's property to a string, containing a single space character. You also must remove the label separator character, which is a colon (:) by default, by setting it as an empty string. The rendered code should look like figure 5.5.

Remember that it's an ancestor to the AnchorLayout, which makes it powerful for dynamically resizing child items. Although the layout in figure 5.5 works, it's static and could be improved. What if you wanted the Name, Location, and Bio fields to dynamically size with their parent? Remember those anchor parameters? Let's use offsets to improve our use of the FormLayout, as shown in the following listing.

Listing 5.4 Using offsets with the FormLayout

```
{
    fieldLabel : 'Name',
    anchor     : '-4'
},
{
    fieldLabel : 'Age',
    width      : 25
},
{
    xtype      : 'combo',
    fieldLabel : 'Location',
    anchor    : '-4',
    store     : [ 'Here', 'There', 'Anywhere' ]
},
{
    xtype      : 'textarea',
    fieldLabel : 'Bio',
    anchor    : '-4, -134'
},
{
    xtype      : 'panel',
    fieldLabel : '',
    labelSeparator : '',
    frame      : true,
    title      : 'Instructions',
    html       : 'Please fill in the form',
    anchor    : '-4'
}
```



Figure 5.5
Using the FormLayout

In the preceding code, you add anchor parameters to the child items originally defined in listing 5.3. The rendered changes should look like figure 5.6. When you resize the example Window, you'll see how well the child items resize and conform to their parent container.

Always try to remember that the `FormLayout` is a direct subclass of the `AnchorLayout`. This way you won't forget to set proper anchor parameters for dynamically resizable forms.

There are times when you need complete control over the positioning of the widget layout. The `AbsoluteLayout` is perfect for this requirement.

5.4 The `AbsoluteLayout`

Next to the `ContainerLayout`, the `AbsoluteLayout` is by far one of the simplest to use. It fixes the position of a child by setting the CSS "position" attribute of the child's element to 'absolute' and sets the top and left attributes to the x and y parameters that you set on the child items. Many designers place HTML elements as a position: absolute with CSS, but Ext leverages JavaScript's DOM-manipulation mechanisms to set attributes to the elements themselves, without having to muck with CSS.

In the following listing you'll create a `Window` with an `AbsoluteLayout`.

Listing 5.5 An `AbsoluteLayout` in action

```
var myWin = new Ext.Window({
    height      : 300,
    width       : 300,
    layout      : 'absolute',
    autoScroll  : true,
    border      : false,
    items        : [
        {
            title : 'Panel1',
            x     : 50,
            y     : 50,
            height : 100,
            width  : 100,
            html   : 'x: 50, y:50',
            frame  : true
        },
        {
            title : 'Panel2',
            x     : 90,
            y     : 120,
            height : 75,
            width  : 77,
            html   : 'x: 90, y: 120',
            frame  : true
        }
    ]
});
```



Figure 5.6 Using offsets to create a much fuller form

```

        ]
});

myWin.show();

```

By now, most of this code should look familiar to you, except for a few new parameters. The first noticeable change should be the Window's layout ① being set to 'absolute'. You attach two children to this Window. Because you're using the AbsoluteLayout, you need to specify the x and y coordinates.

The first child, Panel1, has its x ② (CSS left attribute) coordinate set to 50 pixels and y (CSS top attribute) coordinate set to 50. The second child, Panel2, has its x ③ and y coordinates set to 90 pixels and 120 pixels. The rendered code should look like figure 5.7.

One of the apparent attributes about this example is that Panel2 overlaps Panel1. Panel2 is on top because of its placement in the DOM tree. Panel2's element is below Panel1's element, and because Panel2's CSS position attribute is set to 'absolute' as well, it's going to show above Panel1. Always keep the risk of overlapping in mind when you implement this layout. Also, because the positions of the child items are fixed, the AbsoluteLayout isn't an ideal solution for parents that resize.

If you have one child item and want it to resize with its parent, the FitLayout is the best solution.

5.5 Making components fit

The FitLayout, shown in the following listing, forces a Container's single child to "fit" to its body element and is, by far, the simplest of the layouts to use.

Listing 5.6 The FitLayout

```

var myWin = new Ext.Window({
    height      : 200,
    width       : 200,
    layout      : 'fit',           ① The Window's
    border      : false,
    items       : [
        {
            title : 'Panel1',
            html  : 'I fit in my parent!',
            frame : true
        }
    ]
});

myWin.show();

```

② The single child widget

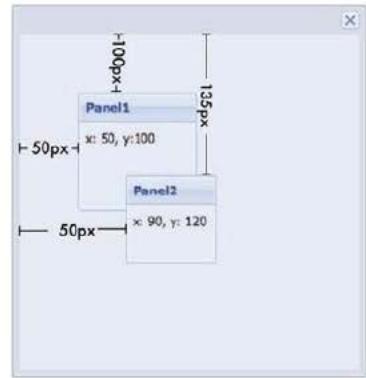


Figure 5.7 The results of our `AnchorLayout` implementation

In the preceding example, you set the Window's layout to 'fit' ① and instantiate a single child, an instance of Ext.Panel ②. The child's xtype is assumed by the Window's defaultType attribute, which is automatically set to 'panel' by the Window's prototype. The rendered Panels should look like figure 5.8.

The FitLayout is a great solution for a seamless look when a Container has one child. Often, however, multiple widgets are housed in a container. All other layout-management schemes are generally used to manage multiple children. One of the best-looking layouts is the AccordionLayout, which allows you to vertically stack items, which can be collapsed, showing the user one item at a time.



Figure 5.8
Using the `FitLayout` for the first time

5.6 The AccordionLayout

The AccordionLayout, shown in the next listing, a direct subclass of the FitLayout, is useful when you want to display multiple Panels vertically stacked, where only a single item can be expanded or contracted.

Listing 5.7 The AccordionLayout

```
var myWin = new Ext.Window({
    height      : 200,
    width       : 300,
    border      : false,
    title       : 'A Window with an accordion layout',
    layout      : 'accordion',
    layoutConfig : {
        animate : true
    },
    items       : [
        {
            xtype     : 'form',
            title    : 'General info',
            bodyStyle : 'padding: 5px',
            defaultType : 'field',
            labelWidth : 50,
            items     : [
                {
                    fieldLabel : 'Name',
                    anchor    : '-10'
                },
                {
                    xtype     : 'numberfield',
                    fieldLabel : 'Age',
                    width     : 30
                },
                {
                    xtype     : 'combo',
                    fieldLabel : 'Location',
                    width     : 150
                }
            ]
        }
    ]
});
```

Annotations for Listing 5.7:

- ① **Creates delegate instSpecify an AccordionLayoutance**: Points to the line `layout : 'accordion'`.
- ② **Layout configuration options**: Points to the line `layoutConfig : { animate : true }`.
- ③ **First child item, a FormPanel**: Points to the first item in the `items` array.

```

        anchor      : '-10',
        store       : [ 'Here', 'There', 'Anywhere' ]
    }
],
{
    xtype  : 'panel',
    title  : 'Bio',
    layout : 'fit',
    items  : {
        xtype : 'textarea',
        value : 'Tell us about yourself'
    }
},
{
    title : 'Instructions',
    html   : 'Please enter information.',
    tools  : [
        {id : 'gear'}, {id:'help'}
    ]
}
]);
myWin.show();

```

4 A Panel, containing a TextArea

5 An empty Panel with tools

Listing 5.7 is quite large to demonstrate the usefulness of the AccordionLayout. The first thing you do is instantiate a Window, myWin, which has its layout set to 'accordion' ①. A configuration option you haven't seen thus far is layoutConfig ②. Some layout schemes have specific configuration options, which you can define as configuration options for a Component's constructor.

These layoutConfig parameters can change the way a layout behaves or functions. In this case, you set the layoutConfig for the AccordionLayout, specifying animate: true, which instructs the AccordionLayout to animate the collapse and expansion of a child item. Another behavior-changing configuration option is activeOnTop, which if set to true will move the active item to the top of the stack. When working with a layout for the first time, I suggest consulting the API for all the options available to you.

Next, you start to define child items, which leverage some of the knowledge you've gained thus far. The first child is a FormPanel ③, which uses the anchor parameters you learned about earlier in this chapter. Next, you specify a Panel ④ that has its layout set to 'fit' and contains a child TextArea. You then define the last child item ⑤ as a vanilla Panel with some tools. The rendered code should look like figure 5.9.

Another way to configure layouts

Instead of using both the layout (String) as well as the layoutConfig (Object) configurations, you can set the layout configuration to an object that contains both the layout type and any options for that layout. For example:

```

layout : {
    type   : 'accordion',
    animate : true
}

```

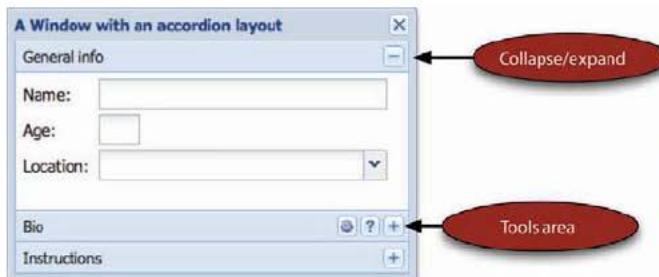


Figure 5.9 The `AccordionLayout` is an excellent way to present the user with multiple items as a single visible Component.

It's important to note that the `AccordionLayout` can function well only with a `Panel` and two of its subclasses, `GridPanel` and `TreePanel`. This is because the `Panel` (and the two specified subclasses) has what's required for the `AccordionLayout` to function properly. If you desire anything else inside an `AccordionLayout` such as a `TabPanel`, wrap a `Panel` around it and add that `Panel` as a child of the Container that has the `AccordionLayout`.

Although the `AccordionLayout` is a good solution for having more than one `Panel` onscreen, it has limitations. For instance, what if you needed to have 10 components in a particular Container? The sum of the heights of the title bars for each item would take up a lot of valuable screen space. The `CardLayout` is perfect for this requirement, because it allows you to show and hide child components or flip through them.

5.7 The `CardLayout`

A direct subclass of the `FitLayout`, the `CardLayout` ensures that its children conform to the size of the Container. Unlike the `FitLayout`, however, the `CardLayout` can have multiple children under its control. This tool gives you the flexibility to create Components that mimic wizard interfaces.

Except for the initial active item, the `CardLayout` leaves all of the flipping to the end developer with its publicly exposed `setActiveItem` method. In order to create a wizard-like interface, you need to create a method to control the card flipping:

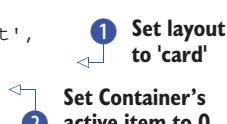
```
var handleNav = function(btn) {
    var activeItem   = myWin.layout.activeItem;
    var index        = myWin.items.indexOf(activeItem);
    var numItems     = myWin.items.getCount() - 1;
    var indicatorEl = Ext.getCmp('indicator').el;

    if (btn.text == 'Forward' && index < numItems - 1) {
        index++;
        myWin.layout.setActiveItem(index);
        index++;
        indicatorEl.update(index + ' of ' + numItems);
    }
    else if (btn.text == 'Back' && index > 0) {
        myWin.layout.setActiveItem(index - 1);
        indicatorEl.update(index + ' of ' + numItems);
    }
}
```

In the preceding code, you control the card flipping by determining the active item's index and setting the active item based on whether the Forward or Back Button is pressed. You then update the indicator text on the bottom toolbar. Next, let's implement your CardLayout. The code example in the following listing is rather long and involved, so please stick with me.

Listing 5.8 The CardLayout in action

```
var myWin = new Ext.Window({
    height      : 200,
    width       : 300,
    border      : false,
    title       : 'A Window with a Card layout',
    layout      : 'card',
    activeItem  : 0,
    defaults    : { border : false },
    items       : [
        {
            xtype      : 'form',
            title     : 'General info',
            bodyStyle : 'padding: 5px',
            defaultType : 'field',
            labelWidth : 50,
            items      : [
                {
                    fieldLabel : 'Name',
                    anchor    : '-10',
                },
                {
                    xtype      : 'numberfield',
                    fieldLabel : 'Age',
                    width     : 30
                },
                {
                    xtype      : 'combo',
                    fieldLabel : 'Location',
                    anchor    : '-10',
                    store     : [ 'Here', 'There', 'Anywhere' ]
                }
            ]
        },
        {
            xtype   : 'panel',
            autoEl : {},
            title  : 'Bio',
            layout : 'fit',
            items  : {
                xtype : 'textarea',
                value : 'Tell us about yourself'
            }
        },
        {
            title : 'Congratulations',
        }
    ],
    buttons   : [
        {
            text : 'Next >',
            icon : 'ext-icon-right'
        },
        {
            text : 'Back <',
            icon : 'ext-icon-left'
        }
    ]
});
```



```

        html : 'Thank you for filling out our form!'
    }
],
bbar : [
    {
        text : 'Back',
        handler : handleNav
    },'-' ,
    {
        text : 'Forward',
        handler : handleNav
    },'->' ,
    {
        xtype : 'box',
        id : 'indicator',
        style : 'margin-right: 5px',
        autoEl : {
            tag : 'div',
            html : '1 of 3'
        }
    }
]);
myWin.show();

```

3 Back and Forward Buttons

4 BoxComponent with id of 'indicator'

Listing 5.8 details the creation of a Window, which leverages the CardLayout. Although most of this should be familiar to you, I should point out a few things. The first obvious item is the layout ① property, which is set to 'card'. Next is the activeItem property ②, which the Container passes to the layout at render time. You set this to 0 (zero), which tells the layout to call the child Component's render method when the Container renders.

Next, you define the bottom toolbar, which contains the Forward and Back ③ Buttons, which call your previously defined handleNav method and the BoxComponent ④ that you use to display the index of the current active item. The rendered Container should look like the one in figure 5.10.

Clicking Forward or Back will invoke the handleNav method, which will take care of the card flipping and update the indicator Box-Component. Remember that with the Card-Layout, the logic of the active item switching is completely up to the end developer to create and manage.

In addition to the previously discussed layouts, Ext offers a few more schemes. The ColumnLayout is one of the favorite schemes among UI developers for organizing UI columns that can span the entire width of the parent Container.



Figure 5.10 Our first CardLayout implementation with a fully interactive navigation Toolbar

5.8 The ColumnLayout

Organizing components into columns allows you to display multiple Components in a Container side by side. Like the AnchorLayout, the ColumnLayout allows you to set the absolute or relative width of the child Components. There are some things to look out for when using this layout. I'll highlight these in a bit, but first let's construct a ColumnLayout Window in the next listing.

Listing 5.9 Exploring the ColumnLayout

```
var myWin = new Ext.Window({
    height      : 200,
    width       : 400,
    autoScroll  : true,
    id          : 'myWin',
    title       : 'A Window with a Card layout',
    layout      : 'column',
    defaults    : {
        frame : true
    },
    items       : [
        {
            title     : 'Col 1',
            id        : 'coll',
            columnWidth : .3
        },
        {
            title     : 'Col 2',
            html      : "20% relative width",
            columnWidth : .2
        },
        {
            title : 'Col 3',
            html   : "100px fixed width",
            width  : 100
        },
        {
            title     : 'Col 4',
            frame    : true,
            html     : "50% relative width",
            columnWidth : .5
        }
    ]
});
```

myWin.show();

- 1 Automatically scroll Container
- 2 Set layout to 'column'
- 3 Set relative column width of 30%
- 4 Set fixed width of 100 pixels
- 5 Another relative width

In a nutshell, the ColumnLayout is easy to use. Declare child items, and specify relative or absolute widths or a combination of both, as you do here. In listing 5.9, you set the `autoScroll` ① property of the Container to `true`, which ensures that scroll bars will appear if the composite of the child Component dimensions grows beyond those of the Container. Next, you set the `layout` property to `'column'` ②. You then declare four child Components, the first of which has its relative width set to 30 percent via the

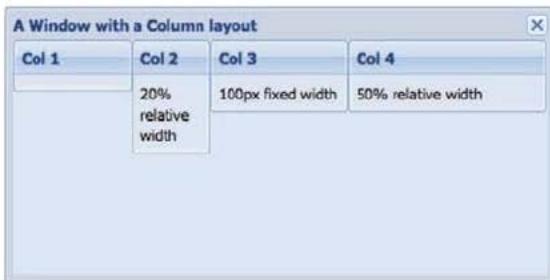


Figure 5.11 Our first ColumnLayout, which uses relative column widths with a fixed width entity

columnWidth ③ attribute. Set the second child's relative width to 20 percent. You mix things up a bit by setting an absolute width for the third child, 100 pixels ④. Last, you set a relative width ⑤ for the last child, 50 percent. The rendered example should look like figure 5.11.

If you tally up the relative widths, you'll see that they total up to 100 percent. How can that be? Three Components, taking 100 percent width, *and* a fixed-width Component? To understand how this is possible, you need to dissect how the ColumnLayout sets the sizes of all of the child Components. Put your math cap back on for a moment.

The meat of the ColumnLayout is its onLayout method, which calculates the dimensions of the Container's body, which in this case is 388 pixels. It then goes through all of its direct children to determine the amount of available space to give to any of the children with relative widths.

To do this, it first subtracts the width of each of the absolute-width child Components from the known width of the Container's body. In our example, we have one child with an absolute width of 100 pixels. The ColumnLayout calculates the difference between 388 and 100, which equals 288 (pixels).

Now that the ColumnLayout knows exactly how much horizontal space it has left, it can set the size of each of the child Components based on the percentage. It goes through each of the children and sizes each based on the known available horizontal width of the Container's body. It does this by multiplying the percentage (decimal) by the available width. Once complete, the sum of the widths of relatively sized Components turns out to be about 288 pixels.

Now that you understand the width calculations for this layout, let's change our focus to the height of the child items. Notice how the height of the child Components doesn't equal the height of the Container body? This is because the ColumnLayout doesn't manage the height of the child Components. This causes an issue with child items that may grow beyond the height of its Container's body. This is precisely why you set autoScroll to true for the Window. You can exercise this theory by adding an extra-large child to the 'Col 1' Component by entering the following code inside Firebug's JavaScript input console. Make sure you have a virgin copy of listing 5.9 running in your browser.

```
Ext.getCmp('col1').add({  
    height : 250,
```

```

        title  : 'New Panel',
        frame  : true
    });
Ext.getCmp('col1').doLayout();

```

You should now see a Panel embedded into the 'Col 1' panel with its height exceeding that of the Window's body. Notice how scroll bars appear in the Window. If you didn't set autoScroll to true, your UI would look cut off and might have its usability reduced or halted. You can scroll vertically and horizontally. The reason you can scroll vertically is that Col1's overall height is greater than that of the Window's body. That's acceptable. The horizontal scrolling is the problem in this case. Recall that the ColumnLayout calculated only 288 pixels to properly size the three columns with relative widths. Because the vertical scroll bar is now visible, the physical amount of space from which the columns can be displayed is reduced by the width of the vertical scroll bar. To fix this issue, you must call doLayout on the parent Container, Ext.getCmp('myWin').doLayout(), which will force a recalculation of the available horizontal space and resize the relatively sized columns so the Container's body need not scroll horizontally. Remembering to call the parent's doLayout method when adding a Component to any of the direct children will help keep your UIs looking great.

As you can see, the ColumnLayout is great for organizing your child Components in columns. With this layout, however, there are two limitations. All child items are always left justified, and their heights are unmanaged by the parent Container. Ext provides us with the HBoxLayout that overcomes the limitations of the ColumnLayout and extends far beyond its capabilities.

5.9 The HBox and VBox layouts

New to version 3.0 are the HBox and VBox layouts. The HBoxLayout's behavior is similar to the ColumnLayout, where it displays items in columns but allows for much greater flexibility. For instance, you can change the alignment of the child items both vertically and horizontally. Another great feature of this layout scheme is the ability to allow the columns or rows to stretch to their parent's dimensions if required. Let's dive into the HBoxLayout, shown in the following listing, where you'll create a Container with three child Panels to manipulate.

Listing 5.10 HBoxLayout, exploring the packing configuration

```

new Ext.Window({
    layout      : 'hbox',
    height     : 300,
    width      : 300,
    title      : 'A Container with an HBox layout',
    layoutConfig : {
        pack : 'start'
    },
    defaults   : {
        frame : true,
    }
});

```

```

items : [
    {
        title : 'Panel 1',
        height : 100
    },
    {
        title : 'Panel 2',
        height : 75,
        width : 100
    },
    {
        title : 'Panel 3',
        height : 200
    }
]
}).show();

```

In listing 5.10, you set the layout to 'hbox' ① and specify the layoutConfig ② configuration object. You create the three child Panels with irregular shapes, allowing you to properly exercise the different layout configuration parameters for which you can specify two, pack and align, where pack means “vertical alignment” and align means “horizontal alignment.” Being able to understand the meanings for these two parameters is important because they’re flipped for the HBoxLayout’s cousin, the VBoxLayout. The pack parameter accepts three possible values: start, center, and end. In this context, I like to think of them as left, center, and right. Modifying that parameter in listing 5.10 will result in one of the rendered Windows in figure 5.12. The default value for the pack attribute is ‘start’.

The align parameter accepts four possible values: ‘top’, ‘middle’, ‘stretch’, and ‘stretchmax’. Remember that with the HBoxLayout, the align property specifies vertical alignment.

The default parameter for align is ‘top’. In order to change how the child panels are vertically aligned, you need to override the default, by specifying it in the layoutConfig object for the Container. Figure 5.13 illustrates how you can change the way the children are sized and arranged based on a few different combinations.

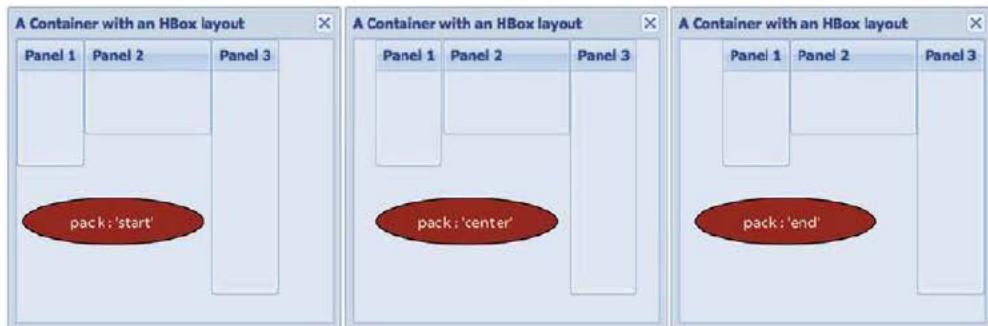


Figure 5.12 Different results with the three pack options

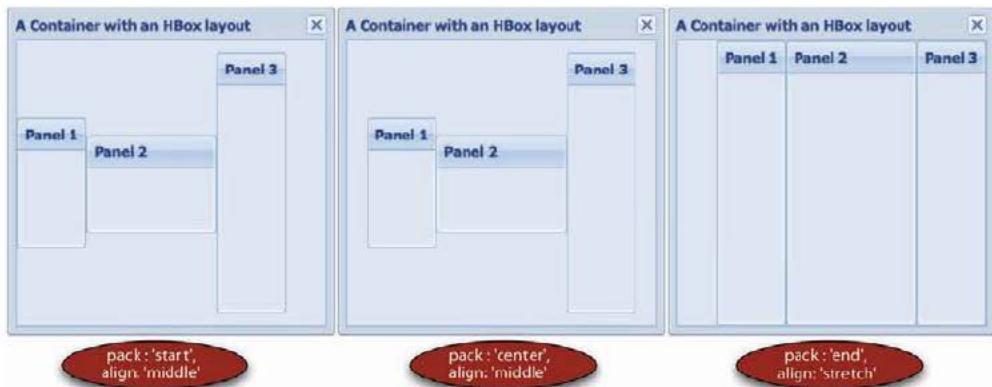


Figure 5.13 The 'stretch' alignment will always override any height values specified by the child items.

Specifying a value of 'stretch' for the align attribute instructs the `HBoxLayout` to resize the child items to the height of the container's body, which overcomes one limitation of the `ColumnLayout`.

The last configuration parameter that we must explore is `flex`, which is similar to the `columnWidth` parameter for the `ColumnLayout` and gets specified on the child items. Unlike the `columnWidth` parameter, the `flex` parameter is interpreted as a weight or a priority instead of a percentage of the columns. Let's say, for instance, you'd like each of the columns to have equal widths. Set each column's `flex` to the same value, and they'll all have equal widths. If you wanted to have two of the columns expand to a total of one half of the width of the parent's Container and the third to expand to the other half, make sure that the `flex` value for each of the first two columns is exactly half that of the third column. For instance:

```
items : [
  {
    title  : 'Panel 1',
    flex   : 1
  },
  {
    title  : 'Panel 2',
    flex   : 1
  },
  {
    title  : 'Panel 3',
    flex   : 2
  }
]
```

Stacking items vertically is also possible with the `VBoxLayout`, which follows exactly the same syntax as the `HBoxLayout`. To use the `VBoxLayout`, modify listing 5.10, change the layout to 'vbox', and refresh the page. Next, you can apply the `flex` parameters

described previously to make each of the Panels relative in height to the parent Container. I like to think of VBoxLayout as the ContainerLayout on steroids.

Contrasting the VBoxLayout with the HBoxLayout, there's one parameter change. Recall that the align parameter for the HBoxLayout accepts a value of top. For the VBoxLayout, however, you specify left instead of top.

Now that you've mastered HBox and VBox layouts, we'll switch gears to the TableLayout, where you can position child Components, such as a traditional HTML table.

5.10 The TableLayout

The TableLayout gives you complete control over how you visually organize your Components. Many of you are used to building HTML tables the traditional way, where you write the HTML code. Building a table of Ext Components, however, is different because you specify the content of the table cells in a single-dimension array, which can get a little confusing. I'm sure that once you've finished these exercises, you'll be an expert in this layout. In the following listing you'll create a basic 3 x 3 TableLayout.

Listing 5.11 A vanilla TableLayout

```
var myWin = new Ext.Window({  
    height      : 300,  
    width       : 300,  
    border      : false,  
    autoScroll  : true,  
    title       : 'A Window with a Table layout',  
    layout      : 'table',  
    layoutConfig : {  
        columns : 3  
    },  
    defaults    : {  
        height : 50,  
        width  : 50  
    },  
    items       : [  
        {  
            html : '1'  
        },  
        {  
            html : '2'  
        },  
        {  
            html : '3'  
        },  
        {  
            html : '4'  
        },  
        {  
            html : '5'  
        },  
        {  
            html : '6'  
        }  
    ]  
});
```

1 Specify layout as 'table'
2 Three columns for the table
3 Default size for box is 50 x 50

```

        },
        {
            html : '7'
        },
        {
            html : '8'
        },
        {
            html : '9'
        }
    ]
);
myWin.show();

```

The code in listing 5.11 creates a Window Container that has nine boxes stacked in a 3 x 3 formation like in figure 5.14. By now, most of this should seem familiar to you, but I want to highlight a few items. The most obvious of these should be the layout parameter ① being set to 'table'. Next, you set a layoutConfig ② object, which sets the number of columns. Always remember to set this property when using this layout. Last, you set the defaults ③ for all of the child items to 50 pixels wide by 50 pixels high.

Often you need sections of the table to span multiple rows or multiple columns. To accomplish this, you must specify either the rowspan or colspan parameter explicitly on the child items. Let's modify your table so the child items can span multiple rows or columns, as shown in the following listing.

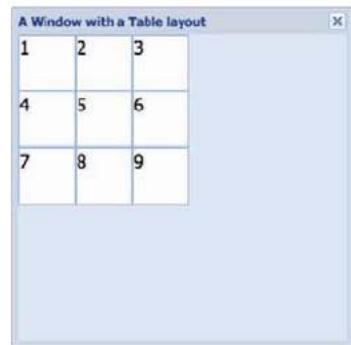


Figure 5.14 The results of our first simple TableLayout

Listing 5.12 Listing 5.12 Exploring rowspan and colspan

```

items : [
    {
        html      : '1',
        colspan   : 3,
        width    : 150
    },
    {
        html      : '2',
        rowspan  : 2,
        height   : 100
    },
    {
        html : '3'
    },
    {
        html      : '4',
        rowspan  : 2,
        height   : 100
    }
]

```

① Set colspan to 3, width to 150 px

② Set rowspan to 2, height to 100 px

③ Set rowspan to 2, height to 100 px

```

},
{
    html : '5'
},
{
    html : '6'
},
{
    html : '7'
},
{
    html : '8'
},
{
    html : '9',
    colspan : 3,
    width : 150
}
]

```

4 Set colspan to 3,
width to 150 px

In listing 5.12, you reuse the existing Container code from listing 5.11 and replace the child items array. You set the colspan attribute for the first panel ① to 3 and manually set its width to fit the total known width of the table, which is 150 pixels. Remember that you have three columns of default 50 x 50 child containers. Next, you set the rowspan of the second child ② item to 2 and its height to the total of two rows, which is 100 pixels. You do the same thing for panel 4 ③. The last change involves panel 9, which has the exact same attributes as panel 1 ④. The rendered change should look like figure 5.15.

When using the TableLayout, you should remember a few things. First is to determine the total number of columns that will be used and specify it in the layoutConfig parameter. Also, if you're going to have Components span rows and/or columns, be sure to set their dimensions accordingly; otherwise the Components laid out in the table won't seem to be aligned correctly.

The TableLayout is extremely versatile and can be used to create any type of box-based layout that your imagination conjures up, with the main limitation being that there's no parent-child size management.

Moving to our last stop on the Ext layout journey, we reach the ever-so-popular BorderLayout, where you can divide any container into five collapsible regions that manage their children's size.

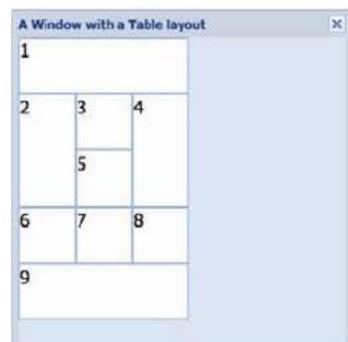


Figure 5.15 When using the TableLayout, you could specify rowspan and colspan for a particular Component, which will make it occupy more than one cell in the table.

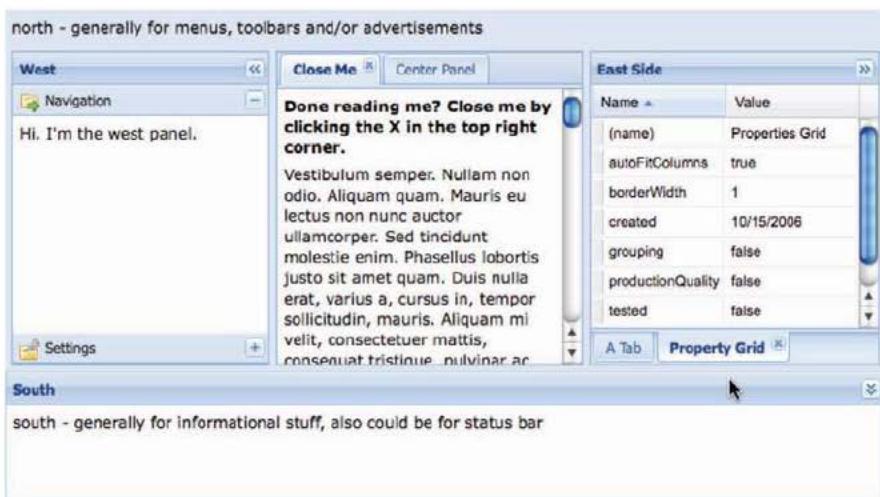


Figure 5.16 The BorderLayout is what attracts many new developers to the Ext Framework and is widely used in many applications to divide the screen into task-specific functional areas.

5.11 The BorderLayout

The BorderLayout made its début in 2006, back when Ext was more than a mere extension to the YUI Library and had matured into an extremely flexible and easy-to-use layout that provides full control over its subparts, or regions. These regions are aptly named by polar coordinates: North, South, East, West, and Center. Figure 5.16 illustrates a BorderLayout implementation from the Ext SDK.

Each region of a BorderLayout is managed by the `BorderLayout.Region` class, which is what provides all of the UI and programmatic controls to that specific division of the layout scheme. Depending on the configuration options provided, the region can be resized or collapsed by the user. There are also options to limit the resize of the region or prevent it from being resized altogether.

To explore the BorderLayout and the Region class, we'll use the Viewport class because it will make it easier for us to see the final result of our exercise.

Listing 5.13 Flexing the BorderLayout

```
new Ext.Viewport({
    layout : 'border',
    defaults : {
        frame : true,
        split : true
    },
    items : [
        {
            title : 'North Panel',
            region : 'north',
            // ...
        }
    ]
});
```

1 Split regions,
allowing for resize

2 Static North region

```

        height      : 100,
        minHeight   : 100,
        maxHeight   : 150,
        collapsible : true
    },
    {
        title      : 'South Panel',
        region     : 'south',
        height     : 75,
        split      : false,
        margins    : {
            top : 5
        }
    },
    {
        title      : 'East Panel',           ← 4 The East region
        region     : 'east',
        width      : 100,
        minWidth   : 75,
        maxWidth   : 150,
        collapsible : true
    },
    {
        title      : 'West Panel',          ← 5 Mini-collapse
        region     : 'west',
        collapsible : true,
        collapseMode : 'mini'
    },
    {
        title      : 'Center Panel',
        region    : 'center'
    }
]
));

```

In listing 5.13, you accomplish quite a lot using the `Viewport` a bit in a few lines of code. You set `layout` to `'border'` ① and set `split` to `true` in the default configuration object. There's a lot going on here at once, so feel free to reference figure 5.17, which depicts what the rendered code will look like.

Although all regions are technically divided, the `split` parameter instructs the `BorderLayout` to render a 5-pixel high (or wide) divider between the center and the regions. This divider is used as the resize handles for the regions. In order to work this magic, the `BorderLayout` employs the `BorderLayout.SplitRegion` class, which creates an absolute-position invisible `div` that intercepts the click-and-drag action of the user. When the drag action occurs, a proxy `div` appears, which is a direct sibling of the split bar handle `div`, allowing users to preview exactly how wide or high they're about to resize a region.

Next, you begin to instantiate child items, which have `BorderLayout.Region`-specific parameters. In order to review many of them, you'll make each region's behavior different from the other.

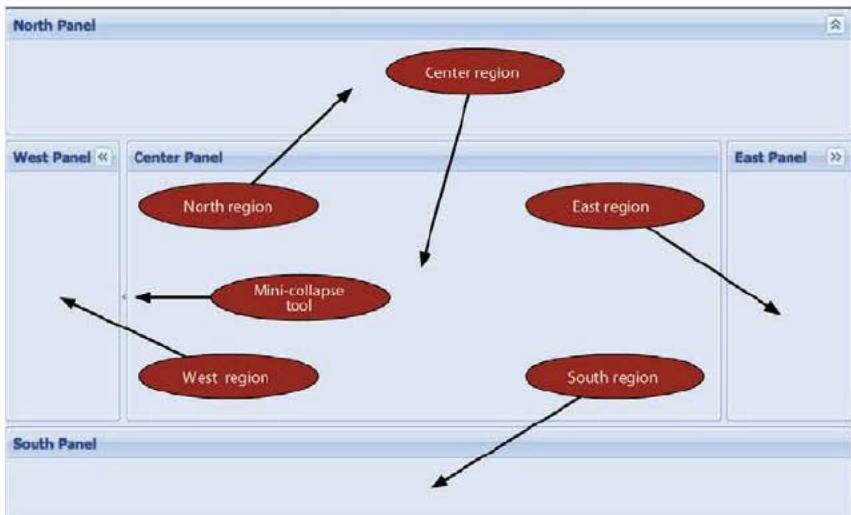


Figure 5.17 The BorderLayout's versatility and ease of use make it one of the most widely used in Ext-based RIAs.

For the first child ②, you set the region property to 'north' to ensure that it's at the top of the BorderLayout. You play a little game with the BoxComponent-specific parameter, height, and the region-specific parameters, minHeight and maxHeight. By specifying a height of 100, you're instructing the region to render the Panel with an initial height of 100 pixels. The minHeight instructs the region to not allow the split bar to be dragged beyond the coordinates that would make the northern region the minimal height of 100. The same is true for the maxHeight parameter, except it applies to expanding the region's height. You also specify the Panel-specific parameter of collapsible as true, which instructs the region to allow it to be collapsed to a mere 30 pixels high.

Defining the South region, the viewport's second child ③, you play some games to prevent it from being resized but work to keep the layout's 5-pixel split between the regions. Setting the split parameter to false, you instruct the region to not allow it to be resized. Doing so also instructs the region to omit the 5-pixel split bar, which would make the layout somewhat visually incomplete. In order to achieve a façade-split bar, you specify a region-specific margins parameter, which specifies that you want the South region to have a 5-pixel buffer between itself and anything above it. One word of caution about this, however: although the layout now looks complete, end users may try to resize it, possibly causing frustration on their end.

The third child ④ is defined as the East region. This region is similarly configured to the north panel except it has sizing constraints that are a bit more flexible. Where the northern region starts its life out at its minimum size, the eastern region starts its life between its minWidth and maxWidth. Specifying size parameters like these allows the UI to present a region in a default or suggested size but allows the Panel to be resized beyond its original dimensions.

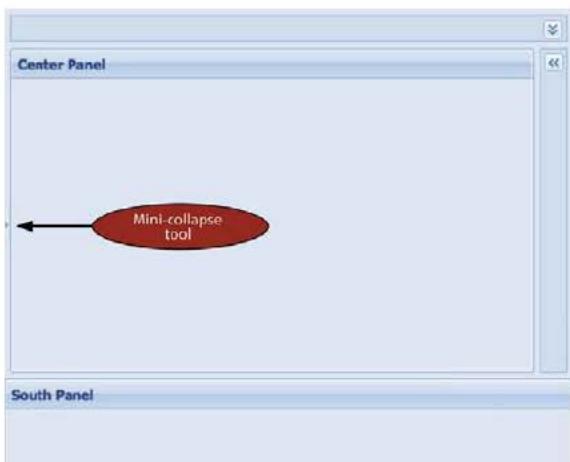


Figure 5.18 Our BorderLayout where two of the regions, North and East, are collapsed in regular mode and the West panel is collapsed in miniature mode

The West region ⑤ has a special region-specific parameter, collapseMode, set to the string 'mini'. Setting this parameter that way instructs Ext to collapse a Panel to a mere 5 pixels, providing more visual space for the Center region. Figure 5.18 illustrates how small. By allowing the split parameter to stay as true (remember our defaults object) and not specifying minimum or maximum size parameters, the western region can be resized as far as the browser will physically allow, as shown in figure 5.18.

The last region is the Center region, which is the only *required* region for the BorderLayout. Although the Center region seems a bit bare, it's special indeed. The Center region is generally the canvas in which developers place the bulk of their RIA UI components, and its size is dependent on its sibling regions' dimensions.

For all of its strengths, the BorderLayout has one huge disadvantage, which is that once a child in a region is defined/created, it can't be changed. Because the BorderLayout.Region is a base class and doesn't extend Container, it doesn't have the power to replace a child once it's instantiated. The fix for this is extremely simple. For each region where you wish to replace Components, specify a Container as a region. Let's exercise this by replacing the Center region section for listing 5.13:

```
{
    xtype : 'container',
    region : 'center',
    layout : 'fit',
    id : 'centerRegion',
    autoEl : {},
    items : [
        title : 'Center Region',
        id : 'centerPanel',
        html : 'I am disposable',
        frame : true
    ]
}
```

Remember that the `Viewport` can be created only once, so a refresh of the page where the example code lies is required. The refreshed `Viewport` should look nearly identical to figure 5.18, except the `Center` region now has HTML showing that it's disposable. In the previous example, you define the `Container` `XType` with the layout of `fit` and an `id` that you can leverage with Firebug's JavaScript console.

Recalling our prior discussion and exercises over adding and removing child Components to and from a `Container`, can you remember how to get a reference to a Component via its `id` and remove a child? If you can, excellent work! If you can't, I've already worked it out for you. But be sure to review the prior sections because they're extremely important to managing the Ext UI. Take a swipe at replacing the `Center` region's child Component; see the following listing.

Listing 5.14 Replacing a Component in the Center region

```
var centerPanel = Ext.getCmp('centerPanel');
var centerRegion = Ext.getCmp('centerRegion');

centerRegion.remove(centerPanel, true);
centerRegion.add({
    xtype      : 'form',
    frame      : true,
    bodyStyle  : 'padding: 5px',
    defaultType: 'field',
    title      : 'Please enter some information',
    defaults   : {
        anchor : '-10'
    },
    items      : [
        {
            fieldLabel : 'First Name'
        },
        {
            fieldLabel : 'Last Name'
        },
        {
            xtype      : 'textarea',
            fieldLabel : 'Bio'
        }
    ]
});
centerRegion.doLayout();
```

Listing 5.14 leverages everything you've learned thus far regarding Components, Containers, and Layouts, providing you with the flexibility to replace the `Center` region's child, a `Panel` with a `FormPanel`, with relative ease. You can use this pattern in any of the regions to replace items at will.

5.12 Summary

We took a lot of time to explore the many and versatile Ext layout schemes. In doing so, you learned some of the strengths, weaknesses, and pitfalls. Remember that although many layouts can do similar things, each has its place in a UI. Finding the correct layout to display Components may not be immediately apparent and will take some practice if you're new to UI design altogether.

If you aren't 100 percent comfortable with the material as you exit this chapter, I suggest moving forward and returning to it after some time has passed and the material has had some time to sink in.

Now that you have many of the core topics behind you, put your seatbelt on because you're going to be in for a wild ride, where you learn more about and use Ext's UI widgets, starting off with form Panels.

Ext JS takes form



This chapter covers

- Getting to know the basics of `FormPanel` input fields
- Creating custom `ComboBox` templates
- Creating a complex layout `FormPanel`

We just finished exploring how to organize UI widgets with the various layout managers in the Ext framework. From here, we'll spring into learning how to instantiate and manage Ext JS form elements. After all, what's any application without user input?

It should be no surprise to hear that developing and designing forms is a common task for web developers. Managing form validation is what JavaScript was mainly used for just a few years ago. Ext JS goes beyond typical form validation, building on the basic HTML input fields to both add features for the developer and enhance the user experience. For instance, let's say a user is required to enter HTML into a form. Using an out-of-the-box `TextArea` input field, the user would have to write the HTML content by hand. This isn't required with the Ext JS `HtmlEditor`, where you get a full WYSIWYG input field, allowing the user to input and manipulate richly formatted HTML easily.

In this chapter, we'll look into the `FormPanel`, and you'll learn about many of the Ext JS form input classes. You'll also see how to leverage what you know about layouts and the `Container` model to build a complex form and use that implementation to submit and load the data via Ajax.

Because there are so many things to cover with input fields, this chapter will follow more of a cookbook style, where I walk you through the various input fields and discuss how to implement them. Once you get a solid grasp on the various input fields, we'll tie things together by implementing and discussing the `FormPanel` class.

6.1

The `TextField`

The Ext `TextField` adds features to the existing HTML input field such as basic validations, a custom validation method, automatic resizing, and keyboard filtering. To utilize some of the more powerful features such as keyboard filters (masks) and automatic character stripping, you'll need to know a little about regular expressions.

Learn more about regex with JavaScript

If you're new to regular expressions, there's a plethora of information on the internet. One of my favorite sites to learn about this topic is <http://www.regular-expressions.info/javascript.html>.

We're going to explore quite a few features of the `TextField` at once. Please stay with me, because some of example code can be lengthy.

Because the `TextField` class is a subclass of `Component`, you could `renderTo` or `applyTo` an element on the page. Instead, you'll build them as children of a `FormPanel`, which will provide a better presentation. To start, you'll create the `items` array, which will contain the `XType` definitions of the different `TextFields`, as shown in the following listing.

Listing 6.1 Our text fields

```
Ext.QuickTips.init();

var fpItems = [
    {
        fieldLabel : 'Alpha only',           ← ① The fieldLabel
        allowBlank : false,
        emptyText : 'This field is empty!',
        maskRe    : /[a-z]/i
    },
    {
        fieldLabel : 'Simple 3 to 7 Chars',
        allowBlank : false,
        minLength : 3,
        maxLength : 7                         ← ⑤ Allow min/max
                                                number of characters
    }
];
```

```

        fieldLabel : 'Special Chars Only',
        stripCharsRe : /[a-zA-Z0-9]/ig
    },
    {
        fieldLabel : 'Web Only with VType',
        vtype      : 'urlOnly'
    }
];

```

6 Allow only special characters
7 Use our custom VType

In listing 6.1 you must work a lot of angles to demonstrate the capabilities of the simple TextField. You create four text fields in the fpItems array. One of the redundant attributes that each child has is `fieldLabel` ①, which describes to the `FormLayout` (remember that the `FormPanel` uses the `FormLayout` by default) what text to place in the `label` element for the `field` element.

For the first child, you ensure that the field can't be blank by specifying `allowBlank` ② as `false`, which ensures that you use one of Ext's basic field validations. You also set a string value for `emptyText` ③, which displays helper text and can be used as a default value. One important thing to be aware of is that it gets sent as the field's value during its form submission. Next, you set `maskRe` ④, a regular expression mask, to filter keystrokes that resolve to anything other than alpha characters. The second text field is built so it can't be left blank and must contain from three to seven characters to be valid. You do this by setting the `minLength` ⑤ and `maxLength` parameters. The third text field can be blank, but it has automatic alphanumeric character stripping. You enable automatic stripping by specifying a valid regular expression for the `stripCharsRe` ⑥ property. For the last child ⑦ item, we're going to veer off course for a bit to explore VTypes.

The last child item is a plain-text field that makes use of a custom VType ⑦, which we'll build out shortly. A VType is a custom validation method that's called automatically by the form field by a field losing focus or sometime after the field is modified. To create your own VType, you can use a regular expression *or* a custom function. The anatomy of a VType is simple and can contain up to three ingredients. The validation method is the only required item; the input mask regular expression and invalid text string are optional. The name of the VType is the validation method, whereas the mask and text properties are a concatenation of the name with "Mask" or "Text." Let's create our custom VType:

```

var myValidFn = function(v) {
    var myRegex = /https?:\/\/([-w\.]+)(:\d+)?(\//([\w_\.]*(\?\$+)?))?/;
    return myRegex.test(v);
};

Ext.apply(Ext.form.VTypes, {
    urlOnly : myValidFn,
    urlOnlyText : 'Must be a valid web URL'
});

```

Don't run away! The regular expression is scary, I know. It does serve a purpose, though, and you'll see what I mean in a bit. Our validation method, `myValidFn`,

contains our monster regular expression and returns the result of using its test method, where we pass v, which is the value of the `TextField` at the time the `VType`'s validation method is called. Next, we apply an object to the `Ext.form.VTypes` singleton, which contains `urlOnly`—the reference to our validation method. Our `VType` is now known to `Ext.form.VTypes` as `urlOnly` and is why we set the `vtype` property as such on the last `TextField`. We also set the `urlOnlyText` property for the `vtype` as a string with our custom error message. Okay, now that we've explored `VTypes`, let's build the form in which our `TextFields` will live, as shown in the following listing.

Listing 6.2 Building the FormPanel for our TextFields

```
var fp = new Ext.form.FormPanel({
    renderTo      : Ext.getBody(),
    width        : 400,
    height       : 160,
    title         : 'Exercising textfields',
    frame         : true,
    bodyStyle     : 'padding: 6px',
    labelWidth   : 126,
    defaultType  : 'textfield',
    defaults      : {
        msgTarget : 'side',
        anchor    : '-20'
    },
    items        : fpItems
});
```

Because we've already gone over the `FormLayout`, most of the code construct in listing 6.2 should be familiar to you. But let's review a few key items relating to the `FormLayout` and Component model. You override the default Component `XType` by setting the `defaultType` ① property to `'textfield'`, which, if you recall, will ensure your objects are resolved into text fields. You also set up some defaults ②, which ensure your error message target is to the right side of the field and your anchor property is set. Last, you reference the `FormPanel`'s items to the `fpItems` variable that you created earlier, which contains the four `TextFields`. The rendered `FormPanel` should look like figure 6.1.

Notice in figure 6.1 that there's a little extra space to the right of the `TextFields`. This is because we wanted to ensure that validation error messages are displayed to the right of the fields. This is why we set `msgTarget` to `'side'` for our default object in our `FormPanel` definition. You can invoke validation one of two ways: focus and blur



Figure 6.1 The rendered results of our `FormPanel`, which contains four `TextFields`



Figure 6.2
'side' validation
error messages

(lose focus) of a field or invoke a form-wide `isValid` method call, `fp.getForm().isValid()`. Figure 6.2 shows what the fields look like after validation has occurred.

Each field can have its own `msgTarget` property, which can be any of five possible attributes:

- `qtip`—Displays an Ext quicktip on mouseover
- `title`—Shows the error in the default browser title area
- `under`—Positions the error message below the field
- `side`—Renders an exclamation icon to the right side of the field
- `[element id]`—Adds the text of the error message as the `innerHTML` of the target element

It's important to note that the `msgTarget` property affects only how the error message is displayed when the field is inside a `FormLayout`. If the `TextField` is rendered to some arbitrary element somewhere on the page (that is, using `renderTo` or `applyTo`), the `msgTarget` will be set only to `title`. I encourage you to spend some time experimenting with the different `msgTarget` values; that way, when it comes down to building your first real-world form, you'll have a good understanding of the way they work. Let's see how to create password and file upload fields using the `TextField`.

6.1.1 Password and file select fields

To create a password field in HTML, you set its `type` attribute to '`password`'. Likewise, for a file input field, you set `type` to '`file`'. In Ext, to generate these, enter the following:

```
var fpItems = [
    {
        fieldLabel : 'Password',
        allowBlank : false,
        inputType  : 'password'
    },
    {
        fieldLabel : 'File',
        allowBlank : false,
        inputType  : 'file'
    }
];
```



Figure 6.3 Our password and file upload fields with data filled in (left) and an example of the side validation error icons (right)

Figure 6.3 shows a rendered version of the password and file input fields in a FormPanel.

When using file upload fields, remember to configure the underlying form element with `fileUpload : true`; otherwise, your files will never get submitted. Also, in case you haven't noticed it, the file upload field in figure 6.3 (right) doesn't have a red bounding box around it. This is because of the browser's security model preventing styling of the upload field.

We've covered a lot about the generic `TextField`, field validations, and the password and file upload fields. We'll now move on to looking at other input fields.

6.1.2 Building a `TextArea`

The `TextArea` extends `TextField` and is a multiline input field. Constructing a `TextArea` is like constructing a `TextField`, except you have to take the Component's height into consideration. Here's an example `TextArea` with a fixed height but a relative width:

```
{
    xtype      : 'textarea',
    fieldLabel : 'My TextArea',
    name       : 'myTextArea',
    anchor     : '100%',
    height     : 100
}
```

It's as easy as that. Let's take a quick look at how you can leverage the `NumberField`, which is another subclass of `TextField`.

6.1.3 The convenient `NumberField`

Sometimes requirements dictate that you place an input field that allows only numbers to be entered. You could do this with the `TextField` and apply your own validation, but why reinvent the wheel? The `NumberField` does pretty much all of the validation for you for integers and floating numbers. Let's create a `NumberField` that accepts floating-point numbers with the precision to thousandths and allows only specific values:

```
{
    xtype      : 'numberfield',
    fieldLabel : 'Numbers only',
    allowBlank : false,
```

```

    emptyText      : 'This field is empty!',
    decimalPrecision : 3,
    minValue       : 0.001,
    maxValue       : 2
}

```

In this example, you create your NumberField configuration object. In order to apply your requirements, you specify the decimalPrecision, minValue, and maxValue properties. This ensures that any floating number written with greater precision than 3 is rounded up. Likewise, the minValue and maxValue properties are applied to ensure that valid range is 0.001 to 2. Any number outside of this range is considered invalid and Ext will mark the field as such. The NumberField looks exactly like the TextField when rendered. There are a few more properties that can assist with the configuration of the NumberField. Please see the API documentation at <http://extjs.com/docs/?class=Ext.form.NumberField> for further details.

Now that we've looked at the TextField and two of its subclasses, the TextArea and NumberField, let's look at its distant cousin, the ComboBox.

6.2 TypeAhead with the ComboBox

The cleverly named ComboBox input field is like a Swiss army knife of all text input fields. It's a *combination* of a general text input field and a general drop-down box to give you a flexible and highly configurable combination input field. The ComboBox has the ability for automatic text completion (known as *type-ahead*) in the text input area, and coupled with a *remote* data Store, it can work with the server side to filter results. If the combo box is performing a remote request against a large dataset, you can enable result paging by setting the pageSize property. Figure 6.4 illustrates the anatomy of a remote loading and paging ComboBox.

Before we look at how the ComboBox works, we should explore how to construct one. Because you're familiar with how to lay out child items, I think this is an excellent opportunity to leverage your new newly gained experience. So moving forward, when we discuss items that don't contain children, such as fields, I'll leave it up to you to build a Container. Hint: You can use the FormPanel from listing 6.2.

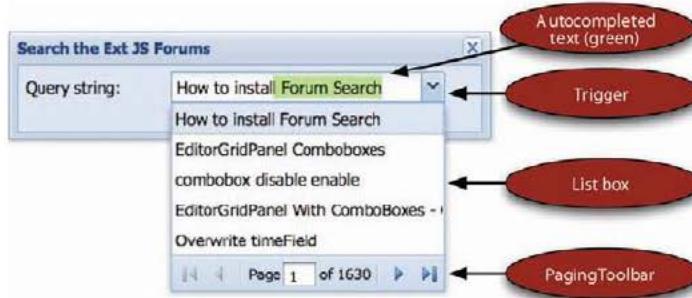


Figure 6.4 An example UI of a remote loading and paging ComboBox with type-ahead

6.2.1 Building a local ComboBox

Creating a `TextField` is simple compared to building a `ComboBox`. This is because the `ComboBox` has a direct dependency on a class called the `data Store`, which is the main tool to manage data in the framework. We'll just scratch the surface of this supporting class here and will go much further into detail in chapter 7. In the following listing you'll build your first `ComboBox` using an `XType` configuration object.

Listing 6.3 Building your first ComboBox

```
var mySimpleStore = new Ext.data.ArrayStore({  
    data : [  
        ['Jack Slocum'], ['Abe Elias'], ['Aaron Conran'], ['Evan Trimboli']  
    ],  
    fields : ['name']  
});  
  
var combo = {  
    xtype : 'combo',  
    fieldLabel : 'Select a name',  
    store : mySimpleStore,  
    displayField : 'name',  
    typeAhead : true,  
    mode : 'local'  
};
```

1 Build your first ArrayStore

2 Specify store in the ComboBox

3 Set display field

4 Set ComboBox to local mode

In listing 6.3, you construct a simple `Store` that reads array data, known as an `ArrayStore` ① (a preconfigured extension of the `Ext.data.Store` class, which makes it easy for you to create a store that digests array data. You populate the consumable array data and set it as the `data` property for the configuration object. Next, you specify the `fields` property as an array of data points from which the `data Store` will read and organize records. Because you have only one data point per array in your array, you specify only a single point and give it a name of '`name`'. Again, we'll go into much greater detail on the `data Store` later on, where you'll learn the entire gamut from records to connection proxies.

You specify your `combo` as a simple POJSO (Plain Old JavaScript Object), setting the `xtype` property as '`combo`' to ensure that its parent `Container` calls the correct class. You specify the reference of your previously created simple store as the `store` ② property. Remember the `fields` property you set for the `store`? Well, the `displayField` ③ is directly tied to the `fields` of the `data Store` that the `ComboBox` is using. Because you have a single field, you'll specify your `displayField` with that single field, which is '`name`'. Last, you set `mode` ④ to '`local`', which ensures that the `data Store` doesn't attempt to fetch data remotely. This attribute is extremely important to remember because the default value for `mode` is '`remote`', which ensures that all data is fetched via remote requests. Forgetting to set it to '`local`' will cause some problems. Figure 6.5 show what the `ComboBox` looks like rendered.

To exercise the filtering and type-ahead features, you can immediately start to type inside the text input field. Now your record set contains only four records, but you can begin to see how this works. Entering a simple `a` into the text field will filter the

list and display only two names in the list box. At the same time, the ComboBox will type-ahead the rest of the first match, which will show up as 'be Elias'. Likewise, entering aa will result in the store filtering out all but a single record, and the type-ahead will fill in the rest of the text, 'ron Conran'. There you have it, a nice recipe for a local ComboBox.

Using a local ComboBox is great if you have a minimal amount of static data. It does have its advantages and disadvantages, however. Its main advantage is that the data doesn't have to be fetched remotely. This, however, ends up being a major disadvantage when there's an extreme amount of data to parse through, which would make the UI slow down, sputter, or even grind to a halt, showing that dreaded "This script is taking too long" error box. This is where the remote loading ComboBox can be called into service.

6.2.2 Implementing a remote ComboBox

Using a remote ComboBox is somewhat more complicated than a static implementation. This is because you have server-side code to manage, which will include some type of server-side store like a database. To keep your focus on the ComboBox, you'll use the preconstructed PHP code at <http://extjsinaction.com/dataQuery.php> on my site, which contains randomly generated names and addresses. Let's get on to implementing our remote ComboBox, as shown in the next listing.

Listing 6.4 Implementing a remote loading ComboBox

```
var remoteJsonStore = new Ext.data.JsonStore({
    root          : 'records',
    baseParams    : {
        column : 'fullName'
    },
    fields        : [
        {
            name      : 'name',
            mapping   : 'fullName'
        },
        {
            name      : 'id',
            mapping   : 'id'
        }
    ],
    proxy : new Ext.data.ScriptTagProxy({
        url : 'http://extjsinaction.com/dataQuery.php'
    })
});

var combo = {
    xtype       : 'combo',
    fieldLabel  : 'Search by name',
    triggerAction: 'all',
    typeAhead   : true,
    mode        : 'local',
    matchCase   : false,
    blankText   : 'Select a name',
    displayField: 'name',
    valueField  : 'id',
    forceSelection: true
};
```

Specify root property



Figure 6.5 An example rendering of our ComboBox from listing 6.3 inside a Window

```

forceSelection : true,
displayField  : 'name',
valueField    : 'id',
hiddenName    : 'customerId',
loadingText   : 'Querying....',
minChars      : 1,
triggerAction : 'name',
store         : remoteJsonStore
};

```



2 Number of characters for autocomplete

In listing 6.4, you change the data Store type to a `JsonStore` ①, a preconfigured extension of the `Ext.data.Store` class, to allow you to easily create a store that can consume JSON data. For the store, you specify a `baseParams` property, which ensures that base parameters are sent out with each request. For this instance, you have only one parameter, `column`, which is set to `'fullName'` and specifies which column in the database the PHP code is to query from. You then specify `fields`, which is now an array containing a single object, and you translate the inbound `'fullName'` property to `'name'` with the `name` and `mapping` attributes. You also create a mapping for the ID for each record, which you'll use for submission. You could have set `fields` to an array of strings, as you did in your local `ArrayStore`, but that makes the mapping order dependant. If you specify `name` and `mapping`, the order of the properties in each record won't matter, which I prefer. Finally, for the store, you specify a `proxy` property where you create a new instance of `ScriptTagProxy`, a tool that's used to request data from across domains. You instruct the `ScriptTagProxy` to load data from a specific URL via the `url` property.

In creating your `ComboBox`, you specify `forceSelection` to `true`, which is useful for remote filtering (and `typeAhead`, for that matter), but it keeps users from entering arbitrary data. Next, you set the `displayField` to `'name'`, which shows the name data point in the `TextField`, and you specify the `valueField` as `'id'`, which ensures that the ID is used to send data when the combo's data is being requested for submission. The `hiddenName` property is greatly overlooked but important. Because you're displaying the name of the person but submitting the ID, you need an element in the DOM to store that value. Because you specified `valueField` previously, a hidden input field is being created to store the field data for the record that's being selected. To have control over that name, you specify `hiddenName` as `'customerId'`.

You also customize the list box's loading text by specifying a `loadingText` string. The `minChars` ② property defines the minimum number of characters that need to be entered into the text field before the combo executes a data Store load and you override the default value of 4. Last, you specify `triggerAction` as `'all'`, which instructs the combo to perform a data Store load querying for all of the data. An example of our newly constructed combo can be seen in figure 6.6.

Exercise the rendered results, and you'll see how remote filtering can be a joy for a user to work with. Let's look at how the data coming back from the server is formatted, as shown in figure 6.7.

In examining a snippet of the resulting JSON in figure 6.7, you can see the root that we specified in our remote combo's JSON store and the `fullName` field we mapped to. The root contains an array of objects, which the data store will translate and pluck out any of the properties we map as "fields". Notice how the `id` is the first property in the record and `fullName` is the second. Because we used name and mapping in our store's fields array, our store will ignore `id` and all other properties in the records.

Following the format in figure 6.6 when implementing your server-side code will help ensure that your JSON is properly formatted. If you're unsure, you can use a free online tool at <http://jsonlint.com>, where you can paste in your JSON and have it parsed and verified.

When exercising the example code in listing 6.4, you might notice that when you click the trigger, the UI's spinner stops for a brief moment. This is because all of the 2,000 records in the database are being sent to the browser and parsed, and DOM manipulation is taking place to clear the list box and create a node. The transfer and parsing of the data are relatively quick for this large dataset. DOM manipulation, however, is one of the main reasons for JavaScript slowing down and is why you'd see the spinner animation stop. The amount of resources required to inject the 2000 DOM elements is intense enough for the browser to halt all animation and focus its attention on the task at hand, not to mention that bombarding the user with that many records may present a usability issue. To mitigate these issues, you should enable paging.

To do this, your server-side code needs to be aware of these changes, which is the hardest part of this conversion. Luckily, the PHP code that you're using already has the code in place necessary to adapt to the changes you're going to make. The first change is adding the following property to your JSON store:

```
totalProperty : 'totalCount'
```

Next, you need to enable paging in your combo box. This can be done by adding a `pageSize` property to your combo box:

```
pageSize : 20
```

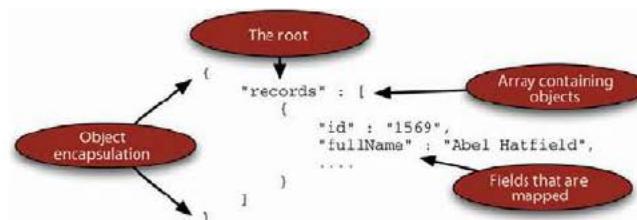


Figure 6.7 An exploded view of a slice of the served-up JSON



Figure 6.6 An example rendition of our remote loading ComboBox from listing 6.4

That's it! Ext is now ready to enable pagination to your combo box. Refresh the code in your browser, and either click the trigger or enter a few characters into the text input field, and you'll see the results of your changes, as shown in figure 6.8.

Thus far, we've explored the UI of the ComboBox and implemented both local and remote versions of using both the Array and JSON stores. Although we've covered many aspects of the ComboBox, we've just been using it as an enhanced version of a drop-down box and have not discussed how to customize the resulting data's appearance. In order to show why we'll be changing some things, such as the template and itemSelector, we need take a quick glance at the innards of the combo.

6.2.3 The ComboBox deconstructed

At the nucleus of the ComboBox lie two helper classes. We've touched on the data Store, which provides the data fetching and loading, but we haven't discussed the DataView, which is the component responsible for displaying the result data in the list box as well as providing the events necessary to allow users to select the data. DataViews work by binding to data Stores by subscribing to events such as 'beforeload', 'datachanged', and 'clear'. They leverage the XTemplate, which provides the DOM manipulation to stamp out the HTML based on the HTML template you provide. Now that we've taken a quick look at the components of a ComboBox, let's move forward in creating our custom ComboBox.

6.2.4 Customizing our ComboBox

When we enabled pagination in our ComboBox, we saw only names. But what if we wanted to see the full address along with the names that we're searching? Our data store needs to know of the fields. In modifying listing 6.4, you'll need to add the mappings for address, city, state, and ZIP. I'll wait here while you finish doing that.

Ready? Okay, before you can create a Template, you must create some CSS that you'll need:

```
.combo-result-item {
    padding: 2px;
    border: 1px solid #FFFFFF;
}

.combo-name {
    font-weight: bold;
    font-size: 11px;
    background-color: #FFFF99;
}

.combo-full-address {
```



Figure 6.8 Adding pagination to our remote ComboBox

```

font-size: 11px;
color: #666666;
}

```

In the preceding CSS, you create a class for each of the divs in our Template. Now you now need to create a new Template so your list box can display the data that you want. Enter the following code before you create your combo:

```

var tpl = new Ext.XTemplate(
    '<tpl for=".">'><div class="combo-result-item">',
        '<div class="combo-name">{name}</div>',
        '<div class="combo-full-address">{address}</div>',
        '<div class="combo-full-address">{city} {state} {zip}</div>',
    '</div></tpl>'
);

```

We won't go too in depth into the XTemplate because it deserves its own section. It's important to note that any string encapsulated in curly braces ({{}}) is directly mapped to the record. Notice how we have all of our data points except for 'id', which we don't need to show and are just using for submission. The last change you need to make is to the combo itself. You need to reference the newly created template and specify an itemSelector:

```

tpl : tpl,
itemSelector : 'div.combo-result-item'

```

It's worth noting that the string for the itemSelector property is part of a pseudo sub-language called Selectors, which are patterns for which a query against the DOM can match. In this case, the Ext.DomQuery class is being used to select the div with the class 'combo-result-item' when any of its children are clicked. Your changes are now ready to be tested. If you did things correctly, your results should look similar to figure 6.9.

What we did to customize our ComboBox is the tip of the iceberg! Because you have complete control of the way the list box is being rendered, you can even include images or QuickTips in the list box.

In this section, you learned how to create a local and a remote ComboBox. You also learned about the ArrayStore and JsonStore data store classes. You had some fun adding pagination to your remote implementation, dissected the ComboBox, and customized the list box. The ComboBox has a subclass, the TimeField, which assists with creating a ComboBox to select times from specific ranges. Let's see how to create a TimeField.

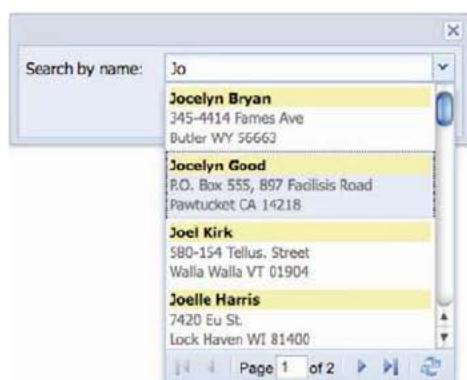


Figure 6.9 An example rendition of our customized ComboBox

6.2.5 Finding the time

TimeField is another convenience class that allows you to easily add a time selection field to a form. To build a generic TimeField, you can create a configuration object with the xtype set to 'timefield', and you'll get a ComboBox that has selectable items from 12:00 A.M. to 11:45 P.M. Here's an example of how to do that:

```
{
    xtype      : 'timefield',
    fieldLabel : 'Please select time',
    anchor     : '100%'
}
```

Figure 6.10 shows an example of how this field would render.

The TimeField is configurable, however, and you can set the range of time, increments, and even the format. Let's modify our TimeField by adding the following properties, which will allow us to use military time, set an increment of 30 minutes, and allow only from 9:00 A.M. to 6:00 P.M.:

```
...
    minValue  : '09:00',
    maxValue  : '18:00',
    increment : 30,
    format    : 'H:i'
```

In this property list, we set the minValue and maxValue properties, which set the range of time that we want our TimeField to have. We also set the increment property to 30 and format to 'H:i', or 24 hours and two-digit minutes. The format property must be valid per the Date.parseDate method. You should consult the full API documentation if you intend to use a custom format. Here's the direct API link: [http://extjs.com / docs/?class=Date&member=parseDate](http://extjs.com/docs/?class=Date&member=parseDate).

Now that you've seen how the ComboBox and its subclass, the TimeField, work, let's take a look at the HtmlEditor.

6.3 WYSIWYG?

The Ext HtmlEditor is known as a WYSIWYG, or *What You See Is What You Get*, editor. It's a great way to allow users to enter rich HTML-formatted text without having to push them to master HTML and CSS. It allows you to configure the Buttons on the Toolbar to prevent certain interactions by the user. Let's move on to building our first HtmlEditor.

6.3.1 Constructing our first HtmlEditor

Just like building the TextField, constructing a generic HTML editor is simple:

```
var htmlEditor = {
    xtype      : 'htmleditor',
    fieldLabel : 'Enter in any text',
```

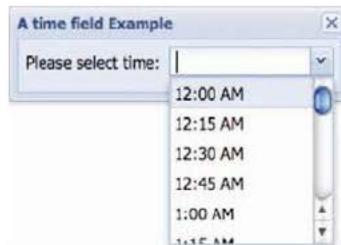


Figure 6.10 Our rendered generic TimeField

```

        anchor      : '100% 100%'
    }
}

```

Our HtmlEditor rendered to a form will look like figure 6.11.

We discussed how the HtmlEditor's Toolbar could be configured to prevent some items from being displayed. This is easily done by setting the enable<someTool> properties to false. For instance, if you wanted to disable the font size and selection menu items, you'd set the following properties as false:

```

enableFontSize : false,
enableFont     : false

```

And that's all there is to it. After making the changes, refresh your page. You'll no longer see the text drop-down menu and the icons to change font sizes. To see a full list of the available options, be sure to visit the API. The HtmlEditor is a great tool, but it, like many things, has some limitations.

6.3.2 Dealing with lack of validation

The single biggest limitation to the HtmlEditor is that it has no basic validation and no way to mark the field as invalid. When developing a form using the field, you'll have to create your own custom validation methods. A simple validateValue method could be created as such:

```

var htmlEditor = {
    xtype          : 'htmleditor',
    fieldLabel     : 'Enter in any text',
    anchor         : '100% 100%',
    allowBlank     : false,
    validateValue  : function() {
        var val = this.getRawValue();
        return (this.allowBlank ||
            (val.length > 0 && val != '<br>')) ? true : false;
    }
}

```

Although this validateValue method will return false if the message box is empty or contains a simple line-break element, it won't mark the field as such. We'll talk about how to test the form for validity before form submissions a little later in this chapter. For now, we'll switch gears and look at the date field.

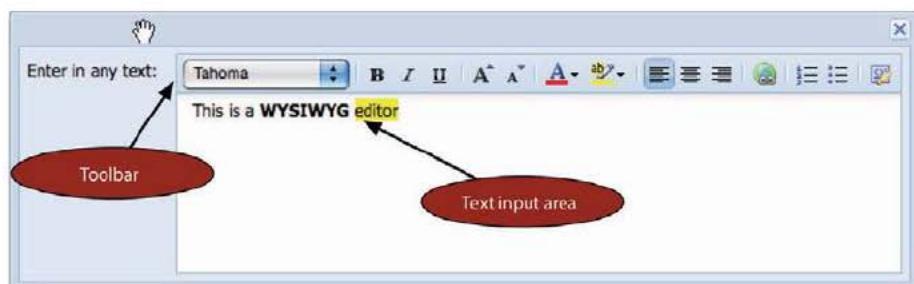


Figure 6.11 Our first HtmlEditor in an Ext Window

6.4 Selecting a date

The DateField is a fun little form widget that's chock full of UI goodness that allows a user to either enter a date via an input field or select one via the leveraged DatePicker widget. Let's build out a DateField:

```
var dateField = {
    xtype      : 'datefield',
    fieldLabel : 'Please select a date',
    anchor     : '100%'
}
```

Yes, it's that easy. Figure 6.12 shows how the DateField renders.

This widget can be configured to prevent days from being selected by setting a date property, which is an array of strings that match the *format* property. The format property defaults to m/d/Y, or 01/01/2001. Here are some recipes for disabling dates using the default format:

```
["01/16/2000", "01/31/2009"] disables these two exact dates
["01/16"] disables this date every year
["01/../2009"] disables every day in January for 2009
[^"01"] disables every month of January
```

Now that you're comfortable with the DateField and the rest of the TextField subclasses, let's move on to explore the Checkbox and Radio fields and learn how you can use the CheckboxGroup and RadioGroup classes to create clusters of fields.

6.5 Checkboxes and Radios

In this section, we're not only going to focus on instantiating Checkboxes and Radios, but we'll also show how to stack them side by side and on top of one another. This will aid you in developing forms that allow for complex data selection.

The Ext Checkbox field wraps Ext element management around the original HTML Checkbox field, which includes layout controls as well. Like with the HTML Checkbox,



Figure 6.12 The DateField the DatePicker exposed (left) and the DatePicker's month and year selection tool (right)

you can specify the value for the Checkbox, overriding the default Boolean value. Let's create some Checkboxes, where we use custom values, as shown in the following listing.

Listing 6.5 Building Checkboxes

```
var checkboxes = [
  {
    xtype      : 'checkbox',
    fieldLabel : 'Which do you own',
    boxLabel   : 'Cat',
    inputValue : 'cat'
  },
  {
    xtype      : 'checkbox',
    fieldLabel : '',
    labelSeparator : ' ',
    boxLabel   : 'Dog',
    inputValue : 'dog'
  },
  {
    xtype      : 'checkbox',
    fieldLabel : '',
    labelSeparator : ' ',
    boxLabel   : 'Fish',
    inputValue : 'fish'
  },
  {
    xtype      : 'checkbox',
    fieldLabel : '',
    labelSeparator : ' ',
    boxLabel   : 'Bird',
    inputValue : 'bird'
  }
];
```

- 1 Set the box label text
- 2 The default input value

The code in listing 6.5 builds out four Checkboxes, where you override the default inputValue for each node. The boxLabel ① property creates a field label to the right of the input field, and the inputValue ② overrides the default Boolean value. An example rendering of this code is shown in figure 6.13.

Although this will work for many forms, for some large forms it's a waste of screen space. In the following listing you'll use the CheckboxGroup to automatically lay out your Checkboxes.

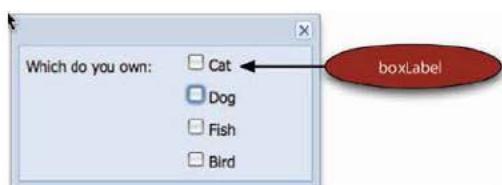


Figure 6.13 Our first four Checkboxes

Listing 6.6 Using a CheckboxGroup

```
var checkboxes = {
  xtype      : 'checkboxgroup',
  fieldLabel : 'Which do you own',
  anchor    : '100%',
```

```

items      : [
{
    boxLabel  : 'Cat',
    inputValue : 'cat'
},
{
    boxLabel  : 'Dog',
    inputValue : 'dog'
},
{
    boxLabel  : 'Fish',
    inputValue : 'fish'
},
{
    boxLabel  : 'Bird',
    inputValue : 'bird'
}
];

```

Using the `CheckboxGroup` in this way will lay out your check boxes in a single horizontal line, as shown in figure 6.14. Specifying the number of columns is as simple as setting the `columns` attribute to the number of desired columns.



Figure 6.14 Two implementations of the `CheckboxGroup`: single horizontal line (left) and a two-column layout (right)

Your implementation of the `CheckboxGroup` will depend on your requirements. Implementing the `Radio` and `RadioGroup` classes is nearly identical to using the `Checkbox` and `CheckboxGroup` classes. The biggest difference is that you can *group* radios by giving them the same name, which allows only one item to be selected at a time. Let's build a group of Radios, as shown in figure 6.15.

Because the `RadioGroup` class extends the `CheckboxGroup` class, the implementation is identical, so I'll save you from going over the same material. Now that we've explored the `Checkbox` and `Radio` classes and their respective Group classes, we'll begin to tie these together by taking a more in-depth look at the `FormPanel`, where you'll learn to perform form-wide checks and complex form layouts.



Figure 6.15 A single column of Radios

6.6 The `FormPanel`

With the Ext `FormPanel` you can submit and load data using Ajax and provide live feedback to users if a field is deemed invalid. Because the `FormPanel` is a descendant

File uploads aren't really Ajax

The XMLHttpRequest object in most browsers can't submit file data. To give the appearance of an Ajax-like submission, Ext JS uses an IFRAME to submit forms that contain file input elements.

of the Container class, you can easily add and remove input fields to create a truly dynamic form.

An added benefit is the FormPanel's ability to leverage other layouts or Components, such as the TabPanel with the CardLayout, to create robust forms that take considerably less screen space than traditionally laid-out single-page forms. Because the FormPanel is a subclass of Panel, you get all of Panel's features, which include top and bottom Toolbars and the button footer bar (fbar).

Like the other Container subclasses, the FormPanel class can leverage any layout that's available from the framework to create exquisitely laid-out forms. To assist with the grouping fields, the FormPanel has a cousin called the Fieldset. Before we build our Components, take a sneak peak of what we're going to achieve (figure 6.16).

To construct your complex form, you'll have to construct two FieldSets: one for the name information and another for the address information. In addition to the FieldSets, you'll set up a TabPanel that has a place for some TextFields and two HtmlEditors. In this task, you'll leverage all of what you've learned thus far, which means we'll go over quite a bit of code.

Now that you know what you'll be constructing, let's start by building out the FieldSet that will contain the TextFields for the name information.

Name Information		Address Information	
First:	<input type="text"/>	Address:	<input type="text"/>
Middle:	<input type="text"/>	Street:	<input type="text"/>
Last:	<input type="text"/>	State:	<input type="text"/> Zip: <input type="text"/>

Phone Numbers Resume Bio

Home:	<input type="text"/>
Business:	<input type="text"/>
Mobile:	<input type="text"/>
Fax:	<input type="text"/>

Figure 6.16 A sneak peek of the complex FormPanel we're going to build

Listing 6.7 Constructing our first FieldSet

```
var fieldset1 = {
    xtype      : 'fieldset',
    title      : 'Name',
    flex       : 1,
    border     : false,
    labelWidth : 60,
    defaultType: 'field',
    defaults   : {
        anchor   : '-10',
        allowBlank: false
    },
    items : [
        {
            fieldLabel : 'First',
            name      : 'firstName'
        },
        {
            fieldLabel : 'Middle',
            name      : 'middle'
        },
        {
            fieldLabel : 'Last',
            name      : 'lastName'
        }
    ]
};
```

 1 Set xtype to 'fieldset'

In constructing your first `fieldset` ① `xtype`, the parameters may look like those of a `Panel` or `Container`. This is because the `FieldSet` class extends `Panel` and adds some functionality for the collapse methods to allow you to include fields in a form or not, which we don't exercise here. The reason you're using the `FieldSet` in this instance is that it's giving you that neat little title up top and you're getting exposure to this Component.

You'll skip rendering this first `FieldSet` because you'll use it in a `FormPanel` a little later on. Let's go on to build the second `FieldSet`, which will contain the address information. This listing is rather large, so please stick with me on this.

Listing 6.8 Building our second FieldSet

```
var fieldset2 = Ext.apply({}, {
    flex      : 1,
    title    : 'Address Information',
    items   : [
        {
            fieldLabel : 'Address',
            name      : 'address'
        },
        {
            fieldLabel : 'Street',
            name      : 'street'
        }
    ]
});
```

 1 Copy properties from first FieldSet

```
{  
    xtype      : 'container',  
    border     : false,  
    layout     : 'column',  
    anchor     : '100%',  
    items      : [  
        {  
            xtype   : 'container',  
            layout  : 'form',  
            width   : 200,  
            items   : [  
                {  
                    xtype      : 'textfield',  
                    fieldLabel : 'State',  
                    name       : 'state',  
                    anchor     : '-20'  
                }  
            ]  
        },  
        {  
            xtype      : 'container',  
            layout     : 'form',  
            columnWidth: 1,  
            labelWidth : 30,  
            items      : [  
                {  
                    xtype      : 'textfield',  
                    fieldLabel : 'Zip',  
                    anchor     : '-10',  
                    name       : 'Zip'  
                }  
            ]  
        }  
    ]  
}, fieldset1);
```

In listing 6.8, you leverage `Ext.apply` ① to copy many of the properties from `fieldset1` and apply them to `fieldset2`. This utility method is commonly used to copy or override properties from one object or another. We'll talk more about this method when we look into Ext's utility toolbelt. To accomplish the desired layout of having the State and ZIP code fields side by side, you must create quite a bit of nesting. The child ② of your second `FieldSet` is a `Container`, which has its layout set to `column`. The first child of that `Container` is a `FormLayout Container` ③, which contains the State `TextField` ④. The second child ⑤ of your `ColumnLayout Container` is another `FormLayout Container`, which contains the ZIP code `TextField` ⑥.

You might be wondering why there are so many nested containers and perhaps why the code to get this done is so darn long. The Container nesting is required to use different layouts within other layouts. This might not make sense to you immediately. I think the picture will be clearer to you when you render the form. For now, let's move on to building a place for these two FieldSets to live.

In order to achieve the side-by-side look of the form, you'll need to create a container for it that's set up to leverage the `HBoxLayout`. In order to have equal widths in the `HBoxLayout`, you must set both of your `FieldSets`' stretch properties to 1. Let's build a home for the two `FieldSets`:

```
var fieldsetContainer = {
    xtype      : 'container',
    layout     : 'hbox',
    height     : 120,
    layoutConfig : {
        align : 'stretch'
    },
    items   : [
        fieldset1,
        fieldset2
    ]
};
```

In the preceding code block, you create a Container that has a fixed height but has no width set. This is because this Container's width will be automatically set via the `VBox` layout, which your future `FormPanel` will use.

Now that you've done that, you'll build a `TabPanel` with three tabs, one for the phone number form elements and the other two for `HtmlEditors`. This will use the bottom half of the `FormPanels`' available height. You'll configure all of the tabs in one shot, so the following listing is pretty lengthy. Please bear with me on this one also.

Listing 6.9 Building a TabPanel with form items

```
var tabs = [
    {
        xtype      : 'container',
        title     : 'Phone Numbers',
        layout     : 'form',
        bodyStyle : 'padding:6px 6px 0',
        defaults  : {
            xtype : 'textfield',
            width : 230
        },
        items: [
            {
                fieldLabel : 'Home',
                name      : 'home'
            },
            {
                fieldLabel : 'Business',
                name      : 'business'
            },
            {
                fieldLabel : 'Mobile',
                name      : 'mobile'
            },
            {
                fieldLabel : 'Fax',
                name      : 'fax'
            }
        ]
};
```



1 Container with four TextFields

```

        name      : 'fax'
    }
]
},
{
    title   : 'Resume',
    xtype   : 'htmleditor',
    name    : 'resume'
},
{
    title   : 'Bio',
    xtype   : 'htmleditor',
    name    : 'bio'
}
];

```

 **Two HtmlEditors
as tabs**

Listing 6.9 contains a lot of code to construct an array that comprises three tabs that will serve as children to your future TabPanel. The first tab ① is a Container that leverages the FormLayout and has four TextFields. The second ② and third tabs are HtmlEditors that will be used to enter a resume and a short biography. Let's move on to building our TabPanel:

```

var tabPanel = {
    xtype           : 'tabpanel',
    activeTab      : 0,
    deferredRender : false,
    layoutOnTabChange : true,
    border         : false,
    flex            : 1,
    plain           : true,
    items           : tabs
}

```

In the preceding code block, you configure a TabPanel object that contains your tabs. You set `deferredRender` to `false` because you want to ensure that the tabs are built and in the DOM when you get around to loading your data. You also set `layoutOnTabChange` to `true` to ensure that the `doLayout` method for the tab you're activating is called, which ensures that the tab is properly sized.

Your task in the next listing will be to construct the FormPanel itself, which is relatively trivial compared to all of its child items.

Listing 6.10 Piecing it all together

```

var myFormPanel = new Ext.form.FormPanel({
    renderTo      : Ext.getBody(),
    width        : 700,
    title        : 'Our complex form',
    height       : 360,
    frame        : true,
    id           : 'myFormPanel',
    layout        : 'vbox',
    layoutConfig : {
        align : 'stretch'
    }
});

```

```

},
items : [
    fieldsetContainer,
    tabPanel
]
);
}

```

Here, you're finally getting to create your FormPanel. You set `renderTo` to ensure that the FormPanel is automatically rendered. In order to have the `fieldsetContainer` and the `TabPanel` properly sized, you use the `vBoxLayout` with `layoutConfig's align` property set to '`stretch`'. You specify only a height for the `fieldsetContainer`. You do this because other than the height of the `fieldsetContainer` you let the `vBoxLayout` do its job in managing the size of the child items of the FormPanel. Take a look at figure 6.17 to see what this beast of a form renders to.

In the preceding figure, I highlighted the different Containers that compose the first half of the form, which include our `fieldsetContainer`, two `FieldSets`, and their child Components. In using this many Containers, you're ensuring complete control over how the UI is laid. It's common practice to have these long code batches to create a UI with this type of complexity. In exercising our newly built FormPanel, you can flip through the three tabs and reveal the `HtmlEditors` underneath.

By now you've seen how combining multiple Components and layouts can result in something that's both usable and space saving. You now must focus your attention on learning to use forms for data submission and loading; otherwise, your forms will be useless.

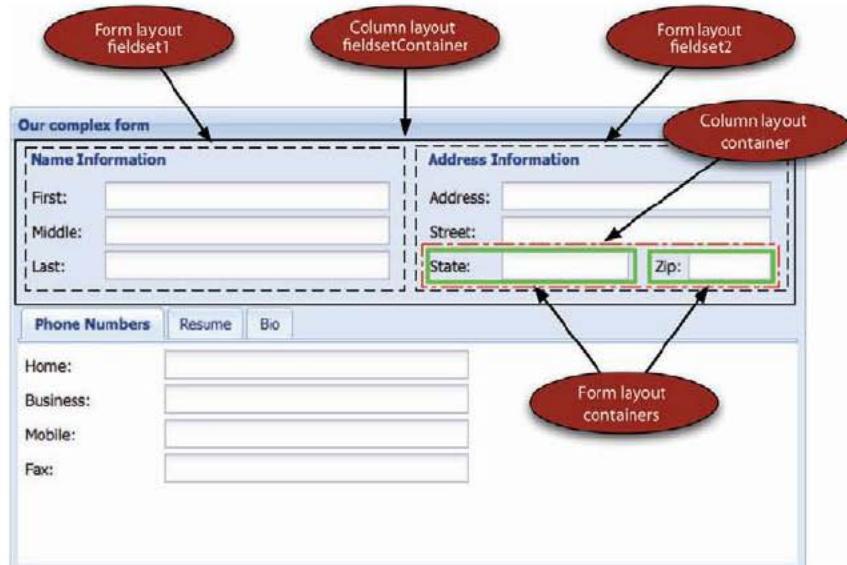


Figure 6.17 The results of our first complex layout form with the different Containers used to compose the complex layouts

6.7 Data submission and loading

Submitting data via the basic form-submit method is one of the areas new developers most commonly get tripped up on. This is because for so many years we were used to submitting a form and expecting a page refresh. With Ext, the form submission requires a bit of know-how. Likewise, loading a form with data can be a little confusing for some, so we'll explore the few ways you can do that as well.

6.7.1 Submitting the good old way

As I said before, submitting your form the good old way is extremely simple, but you need to configure the `FormPanel`'s underlying form element with the `standardSubmit` property set to true. To perform the submission you call

```
Ext.getCmp('myFormPanel').getForm().submit();
```

This will call the generic DOM form `submit` method, which will submit the form the old-fashioned way. If you're going to use the `FormPanel` in this way, I'd still suggest that you review submitting via Ajax, which will point out some of the features that you can't use when using the older form-submission technique.

6.7.2 Submitting via Ajax

To submit a form, you must access the `FormPanel`'s `BasicForm` component. To do this, you use the accessor method `getForm` or `FormPanel.getForm()`. From there, you have access to the `BasicForm`'s `submit` method, which you'll use to send data via Ajax. The code is shown in the following listing.

Listing 6.11 Submitting our form

```
var onSuccessOrFail = function(form, action) {
    var formPanel = Ext.getCmp('myFormPanel');
    formPanel.el.unmask();

    var result = action.result;
    if (result.success) {
        Ext.MessageBox.alert('Success',action.result.msg);
    }
    else {
        Ext.MessageBox.alert('Failure',action.result.msg);
    }
}

var submitHandler = function() {
    var formPanel = Ext.getCmp('myFormPanel');
    formPanel.el.mask('Please wait', 'x-mask-loading');

    formPanel.getForm().submit({
        url      : 'success.true.txt',
        success : onSuccessOrFail,
        failure : onSuccessOrFail
    });
}
```

1 Display message driven by JSON

2 Perform form submission

In listing 6.11, you create a success and failure handler called `onSuccessOrFail`, which will be called if the form-submission attempt succeeds or fails. It will display an alert `MessageBox` ① depending on the status of the returning JSON from the web server. You then create the submission handler method, `submitHandler`, which performs the form submission ②. Although you specify the URL on the `submit` call, you could have specified it at the `BasicForm` or `FormPanel` level, but you specify it here because I wanted to point out that the target URL could be changed at runtime. Also, if you're providing any type of wait message, as you do here, you should have success and failure handlers.

At minimum, the returning JSON should contain a 'success' Boolean with the value of `true`. Your success handler is expecting a `msg` property as well, which should contain a string with a message to return to the user:

```
{success: true, msg : 'Thank you for your submission.'}
```

Likewise, if your server-side code deems that the submission was unsuccessful for any reason, the server should return a JSON object with the `success` property set to `false`. If you want to perform server-side validation, which can return errors, your return JSON could include an `errors` object as well. Here's an example of a failure message with attached errors:

```
{
  success : false,
  msg      : 'This is an example error message',
  errors   : {
    firstName : 'Cannot contain "!" characters.',
    lastName  : 'Must not be blank.'
  }
}
```

If the returning JSON contains an `errors` object, the fields that are identified by that name will be marked invalid. Figure 6.18 shows the form with the JSON code served to it.

In this section, you learned how to submit your form using the standard `submit` methods as well as the Ajax way. You also saw how to leverage the `errors` object to provide server-side validation with UI-level error notification. Next, we'll look at loading data into the form using the `load` and `setValues` methods.

6.7.3 Loading data into our form

The use cycle of just about every form includes saving and loading data. With Ext, we have a few ways to load data, but we must have data to load, so we'll dive right into creating some data to load. Let's create some mock data and save it in a file called `data.txt`.

```
var x = {
  success : true,
  data    : {
    firstName : 'Jack',
    lastName  : 'Slocum',
```

```

        middle      : '',
        address     : '1 Ext JS Corporate Way',
        city        : 'Orlando',
        state       : 'Florida',
        zip         : '32801',
        home        : '123 346 8832',
        business    : '832 932 3828',
        mobile      : '',
        fax         : '',
        resume      : 'Skills:<br><ul><li>Java Developer</li>' +
                      '<li>Ext JS Senior Core developer</li></ul>',
        bio         : 'Jack is a stand-up kind of guy.<br>'
    }
}

```

Just like with form submission, the root JSON object must contain a success property with the value of true, which will trigger the setValues call. Also, the values for the form need to be in an object, whose reference property is data. Likewise, it's great practice to keep your form element names inline with the data properties to load. This will ensure that the right fields get filled in with the correct data. For the form to load the data via Ajax, you can call the BasicForm's load method, whose syntax is just like submit:

```

var formPanel = Ext.getCmp('myFormPanel');

formPanel.el.mask('Please wait', 'x-mask-loading');
formPanel.getForm().load({
    url      : 'data.txt',
    success  : function() {
        formPanel.el.unmask();
    }
});

```

Figure 6.18 The results from our server-side errors object using the standard QuickTip error msg

Figure 6.19 The results of loading our data via XHR

Executing this code will result in your form panel performing an XHR (XMLHttpRequest) and ultimately the form being filled in with the values, as illustrated in figure 6.19.

If you have the data on hand, let's say from another component such as a DataGrid, you can set the values via `myFormPanel.getForm().setValues(dataObj)`. Using this, `dataObj` would contain only the proper mapping to element names. Likewise, if you have an instance of `Ext.data.Record`, you could use the form's `loadRecord` method to set the form's values.

TIP To retrieve the values from any given form, call `getValues` from the FormPanel's `BasicForm` instance. For example, `myFormPanel.getForm().getValues()` would return an object containing keys representing the names of the fields and their values.

Loading data can be as simple as that. Remember that if the server side wants to deny data loading, you can set the `success` value to `false`, which will trigger the `failure` method as referenced in the `load`'s configuration object.

Congratulations! You've configured your first truly complex FormPanel and learned how to load and save its data.

6.8 Summary

In focusing on the `FormPanel` class, we covered quite a few topics, including many of the commonly used fields. You even got a chance to take an in-depth look at the `ComboBox` field, where you got your first exposure to its helper classes, the `data Store` and the `DataView`. Using that experience, you saw how to customize the `ComboBox`'s

resulting list box. We also took some time to build a relatively complex layout form and used our new tool to submit and load data.

Moving forward, we're going to take an in-depth look at the `GridPanel`, where you'll learn about its inner `Components` and see how to customize the look and feel of a grid. You'll also see how to leverage the `EditorGridPanel` class to edit data inline. Along the way, you'll learn more about the `data Store`. Be sure to get some candy; this is going to be a fun ride!

Part 3

Data-driven Components

I

In this part, we'll look at the widgets in the framework that consume data, including the `GridPanel`, `DataView`, `Charts`, and `TreePanel`. Here you'll learn about the intricacies of the supporting classes, such as the `data Store`.

Chapter 7 is where we take a detailed look at how the `GridPanel` works and discuss its supporting classes. This chapter includes an in-depth discussion of the `data Store` class and how it leverages several supporting classes to control data flow within the framework.

In chapter 8 you'll add to your newly found knowledge of `GridPanels` and `data Stores` and learn to implement the `EditorGridPanel`. Here you'll learn how to use the `data Writer` class, allowing you to create a UI that allows full `CRUD` capabilities for your users.

Chapter 9 is dedicated to exploring the `DataView` and its subclass the `List-View`. In addition to learning about these widgets, you'll learn how to bind them together with a `FormPanel` to create a screen with a workflow that can be implemented in any application.

You'll learn how to visualize data by using the framework's various charting widgets in chapter 10.

In chapter 11, you'll learn about displaying hierarchical data with the `TreePanel` widget. You'll also learn how to use the `TreeEditor` class to enable full `CRUD` against data nodes.

We'll close this section out by taking a deep look at `Buttons`, `Menus`, and `Tool-bars` in chapter 12.

While completing this section, you'll learn about and experience almost all of the framework's widgets.



The venerable GridPanel

This chapter covers

- Learning about the `GridPanel` Component
- Becoming an expert at Ext JS data `Stores`
- Setting up custom column renderers
- Configuring `GridPanel` mouse interaction event handlers
- Enabling `GridPanel` pagination with the `PagingToolbar`
- Implementing a custom context menu on the `GridPanel`

Since the early days of Ext JS, the `GridPanel` has been the centerpiece of the Ext Framework. It can display data like a table, but is much more robust. In many respects, I believe this holds true today, and the `GridPanel` is arguably one of its more complicated widgets, because directly depends on five directly supporting classes.

In this chapter, you'll learn a lot about the `GridPanel` and the class that feeds it data, the data `Store`. We'll start by constructing `GridPanel` that feeds from a `Store` that reads local in-memory array data. At each step of the process, you'll learn more about both the `data Store` and the `GridPanel` and their supporting classes.

Once you become more familiar with the `data Store` and `GridPanel`, we'll move on to building a remote-loading `data Store` that can parse JSON that will feed a paging toolbar.

7.1 Introducing GridPanel

At a first glance, the GridPanel may look like a glorified HTML table, which has been used for ages to display data. If you take a moment to look at one of the Ext JS grid examples, you'll come to the realization that this is no ordinary HTML table. You can see one example implementation of the GridPanel that uses an array store at <http://extjs.com/deploy/dev/examples/grid/array-grid.html>. If you're not online, that's all right. I've included a snapshot of it in figure 7.1.

In the array grid example, you can see that the features provided by this widget extend beyond those of a typical HTML table. These include column-management features such as sorting, resizing, reordering, showing, and hiding. Mouse events are also tracked, out of the box, to allow you to highlight a row by hovering over it and even select it by clicking it.

The example also demonstrates how the GridPanel's view (known as the GridView) can be customized with what are known as custom renderers, which are applied to the Change and % Change columns. These custom renderers color the text based on negative and positive values.

This example merely skims the surface when it comes to how the GridPanel can be configured or extended. In order to fully understand the GridPanel and why it's so extensible, you need to know more about its supporting classes.

7.1.1 Looking under the hood

The key supporting classes that drive the GridPanel are the ColumnModel, GridView, SelectionModel, and data Store. Let's take a quick glance at an implementation of a grid panel and see how each class plays a role in making the GridPanel work (figure 7.2).

In figure 7.2, you see a GridPanel and its five supporting classes highlighted. Starting from the beginning, the data source, you see the data Store class. Data Stores work by leveraging a reader, which is used to "map" data points from a data source

Array Grid				
Company	Price	Change	% Change	Last Updated
3m Co	\$71.72	0.02	0.03%	09/01/2009
Alcoa Inc	\$29.01	0.42	1.47%	09/01/2009
Altria Group Inc	\$83.81	0.28	0.34%	09/01/2009
American Express Company	\$52.55	0.01	0.02%	09/01/2009
American International Group, Inc.	\$64.13	0.31	0.49%	09/01/2009
AT&T Inc.	\$31.81	-0.48	-1.54%	09/01/2009
Boeing Co.	\$75.43	0.53	0.71%	09/01/2009
General Electric Company	\$34.14	-0.08	-0.23%	09/01/2009
General Motors Corporation	\$30.27	1.09	3.74%	09/01/2009
Hewlett-Packard Co.	\$36.53	-0.03	-0.08%	09/01/2009

Figure 7.1 The array grid example, found in the examples folder of the downloadable SDK

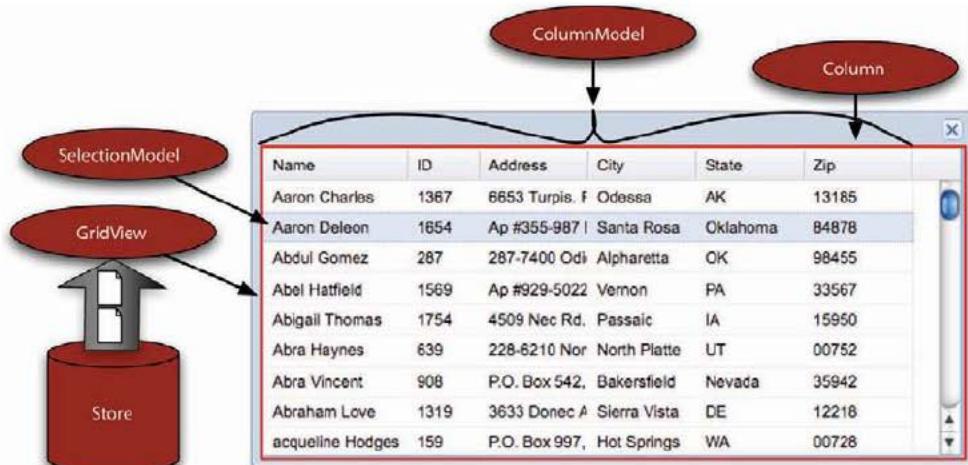


Figure 7.2 The GridPanel's five supporting classes: data Store, GridView, ColumnModel, Column, and SelectionModel

and populate the data store. They can be used to read array, XML, or JSON data via the array, XML, and JSON readers. When the reader parses data, it's organized into records, which are organized and stored inside the data Store.

This should be somewhat familiar to you, because you leveraged it when creating ComboBoxes. As you learned earlier, data Stores can get their data from either local or remote sources. Like the ComboBox, the data Store feeds a view. In this case, it's the GridView.

The GridView class is the UI component of the GridPanel. It's responsible for reading the data and controlling the painting of data onscreen. It leverages the ColumnModel to control the way the data is presented onscreen.

The ColumnModel is the UI controller for each individual column. It's what provides the functions for columns, such as resize, sort, and so on. In order to do its job, it has to leverage one or more instances of Column.

Columns are classes that map the data fields from each individual record for placement on screen. They do this by means of a dataIndex property, which is set for each column and is responsible for displaying the data it obtains from the field it's mapped to.

Finally, the SelectionModel is a supporting class that works with a view to allow users to select one or more items onscreen. Out of the box, Ext supports Row, Cell, and Checkbox SelectionModels.

You have a nice head start on GridPanels and their supporting classes. Before you construct your first grid, you should learn more about the data Store class, which many widgets in the framework depend on for data.

7.2 The data Store at a glance

As you learned a bit ago, the data Store is the class that provides the data for the GridPanel1. The data Store feeds quite a few widgets throughout the framework whenever data is needed. To put this into plain view, figure 7.3 enumerates the classes that depend on the data Store.

As you can see, the data Store supports quite a few widgets, which include the DataView, ListView, ComboBox, Charts, the GridPanel, and all of its subclasses. The only exception to this pattern is the TreePanel1. The reason for this is the data Store contains a list of records, whereas TreePanels require hierarchical data.

As a quick warning, this may be one of those “dry” areas that you might not think is important—but hold on one second. Remember all of those classes that the data Store feeds data to? Being proficient in this area of the framework better enables you to easily use any of those consumer widgets.

7.2.1 How data Stores work

When you got your first real exposure to the data Store, you learned how to use subclasses of the data Store, ArrayStore, and JsonStore, to read array and JSON data. These subclasses are convenience classes, or preconfigured versions of the actual data Store, which take care of things for us like attaching the correct reader for data consumption. We used these convenience methods in the earlier chapters because they make life easier for us, but there’s a lot going on under the hood that’s not immediately exposed and is important to know as well. We’ll start by looking at exactly how the data flows from a data source to the store. We’ll begin with a simple flow illustration, shown in figure 7.4.

As you can see, the data always starts from a DataProxy. The DataProxy classes facilitate the retrieval of unformatted data objects from a multitude of sources and contain their own event model for communication for subscribed classes such as the DataReader. In the framework, there’s an abstract class aptly called DataProxy, which serves as a base class for the subclasses, which are responsible for retrieving data from specific sources, as shown in figure 7.5.

The most commonly used proxy is the HttpProxy, which leverages the browser’s XHR object to perform generic AJAX requests. The HttpProxy is limited, however, to

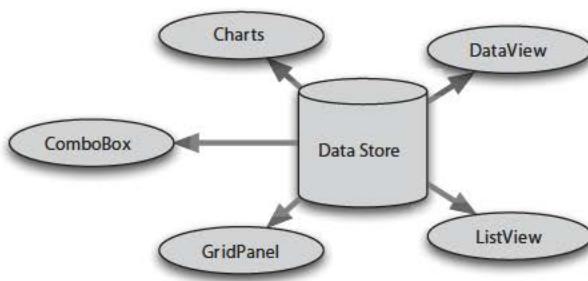


Figure 7.3 The data Store and the classes it feeds data to. This illustration doesn’t depict class hierarchy.

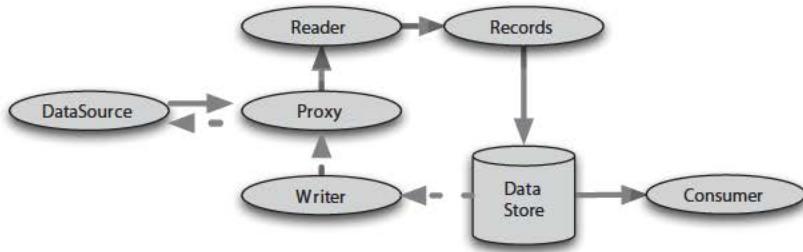


Figure 7.4 The data flow from a data source to a data Store consumer

the same domain because of what is known as the “same-origin policy.” This policy dictates that XHR requests via XHR can’t be performed outside of the domain from which a specific page is being loaded. This policy was meant to tighten security with XHRs but has been construed as more of an annoyance than a security measure. The Ext developers were quick to come up with a workaround for this “feature,” which is where the ScriptTagProxy (STP) comes into the picture.

The STP cleverly leverages the script tag to retrieve data from another domain and works well, but it requires that the requesting domain return JavaScript instead of generic data snippets. This is important to know because you can’t just use the STP against any third-party website to retrieve data. The STP requires the return data to be wrapped in a global method call, passing the data in as the only parameter. You’ll learn more about the STP in a bit because we’ll be using it to leverage extjsinaction.com to retrieve data from our examples.

The MemoryProxy class offers Ext the ability to load data from a memory object. Although you can load data directly to an instance of data Store via its `loadData` method, use of the MemoryProxy can be helpful in certain situations. One example is the task of reloading the data Store. If you use `data Store.loadData`, you need to pass in the reference to the data, which is to be parsed by the reader and loaded into the store. Using the MemoryProxy makes things simple, because you only need to call the `data Store.reload` method and let Ext take care of the dirty work.

The DirectProxy is new to Ext JS 3.0 and allows the data store to interact with the `Ext.direct` remoting providers, allowing for data retrievals via remote procedure calls (RPCs). We won’t be covering usage of Direct because there’s a direct dependency on server-side language to provide the remoting methods.

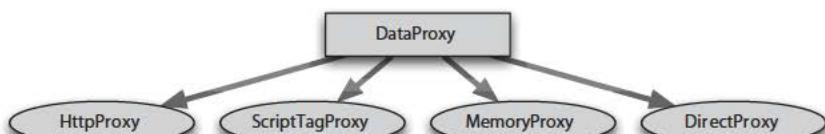


Figure 7.5 The DataProxy and its four subclasses. Each is responsible for retrieving data from a specific data source.

NOTE If you're interested in learning more about Ext.direct, I suggest visiting <http://extjs.com/products/extjs/direct.php> for details on specific server-side implementations.

After a proxy fetches the raw data, a Reader then reads or parses it. A Reader is a class that takes the raw, unformatted data objects and abstracts the data points, known as dataIndexes, and arranges them into name data pairs, or generic objects. Figure 7.6 illustrates how this mapping works.

As you can see, the raw and unformatted data is organized and fed into Records that the Reader then creates. These Records are then spooled into the data Store and are now ready to be consumed by a widget.

Ext provides readers for the three common data types: array, XML, and JSON. As the reader chews on Records, it creates a Record for each row of data, which is to be inserted into the data Store.

A Record is a fully Ext-managed JavaScript object. Much like Ext manages Element, the Record has getter and setter methods and a full event model for which the data Store is bound. This management of data adds usability and some cool automation to the framework.

For example, changing a value of a Record in a store that's bound to a consumer, like the GridPanel1, will result in the UI being updated when the Record is committed. You'll learn much more about management of Records in the next chapter, when we discuss editable grids. After the Records are loaded into the data Store, the bound consumer refreshes its view and the load cycle completes.

Now that you have some fundamental knowledge of the data Store and its supporting classes, we can begin to build our first GridPanel1.

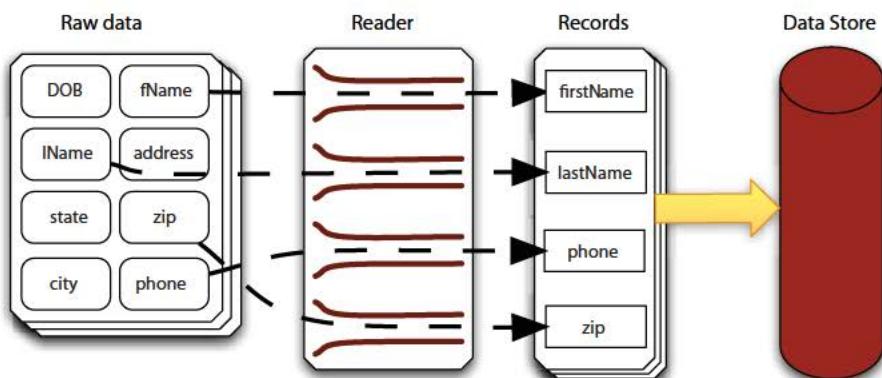


Figure 7.6 A Reader maps raw or unformatted data so that it can be inserted into Records, which then get spooled into a data Store.

7.3 Building a simple GridPanel

When implementing GridPanels, I typically start by configuring the data Store. The reason for this is that the configuration of the ColumnModel is directly related to the configuration of the data Store. This is where you'll start too.

7.3.1 Setting up an ArrayStore

In the example shown in listing 7.1, we'll create a complete end-to-end data Store that reads data already present in memory. This means that we're going to instantiate instances of all of the supporting classes from the Proxy to the Store. This exercise will help you see the working parts being configured and instantiated. Afterwards, you'll learn how to use some of the preconfigured Data Store convenience classes to make constructing certain types of stores easier with much less code.

Listing 7.1 Creating a data Store that loads local array data

```
var arrayData = [
    ['Jay Garcia',      'MD'],
    ['Aaron Baker',     'VA'],
    ['Susan Smith',     'DC'],
    ['Mary Stein',       'DE'],
    ['Bryan Shanley',   'NJ'],
    ['Nyri Selgado',    'CA']
];
var nameRecord = Ext.data.Record.create([
    { name : 'name', mapping : 1 },
    { name : 'state', mapping : 2 }
]);
var arrayReader = new Ext.data.ArrayReader({}, nameRecord);
var memoryProxy = new Ext.data.MemoryProxy(arrayData);
var store = new Ext.data.Store({
    reader : arrayReader,
    proxy   : memoryProxy
});
```

1 Create local array data
2 Create Ext.data.Record constructor
3 Instantiate an ArrayReader
4 Construct new MemoryProxy
5 Build our Store

In listing 7.1, you implement the full gamut of data Store configuration. You start by creating an array of arrays, which is referenced by the variable `arrayData` ①. Please pay close attention to the format the array data is in, because this is the expected format for the `ArrayReader` class. The reason the data is an array of arrays is that each child array contained within the parent array is treated as a singular Record.

Next, you create an instance of `data.MemoryProxy`, which is what will load your unformatted data from memory and is referenced by the variable `memoryProxy` ②. You pass in the reference `arrayData` as the only argument.

You create an instance of `data.Record` ③ and reference it in the variable `nameRecord`, which will be used as the template to map your array data points to create records. You pass an array of object literals, which are known as fields ④, to the `Record.create` method, and detail each field name and its mapping. Each of these

object literals is a configuration object for the `Ext.data.Field` class, which is the smallest unit of managed data within a `Record`. In this case, you map the field `personName` to the first data point in each array record and the `state` field to the second data point.

NOTE Notice that we're not calling `new Ext.data.Record()`. This is because `data.Record` is a special class that's able to create constructors by using its `create` method, which returns a new record *constructor*. Understanding how `data.Record.create` works is essential to performing additions to a data `Store`.

You then create an instance of `ArrayReader` ❸, which is what's responsible for sorting out the data retrieved by the proxy and creating new instances of the record constructor you just created. The `ArrayReader` reads each `Record` and creates a new instance of `nameRecord`, passing the parsed data to it, which is then loaded into the store.

Last, you create your data `Store`, for which you pass the reader and proxy you created, which completes the creation of your `ArrayStore`. This completes our end-to-end example of how to create a store that reads array data. With this pattern, you can change the type of data the store is able to load. To do this, you swap out the `ArrayReader` with either a `JsonReader` or an `XmlReader`. Likewise, if you wanted to change the data source, you could swap out the `MemoryProxy` for another such as the `HttpProxy`, `ScriptTagProxy`, or `DirectProxy`.

Recall that I mentioned something a bit earlier about convenience classes to make our lives a little easier. If you were to re-create the `Store` using the `ArrayStore` convenience class, this is what your code would look like using the previous `arrayData`:

```
var store = new Ext.data.ArrayStore({
    data   : arrayData,
    fields : ['personName', 'state']
});
```

As you can see in this example, you use shortcut notation for the fields to create an instance of `Ext.data.ArrayStore`. You achieve this by passing a reference of the data, which is your `arrayData` and a list of fields, which provide the mapping. Notice how the `fields` property is a simple list of strings? This is a completely valid configuration of field mappings because Ext is smart enough to create the name and index mapping based on the string values passed in this manner. You could have a mixture of objects and strings in a `fields` configuration array. For instance, the following configuration is completely valid:

```
fields : [ 'fullName', { name : 'state', mapping : 2 } ]
```

Having this flexibility is something that can be really cool to leverage. Just know that having a mixture of field configurations like this can make the code a bit hard to read.

Using this convenience class saved you from having to create a proxy, record template, and reader to configure the store. Use of the `JsonStore` and `XmlStore` is equally as simple, which you'll learn more about later. Moving forward, we'll be using the convenience classes to save us time.

For now, we'll move on to creating the `ColumnModel`, which defines the vertical slices of data that our `GridPanel` will display along with our `GridView` component.

7.3.2 Completing our first `GridPanel`

As we discussed before, the `ColumnModel` has a direct dependency on the data `Store`'s configuration. This dependency has to do with a direct relationship between the data field records and the column. Just as the data fields map to a specific data point in the raw inbound data, columns map to the record field *names*.

To finish your `GridPanel` construction, you need to create a `ColumnModel`, `GridView`, and `SelectionModel`, and then you can configure the `GridPanel` itself, as shown in the following listing.

Listing 7.2 Creating an `ArrayStore` and binding it to a `GridPanel`

```
var colModel = new Ext.grid.ColumnModel([
    {
        header      : 'Full Name',
        sortable    : true,
        dataIndex  : 'fullName'
    },
    {
        header      : 'State',
        dataIndex  : 'state'
    }
]);
var gridView = new Ext.grid.GridView();
var selModel = new Ext.grid.RowSelectionModel({
    singleSelect : true
});
var grid = new Ext.grid.GridPanel({
    title       : 'Our first grid',
    renderTo    : Ext.getBody(),
    autoHeight  : true,
    width       : 250,
    store       : store,
    view        : gridView,
    colModel    : colModel,
    selModel    : selModel
});
```

The code is annotated with numbered callouts pointing to specific parts of the code:

- 1 Create ColumnModel**: Points to the first two columns in the `ColumnModel` definition.
- 2 Map dataIndexes to columns**: Points to the `dataIndex` properties in the `ColumnModel` columns.
- 3 Instantiate new GridView**: Points to the `gridView` variable.
- 4 Create single-selection RowSelectionModel**: Points to the `RowSelectionModel` configuration object.
- 5 Instantiate our Grid**: Points to the `grid` variable.
- 6 Reference supporting classes**: Points to the `store`, `gridView`, `colModel`, and `selModel` references.

In listing 7.2, you configure all of the supporting classes before constructing the `GridPanel` itself. The first thing you do is create a reference for a newly instantiated instance of a `ColumnModel` ①, for which you pass in an array of configuration objects. Each of these configuration objects is used to instantiate instances of `Ext.grid.Column` (or any subclasses thereof), which is the smallest managed unit of the `ColumnModel`. These configuration objects ② detail the text that's to be populated in the column `header` and which Record field the column maps to, which is specified by the `dataIndex` property. This is where you see the direct dependency on the configuration of the

Store's fields and the ColumnModel's columns. Also, notice that you set sortable to true for the Full Name column and not the State column. This will enable sorting on that one column.

You then create an instance of Ext.grid.GridView ③, which is responsible for managing each individual row for the grid. It binds key event listeners to the data Store, which it requires to do its job. For instance, when the data Store performs a load, it fires the datachanged event. The GridView listens for that event and will perform a full refresh. Likewise, when a record is updated, the data Store fires an update event, for which the GridView will only update a single row. You'll see the update event in action in the next chapter, when you learn how to leverage the EditableGrid.

Next, you create an instance of Ext.grid.RowSelectionModel ④ and pass a configuration object that instructs the selection model to allow only single selection of rows to occur. There are two things to know in this step. The first is that by default the GridPanel always instantiates an instance of RowSelectionModel and uses it as the default selection model if you don't specify one. But you did create one because by default the RowSelectionModel allows for multiple selections. You can elect to use the CellSelectionModel in place of the RowSelectionModel. The CellSelectionModel doesn't allow for multiple selections of items, however.

After you instantiate your selection model, you move on to configure your GridPanel ⑤. GridPanel extends Panel, so all of the Panel-specific configuration items apply. The only difference is you *never* pass a layout to the GridPanel because it will get ignored. After you set the Panel-specific properties, you set your GridPanel-specific properties. This includes configuring the references for the data Store, ColumnModel, GridView, and Selection Model ⑥. Loading the page will generate a grid panel that looks like the one in figure 7.7.

You can see that the data isn't in the order specified. This is because before I took the snapshot, I clicked the Full Name column, which invoked the click handler for that column. The click handler checks to see if this column is sortable (which it is) and invokes a data Store sort method call, passing in the data field (dataIndex), which is `fullName`. The sort method call then sorts all of the records in the store based on the field that was just passed. It first sorts in ascending order, then toggles to descending. A click on the State column would result in no sorting because we didn't specify `sort : true` as we did for the Full Name column.



Figure 7.7 Our first grid rendered onscreen demonstrating the single-select configured RowSelectionModel and the sortable Full Name Column

The `ColumnModel` has other features that you can use. You can drag and drop the columns to reorder them, resize them by dragging the resize handle, or click the column menu icon, which appears whenever the mouse hovers over a particular column.

To use the `SelectionModel`, select a row by clicking it. Once you've done that, you can use the keyboard to navigate rows by pressing the up- and down-arrow keys. To exercise the multiselect `RowSelectionModel`, you can modify the `SelectionModel` by removing the `singleSelect: true` property, which defaults to `false`. Reloading the page will allow you to select many items by using typical operating system multiselect gestures such as Shift-click or Ctrl-click.

Creating our first grid was a cinch, wasn't it? Obviously, there's much more to `GridPanels` than displaying data and sorting it. Features like pagination and setting up event handlers for gestures like right mouse clicks are used frequently. These advanced usages are exactly where we're heading next.

7.4 Advanced GridPanel construction

In the previous section, we built a `GridPanel` that used static in-memory data. We instantiated every instance of the supporting classes, which helped us get some exposure to them. Like many of the Components in the framework, the `GridPanel` and its supporting classes have alternate configuration patterns. In building our advanced `GridPanel`, we'll explore some of these alternate patterns in a couple of the supporting classes.

7.4.1 What we're building

The `GridPanel` we'll construct will leverage some advanced concepts, the first of which is using a remote data `Store` to query against a large data set of randomly generated data, giving us the opportunity to use a `PagingToolbar`. You'll learn how to construct custom renders for two of these columns. One of these will apply color to the ID column, and the other will be more advanced, concatenating the address data into one column. After we build this `GridPanel`, we're going to circle around and set up a `rowdblclick` handler. You'll be introduced to context menus as you learn to use the `GridPanel`'s `rowcontextmenu` event. Put on your propeller hat if you have one; we'll be spending the rest of this chapter on this task and will be covering a lot of material.

7.4.2 Creating the store using shortcuts

When creating your store in listing 7.3, you'll learn some of the common shortcuts, which will save you time. If you need to customize the configuration beyond what's covered here, you can mix and match shortcuts with longhand versions of the configuration.

Listing 7.3 Creating an ArrayStore

```

var recordFields = [
    { name : 'id',           mapping : 'id'          },
    { name : 'firstname',   mapping : 'firstname'   },
    { name : 'lastname',    mapping : 'lastname'    },
    { name : 'street',      mapping : 'street'      },
    { name : 'city',         mapping : 'city'        },
    { name : 'state',        mapping : 'state'       },
    { name : 'zip',          mapping : 'zip'         },
    { name : 'country',     mapping : 'country'     }
];
var remoteJsonStore = new Ext.data.JsonStore({
    fields      : recordFields,
    url         : 'http://extjsinaction.com/dataQuery.php',
    totalProperty : 'totalCount',
    root         : 'records',
    id           : 'ourRemoteStore',
    autoLoad     : false,
    remoteSort   : true
});

```

In this code, you're configuring a remote JsonStore using some shortcuts. The first thing you do is create a reference, `recordFields` ①, which is an array of field configuration objects. In this array, you're mapping a lot of data fields, some of which you'll specify in the column model.

If the field labels map the data point labels, and you want to further simplify the mappings, you could specify an array of string values:

```

var recordFields = [
    'id','firstname','lastname','street','city','state','zip','country'
];

```

You could also specify a mixture of objects and strings for the list of fields. When I build applications, I always configure objects instead of strings because I like to think of the code as self-documenting. Also, if the data point on the backend needs to change, all you need to modify is the mapping attribute compared to having to modify the mapping *and* column model if you were to use just strings.

You then move on to configure your JsonStore ②, which will fetch data remotely. When configuring this Store, you set the `fields` property to the reference of the `recordFields` array you just created. Ext uses this `fields` configuration array to automatically create the `data.Record` that it will use to fill the store.

Next you pass a `url` property, which is one of the shortcuts we're using. Because you pass this property, the `Store` class will use it to instantiate a `Proxy` to fetch data. Also, because this is a remote URL, an instance of `ScriptTagProxy` will be used. Remember that the `ScriptTagProxy` requires that the data get passed as the first parameter to the callback method that it automatically produces. Figure 7.8 illustrates the format in which the server must respond.

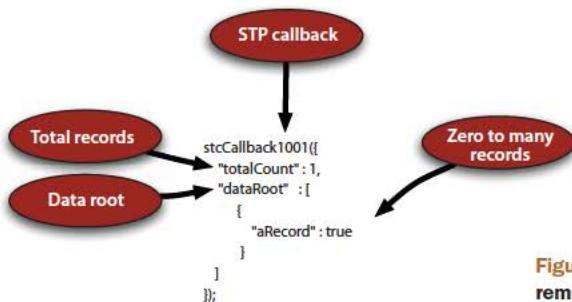


Figure 7.8 The format in which a remote server must respond

In this figure, you see that the server returns a method call to `stcCallback1001`. The callback method name the server responds with is passed to the server in the request via a `callback` property during each request. The number will increment for each STP request.

The `totalCount` property is an optional value, which specifies how many records are available for viewing. In configuring your remote `JsonStore`, you specified the `totalProperty` configuration property as `totalCount`. This property will be leveraged by the `PagingToolbar` to calculate how many pages of data are available.

The most important property is the `dataRoot`, which is the property that contains our array of data. You specified the `root` configuration property as `records` in the `remote JsonStore` configuration.

You then instruct the store not to automatically fetch the data from the data source. You'll need to specially craft the first request so you don't fetch all of the records in the database for the query that you're performing.

You also set a static `id`, `ourRemoteStore`, for the `Store`, which you'll use later to get a reference of the `Store` from the `Ext.StoreMgr`, which is to `data Stores` what the `ComponentMgr` is to `Components`. Each instance of `Data Store` can have a unique `ID` assigned to it or will assign one to itself and is registered to the `StoreMgr` singleton upon instantiation. Likewise, deregistration of the store occurs when a store is destroyed.

NOTE We could configure the `JsonStore` using the `xType jsonstore`, but because we're binding it to the `GridPanel` *and* the `PagingToolbar`, we must use an instance of `Ext.data.Store`.

Last, you enable remote sorting by specifying `remoteSort` as the Boolean value of `true`. Because you're paging, sorting locally would cause your UI to behave abnormally because the data sorting and page count would mismatch.

Now that we have that out of the way, we can move on to configure our advanced `ColumnModel`.

7.4.3 Building a ColumnModel with custom renderers

The ColumnModel we constructed for our first GridPanel was pretty boring. All it did was map the column to the record data field. This new ColumnModel, however, will leverage two custom renderers, shown in the following listing, one of which will allow us to make use of the Address data fields to build composite and stylized cells.

Listing 7.4 Creating two custom renderers

```
var colorTextBlue = function(id) {
    return '<span style="color: #0000FF;">' + id + '</span>';
};

var stylizeAddress = function(street, column, record) {
    var city = record.get('city');
    var state = record.get('state');
    var zip = record.get('zip');

    return String.format('{0}<br>{1} {2}, {3}', street, city, state, zip );
};
```

In listing 7.4, you construct two custom renderers (methods) that will be used by two different columns. The first method, `colorTextBlue`, returns a concatenated string that consists of a span tag that wraps the `id` argument being passed to it. The span tag has a CSS-style property that will result in blue text.

The second custom renderer, `stylizeAddress`, is a much more complex method that will create a composite view of all of the address data available to us minus the country. All custom renderers are called with six arguments. You're using the first and third in this case. The first is the field value that the column is bound to. The second is the column metadata, which you're not using. The third is a reference to the actual data Record, which you'll use heavily.

In this method, you create references to the city and state values of the record by using its `get` method, passing in the field for which you want to retrieve data. This gives you all the references you need to construct your composite data value.

The last thing you do in this method is return the result of the `String.format` method call, which is one of the lesser-known power tools that Ext offers. The first argument is a string that contains integers wrapped in curly braces, which get filled in by the subsequent values passed to the method. Using this method is a nice alternative to the string concatenation you performed previously.

Excellent. Your custom renderers are set and you can now proceed to construct your column configuration. This next listing is rather long because you're configuring five columns, which requires quite a few configuration parameters. Please stick with me on this. Once you start to see the pattern, reading through this will be rather easy.

Listing 7.5 Configuring our advanced ColumnModel

```
var columnModel = [
{
    header : 'ID',
```

```

        dataIndex : 'id',
        sortable  : true,
        width     : 50,
        resizable : false,
        hidden    : true,
        renderer  : colorTextBlue
    },
    {
        header      : 'Last Name',
        dataIndex  : 'lastname',
        sortable   : true,
        hideable   : false,
        width      : 75
    },
    {
        header      : 'First Name',
        dataIndex  : 'firstname',
        sortable   : true,
        hideable   : false,
        width      : 75
    },
    {
        header      : 'Address',
        dataIndex  : 'street',
        sortable   : false,
        id         : 'addressCol',
        renderer   : stylizeAddress
    },
    {
        header      : 'Country',
        dataIndex  : 'country',
        sortable   : true,
        width      : 150
    }
];

```

Configuring this `ColumnModel` is much like configuring the `ColumnModel` for our previous grid. The biggest difference is that instead of instantiating an instance of `Ext.grid.ColumnModel`, you're using the shortcut method by creating an array of objects, which will be translated to a list of `Ext.grid.Columns`. But you do some things differently. For instance, the ID column is hidden ① and bound to the `colorTextBlue` ② custom renderer.

You also set both the `hideable` property for the Last Name and First Name columns to `false`, which will prevent them from being hidden via the `Columns` menu. You'll get a chance to see this in action after you render the `GridPanel`.

The Address column is a bit special because you disable sorting. This is because you're binding the column to the `street` field but are using the `stylizeAddress` custom renderer ③ to provide cells based on a composite of other fields in the record, such as `city`, `state`, and `zip`. You do, however, enable sorting on each individual column. This column also has an `id` property set to `addressCol` and no `width` property. It's configured this way because you're going to configure the `GridPanel` to automatically

expand this column so that it takes all of the available width after all of the statically sized columns are rendered.

Now that you've constructed the array of Column configuration objects, we can move on to piece together our paging GridPanel.

7.4.4 Configuring our advanced GridPanel

You now have just about all of the pieces required to configure our paging GridPanel. In order to do this, however, you'll need to first configure the paging toolbar, which will be used as the bottom toolbar, or bbar, in the GridPanel, as shown in the following listing.

Listing 7.6 Configuring our advanced GridPanel

```
var pagingToolbar = {
    xtype      : 'paging',
    store      : remoteJsonStore,
    pageSize   : 50,
    displayInfo : true
};

var grid = {
    xtype          : 'grid',
    columns        : columnModel,
    store          : remoteJsonStore,
    loadMask       : true,
    bbar           : pagingToolbar,
    autoExpandColumn : 'addressCol'
};
```

In listing 7.6, you use the XType as a shortcut to configure both the PagingToolbar and the GridPanel.

For the PagingToolbar configuration ①, you bind the remote JsonStore you configured earlier and set the pageSize property to 50. This will enable the PagingToolbar to bind to the data Store, allowing it to control requests. The pageSize property will be sent to the remote server as the limit property and will ensure that the data Store receives bundles of 50 (or fewer) records per request. The PagingToolbar will leverage this limit property along with the server's returning totalCount property to calculate how many “pages” there are for the dataset. The last configuration property, displayInfo, instructs the PagingToolbar to display a small block of text, which displays the current page position and how many records (remember totalCount) are available to be flipped through. I'll point this out when we render the GridPanel.

You then configure a GridPanel XType configuration object ②. In this configuration, you bind the earlier created configuration variables columnModel, remoteJsonStore, and pagingToolbar. Because you set the columns property, Ext will automatically generate an instance of Ext.grid.ColumnModel based on the array of configuration objects in the columnModel variable.

You set the loadMask property to true, which will instruct the GridPanel to create an instance of Ext.LoadMask and bind it to the bwrap (body wrap) element, which is

the tag that ultimately wraps or contains all of the elements below the titlebar of a Panel. These elements include the top toolbar, content body, bottom toolbar, and fbar, which is the bottom button footer bar. The LoadMask class binds to various events that the Store publishes to show and hide itself based on the situation the Store is in. For instance, when the Store initiates a request, it will mask the bwrap element, and when the request completes, it will unmask that element.

You then set the bbar property to our pagingToolbar XType configuration object, which will render an instance of the PagingToolbar widget with that configuration data as the bottom toolbar in the GridPanel.

Last, you set the autoExpandColumn property to the string of 'addressCol', which is the ID of your Address column, ensuring that this column will be dynamically resized based on all of the available viewport width minus the other fixed-width columns.

Our GridPanel is now configured and ready to be placed in a Container and rendered. We could render this GridPanel to the document body element, but I'd like to place it as a child of an instance of Ext.Window; this way we can easily resize the GridPanel and see how features like the automatic sizing of the Address column work.

7.4.5 Configuring a Container for our GridPanel

We'll now move on to create the Container for our advanced GridPanel, as shown in the following listing. Once we render the Container, we'll initiate the first query for the remote data Store we created just a while ago.

Listing 7.7 Placing our GridPanel inside a Window

```
new Ext.Window({
    height : 350,
    width  : 550,
    border : false,
    layout  : 'fit',
    items   : grid
}) .show();

Ext.StoreMgr.get('ourRemoteStore') .load({
    params : {
        start : 0,
        limit : 50
    }
});
```

1 Render GridPanel in a Window

2 Perform initial load request

In listing 7.7, you perform two tasks. The first is the creation of Ext.Window ①, which uses the FitLayout and has our GridPanel as its only item. Instead of creating a reference to the instance of Ext.Window and then calling the reference.show method, you use chaining to call the show method directly from the result of the constructor call.

Then you use the Ext.StoreMgr.get method ②, passing it our remote Store ID string, and again use chaining to call the result's load method. You pass an object, which contains a params property, which itself is an object specifying start and limit properties.



Figure 7.9 The results of our advanced paging GridPanel implementation.

The start property is instructed by the server as to which Record or row number to begin the query. It will then read the start plus the limit to return a “page” of data. You have to call this load method because the PagingToolbar doesn’t initiate the first Store load request on its own. You have to nudge it a little to get it started.

Your rendered GridPanel should look like the one in figure 7.9. As you can see from the fruits of our labor, our GridPanel’s Address column displays a composite of the address fields in one neat column that’s dynamically sized and can’t be sorted, whereas all of the other columns start life with a fixed size and can be sorted.

A quick look at the communication from the first request via Firebug will show us the parameters sent to the server. Figure 7.10 illustrates those parameters. We covered the callback, limit, and start parameters a short while ago when we discussed the paging toolbar. What you see new here are the _dc and xaction parameters.

The _dc parameter is what’s known as a *cache buster* parameter that’s unique for every request and contains the timestamp for which the request was made in the UNIX epoch format, which is the number of seconds since the beginning of computer time, or 12 A.M. on January 1, 1970. Because the value for each request is unique, the



Figure 7.10 A list of parameters sent to the remote server to request paged data



Figure 7.11 Enabling the ID column via the Columns menu

request bypasses proxies and prevents them from intercepting the request and returning cached data.

The `xaction` parameter is used by `Ext.direct` to instruct the controller as to which action to execute, which in this case happens to be the `load` action. The `xaction` parameter is sent with every request generated by stores and can safely be ignored if needed.

I'm not sure if you've detected this already, but we haven't seen our ID column in action. This is because we configured it as a hidden column. In order to enable it, we can leverage the Columns menu and check the ID column, as shown in figure 7.11.

After checking the ID column in the Columns menu, you'll see it appear in the `GridView`. In this menu, you can also specify the direction in which a column is to be sorted. One thing you may notice right away by looking at the Columns menu is that the menu options for the First Name and Last Name columns are missing. This is because we set the `hideable` flag to `false`, which prevents their respective menu options from being rendered. The Columns menu is also a great way to sort a column directly by the order that you desire.

Cool; we have our `GridPanel` constructed. We can now configure some event handlers for the `GridPanel` that will allow us to interact more with it.

7.4.6 Applying event handlers for interaction

In order to create row-based user interaction, you need to bind event handlers to events that are published by the `GridPanel`. Here, you'll learn how to leverage the `rowdblclick` event to pop up a dialog box when a double-click is detected on a row. Likewise, you'll listen for a `contextmenu` (right-click) event to create and show a single-item context menu using the mouse coordinates.

You'll begin by creating a method to format a message for the Ext alert message box and then move on to create the specific event handlers, as shown in the following listing. You can insert this code anywhere *before* your `GridPanel` configuration.

Listing 7.8 Creating event handlers for our data grid

```

var doMsgBoxAlert = function(record) {
    var record      = thisGrid.selModel.getSelected();
    var firstName   = record.get('firstname');
    var lastName    = record.get('lastname');

    var msg = String.format('The record you chose:<br /> {0}, {1}',
                           lastName, firstName);

    Ext.MessageBox.alert('', msg);
};

var doRowDblClick = function(thisGrid) {
    doMsgBoxAlert(thisGrid);
};

var doRowCtxMenu = function(thisGrid, rowIndex, evtObj) {
    evtObj.stopEvent();

    thisGrid.getSelectionModel().selectRow(rowIndex);

    if (!thisGrid.rowCtxMenu) {
        thisGrid.rowCtxMenu = new Ext.menu.Menu({
            items : [
                {text : 'View Record',
                 handler : function() {
                     doMsgBoxAlert(thisGrid);
                 }
            }
        });
    }

    thisGrid.rowCtxMenu.showAt(evtObj.getXY());
};

```

In listing 7.8, you create three methods. The first of these, `doMsgBoxAlert` ①, is a utility method that accepts `thisGrid` as its only argument, which is a pointer to the `GridPanel` generating the event. It leverages the `RowSelectionModel` `getSelected` method to obtain a reference to the selected record and `record.get` method to extract the first and last name fields and uses them to display an `Ext alert` message box that contains a message with those two properties.

Next, you create the first handler, `doRowDblClick` ②, which is configured to accept two of the parameters that the event publishes, the reference to the `GridPanel` firing the event. All this method does is execute the `doMsgBoxAlert` method that we discussed previously.

Context menus typically select items

Most desktop applications select an item when the user right-clicks it. Because Ext JS doesn't provide this functionality natively, you can force the selection of the item that the user is right-clicking. This will give your application more of a desktop feel.

The last method, `doRowCtxMenu` ③, is much more complicated and accepts three parameters. The first is the reference to the grid, `thisGrid`, and the second is the index of the row, `rowIndex`, for which the event occurred. The third parameter is an instance of `Ext.EventObject`. Knowing this is important because on some browsers such as Firefox for OS X you need to prevent the browser's own context menu from displaying. This is why it calls `evtObj.stopEvent` ④ as the first task. Calling `stopEvent` stops the native browser context menu from showing.

Next, this handler uses the `rowIndex` parameter to force the selection of the row for which the event was generated by calling the `RowSelectionModel`'s `selectRow` method, passing in the `rowIndex` parameter.

You then select the record based on the `rowIndex` argument. Doing so will provide the necessary feedback to the user. You then test to see whether `thisGrid` has a `rowCtxMenu` property, which on the first execution of this method will be `true` and the interpreter will dive into this branch of code. You do this because you want to create the menu once if it doesn't exist. Without this fork in the logic, you'd be creating menus every time the context menu is called, which would be wasteful.

You then assign the `rowCtxMenu` property ⑤ to `thisGrid` as the result of a new instance of `Ext.menu.Menu`, which has one item, written in typical XType shorthand. The first property of the menu item is the text that will be displayed when the menu item is shown. The other is a handler method that's defined inline and causes `doMsgBoxAlert` to be called with the referenced record.

The last bit of code calls upon the newly created `rowCtxMenu`'s `showAt` method, which requires the X and Y coordinates to display the menu. You do this by directly passing the results of the `evtObj.getXY()` to the `showAt` method. The `EventObject.getXY` will return the exact coordinates where the event was generated.

Your event handlers are now armed and ready to be called upon. Before you can use them in the grid, you need to configure them as listeners, as shown in the following listing.

Listing 7.9 Attaching your event handlers to your grid

```
var grid = {
    xtype           : 'grid',
    columns         : columnModel,
    store           : remoteJsonStore,
    loadMask        : true,
    bbar            : pagingToolbar,
    autoExpandColumn: 'addressCol',
    selModel         : new Ext.grid.RowSelectionModel({
        singleSelect : true
    }),
    stripeRows     : true,
    listeners       : {
        rowdblclick   : doRowDblClick,
        rowcontextmenu: doRowCtxMenu
    }
};
```

 1 Attach event
handlers to grid

To configure the event handlers to the grid, you add a `listeners` ① configuration object, with the event to handle mapping. Because your event handlers can handle only one selected record, you have to enforce single selection. To do this, you add a `RowSelectionModel` with the `singleSelect` option set to true.

Refresh the page and generate some double-click and right-click gestures on the grid. What happens? See figure 7.12.

Now double-clicking any record will cause the Ext alert message box to appear. Likewise, right-clicking a row will cause your custom context menu to appear. If you click the View Record menu item, the Ext alert box will then appear.

Adding user interaction to a grid can be as simple as that. One key to effective development of UI interactions is not to instantiate and render widgets only once and when needed, as you did with the context menu. Although this technique works to prevent duplicate items, it falls short of cleanup. Remember the destruction portion of the Component lifecycle? You can attach a quick method to destroy the context menu when the grid panel is destroyed by adding a `destroy` handler method to the list of listeners:

```
listeners      : {
    rowdblclick   : doRowDblClick,
    rowcontextmenu : doRowCtxMenu,
    destroy       : function(thisGrid) {
        if (thisGrid.rowCtxMenu) {
            thisGrid.rowCtxMenu.destroy();
        }
    }
}
```

In this code snippet, you add the `destroy` event handler inline instead of creating a separate referenced method for it. The `destroy` event always passes the Component that's publishing the event, which is labeled `thisGrid`. In that method, you test for the existence of the `rowCtxMenu` variable. If this item exists, you call its `destroy` method.



Figure 7.12 The results of adding the context menu handler to our advanced grid

Context menu cleanup is one of those topics that developers often miss and can lead to lots of leftover DOM node garbage, which chews up memory and can contribute to application performance degradation over time. If you’re attaching context menus to any Component, always be sure to register a destroy event handler for that Component that destroys any existing context menus.

7.5 Summary

In this chapter, you learned quite a bit about the `GridPanel` and the `data Store` classes. You started by constructing a local data-feeding `GridPanel` and learned about the supporting classes for both the `data Store` and `GridPanel`.

While building your first `GridPanel`, you got to see how the `data Store` uses proxies to read data, uses a reader to parse it, and spools up `Records`, which are Ext-managed data objects. You also learned how the `GridView` knows when to render data from the `Store` by listening to events.

When you constructed your remote-loading `GridPanel`, you learned about some of the shortcuts that can be used to configure the `GridPanel` and many of its supporting classes. You learned more about the `ColumnModel` and how it can have hidden columns or columns that can’t be hidden. While doing this, you configured the JSON-reading `data Store` that allows for remote sorting as well.

Last, you added grid interactions to the `GridPanel`, where mouse double-click and right-click gestures were captured and the UI responded. In doing this, you got a quick glance at menus and learned the importance of cleaning up menu items after their parent Component is destroyed.

Many of the concepts that you learned in this chapter will carry forward when you learn how to use the `EditorGridPanel` and its subclass, the `PropertyGrid`.

The EditorGridPanel



This chapter covers

- Implementing an `EditorGridPanel`
- Learning to exercise full data CRUD cycles
- Deploying the `DataWriter`

In the last chapter, you learned about the `GridPanel` and how it can be used to display data. We integrated a `PagingToolbar` into our complex `GridPanel` to allow us to flip through large amounts of paginated data.

In this chapter, we'll build on our previous work to construct a working `EditorGridPanel`, which will allow you to modify data inline much like you can in popular desktop spreadsheet applications like Microsoft Excel. You'll also learn how to integrate context menus and toolbar buttons with Ajax requests for CRUD operations.

You'll start out by creating your first `EditorGridPanel`, where you'll get an introduction to what an `EditorGridPanel` is and how edits are possible. We'll discuss the ins and outs of setting up UI widgets for interaction to support insert and delete CRUD operations as well as how to get modified Records from the store or even reject changes. Building up an `EditorGridPanel` without saving the data is useless, so we'll take advantage of this opportunity to show how to code for CRUD operations.

Afterward, we'll integrate `Ext.data.DataWriter` and show how it can save you time by doing a lot of the heavy lifting and reducing the amount of code that you need to write.

This is going to be one of the most intense chapters yet.

8.1 A close look at the EditorGridPanel

The `EditorGridPanel` class builds on the `GridPanel` class, which works with the `ColumnModel`, to allow the use of Ext form fields to edit data on the fly without the use of a separate `FormPanel`. It uses the `CellSelectionModel` by default and has an internal event model to detect user input, such as clicks and keyboard keystrokes, to trigger the cell selection and even the rendering or repositioning of the editor fields. It can leverage the `Ext.data.DataWriter` class to automatically save data after it's been edited, which we'll explore later in this chapter.

Excited yet? Before we break ground, we should discuss what you're going to be constructing.

We'll expand on the complex `GridPanel` you constructed in the last chapter, but with some changes to allow you to edit data. The first obvious change is the use of the `EditorGridPanel` instead of the `GridPanel` widget.

Another change you'll make is to split up the composite Address column into separate columns for each `dataIndex`, which will allow you to easily edit the separate address information instead of having to craft a complex editor. Figure 8.1 illustrates what your `EditorGridPanel` panel will look like.

A screenshot of a Windows application window titled "EditorGridPanel". The window contains a grid of data with columns: Last Name, First Name, Street Address, City, State, and Zipcode. The "State" column shows dropdown menus for selecting values. A dropdown menu is open over the "State" cell for the row where "Last Name" is "Acosta" and "First Name" is "Lydia". The menu lists several US states: MA, HI, IA, ID, IL, IN, KS, KY, LA, and MA. The item "MA" is highlighted in green. A mouse cursor is visible over the "HI" option. At the bottom of the window, there are navigation buttons (left, right, first, last), a page indicator ("Page 1 of 40"), and buttons for "Save Changes" and "Reject". A status bar at the bottom right shows "Showing 1 - 50 of 2000".

Last Name	First Name	Street Address	City	State	Zipcode
Acevedo	Venus	975-4076 Accun	San Fernando	AK	62848
Acevedo	Stone	Ap #296-1609 N	Clarksville	DE	80668
Acevedo	Hillary	Ap #170-115 Ad	Beckley	KS	57104
Acosta	Lydia	2446 Ipsum Stre	Huntsville	GA	97985
Acosta	Joan	7447 Sed Street	Salem	ID	87752
Acosta	Cadman	P.O. Box 830, 1f	Athens	MA	63549
Acosta	Minerva	997-5660 Curab	New Iberia	HI	39439
Acosta	Quyn	4301 Sed St.	Appleton	IA	56516
Adkins	Carly	6587 Tincidunt /	New York	ID	57766
Aguirre	Elliott	824-6296 Ut Av.	Manhattan	IL	08534
Aguirre	Clementine	P.O. Box 920, 3'	Richmond	IN	25390
Aguirre	Jamalia	572-1521 Lacus	Fargo	KS	74005
Aguirre	Veda	1137 Nihil St.	Alameda	KY	83704

Figure 8.1 A quick peek at what you'll be constructing

In building this `EditorGridPanel`, you'll leverage the necessary UI components to construct something that could be considered a mini-application, because it will have simulated CRUD (create, read, update, and delete) capabilities for Records. The reason it's simulated is that you can't make Ajax requests to a different domain, and in order to keep server-side code out of the picture, you need to create some static responses.

To enable CRUD, you'll add two Buttons to the `PagingToolbar` that will allow you to save or reject changes. Likewise, you'll create a usable context menu to add or delete rows based on which cell is right-clicked. This will be the most complex code thus far, and you'll perform this in phases.

The first phase is getting the `EditorGridPanel` functioning. You'll then circle back and add slices of each CRUD action, one slice at a time.

8.2 *Building your first EditorGridPanel*

Because you're expanding on the complex `GridPanel` you built in the last chapter, you'll see some of the exact same code and patterns. We're doing it this way so the flow of the code is as smooth as possible. In most cases, there'll be changes, so please take the time to read through every bit. I'll point out all of the pertinent modifications.

Before you begin, you need to create two files that contain some JSON that will enable the simulation of server-side responses to calls you're going to make for the CRUD actions. The first of these will be called `successTrue.js` and will contain

```
{success : true}
```

The second one will be called `successFalse.js` and will contain

```
{success: false}
```

Please save these in your project space on your development web server. Once you have that out of the way, you can begin to construct your store, as follows.

Listing 8.1 Creating our remote store

```
var remoteProxy = new Ext.data.ScriptTagProxy({
    url : 'http://extjsinaction.com/dataQuery.php'
}) ;

var recordFields = [
    { name : 'id',           mapping : 'id'          },
    { name : 'firstname',    mapping : 'firstname'   },
    { name : 'lastname',     mapping : 'lastname'   },
    { name : 'street',       mapping : 'street'      },
    { name : 'city',         mapping : 'city'        },
    { name : 'state',        mapping : 'state'       },
    { name : 'zipcode',      mapping : 'zip'         },
    { name : 'newRecordId',  mapping : 'newRecordId' }
] ;

var remoteJsonStore = new Ext.data.JsonStore({
    proxy           : remoteProxy,
    storeId        : 'ourRemoteStore',
```

```

root          : 'records',
autoLoad     : false,
totalProperty: 'totalCount',
remoteSort   : true,
fields        : recordFields,
idProperty   : 'id'

});

```

You begin by creating your `ScriptTagProxy`, which will allow you to fetch data from a remote domain. You then move on to create a list of fields, which map to the data points in the raw data. Remember, these are used to create instances of `Ext.data.field`, which are the smallest parts of an `Ext.data.Record`. Notice that the last field is added to the list. Our fictitious server-side controller will use this 'newRecordId' for insert operations. We'll discuss this further later on when we talk about saving inserted records and see why only new records will have this property.

Last, you create your `remoteJsonStore`, which uses your `remoteProxy` and `recordFields`. You could have set `remoteJsonStore` as an XType configuration object, but you'll need that reference later on when you create some of the handlers for your CRUD actions. This will keep things simple for you down the road, I promise. For the `JsonStore`, you also set the `idProperty` to '`id`', which will ensure that the data store tracks IDs, allowing you to monitor insert operations down the road.

Your next step is to create the field editors that will be used for the `ColumnModel` later on, shown in the following listing.

Listing 8.2 Creating ComboBox and NumberField editors

```

var textFieldEditor = new Ext.form.TextField();

var comboEditor = {
    xtype      : 'combo',
    triggerAction : 'all',
    displayField : 'state',
    valueField   : 'state',
    store       : {
        xtype  : 'jsonstore',
        root   : 'records',
        fields : ['state'],
        proxy  : new Ext.data.ScriptTagProxy({
            url   : 'http://extjsinaction.com/getStates.php'
        })
    }
};

var numberFieldEditor = {
    xtype      : 'numberfield',
    minLength : 5,
    maxLength : 5
};

```

When creating your editors, you use two techniques: direct and lazy instantiation. You directly instantiate an instance of `Ext.form.TextField` ① because you're going to be using it multiple times, and it would be wasteful to use an XType configuration.

Conversely, the `comboEditor` ② and `numberFieldEditor` ③ use XType configurations because they'll be used for only a single column. The `comboEditor` is an XType configuration for the `Ext.Form.ComboBox` and has a nested XType configuration for an `Ext.data.JsonStore`, which uses a `ScriptTagProxy` so you can get a list of states from the remote database. Likewise, the `numberFieldEditor` is an XType configuration for the `Ext.form.NumberField` class. You're using this in the ZIP Code column, so you set two basic validation rules that dictate the minimum and maximum character lengths for the field. Because the editor is a `NumberField`, no alpha characters can be entered, and only values with five integers will be accepted.

You can now begin creating the `ColumnModel`, where you'll use the editors you just configured. As was the case for our complex `GridPanel`, this listing is relatively lengthy. The patterns should be obvious, however.

Listing 8.3 Creating ColumnModel

```
var columnModel = [
    {
        header      : 'Last Name',
        dataIndex  : 'lastname',
        sortable   : true,
        editor     : textFieldEditor
    },
    {
        header      : 'First Name',
        dataIndex  : 'firstname',
        sortable   : true,
        editor     : textFieldEditor
    },
    {
        header      : 'Street Address',
        dataIndex  : 'street',
        sortable   : true,
        editor     : textFieldEditor
    },
    {
        header      : 'City',
        dataIndex  : 'city',
        sortable   : true,
        editor     : textFieldEditor
    },
    {
        header      : 'State',
        dataIndex  : 'state',
        sortable   : true,
        editor     : comboEditor
    },
    {
        header      : 'Zip Code',
        dataIndex  : 'zipcode',
        sortable   : true,
        editor     : numberFieldEditor
    }
];
```

Annotations:

- ① Use **TextField editor**: Points to the first three entries in the `columnModel` array, where the `editor` property is set to `textFieldEditor`.
- ② Specify **ComboBox configuration object**: Points to the fourth entry in the `columnModel` array, where the `editor` property is set to `comboEditor`.
- ③ Set **numberFieldEditor to column**: Points to the fifth entry in the `columnModel` array, where the `editor` property is set to `numberFieldEditor`.

As we review the `ColumnModel` configuration array, you'll see familiar properties such as `header`, `dataIndex`, and `sortable`. You'll also see a new kid on the block, `editor`, which allows you to specify an editor for each of the `Columns`.

Notice that the `textFieldEditor` ① is used in four of the six `Column` configuration objects. The main reason for this is performance. Instead of using an `XType` configuration object and having one instance of `Ext.form.TextField` instantiated for each column, the single `TextField` class is merely rendered and positioned where it's needed, which saves memory and reduces DOM bloat. Consider this a performance-saving technique. You'll see this in action when we get around to rendering our `EditorGridPanel`.

Last, you have the `comboEditor` ② used for the `State` column and the `numberFieldEditor` ③ used for the `ZIP Code` column. Remember that because these are used only once, using an `XType` configuration object is okay.

You now have your `Store`, `editors`, and `ColumnModel` configured. You can now move on to creating your `PagingToolbar` and `EditorGridPanel`, as in the following listing.

Listing 8.4 Creating the PagingToolbar and EditorGridPanel

```
var pagingToolbar = {
    xtype      : 'paging',
    store      : remoteJsonStore,
    pageSize   : 50,
    displayInfo : true
};

var grid = {
    xtype      : 'editorgrid',
    columns    : columnModel,
    id         : 'myEditorGrid',
    store      : remoteJsonStore,
    loadMask   : true,
    bbar       : pagingToolbar,
    stripeRows : true,
    viewConfig : {
        forceFit : true
    }
};

new Ext.Window({
    height   : 350,
    width    : 550,
    border   : false,
    layout   : 'fit',
    items    : grid
}).show();

remoteJsonStore.load({          ← ② Load the Store
    params : {
        start : 0,
        limit : 50
    }
});
```




In this code, you create the rest of your EditorGridPanel, starting with the PagingToolbar, which uses your remoteJsonStore and has the pageSize set to 50 records. Next, you create your EditorGridPanel ①, which has its xtype property set to 'editorgrid' and uses your columnModel, remoteJsonStore, and pagingToolbar.

You then move on to create the container for your EditorGridPanel, which is an instance of Ext.Window, and has its layout set to 'fit'. You use chaining to show the Window immediately after it's instantiated.

Last, you call remoteJsonStore.load ② and pass a configuration object that specifies the parameters to send to the server. This ensures you start at record 0 and limits the number of returning records to 50.

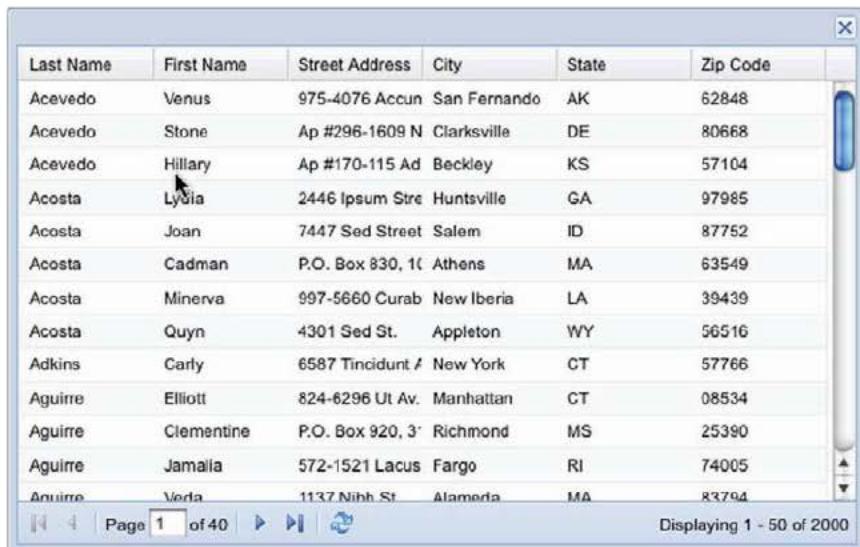
All of the pieces of the puzzle are in place for this phase. You can now render your EditorGridPanel and begin to edit data. Figure 8.2 shows the EditorGridPanel in action.

You can see that our EditorGridPanel and PagingToolbar have rendered with data just waiting to be modified. Initially this seems like a normal GridPanel. But under the covers lies a whole new level of functionality just waiting to be unleashed. We'll take a moment to discuss exactly how you can use it.

8.3 *Navigating our EditorGridPanel*

You can use mouse or keyboard gestures to navigate through the cells and enter or leave editing mode.

To initiate editing mode via the mouse, double-click a cell and the editor will appear, as in figure 8.2. You can then modify the data and click or double-click another cell or anywhere else on the page to cause the blur of the editor to occur. Repeat this process to update as many cells as you wish.



Last Name	First Name	Street Address	City	State	Zip Code
Acevedo	Venus	975-4076 Accun	San Fernando	AK	62848
Acevedo	Stone	Ap #296-1609 N	Clarksville	DE	80668
Acevedo	Hillary	Ap #170-115 Ad	Beckley	KS	57104
Acosta	Lydia	2446 Ipsum Stre	Huntsville	GA	97985
Acosta	Joan	7447 Sed Street	Salem	ID	87752
Acosta	Cadman	P.O. Box 830, 1C	Athens	MA	63549
Acosta	Minerva	997-5660 Curab	New Iberia	LA	39439
Acosta	Quyn	4301 Sed St.	Appleton	WY	56516
Adkins	Carly	6587 Tincidunt A	New York	CT	57766
Aguirre	Elliott	824-6296 Ut Av.	Manhattan	CT	08534
Aguirre	Clementine	P.O. Box 920, 3 rd	Richmond	MS	25390
Aguirre	Jamalia	572-1521 Lacus	Fargo	RI	74005
Aguirre	Veda	1137.Nihb. St.	Alameda	MA	83794

Figure 8.2 Our first EditorGridPanel

You can modify how many clicks it takes to edit a cell by adding a `clicksToEdit` property to the `EditorGridPanel` configuration object and specifying an integer value. Some applications allow editing via a single click of a cell; if so, so you'd set `clicksToEdit` to 1 and be done.

Being a command line junkie, I feel that keyboard navigation offers you much more power than the mouse. If you're a power user of Excel or a similar spreadsheet application, you know what I'm talking about. To initiate keyboard navigation, I like to use the mouse to focus on the first cell I want to edit. This immediately places focus exactly where I need it. I can use the Tab key or Shift-Tab key combination to move left or right. I can also use the arrow keys to focus on any cell at will.

To enter edit mode using the keyboard, press Enter, which displays the editor for that cell. While in edit mode, you can modify adjacent cells by pressing Tab to move one cell to the right or Shift-Tab to move one cell to the left.

To exit edit mode, you can press Enter again or press Esc. If the data you entered or modified validates properly, the record will be modified and the field will be marked as dirty. You can see quite a few fields being modified in figure 8.3.

When exiting an editor, depending whether the field has a validator and the results of the validation, the data will be discarded. To test this, edit a ZIP Code cell and enter more or fewer than five integers. Then exit edit mode by pressing Enter or Esc.

You can now edit data, but the edits are useless unless you save your changes. This is where you enter the next building phase, adding the CRUD layers.

8.4 Getting the CRUD in

With `EditorGridPanel`, CRUD server requests can be fired either automatically or manually. Automatic requests take place whenever a Record is modified or when modifications occur and a preset timer expires in the client-side logic, firing off a request

The screenshot shows a grid-based user interface for managing records. The columns are labeled: Last Name, First Name, Street Address, City, State, and Zip Code. A red oval labeled 'Dirty field marker' points to a cell in the Zip Code column that contains '90210'. Another red oval labeled 'TextField editor' points to a separate text input field below the grid, which also contains '90210'. The grid displays 14 rows of data. At the bottom, there are navigation icons for first, previous, next, last, and search, along with a page indicator 'Page 1 of 40' and a status message 'Displaying 1 - 50 of 2000'.

Last Name	First Name	Street Address	City	State	Zip Code
Acevedo	Venus	975-4076 Accumsan Rd.	San Fernando	AK	62848
Acevedo	Stone	Ap #296-1609 Nascentur St.	Clarksville	DE	80668
Acevedo	Hillary	Ap #170-115 Adipiscing, Rd	Beckley	KS	57104
Acostas	Michael	2448 Ipsum Street	Huntsville	GA	97985
Acosta	Joan	7447 Sed Street	Salem	IP	87752
Walsh	Brenda	933 Hillcrest Drive	Beverly Hills	CA	90210
Acosta	Minerva	997-5660 Curabitur St.	New Iberia	LA	34439
Acosta	Quyn	4301 Sed St.	Appleton	WY	56516
Adkins	Carly	6587 Tincidunt Ave	New York	CT	57766
Aguirre	Elliott	824-6296 Ut Av.	Manhattan	CT	08534
Aguirre	Clementin	P.O. Box 920, 3151 Enim, A	Richmond	MS	25390
Aguirre	Jamalia	572-1521 Lacus, Ave	Fargo	RI	74005
Aguirre	Veda	1137 Nihil St.	Alameda	MA	83794

Figure 8.3 Our first `EditorGridPanel` with an editor and dirty field markers

to the server. To set up automatic CRUD, you can create your own logic to send the requests, or you can do things the easy way and use the `Ext.data.DataWriter` class, which is exactly what you'll do later in this chapter.

For now, we'll focus on manual CRUD, which is when the user invokes an action via UI, such as clicking a menu Item or a Button somewhere. The reason we're focusing on manual CRUD is that even though `Ext.data.DataWriter` is helpful, it won't satisfy everyone's needs, and going through this exercise will give you valuable exposure to what's going on with the Store and Records when data is modified. Also, because Create and Delete are CRUD actions, you'll explore how to insert and delete Records from the Store.

8.4.1 Adding save and reject logic

You'll begin by creating the save and change rejection methods, which you'll tie into Buttons that will live in your `PagingToolbar`. The following code is quite complicated, so please bear with me. We'll have an in-depth discussion about it, in which I'll walk you through just about every bit.

Listing 8.5 Setting up your save and change rejection handlers

```
var onSave = function() {
    var modified = remoteJsonStore.getModifiedRecords();
    if (modified.length > 0) {
        var recordsToSend = [];
        Ext.each(modified, function(record) {
            recordsToSend.push(record.data);
        });

        var grid = Ext.getCmp('myEditorGrid');
        grid.el.mask('Updating', 'x-mask-loading');
        grid.stopEditing();

        recordsToSend = Ext.encode(recordsToSend);

        Ext.Ajax.request({
            url      : 'successTrue.js',
            params   : {
                recordsToInsertUpdate : recordsToSend
            },
            success  : function(response) {
                grid.el.unmask();
                remoteJsonStore.commitChanges();
            }
        });
    }
};

var onRejectChanges = function() {
    remoteJsonStore.rejectChanges();
};
```

The diagram consists of five numbered callouts pointing to specific parts of the code:

- 1 Get list of modified Records
- 2 Gather Record data into list to send
- 3 Manually mask grid's element
- 4 Encode JSON to be sent over wire
- 5 Send Ajax.request

In this listing you have two methods: `onSave`, which will be called when Save Changes is clicked, and `onRejectChanges`, which will be called when Reject Changes is clicked.

onSave contains quite a few lines to achieve your goal of data updates by means of Ajax requests. It begins with retrieving a list of modified Records by calling the remoteJsonStore's getModifiedRecords **1** method, which returns a list of Record instances. In essence, whenever a Record Field is modified, it's marked as *dirty* and placed into the Store's modified list, which getModifiedRecords returns. You test to see if the length of the returned array is greater than zero, which indicates that you have data to save. You then create an empty array, recordsToSend, which you populate by looping through the modified records using Ext.each **2**. When calling Ext.each, you pass two parameters, the modified records list and an anonymous method, which Ext.each will call for each item in the modified list. The anonymous method takes a single parameter, record, which changes with each item in the modified list. Inside the anonymous method, you push the record.data reference, which is an object that contains every data point in the record.

You then mask the EditorGridPanel's element via the mask method **3**. You pass two properties to the mask method; the first is a message to display while the mask is visible, and the second is a CSS class that Ext JS uses to show a spinner loading graphic.

The recordsToSend reference is then overwritten with the result of the Ext.encode method call **4**, for which you pass the original recordsToSend list. This "stringifies" your list of JSON objects so you can send it over the wire.

Next, you perform your Ajax.request **5**, which is where the fun begins. You pass Ext.Ajax.request a configuration object that has three properties to get the job done.

The first is the url for which you have your successTrue.js dummy response file. Naturally, there would be some business logic here on the server side to insert or update Records. This dummy file assumes the role of a central controller for all of your CRUD operations.

The second property, params, is an object that contains the recordsToInsert-Update property with its value set to the stringified JSON, recordsToSend. Setting the params object ensures that the XHR being lobbed over at the server has a parameter or parameters sent to it, which in this case will be one parameter. The last property of the Ajax.request single parameter is success, which is a method to be called if the server returns successful status codes, such as 200 and so on.

Because this is a simulation, you don't check the response from the request. In here, you'd generally have some type of business logic to do something based on the results returned. For now, you unmask the grid's element and call the remoteJsonStore's commitChanges method.

Know the JSON tools

Ext.encode is a shortcut for Ext.util.JSON.encode. Its counterpart is Ext.decode or Ext.util.JSON.decode. The Ext.util.JSON class is a modified version of Douglas Crockford's JSON parser but doesn't modify the Object prototype. Please see <http://www.json.org/js.html> for more details on Douglas Crockford's JSON parser.

This is an important step because it clears the dirty flag from the Records and Fields that were modified, which clears the dirty flag on the modified cells within the EditorGridPanel. Failing to do this after a successful submission will result in Fields not being cleared in the UI and the modified Records not being purged from the Store's internal modified list.

The last method, `onRejectChanges`, calls the `remoteJsonStore`'s `rejectChanges` method, which reverts the data to the original values in the Fields and clears the dirty flag from the UI.

The supporting methods for save and rejection are all set up. You can move on to modifying our PagingToolbar to include the two Buttons that will call these methods, as shown in the following listing.

Listing 8.6 Reconfiguring the PagingToolbar to include save and reject Buttons

```
var pagingToolbar = {
    xtype      : 'paging',
    store      : remoteJsonStore,
    pageSize   : 50,
    displayInfo: true,
    items      : [
        '-',
        {
            text      : 'Save Changes',
            handler   : onSave
        },
        '-',
        {
            text      : 'Reject Changes',
            handler   : onRejectChanges
        },
        '-'
    ]
};
```

1 Vertical line spacer
for a cleaner UI

In this listing you reconfigure the `PagingToolbar` XType configuration object to include items ①, which consists of five entities. The string entities that you see with the hyphens ('-') are shorthand for the `Ext.Toolbar.Separator`, which will place a tiny vertical bar between toolbar child items. You're doing this because you want to show some separation between the Buttons and the generic `PagingToolbar` navigational items.

Also in the list are generic objects, which are translated to instances of `Ext.Toolbar.Button`. Figure 8.4 shows the Save Changes and Reject Changes Buttons, which have their respective handlers set. As you can see in the figure, the save and reject Buttons are placed neatly inside the `PagingToolbar`'s center, which normally is empty space, and the Buttons are separated by neat Button separators. You can now begin to edit data and exercise your newly modified `PagingToolbar` functionality and newly created CRUD methods.

Last Name	First Name	Street Address	City	State	Zip Code
Acevedo	Venus	975-4076 Accun	San Fernando	AK	62848
Acevedo	Stone	Ap #296-1609 N Clarksville		DE	80668
Acevedo	Hillary	Ap #170-115 Ad Beckley		KS	57104
Acosta	Lydia	2446 Ipsum Stre	Huntsville	GA	97985
Acosta	Joan	7447 Sed Street	Salem	ID	87752
Acosta	Cadman	P.O. Box 830, 1C	Athens	MA	63549
Acosta	Minerva	997-5660 Curab	New Iberia	LA	39439
Acosta	Quyn	4301 Sed St.	Appleton	WY	56516
Adkins	Carly	6587 Tincidunt A	New York	CT	57766
Aguirre	Elliott	824-6296 Ut Av.			08534
Aguirre	Clementine	P.O. Box 920, 3'	Richmond	MS	25390
Aguirre	Jamalia	572-1521 Lacus Fargo		RI	74005
Aguirre	Vera	1137.Nihh St.	Alameda	MA	83794

Figure 8.4 Our EditorGridPanel with Save Changes and Reject Changes buttons added

8.4.2 Saving or rejecting your changes

To use your save and reject buttons, you first need to modify data. Leveraging what you know about using the EditorGridPanel, change some data and click Save Changes. You should see the EditorGridPanel's element mask appear briefly and then disappear once the save completes and the cells that are marked as dirty are marked clean or committed. Figure 8.5 shows the masking in action.

Remember that your onSave method retrieved a list of modified records and used the Ext.encode method to convert the raw list of JavaScript objects to stringified

Last Name	First Name	Street Address	City	State	Zip Code
Acevedo	Venus	975-4076 Accun	San Fernando	AK	62848
Acevedo	Stone	Ap #296-1609 N Clarksville		DE	80668
Acevedo	Hillary	Ap #170-115 Ad Beckley		KS	57104
Acosta	Lydia	2446 Ipsum Stre	Huntsville	GA	97985
Acosta	Joans	7447 Sed Street	Salem	ID	87752
Acosta	Cadman	P.O. Box 830, 1C	Athens	MA	63549
Acosta	Minerva	997-5660 Curab	New Iberia	LA	39439
Acosta	Quyn	4301 Sed St.	Appleton	WY	56516
Adkins	Carly	6587 Tincidunt A	New York	CT	57766
Aguirre	Elliott	824-6296 Ut Av.	Manhattan	CT	08534
Aguirre	Clementine	P.O. Box 920, 3'	Richmond	MS	25390
Aguirre	Jamalia	572-1521 Lacus Fargo		RI	74005
Aguirre	Vera	1137.Nihh St.	Alameda	MA	83794

Figure 8.5 The load mask shows when save requests are being sent to the server.



Figure 8.6 Inspecting our `Ajax.request` POST parameter in Firebug

JSON. It then used that JSON and posted it as the records parameter sent by the Ajax request. Figure 8.6 shows what the request and the POST parameters look like in Firebug's XHR inspection view.

As you can see in the Firebug request inspection view, the records parameter is an array of items. In this case, it's two JavaScript objects, which represent the data records. Whenever you're developing or debugging, always remember that you can inspect the POST and GET parameters being sent to the web server via Firebug. Also, sometimes JSON BLOBs can get enormous and extremely hard to read. What I typically do is copy the JSON from Firebug and paste it in the web form at <http://JSON-Lint.com>, which tabs indents and formats the data so it's readable.

If you were to have actual code on the server side to handle this update request, you'd read the records parameter, decode the JSON, and test to see if it's an instance of an array. If so, you'd loop through each object inside that array and search the database for the ID that's presented in the object instance. If the ID is in the database, you'd code the proper SQL update. Once the updates occur, you return a JSON object with `{success: true}` and an optional `msg` or `errors` property, which could contain a message from the server or a list of IDs for which the records could not be updated due to some business rules. You could then use the `success` or `failure` callback handlers, which you send to the `Ajax.request` method, to inspect what's sent back from the server and perform commits or post error messages accordingly.

The last bit we need to discuss regarding saving modifications has to do with sorting and pagination. Remember that changing data in a sorted column throws off the sorting completely. What I typically do after a successful change in a sorted column is call the Store's `reload` method, which requests a new copy of the data set from the server and fixes sorting in the UI. Remember that you're simulating a successful server-side save, which is why you don't reload the Store in the `Ajax.request`'s `success` handler.

You've saved your data and seen what it looks like going over the wire. You have yet to reject changes though. Let's see what happens when you reject changes. To test this, modify data and click Reject Changes. What happened? Remember that the handler called the remote Store's `rejectChanges` method, which looks at each Record in its modified list and calls its `reject` method. This, in turn, clears the dirty flag both on the Record and the UI. That's it—no magic.

Now that you've seen what it takes to perform remote saves to modified Records, you'll add create and delete functionality to your `EditableGrid`, which will complete your CRUD actions.

8.4.3 Adding create and delete

When configuring the UI for your save and reject functionality, you added Buttons to the PagingToolbar. Although you could add the create and delete functionality the same way, it's best to use a context menu because it's much smoother to delete and add from a context menu. Think about it for a second. If you've ever used a spreadsheet application, you know that right-clicking a cell brings up a context menu that, among other things, has insert and delete menu items. We're going to introduce the same paradigm here.

As you did with the previously added functionality, you'll develop the supporting methods in the following listing before you construct and configure the UI components. We're going to ratchet up the complexity.

Listing 8.7 Constructing your delete and new Record methods

```
var doDelete = function(rowToDelete) {
    var grid = Ext.getCmp('myEditorGrid');
    var recordToDelete = grid.store.getAt(rowToDelete);

    if (recordToDelete.phantom) {
        grid.store.remove(recordToDelete);
        return;
    }

    grid.el.mask('Updating', 'x-mask-loading');

    Ext.Ajax.request({
        url : 'successTrue.js',
        parameters : {
            rowToDelete : recordToDelete.id
        },
        success : function() {
            grid.el.unmask();
            grid.store.remove(recordToDelete);
        }
    });
};

var onDelete = function() {
    var grid = Ext.getCmp('myEditorGrid');
    var selected = grid.getSelectionModel().getSelectedCell();

    Ext.MessageBox.confirm(
        'Confirm delete',
        'Are you sure?',
        function(btn) {
            if (btn == 'yes') {
                doDelete(selected[0]);
            }
        }
    );
};
```

1 Method for delete operations

2 Delete phantom Records

3 Request to delete Records

4 Delete menu item handler

5 Get confirmation from user

I hope you haven't run away, but chances are that if you're reading this right now, you're still with me. Awesome. Some of this will look familiar to you from the save feature you added to your `EditorGridPanel` panel earlier.

The first method in the listing, `doDelete` ❶, will be called by the delete menu item handler that you create just after it. Its only argument is `rowToDelete`, which is an integer indicating the index of the record that you're to delete. This method is responsible for removing Records from the Store. Here's how it works.

This method first gets a reference to the `EditorGridPanel` panel via the `ComponentMgr`'s `get` method. It immediately gets the Record that the Store is to remove using the Store's `getAt` method and passes the `rowToDelete` argument. Then it checks to see if the Record is a phantom (new Record) or not.

If it is, the Record is immediately removed ❷ from the Store, and this method is aborted with a return call. When the Record is removed from the Store, the GridView immediately shows the change by removing the Record's row in the DOM.

If the Record isn't a phantom, the grid's element is masked, preventing any further user interaction, and provides feedback that something is taking place. `Ajax.request` ❸ is then called to your server-side simulation file, `successTrue.js`, with the single parameter `rowToDelete`, which is the ID of the Record in the database. The success handler of this `Ajax.request` will unmask the element and remove the Record from the Store.

The `onDelete` handler ❹ method will query the selected cell from the selection model and request a confirmation from the user. If the user clicks the Yes button, it will call the `doDelete` method. Here's how it works.

When `onDelete` is first called, it gets a reference to your `EditorGridPanel` via the `Ext.getCmp` method. It then gets the selected cell via calling the `EditorGridPanel`'s `SelectionModel.getSelectCell` method. What `getSelectedCell` returns is an array with two values, which are the coordinates of the cell: the row and column number.

A call to `Ext.MessageBox.confirm` ❺ is made, passing in three arguments: title, message body, and button handler, which is an anonymous method. The button handler determines whether the button pressed was 'yes' and calls your `doDelete` method, passing the first value of the cell coordinates, which is the row of the selected cell.

Before you move on to deploy delete, you should add the insert handler. This one is relatively small:

```
var onInsertRecord = function() {
    var newRecord      = new remoteJsonStore.recordType({
        newRecordId : Ext.id()
    });
    var grid          = Ext.getCmp('myEditorGrid');
    var selectedCell  = grid.getSelectionModel().getSelectedCell();
    var selectedRowIndex = selectedCell[0];

    remoteJsonStore.insert(selectedRowIndex, newRecord);
    grid.startEditing(selectedRowIndex,0);
}
```

The purpose of this method is to locate the row index that was right-clicked and insert a phantom Record at the index. Here's how it works.

First it creates a new record via a call to `new remoteJsonStore.recordType`. It does this by passing an object with a single property, `newRecordId`, which is a unique value by virtue of the `Ext.id` utility method call. Having this unique `newRecordId` will aid the server side in inserting new records and returning a mapping for the client to register real ids for each of the new Records. We'll discuss this more a little later, when we explore what the server side could be doing with the data we're submitting.

All data stores have the default Record template accessible via the `recordType` property. Remember that to instantiate a new instance of a Record, you must use the `new` keyword.

Next, you create a reference, `rowInsertIndex`, to the row of the newly selected cell. You do this because it ends up in easier-to-read code when you use it in the following two statements.

A call is then made to the `remoteJsonStore`'s `insert` method, which requires two parameters. The first is the `index` for which you wish to insert the Record, and the second is a reference to an actual Record. This effectively inserts a Record above the row that's right-clicked, emulating one of the spreadsheet features we discussed earlier.

Last, you want to initiate editing of that Record immediately. You accomplish this by a call to the `EditorGridPanel`'s `startEditing` method, passing it the row for which you inserted the new Record and 0, which means the first column.

This concludes the supporting methods for the create and delete functions. You can now move on to create the context menu handler and reconfigure the grid to listen to the `cellcontextmenu` event, as shown in the following listing.

Listing 8.8 Setting up your context menu handler for the `EditorGridPanel`

```
var doCellCtxMenu = function(editorGrid,
    rowIndex, cellIndex, evtObj) {
    evtObj.stopEvent();
    if (!editorGrid.rowCtxMenu) {
        editorGrid.rowCtxMenu = new Ext.menu.Menu({
            items : [
                {
                    text      : 'Insert Record',
                    handler   : onInsertRecord
                },
                {
                    text      : 'Delete Record',
                    handler   : onDelete
                }
            ]
        });
        editorGrid.getSelectionModel().select(rowIndex, cellIndex);
        editorGrid.rowCtxMenu.showAt(evtObj.getXY());
    };
}
```

The diagram consists of three numbered callouts pointing to specific parts of the code:

- 1 Cell context menu listener method**: Points to the first line of the function definition, `var doCellCtxMenu = function(editorGrid,`.
- 2 Create context menu object**: Points to the line where the `Menu` object is instantiated, `editorGrid.rowCtxMenu = new Ext.menu.Menu({`.
- 3 Select right-clicked cell**: Points to the line where the selection model is selected, `editorGrid.getSelectionModel().select(rowIndex, cellIndex);`.

Listing 8.8 contains `doCellCtxMenu` ①, a method to handle the `cellcontextmenu` event from the `EditorGridPanel`, which is responsible for creating and showing the context menu for the insert and delete operations. Here's how it works.

`doCellCtxMenu` accepts four arguments, which are passed by the `cellcontextmenu` handler. They are `editorGrid`, a reference to the `EditorGridPanel` that fired the event, `rowIndex` and `cellIndex`, which are the coordinates of the cell that was right-clicked, and `evtObj`, an instance of `Ext.EventObject`.

The first function that this method performs is preventing the right-click event from bubbling upward by calling the `evtObj.stopEvent`, preventing the browser from displaying its own context menu. If you didn't prevent the event from bubbling, you'd see the browser context menu on top of yours, which would be silly and unusable.

`doCellCtxMenu` then tests ② to see if the `EditorGridPanel` has a `rowCtxMenu` property and creates an instance of `Ext.menu.Menu` and stores the reference as the `rowCtxMenu` property on the `EditorGridPanel`. This effectively allows for the creation of a single `Menu`, which is more efficient than creating a new instance of `Ext.menu.Menu` every time the event is fired and will last until the `EditorGridPanel` is destroyed, as you'll see later.

You pass a configuration object to the `Ext.menu.Menu` constructor, which has a single property, `items`, that's an array of configuration objects that get translated to an instance of `Ext.menu.MenuItem`. The `MenuItem` configuration objects both reference the respective handlers to match the `Item text`.

The last two functions that this method performs are selecting the cell that was right-clicked and showing the context menu at the correct X and Y coordinates onscreen. It does this by calling the select ③ method of the `EditorGridPanel`'s `CellSelectionModel` and passing it the `rowIndex` and `cellIndex` coordinates. Last, you display the context menu using the coordinates where the right-click event occurred.

Before you execute your code, you'll have to reconfigure the grid to register the context menu handler. Please add the following to your grid configuration object:

```
listeners : {
    cellcontextmenu : doCellCtxMenu
}
```

You now have everything you need to start using our new UI features. I want to see this thing in action.

8.4.4 **Using create and delete**

At this point, you have your insert and delete handlers developed and ready to be used. You just finished creating the context menu handler and reconfigured your grid to call it when the `cellcontextmenu` event is fired.

You'll start your exploration by creating and inserting a new Record, as shown in figure 8.7.

The screenshot shows a data grid with three columns of data. A right-clicked cell in the first column of the first row has opened a context menu with 'Insert Record' and 'Delete Record' options. A second context menu is shown over the 'Insert Record' option, also containing 'Insert Record' and 'Delete Record'. A large red arrow points from the first context menu towards the second one.

Last Name	First Name	Last Name	First Name	Last Name	First Name	Street Address	City	State	Zip Code
Acevedo	Venus	Acevedo	Venus	Acevedo	Venus	975-4076 Accun	San Fernando	AK	62848
Acevedo	Stone	Acevedo	Stone	Acevedo	Stone	Ap #296-1609 N Clarksville		DE	80668
Acevedo	Hillary	Acevedo	Hillary	Acevedo	Hillary	Ap #170-115 Ad Beckley		KS	57104
Acosta	Minerva	Acosta	Minerva	Acosta	Lydia	2446 Ipsum Stre	Huntsville	GA	97985
Acosta	Gwyn	Acosta	Gwyn	Acosta	Joan	7447 Sed Street	Salem	ID	87752
Adkins	Carly	Adkins	Carly	Adkins	Cadman	P.O. Box 830, 11	Athens	MA	63549
Aguirre	Elliott	Aguirre	Elliott	Aguirre	Minerva	997-5660 Curab	New Iberia	LA	39439
Aguirre	Clementine	Aguirre	Clementine	Aguirre	Quyn	4301 Sed St.	Appleton	WY	56516
Aguirre	Jamalia	Aguirre	Jamalia	Aguirre	Carly	6587 Tincidunt /	New York	CT	57766
Aguirre	Veda	Aguirre	Veda	Aguirre	Elliott	824-6296 Ut Av.	Manhattan	CT	08534
Amirre		Amirre		Amirre	Clementine	P.O. Box 920, 3	Richmond	MS	25390
Amirre		Amirre		Amirre	Jamalia	572-1521 Larus Farn		RI	74005

Figure 8.7 Adding a new Record with our newly configured Insert Record menu item

As illustrated in figure 8.7, you can display the context menu by right-clicking any cell, which calls the doCellContextMenu handler. This causes the selection to occur and displays the custom Ext menu at the mouse's coordinates. Clicking the Insert Record menu Item forces the call to the registered handler, onInsertRecord, which inserts a new Record at the index of the selected cell and begins editing on the first column. Cool!

Now, in order to save changes, you need to modify the newly inserted Record and then click the Save Changes Button that you created earlier. Figure 8.8 shows this screen.

Clicking Save Changes invokes the onSave handler, which performs the Ajax.request to our mock server handler, the successTrue.js file. Figure 8.9 shows what the JSON looks like being submitted in Firebug's XHR inspection tool.

The screenshot shows the same data grid as Figure 8.7, but with a new row added. The last row now contains the values: Garcia, Jesus, Garcia, Jesus, Acosta, Lydia, Acosta, Lydia, Acosta, Cadman. A red arrow points from the original last row to the new row, indicating the transition. The 'Save Changes' button is visible at the bottom right of the grid.

Last Name	First Name	Last Name	First Name	Last Name	First Name	Street Address	City	State	Zip Code
Acevedo	Venus	Acevedo	Venus	Acevedo	Venus	975-4076 Accun	San Fernando	AK	62848
Acevedo	Stone	Acevedo	Stone	Acevedo	Stone	Ap #296-1609 N Clarksville		DE	80668
Acevedo	Hillary	Acevedo	Hillary	Acevedo	Hillary	Ap #170-115 Ad Beckley		KS	57104
Garcia	Jesus	Garcia	Jesus	Garcia	Jesus	123 ExtJsInActic	Frederick	MD	21703
Acosta	Lydia	Acosta	Lydia	Acosta	Lydia	2446 Ipsum Stre	Huntsville	GA	97985
Acosta	Joan	Acosta	Joan	Acosta	Joan	7447 Sed Street	Salem	ID	87752
Acosta	Cadman	Acosta	Cadman	Acosta	Cadman	P.O. Box 830, 11	Athens	MA	63549
Acosta	Minerva	Acosta	Minerva	Acosta	Minerva	997-5660 Curab	New Iberia	LA	39439
Acosta	Quyn	Acosta	Quyn	Acosta	Quyn	4301 Sed St.	Appleton	WY	56516
Adkins	Carly	Adkins	Carly	Adkins	Carly	6587 Tincidunt /	New York	CT	57766
Aguirre	Elliott	Aguirre	Elliott	Aguirre	Elliott	824-6296 Ut Av.	Manhattan	CT	08534
Aguirre	Clementine	Aguirre	Clementine	Aguirre	Clementine	P.O. Box 920, 3	Richmond	MS	25390
Aguirre	Jamalia	Aguirre	Jamalia	Aguirre	Jamalia	572-1521 Larus Farn		RI	74005

Figure 8.8 The UI transitions when saving our newly inserted Record



Figure 8.9 Using Firebug to inspect the JSON being submitted for our newly inserted Record

As you can see, there's no `id` associated with this Record, but there is a `newRecordId` property, which is a telltale sign that it's a new Record. This property is important because the controller code on the server could use this to know that this is a new record to be inserted versus an update operation. Remember that our `onSave` handler is set up to handle both inserts and update operations; thus, the theoretical controller needs to be able to handle both situations. Here's a quick overview of how things might work if you have server code to submit to.

The server would receive the `records` parameter and decode the JSON. It would then loop through the array and perform inserts on any of the records that have this `newRecordId` property and return a list of database ids for the records that you've newly inserted. Instead of a generic return of `{ success : true }`, it could return something much more intelligent, like a list of objects that map the `newRecordId` to the Record's database `id`, which would look something like this:

```
{
    success : true,
    records : [
        {
            newRecordId : 'ext-gen85',
            id          : 2213
        }
    ]
}
```

Your success handler can then search the Store for the Records that you just inserted and set the Records to the database `id`, which effectively makes the Record a nonphantom, or a real record. The success handler code would look something like this:

```
success : function(response) {
    grid.el.unmask();
    remoteJsonStore.commitChanges();

    var result = Ext.decode(response.responseText);
    Ext.each(result.records, function(o) {
        var rIndex = remoteJsonStore.find('newRecordId', o.newRecordId);
        var record = remoteJsonStore.getAt(rIndex);

        record.set('id', o.id);
        delete record.data.newRecordId;
    });
}
```

In this snippet, you use Ext.decode to decode the returning JSON, which is the response.responseText property. You then use Ext.each to loop through the resulting array of objects. For each object in the list, you get the Record index by using the remoteJsonStore's find method and pass two properties. The first is the field you're searching for, which is newRecordId, and the other is the returned object's newRecordId. You get the reference of the Record by calling the remoteJsonStore's getAt method and pass the Record index that you just obtained. You use the Record's set method to set the database id you just got back from the server and then move on to delete the Record's newRecordId property. This ensures that any further modifications to that Record will only result in an update because it will pass its database id to the controller. Figure 8.10 shows what an update to the recently inserted record looks like in Firebug.

In this figure, you can see that the newRecordId is being sent to the server for insertion. The server then returns the database id as 9999, and our newly modified success handler sets the Record's database id and removes the newRecordId. Whoa, that's a lot of material just for the creation of Records. What about delete? Surely that's simpler, right?

Absolutely! Before we discuss the process of deleting records, we'll examine how the UI works.

When you right-click a Record, an Ext.MessageBox displays to confirm the delete operation, as shown in figure 8.11. You click Yes, and an Ajax.request is made to the controller to delete the records.

Figure 8.12 shows what the delete request looks like in Firebug's XHR inspection tool.

This works because our onDelete handler called MessageBox.confirm and will call our doDelete method, which checks to see if this is a new Record or not. Because you happened to request a deletion of a nonphantom Record, an Ajax.request was made to the central controller with one parameter, rowToDelete, which is the database id of the Record. If the record had been a phantom, the request would have never been made and the Record would have been immediately moved from the Store.

You did a lot of work to get manual CRUD operations set up for your first EditorGridPanel. In doing so, you learned more about Stores and Records and how to

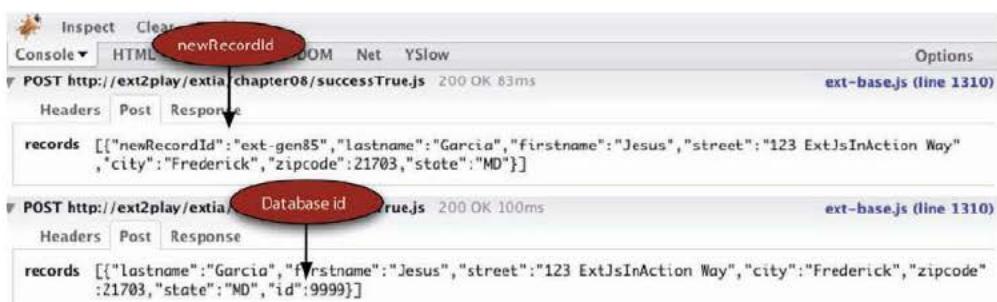


Figure 8.10 A Firebug view of a newly inserted Record followed by a subsequent update



Figure 8.11 The UI workflow for deleting a Record

detect changes and save them using `Ajax.requests`. Along the way you got a chance to see a real-life case of an Ext confirmation `MessageBox` in action. Cool!

Now that you've learned the nuts and bolts of manual CRUD, you can switch tracks to learn how you can leverage `Ext.data.DataWriter` to manage CRUD operations easily and even automatically.

8.5 Using `Ext.data.DataWriter`

In our last example you learned how to code manual CRUD actions, which meant you had to code your own `Ajax.requests`. But what if you wanted the `EditorGridPanel` to automatically save when you're editing? In order to do this without a Writer, you'd have to write an entire event model that fired off requests when a CRUD UI action took place. This would have to take into account exception handling, which means you'd have to code for the rollback changes. I can personally tell you that it's a lot of work. Luckily, you don't have to do all of this for easy and automated CRUD.

8.5.1 Enter `Ext.data.DataWriter`

Writer saves you time and effort by removing the requirement for you to have to code `Ajax.requests` and exception handling, giving you more time to do more of the important stuff, like building out the business logic for your application. Before you



Figure 8.12 The controller request to delete a Record as viewed in Firebug's XHR inspection tool

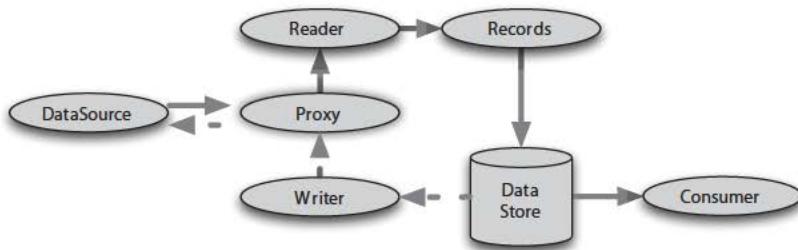


Figure 8.13 A depiction of the flow for data reads and writes when a data **Store** is used

start coding your **Writer** implementation, you should have a quick review of how **Writer** fits into the picture.

Please recall our discussion about the operation of data Stores from the last chapter, where you learned about the flow of data from the source to the consumer. Remember that **Proxy** is the intermediary connection class for reads as well as writes. If this still seems a little fuzzy, figure 8.13 should help clear things up.

In order to user **Writer**, you'll need to reconfigure your data **Store** and the supporting **Proxy**. Instead of configuring a `url` property for the **Proxy**, you'll create a configuration object known as the `api`. The proxy `api` is a new concept for you, and we'll discuss it more in detail in a bit, when we review the example code.

You'll then need to create an instance of **Writer** and plug it into your **data Store** as well as add some new configuration properties to the **Store**'s configuration object itself, thus completing the reconfiguration of the **Store**.

To reconfigure the **EditorGridPanel** and the **CRUD** actions, you'll keep all of the UI changes but remove the supporting code for the `Ajax.requests`. Because you're familiar with most of this code, we'll be moving at a faster pace, but we'll slow down for the new material.

8.5.2 Adding DataWriter to our JsonStore

Now that you have an understanding of what you'll be doing, you can get out your shovels and start digging. As before, you'll begin by reconfiguring your **Store**, as shown in the following listing.

Listing 8.9 Reconfiguring data Store to use Writer

```

var remoteProxy = new Ext.data.ScriptTagProxy({
    api : {
        read   : 'http://extjsinaction.com/dataQuery.php',
        create : 'http://extjsinaction.com/dataCreate.php',
        update : 'http://extjsinaction.com/dataUpdate.php',
        destroy : 'http://extjsinaction.com/dataDelete.php'
    }
});

var recordFields = [
    { name : 'id',           mapping : 'id' },
    ...
];
  
```

1 Configuring
ScriptTagProxy api

```

{ name : 'firstname', mapping : 'firstname' },
{ name : 'lastname', mapping : 'lastname' },
{ name : 'street', mapping : 'street' },
{ name : 'city', mapping : 'city' },
{ name : 'state', mapping : 'state' },
{ name : 'zipcode', mapping : 'zip' }
];

var writer = new Ext.data.JsonWriter({
    writeAllFields : true
});

var remoteJsonStore = new Ext.data.JsonStore({
    proxy           : remoteProxy,
    storeId         : 'ourRemoteStore',
    root            : 'records',
    autoLoad        : false,
    totalProperty   : 'totalCount',
    remoteSort      : true,
    fields          : recordFields,
    idProperty      : 'id',
    autoSave        : false,
    successProperty : 'success',
    writer          : writer,
    listeners        : {
        exception : function () {
            console.info(arguments);
        }
    }
});

```

In listing 8.9, you kick things off by creating a new `ScriptTagProxy` ① and pass a configuration object as the property `api`, which denotes URLs for each of the CRUD actions, with `read` being the request to load data. Instead of using the dummy `successTrue.js` file as a single controller, you'll use somewhat intelligent remote server-side code, where a controller exists for each CRUD action. `Writer` requires intelligent responses; thus remote server-side code was developed. Technically, you could use the same server-side script for all of the CRUD actions, but I find it easier to create one for each action.

You then move on to create the list of fields, which gets translated into, *what?* Correct! `Ext.data.Fields`. These `Fields` are the lowest supporting class for the, *what?* Yes! The `Ext.data.Record`. You're progressing in this framework nicely.

Next, you create a subclass of `Ext.data.DataWriter`, known as `JsonWriter` ②, which has the ability to save a request to modify a single or batch (list) of `Records`. In the `JsonWriter` configuration object, you specify `writeAllFields` as `true`, which ensures that for each operation `Writer` returns all of the properties, which is great for development and debugging. Naturally, you want to set this to `false` in production, which will reduce overhead over the wire and at the server-side and database stack.

The last thing you do in this listing is reconfigure the `Store`. Note that everything is exactly the same except for a few property additions to enable `Writer` integration and some debugging capabilities.

The first addition is `autoSave` ❸, which you set to `false` but defaults to `true`. If left as `true`, the `Store` would automatically fire requests for CRUD operations, which isn't what you want just yet. I want to show you how *easy* it is to invoke CRUD requests with `Writer` now in the picture.

Next, you add the `successProperty`, which is used as an indication that the operation was a success or failure and is consumed by the `JsonReader`, which the `JsonStore` automatically instantiates for you. Remember, this is just like when you submitted data with the `FormPanel`, where you required at a minimum a return of `{ success : true }` as the response from the web server. The same principle applies with the `Store` when using `DataWriter`. In your new `remoteJsonStore`, you're specifying the `successProperty` of '`success`', which is common and self-documenting.

The last change you make is adding a global exception event listener to your `JsonStore`, which is needed if you want something to occur upon any exception that the `Store` raises. Here, you spit all of the arguments to the Firebug console, which I use when developing with `Ext.data.DataWriter` because it provides a wealth of information that's hard to find anywhere else during debugging. I highly suggest you doing the same. Trust me; it will save you time in the long run.

Cool! You've just re-created our `ScriptTagProxy` to work with your new instance of `Ext.data.JsonWriter` and reconfigured our `Store` to prevent `autoSaves`. Your next task is to modify the `PagingToolbar` and make the delete context menu handler leaner, as shown in the following listing.

Listing 8.10 Reconfiguring the PagingToolbar and delete handler

```
var pagingToolbar = {
    xtype      : 'paging',
    store      : remoteJsonStore,
    pageSize   : 50,
    displayInfo : true,
    items      : [
        '-',
        {
            text      : 'Save Changes',
            handler   : function () {
                remoteJsonStore.save();
            }
        },
        '-',
        {
            text      : 'Reject Changes',
            handler   : function () {
                remoteJsonStore.rejectChanges();
            }
        },
        '-'
    ]
};

var onDelete = function() {
```

1 Save changes via Writer

2 Reject changes from our Store

3 Leaner onDelete context menu handler

```

var grid          = Ext.getCmp('myEditorGrid');
var selected     = grid.getSelectionModel().getSelectedCell();
var recordToDelete = grid.store.getAt(selected[0]);

grid.store.remove(recordToDelete);
};

```

In listing 8.10, you reconfigure the PagingToolbar's save button handler ❶ to call the save method of the data Store, which uses Writer to gather the data to save and eventually invoke a request to save changes. This effectively replaces the previous onSave handler, which is what was responsible for sending create and update Ajax.requests. This is where you start to see some of the code savings we discussed earlier. You also add an inline method to reject ❷ the Store's changes.

Next, you refactor the onDelete ❸ context menu handler. You remove the typical confirmation dialog box to make it much leaner. You can choose to reject the changes from here, which means that the Records that are deleted from the UI are rolled back via the rejectChanges handler you created previously. You also remove the Ajax.request code, for more code savings.

Your changes to integrate Writer into your EditorGridPanel panel are now complete. The EditorGridPanel configuration code stays exactly the same as in listing 8.8. Let's see Writer in action.

8.5.3 Using DataWriter

The changes you made in the previous listings where you integrated Writer were designed so you could use the same interaction to invoke a request. Now let's see how you can reduce the amount of code when using Writer relative to creating your own Ajax.requests and handlers.

You'll start by modifying some Records and clicking Save Changes to inspect what Writer is sending to the server. Figure 8.14 illustrates the parameters being sent for an update request in Firebug's request inspection tool.

In figure 8.14 you see the result of a request being sent to the update URL as configured in the Proxy API. Along with the usual _dc (cache buster) and callback parameters, you see id, which is a list of IDs affected, and records, which is the list of



Figure 8.14 The result of our update request as shown in Firebug's request inspection tool



Figure 8.15 The server-side response from our update request with Writer

Records that were changed. You see the entire Record contents here because we set the `writeAllFields` configuration parameter to true.

Our server-side code then processes the list of records and returns the following JSON. The response looks like figure 8.15.

Notice that the `successProperty`, `success`, has a value of true, which is an indication that the server processed the data successfully. It also returned the list of records after it was processed. This is used to apply any changes that may be required by business logic. For instance, what if someone put a forbidden word as one of the values? The server could reject the change by quietly replacing that forbidden value with what was previously in that field. The UI would then update accordingly, thus completing an update cycle.

Next, you should perform an insert and see what happens. This is where things get interesting. Insert a Record via the context menu, add some values, and click the Save Changes Button in the PagingToolbar. You'll see that a request was made to the create URL that you defined in the `api` configuration object for the `ScriptTagProxy`, as shown in figure 8.16.

The most important item to note in the records parameter being sent to the server is the `id` property. Notice that the `id` is fictitious; its value is "ext-record-1". Because the create server-side action is different than the update action, the `id` parameter is ignored when the record is inserted into the database. The server then gets the `id` for the newly inserted record and returns the database `id` in return, as illustrated in figure 8.17.



Figure 8.16 Inserting a Record with Writer, as viewed in the Firebug request inspection tool



Figure 8.17 Using Firebug to inspect the results of a Record insert using Writer

If an insert was successful, then the `id` value (along with all of the other values) returned to the browser will be applied to the recently inserted record. This ensures action requests for update and delete will submit the database `id` of the record moving forward. This is where you can see the added value of using Writer, because you don't have to manage this verification logic yourself.

In our test case, you inserted a single Record. If you insert multiple Records, they'll be submitted to the server, upon save, in an array. It's important to note that the server must return the records in the exact same order, or the database `id` to record mapping or association will fail.

The delete action is the simplest, where the delete request sends a list of IDs to the host for processing. To try this out, right-click a Record, and choose Delete from the context menu. Heck, do this for a few Records. Notice how they're removed from the store? Now click Save Changes and inspect the request in Firebug; our results are shown in figure 8.18.

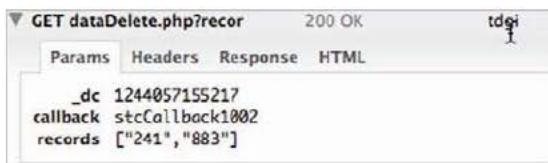


Figure 8.18 The JSON parameters for a delete action request

For the delete action requests, the `records` parameter is a list of IDs. Let's look at what the server side returns. Figure 8.19 shows the result from the server for the delete request.

The server-side code takes the list of IDs, removes the records from the database, and returns the list of IDs the store is to permanently remove. And that's all there is to delete operations.

You've seen how you could use Writer for CRUD operations that were invoked manually but required no special Ajax.request code and handling of your own. The last topic for discussion is automated CRUD with Writer.



Figure 8.19 The result of our delete action request using Writer

8.5.4 An automated writing store

To set up Writer for automated CRUD actions, all you need to do is set the autoSave property for the data Store configuration object to true. That's it. You already set up all of the hard stuff, if you want to call it that. Now all you need to do is exercise CRUD operations, and the Store will automatically invoke requests based on your CRUD action.

The one thing to look out for with a Store that automatically writes is that there's *no undo for actions*. When data has been modified in the database, the rejectChanges method has no effect. The database reflects the latest changes. The same goes for delete and insert operations.

8.6 Summary

In this chapter you got your first exposure to the EditableGrid class and learned how it uses Ext.form.Fields to allow for editing of data on the fly. This gave you an opportunity to learn about the CellSelectionModel and some of its methods, such as getSelectedCell. You also learned how you could leverage keyboard and mouse gestures to navigate the EditorGridPanel to edit data relatively rapidly.

You learned how to manually code for CRUD operations with your own custom Ajax.request logic and used a mock controller while doing so. You added two menu items to the PagingToolbar and a context menu to the EditableGrid to allow you to insert and delete Records as well as reject changes. In doing this, you learned how to use getModifiedRecords from the Store for submission to the mock controller.

Finally, you learned how you could reduce the amount of code you need to generate by leveraging the Ext.data.DataWriter class for CRUD operations. We also discussed how to set up an automated Store with Writer.

In the next chapter, you'll learn about another data Store-consuming component, the DataView and its descendant the ListView.

DataView and ListView



This chapter covers

- Learning about `DataView`
- Customizing the `DataView` rendering of data
- Implementing a custom `XTemplate`
- Exercising multicomponent event communication

Displaying lists of data in a web application is something that we've all had to deliver at one time or another in our careers. Whether it's a list of books, servers on a particular subnet, or a list of employees, the process is the same. Retrieve the data; format and display it. Although this process is simple from a high level, the burden of maintaining the under-the-hood JavaScript has prevented us from being able to focus all of our attention on getting the task done. Throw in the ability to select multiple items, and you find yourself spending more time on maintenance than further developing your application.

In this chapter, you'll learn that with the `DataView` you can achieve this goal easily, saving you time and allowing you to focus on the deliverables at hand. We'll begin by constructing a `DataView` and introduce a major supporting class, the `XTemplate`, along the way. You'll learn what it takes to properly configure the `DataView` for single or multiple Record selections.

Afterward, you'll learn how to create a ListView to display data in a tabular format, much like the GridPanel. You'll see what it takes to bind it to your implementation of the DataView to assist with the filtering of data from the DataView.

As icing on the cake, you'll learn how to make complex two-way bindings between the DataView and FormPanel, to allow users to update data. What you'll learn in the final exercise will help you in binding the DataView and ListView to other widgets in the framework.

9.1 What Is the DataView?

The DataView class uses the data Store and XTemplate to provide the ability to paint data on the screen easily. It has all of the necessary plumbing on its DOM structure to provide for tracking the mouse and has single- or multiple-node selection models.

Figure 9.1 illustrates a DataView in action and highlights how the data Store and XTemplate support it.

As illustrated, the DataView consumes data from the data store by means of event bindings. Because of these bindings, it's smart enough to know how to efficiently handle the DOM changes. For instance, if a single Record is deleted from a store, the element whose index matches the Record index is removed from the DOM. For added flexibility, pagination can also be applied to the DataView via binding a PagingToolbar to the DataView's bound store.

NOTE Unlike the GridPanel and TreePanel, DataView doesn't extend from Panel, which means that it can't be configured to use any of the Panel features, such as Toolbars. The good news is that the DataView does extend from BoxComponent, which means it can be used in layouts and can easily be wrapped by a Panel.

We talked about Templates earlier in this book, and you learned how you can stamp out HTML fragments easily with that tool. The DataView uses the Template's more powerful cousin, the XTemplate, which adds the ability to have subtemplates, inline code execution, conditional processing, and much more.

Now that you know what a DataView is and does, it's time to start building one.

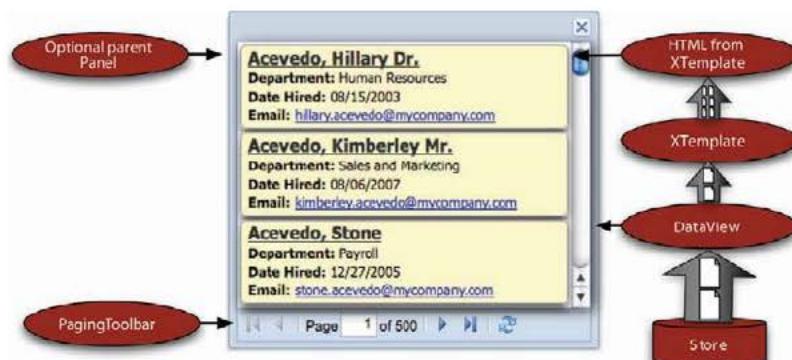


Figure 9.1 The DataView and various supporting classes

9.2 Constructing a *DataView*

You've been asked to develop a full-screen mini-application to allow members of the HR team to quickly list employees in the company. They want the records to be styled and have a background similar to a manila folder. For each Record, the view needs to be able to display the employee's full name, department, date hired, and email address. The requestor stated that this view would be part of a larger app, which you'll learn more about once you've completed this view. The backend is complete and ready to serve up JSON, which means that all you need to do is write the frontend code.

To fulfill this initial requirement, you'll have to create a *DataView* that will live in a *ViewPort*. But before you can start writing the JavaScript code, you need to construct the CSS for your HTML. This is because when implementing *DataViews*, as end developers you're *required* to configure the CSS to style the contents of the widget. If you didn't apply styling, the painted data would be unusable.

Figure 9.2 shows what our *DataView* would look like if it was not styled, versus styled.

It should be obvious that a styled *DataView* is better for both usability and the user's eyes. Each implementation of the *DataView* has its own styles. Perhaps when you implement this widget on your projects, you can create a base CSS set of rules that all of these widgets can leverage, giving a unified look to the application.

Having seen what it needs to look like, you can configure the CSS before you begin work on the JavaScript for the widget and its supporting classes, as shown in the following listing.

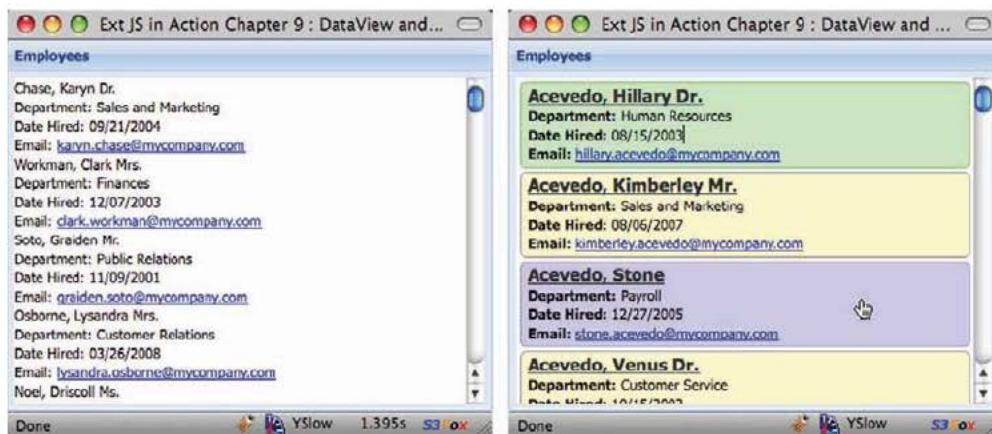


Figure 9.2 An unstyled (left) *DataView* compared to a styled (right) *DataView*

Listing 9.1 Setting the DataView styles

```
<style type="text/css">
    .emplWrap {
        border: 1px #999999 solid;
        margin : 3px;
        -moz-border-radius: 5px;
        -webkit-border-radius: 5px;
        background-color: #ffffcc;
        padding-bottom: 3px;
    }

    .emplSelected {
        border: 1px #66ff66 solid;
        background-color: #ccffcc;
        cursor: pointer;
    }

    .emplOver {
        border: 1px #9999ff solid;
        background-color: #ccccff;
        cursor: pointer;
    }

    .emplName {
        font-weight: bold;
        margin-left: 5px;
        font-size: 14px;
        text-decoration: underline;
        color: #333333;
    }

    .title {
        margin-left: 5px;
        font-weight: bold;
    }
</style>
```

The diagram consists of four numbered callouts (1, 2, 3, 4) with blue arrows pointing from them to specific parts of the CSS code:

- 1 Color all Records yellow**: Points to the `.emplWrap` rule.
- 2 Color selected Records green**: Points to the `.emplSelected` rule.
- 3 Custom color on mouseover**: Points to the `.emplOver` rule.
- 4 Enlarge employee name**: Points to the `.emplName` rule.

In listing 9.1, you configure all of the CSS that will be used by the DataView. The first rule, `emplWrap` ①, will be used to style each Record with a light gray border and a yellowish background. The next rule, `emplSelected` ②, will be used to color a Record green when a user has selected it. The third rule, `emplOver` ③, will be applied to a Record when the mouse is hovering over it and will color it blue. The last two rules, `emplName` ④ and `title`, are additional rules to style the inner contents of each rendered Record.

Now that you have the CSS in place, you can begin with the construction of the store that will provide the data.

9.2.1 Building the Store and XTemplate

We're constructing the data Store first, in the following listing, because it will help you know what the mapped fields are when you configure the XTemplate for the DataView.

Listing 9.2 Implementing a remote JsonStore

```

var employeeStoreProxy = new Ext.data.ScriptTagProxy({
    url : 'http://extjsinaction.com/getEmployees.php'
});

var employeeDvStore = {
    xtype   : 'jsonstore',
    root    : 'rows',
    autoLoad: true,
    storeId : 'employeeDv',
    proxy   : employeeStoreProxy,
    fields  : [
        { name : 'datehired', mapping : 'datehired' },
        { name : 'department', mapping : 'department' },
        { name : 'email',     mapping : 'email' },
        { name : 'firstname', mapping : 'firstname' },
        { name : 'id',        mapping : 'id' },
        { name : 'lastname',  mapping : 'lastname' },
        { name : 'middle',    mapping : 'middle' },
        { name : 'title',     mapping : 'title' }
    ]
};

```

You create the JsonStore for your DataView in listing 9.2, which leverages a remote ScriptTagProxy ① to perform the data request tasks. When creating the JsonStore ② XType, you set autoLoad to true, which will automatically cause the proxy to fire the request after instantiation. You also define the field mappings inline for all of the required data points. This will help you in constructing the XTemplate.

Because the Store is a nonvisual component, there's not much to see at this point. You'll begin by constructing the XTemplate in the next listing, and then we'll have a brief discussion about it because it's important to understand how the data that will be passed to the XTemplate is applied to construct the DOM fragments.

Listing 9.3 Constructing the XTemplate

```

var employeeDVTpl = new Ext.XTemplate(
    '<tpl for=".">' ,
        '<div class="emplWrap" id="employee_{id}">',
            '<div class="emplName">{lastname}, {firstname} {title}</div>',
            '<div>',
                '<span class="title">Department:</span>',
                '{department}',
            '</div>',
            '<div>',
                '<span class="title">Email:</span>',
                '<a href="#">{email}</a>',
            '</div>',
        '</div>',
    '</tpl>'
);

```

In order for a DataView to render data onscreen, it needs an Ext JS Template. This is why you instantiate an instance of Ext.XTemplate first ①. Although we're not going

to dive too deeply into the usage of XTemplates, I do feel that it's important to discuss what the XTemplate is doing. This is your first exposure to this Component, and many developers commonly overlook the `tpl` tag and the `for` attribute ②. I want to make sure you're not one of them.

The first (and last) tags that are specified in the XTemplate list of arguments are `tpl`, and they help the XTemplate organize logical branches of HTML. In the first `tpl` tag, there is a `for` attribute, which specifies which data point the XTemplate is to use to fill in for that branch. To help you understand this, we'll quickly examine the data returned by the server and ponder how the Template would look if the data were different.

Each of the Records the XTemplate will use is constructed like the following plain JavaScript object:

```
{  
    'id'      : '1',  
    'firstname' : 'Karyn',  
    'lastname'  : 'Chase',  
    ...  
}
```

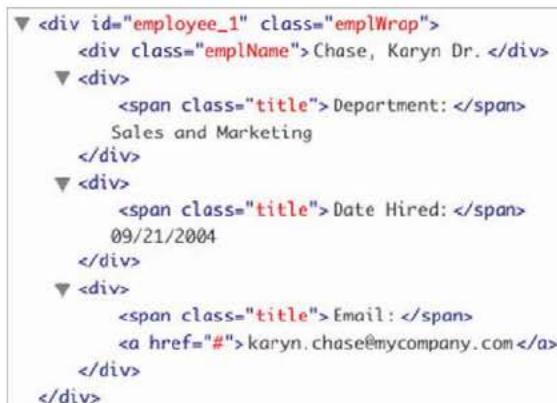
By setting the `for` attribute of the `tpl` tag with a single period `".`, the XTemplate knows that the branch below the `tpl` will use the root object to fill the data points as specified in the HTML fragment defined within.

Figure 9.3 shows what that Record looks like stamped out in the DOM with the XTemplate we just defined.

The HTML fragment illustrated in the figure shows the Template filled out with the data for a single Record. Notice that all of the data points that are defined in the XTemplate are replaced by the actual data from the *root* of the Record.

Okay, but what if the requirement was for phone numbers to be displayed in a flexible fashion—to display only what's in the record? For this, the data might be structured differently.

For instance, added to the following object is a `phoneNumbers` property, which is an array of objects containing the phone type and number:



The screenshot shows a rendered HTML fragment within a Firebug DOM inspection panel. The fragment is contained within a `<div id="employee_1" class="emplWrap">`. It includes several `<div>` elements with classes like `emplName`, `title`, and `date-hired`. The `emplName` div contains the text "Chase, Karyn Dr.". The `title` class is used for labels like "Department:" and "Email:", and for the date "Date Hired:". The `date-hired` class is used for the date "09/21/2004". There are also `karyn.chase@mycompany.com` and `` elements.

Figure 9.3 A rendered HTML fragment as viewed in Firebug's DOM inspection panel

```
{
    'id'          : '1',
    'firstname'   : 'Karyn',
    'lastname'    : 'Chase',
    ...
    'phoneNumbers' : [
        {
            'type' : 'Mobile',
            'num'  : '555-123-4567'
        },
        {
            'type' : 'Office',
            'num'  : '555-765-4321'
        }
    ]
};
```

In this case, the XTemplate to consume this data would look like the following:

```
var otherTemplate = new Ext.XTemplate(
    '<tpl for=".">' ,
        '<div class="emplWrap" id="employee_{id}">',
            '<div class="emplName">{lastname}, {firstname} {title}</div>',
            '<div>',
                '<span class="title">Department:</span>',
                '{department}',
            '</div>',
            '<div>',
                '<span class="title">Date Hired:</span>',
                '{datehired}',
            '</div>',
            '<div>',
                '<span class="title">Email:</span>&nbsp;',
                '<a href="#">{email}</a>',
            '</div>',
            '<tpl for="phoneNumbers">',
                '<div><span class="title">{type}</span> {num}</div>',
            '</tpl>',
            '</div>',
        '</tpl>'
);
```

Notice the second `tpl` tag toward the end of the argument list. This denotes another branch of the HTML fragment, and the `for` attribute specifies that this branch is *for* the "phoneNumbers" property, which happens to be an array. For every object in that array, XTemplate will loop through and produce a copy of that branch of HTML. Figure 9.4 shows that HTML fragment.

Notice that there are two `div` elements for the `phoneNumber` objects, and the values for the mapped properties are populated within. You now

Learn more about XTemplates

Though we won't be touching on the XTemplate's many capabilities, it's important to note that the Ext JS API has well-written examples of the XTemplate on the API documentation page: <http://www.extjs.com/deploy/dev/docs/?class=Ext.XTemplate>.

```

▼ <div id="employee_1" class="emplWrap">
  <div class="emplName">Chase, Karyn Dr. </div>
  ▼ <div>
    <span class="title">Department: </span>
    Sales and Marketing
  </div>
  ▼ <div>
    <span class="title">Date Hired: </span>
    09/21/2004
  </div>
  ▼ <div>
    <span class="title">Email: </span>
    <a href="#">karyn.chase@mycompany.com </a>
  </div>
  ▼ <div>
    <span class="title">Mobile: </span>
    555-123-4567
  </div>
  ▼ <div>
    <span class="title">Office: </span>
    555-765-4321
  </div>
</div>

```

Figure 9.4 The exploded HTML fragment that can be produced by the XTemplate with a for loop

know how to flex some of the XTemplate's muscle, and you're better prepared for a similar situation.

You now have your XTemplate (`employeeDvTpl`) constructed and a basic understanding of what the `tpl` tag and `for` attribute arguments are and what they do. We can now move forward with constructing the `DataView` and placing it in a `Viewport`.

9.2.2 Building the `DataView` and `Viewport`

In the following listing, you'll construct the `DataView` that will display all of the employees in the company.

Listing 9.4 Constructing the `DataView`

```

var employeeDv = new Ext.DataView({
  tpl          : employeeDvTpl,
  store        : employeeDvStore,
  singleSelect : true,
  itemSelector : 'div.emplWrap',
  selectedClass: 'emplSelected',
  overClass   : 'emplOver',
  style        : 'overflow:auto; background-color: #FFFFFF;'
});

```

1 Instantiate new `DataView`

2 Enable single-node selection

To construct the `DataView` 1, not much configuration has to be applied. Most of the code to create a `DataView` occurs in the configuration or instantiation of the supporting data `Store` and `XTemplate`. But it's important to take a good look at the configuration options that have been supplied.

Other than the usage of the template and store, you set `singleSelect` ② to the Boolean value `true`. Setting this property as such will instruct the `DataView` to allow single or multiple (`multiSelect`) node selections when `DataView`'s element is clicked. This is important when you want a rendered Record to be selectable. We set this property to `true` because I have a strong feeling that the company will want to do something with this `DataView` in the future, such as update Records when an item is selected.

In order to help the `DataView` along with the selection of a node, when setting `singleSelect` or `multiSelect` properties to `true` you must set the `itemSelector` property, which must be filled in with a proper CSS selector. This property helps the `DataView` hone in on the element that you want to be displayed as selected. It also helps with managing the visual cues for mouseover. The selector that you set will help the `DataView` highlight the entire Record. In this case, you're using the `div` element with the CSS class `emplWrap` as the selector.

Next, you set `selectedClass` and `overClass` for the CSS classes that you defined earlier, and they'll be used to give the user visual cues as to when a Record is selected or when the mouse hovers over a Record.

In order to allow automatic scrolling of the `DataView`'s element, you need to manually set the CSS on the element. I elected to include it inline to help you see the CSS being applied for automatic scrolling; you can just as easily replace the style with `cls`, whose value is a CSS class to enable automatic scrolling.

This concludes the `DataView` construction. You need to give it a home. Because the client wants a full-screen view, you should place this in a `Viewport`, which is what you'll do in the next listing.

Listing 9.5 Constructing the Viewport

```
new Ext.Viewport({
    layout      : 'hbox',
    defaults    : {
        : 1
    },
    layoutConfig : {
        align : 'stretch'
    },
    items       : [
        {
            title  : 'Employees',
            frame  : true,
            layout : 'fit',
            items   : employeeDv
        }
    ]
});
```

1 Create the Viewport

2 Panel to manage DataView

3 Include employee DataView

Here you instantiate an instance of `Viewport` ① to help render the `DataView` to take up the full browser view. You could instruct the `Viewport` to use the `FitLayout`, because there's a single child element, but to have room for future expansion, you'll use the `HBoxLayout`.

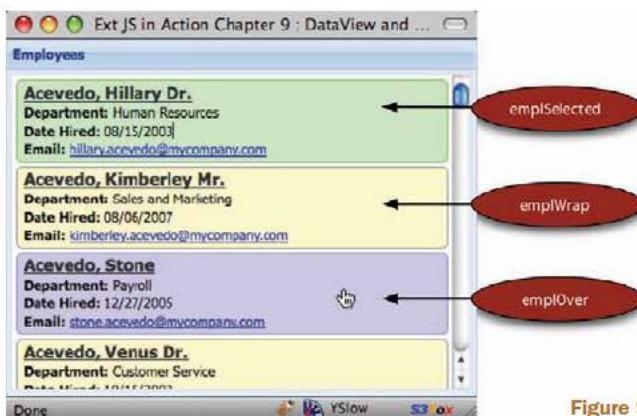


Figure 9.5 The rendered DataView

Also, notice that the first child item for the Viewport is a Panel ②, whose layout is 'fit' and has its frame property set to true. Wrapping the DataView ③ in a Panel will allow you to provide a nice blue frame around it, helping users understand what they're looking at.

This concludes the construction of the DataView. Let's see what this thing looks like and how it behaves onscreen (figure 9.5).

Our DataView renders onscreen, giving users the ability to view all of the employees in the company. You can see that the mouseover event is properly tracked and a single rendered Record can be selected. Great!

But something isn't right. The UI seems somewhat slow. The initial render of the data is slow, and when the browser is resized, the UI update lags significantly, as apparent in figure 9.6.

If you look at the store, you'll see 2,000 Records onscreen. Surely this is impacting performance. Also, users would most likely complain if we bombarded them with that many rows at a time. We need to come up with a way to increase performance. We need to take a moment to ponder the possible solutions.

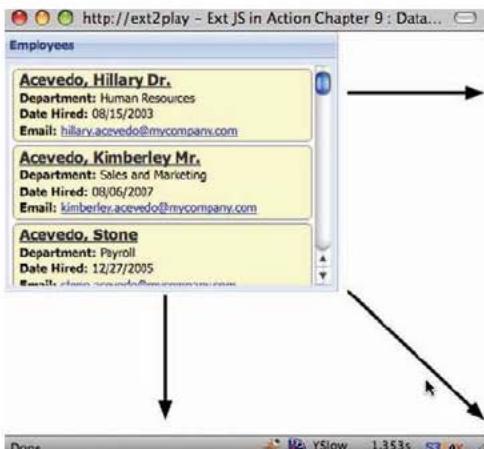


Figure 9.6 Because there are too many Records onscreen, the simple act of resizing the browser results in a visual delay of the Ext Viewport resize.

A quick fix would be to add a `PagingToolbar` to the `DataView`'s parent `Panel` and bind it to the `DataView`'s `Store`. Surely this would assist with the performance, but it wouldn't really make the `DataView` usable. Even if we split 2,000 Records into 100-Record pages, users would have to flip through 20 pages of data to get what they want. How can we increase performance and make it more usable?

What's that you say? Display the Records by department? Yes! I love that idea. Okay, but how? We could use a `ComboBox`, but the list of departments wouldn't be static. Also, it would require two clicks to select a department. I think users would want something that contained a static list of Records, allowing them to filter the list by means of a single click to select a department.

We could use another `DataView`, but I think it would be helpful to display the number of employees in each department, which means we need something that can easily manage the data in a column format. A `GridPanel` would be a nice choice, but it's overkill. It has features such as column drag and drop, which aren't needed and add costs to the UI. I think this is a perfect job for the `ListView`.

9.3 Enter the ListView

We just constructed a `DataView` that renders data about all of our company's employees onscreen at one time, and its performance is less than ideal. We determined that we should use the `ListView` to display the departments in our company and how many employees each department contains. But what's a `ListView`?

The `ListView` widget is a subclass of the `DataView` class that provides a means of displaying data in a tabular format and has a few of the features from the `DataView` and `GridPanel`. These features include resizable and sortable `Columns`, selectable `Records`, and the ability to have customized `Templates`.

NOTE Even though the `ListView` presents a `GridPanel`-like UI, it's not designed to be used in place of the `GridPanel` where `GridPanel`-specific features are required. For instance, the `ListView` doesn't have the ability for horizontal scrolling and has no native support for editing the data inline like the `EditorGridPanel`. The `ListView` also doesn't have the ability to drag and drop `Columns`, nor does it include a `Column` menu.

The `ListView` also comes prepackaged with a `Template` and required CSS, which makes it a cinch to implement, as you'll see. Let's construct the `ListView` that you'll need. After all of the configuration required to use the `DataView`, you'll see that constructing a `ListView` is much easier. This code will have to be placed before the `Viewport`, because it will be rendered next to the `DataView`.

Listing 9.6 Constructing the ListView

```
var listViewStore = new Ext.data.ScriptTagProxy({
    url : 'http://extjsinaction.com/getDepartments.php'
});

var departmentLvStore = {
    xtype   : 'jsonstore',
    // ...
}
```

← **2 Configure JsonStore**

← **1 Create ScriptTagProxy**

```

root      : 'records'
autoLoad  : true,
storeId   : 'departmentDv',
proxy     : listViewStore,
fields    : [
  { name : 'department', mapping : 'department' },
  { name : 'numEmployees', mapping : 'numEmployees' }
]
};

var departmentLV = new Ext.ListView({
  store       : departmentLvStore,
  singleSelect : true,
  style        : 'background-color: #FFFFFF;',
  columns     : [
    {
      header    : 'Department Name',
      dataIndex : 'department'
    },
    {
      header    : '# Emp.',
      dataIndex : 'numEmployees',
      width     : .20
    }
  ]
});

```

To construct the ListView, you begin with the creation of ScriptTagProxy ① to fetch and feed the data to the reader of the ListView-supporting JsonStore ②. The JsonStore is pulling only the department name and number of employees per Record.

Next, you create the ListView ③ to display the departments. In addition to the previously created JsonStore, the configuration properties contain singleSelect, to enable selection. Because the ListView ships with prebuilt CSS rules and a Template, you needn't specify the overCls, selectedCls, and itemSelector properties. But if you do want to use a custom Template for your own projects, you'll most likely have to set those properties accordingly to match your Template.

Next, you style the ListView with a white background. By default, the ListView element contains no background styling and would appear blue when it renders in the wrapped Panel because you set the Panel's frame property to true. Notice that you don't have to set the scroll CSS rule. This is because the ListView sets its element to automatically scroll for you.

Finally, you set a columns ④ property, which is an array of objects that are used to configure the Columns that will vertically organize the data. The second Column is configured to display the number of employees for the departments. Notice that the width is .20, which is to express the percentage of the ListView width that column will take. Because there's no horizontal scrolling with this grid-like widget, the Column-sizing rules are a bit convoluted. Knowing these rules will help you understand why we've configured these Columns this way and in further implementations of this widget.

The first rule is that Column widths are always expressed as a percentage of the ListView's container. If no Column widths are configured, the ListView will

automatically size each column equally to fit the ListView's element. This means that for any columns that you wish to have some control over the widths, you must configure them. Otherwise, if left blank, they'll be automatically resized.

To translate these rules to listing 9.6, because the 'Department Name' column has no defined width property, it will be stretched to the remaining width of the ListView after 20 percent has been carved out for the '# Emp' column. This gives the 'Department Name' column as much room as possible and makes the '# Emp' column small enough to display the data without being truncated.

The ListView is now set up and ready to be rendered onscreen. Let's wrap the ListView in a Panel and place it in a Viewport to the left of the DataView. To do this, you'll have to modify the Viewport's items array. Here's what the changes should look like:

```
items : [
  {
    title : 'All Departments',
    frame : true,
    layout : 'fit',
    items : departmentLV,
    flex : null,
    width : 210
  },
  {
    title : 'Employees',
    frame : true,
    layout : 'fit',
    items : employeeDv
  }
]
```

To add the ListView to the Viewport, you wrap it in a Panel. You inject it before the Employees DataView so it will be rendered to the left-most column and have a static width. Figure 9.7 shows what the ListView looks like rendered next to the DataView.

Cool! The ListView renders to the left of the DataView, and department records can be selected. There are two problems with the current implementation of these two widgets. The first should be obvious—nothing happens when you select a record. Also, the Employees DataView is still loading the 2,000 records. In order to finish this, you'll need to bind the DataView to the ListView and prevent it from loading all of those records automatically.

9.3.1 Binding the DataView to the ListView

We just solved the problem of displaying the departments and their total number of employees by implementing a ListView and rendering it to the left of the Employees DataView, but we didn't bind them to solve the performance problem. To do this, we'll first need to prevent the DataView's store from automatically loading. This one is easy. Set the autoLoad property of the employeeDvStore as follows:

```
autoLoad : false
```

Department Name	# Emp
Accounting	114
Advertising	151
Asset Management	106
Customer Relations	124
Customer Service	141
Finances	176
Human Resources	120
Legal Department	144
Media Relations	146
Payroll	117
Public Relations	127
Quality Assurance	110
Research and Development	125

Figure 9.7 The ListView (left) rendered with the DataView (right)

Next comes the fun part: configuring a click listener for the ListView to call on the DataView's store to request the employees for the department that's selected. To do this, you'll need to add the following listeners configuration object to the ListView's config properties.

```
listeners : {
    click : function(thisView, index) {
        var record = thisView.store.getAt(index);
        if (record) {
            Ext.StoreMgr.get('employeeDv').load({
                params : {
                    department : record.get('department')
                }
            });
        }
    }
}
```

By adding this listener to the ListView, you ensure that the DataView is loaded with the Records that represent the department desired by the users. Here's how it works.

The click event generated by the DataView (remember, ListView is a descendant of DataView) passes the source view Component and the index of the Node that was clicked as located by the configured itemSelector. You attempt to create a reference of the Record selected to instruct the Employees DataView to load. If the Record is defined, then you use the Ext.StoreMgr.get method to obtain a reference to the Employees DataView store by its ID and call its load method. You pass in an object, which contains a params object. The params object contains the department name that was selected.

The load method call will instruct the Employees DataView store to call on the proxy to invoke a request for the employees of the selected department, as shown in figure 9.8. Let's examine how this changes the behavior thus far.

The screenshot shows a browser window titled "Ext JS in Action Chapter 9 : DataView and ListView". On the left, a "ListView" displays a table titled "All Departments" with columns "Department Name" and "# Emp". The data includes Accounting (114), Advertising (151), Asset Management (108), Customer Relations (124), Customer Service (141), Finances (178), Human Resources (120), Legal Department (144), Media Relations (146), Payroll (117), Public Relations (127), Quality Assurance (110), and Research and Development (125). On the right, a "DataView" displays detailed information for selected employees. The first employee listed is "Alvarez, Steven Mrs." with the details: Department: Customer Relations, Date Hired: 01/31/2006, Email: steven.alvarez@mycompany.com. The second employee listed is "Barber, Flavia Ms." with the details: Department: Customer Relations, Date Hired: 09/28/2003, Email: flavia.barber@mycompany.com. The third employee listed is "Bates, Maite" with the details: Department: Customer Relations, Date Hired: 12/19/2008, Email: maite.bates@mycompany.com. The fourth employee listed is "Benson, Chandler Dr." with the details: Department: Customer Relations, Date Hired: 07/03/2005, Email: chandler.benson@mycompany.com. The bottom status bar shows "Done.", "YSlow 1.423s", and "S3 Box".

Figure 9.8 The ListView's (left) click event now filters the DataView (right).

Excellent. The ListView now filters the DataView as you've configured it to. You can see that the changes result in a much more responsive UI for the user.

I've sent this over to the users, and they've responded expressing their appreciation but have one last request. They want the ability to modify the data for the employee selected. To do this you'll have to configure a FormPanel and add it to the Viewport. This gives you an excellent opportunity to learn how to bind a FormPanel to a DataView and observe the DataView's ability to efficiently update data on HTML onscreen.

9.4 Bringing it all together

In order to allow users to edit the employee Records, you'll need to create a FormPanel for them. The FormPanel needs to have a Button to allow them to commit the saved changes. In order to get all of this stuff to work together, you'll have to create a small event model. Here's how this stuff will work.

Figure 9.9 shows the proposed layout changes and proposed event handlers and their expected behavior.

To populate the FormPanel with the selected data, you'll have to reconfigure the DataView with a click handler to get the job done. Also, the FormPanel's Save Button will be required to set the various properties on the Record to update the DataView. Last, the Departments ListView will have to clear the FormPanel's values when it's clicked to avoid an exception. It sounds like a lot of work, but it's not. You've done most of it already.

Let's begin by creating the FormPanel and adding it to the Viewport. Then we'll circle back and work on the bindings.

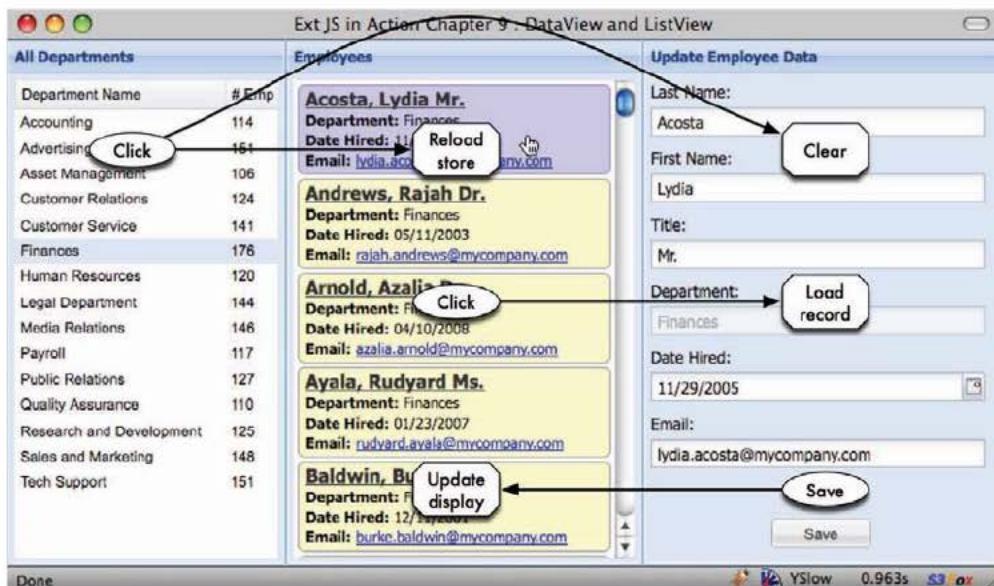


Figure 9.9 The addition of the FormPanel and the required event model

9.4.1 Configuring the FormPanel

The following listing is lengthy, but it's mainly due to the number of fields that need to be in the form. The following code needs to be placed just before the instance of Viewport is created.

Listing 9.7 Constructing the FormPanel

```
var updateForm = {
    frame      : true,
    id         : 'updateform',
    labelWidth : 70,
    xtype      : 'form',
    defaultType: 'textfield',
    buttonAlign: 'center',
    title      : 'Update Employee Data',
    labelAlign  : 'top',
    defaults   : {
        anchor : '-5'
    },
    items      : [
        {
            name      : 'lastname',
            fieldLabel: 'Last Name'
        },
        {
            name      : 'firstname',
            fieldLabel: 'First Name'
        },
    ]
},
```

```

    },
    name      : 'title',
    fieldLabel : 'Title'
},
{
    name      : 'department',
    fieldLabel : 'Department',
    disabled   : true
},
{
    xtype     : 'datefield',
    name      : 'datehired',
    fieldLabel : 'Date Hired'
},
{
    name      : 'email',
    fieldLabel : 'Email'
}
];
};

```

Here you create the `FormPanel` with six fields. Notice that each field has a `name` attribute that matches the corresponding `Record` field name. This is important to know because if you want to load the `Record`, the field name must match the `Record` that it will be configured to consume.

The `Department` field is disabled because the users have indicated that they don't want to use this tool to update departments. They want a drag-and-drop tool for that, which we'll be tasked to build later on.

Next, you'll place it in the `Viewport`. Here's what the modified `items` array will look like:

```

items      : [
{
    title  : 'All Departments',
    frame   : true,
    layout  : 'fit',
    items   : departmentLV,
    flex    : null,
    width   : 210
},
{
    title  : 'Employees',
    frame   : true,
    layout  : 'fit',
    items   : employeeDv,
    flex    : 1
},
updateForm
]

```

Notice that all you're doing is adding the `updateForm` reference to the end of the list, which will make it appear to the right of the `Employees` `DataView`. Figure 9.10 shows what it will look like rendered.

The screenshot shows a web application interface with three main components:

- ListView (Left):** A table titled "All Departments" listing various departments with their names and employee counts.
- DataView (Center):** A list of employees with their details: Alford, Ross; Ashley, Ferdinand Mrs.; Ayers, Breanna Dr.; Bailey, Adam Dr.; and Banks, Hope.
- FormPanel (Right):** A panel titled "Update Employee Data" containing fields for Last Name, First Name, Title, Department, Date Hired, and Email, along with a YSlow performance indicator.

Figure 9.10 The ListView (left), DataView (center), and FormPanel (right)

The FormPanel renders perfectly, which means you're ready to begin the bindings. This is where the fun begins.

9.4.2 Applying the final bindings

You'll begin by binding the Employees DataView to the FormPanel by means of a click handler, which will retrieve the selected Record and call on the FormPanel's BasicForm to load the Record. To assist with the task of binding the FormPanel to the DataView, you'll set a local reference to the selected Record on the FormPanel itself.

To add the click handler to the Employees DataView, you'll need to add the following listeners object to its configuration object:

```
listeners : {
    click : function(thisDv, index) {
        var record = thisDv.store.getAt(index);
        var formPanel = Ext.getCmp('updateform');
        formPanel.selectedRecord = record;
        formPanel.getForm().loadRecord(record);
    }
}
```

This code snippet works just like the click handler you assigned to the ListView a bit earlier. The difference is that you're setting the Record reference on the FormPanel and calling on its BasicForm's loadRecord to set the values of the fields. Notice that the Record reference that's being set is selectedRecord. This will be key when you work on the round-trip binding.

The screenshot shows a web application interface. On the left, there is a table titled "All Departments" with columns "Department Name" and "# Emp". The data includes:

Department Name	# Emp
Accounting	114
Advertising	151
Asset Management	106
Customer Relations	124
Customer Service	141
Finances	176
Human Resources	120
Legal Department	144
Media Relations	146
Payroll	117
Public Relations	127
Quality Assurance	110
Research and Development	125
Sales and Marketing	148
Tech Support	151

In the center, there is a "Employees" section displaying five employee records in a list view:

- Alford, Ross**
Department: Media Relations
Date Hired: 03/02/2008
Email: ross.alford@mycompany.com
- Ashley, Ferdinand Mrs.**
Department: Media Relations
Date Hired: 07/18/2007
Email: ferdinand.ashley@mycompany.com
- Ayers, Breanna Dr.**
Department: Media Relations
Date Hired: 05/01/2002
Email: breanna.ayers@mycompany.com
- Bailey, Adam Dr.**
Department: Media Relations
Date Hired: 06/24/2008
Email: adam.bailey@mycompany.com
- Banks, Hope**
Department: Media Relations
Date Hired: 04/07/2001
Email: hope.banks@mycompany.com

On the right, there is a "Update Employee Data" form panel with fields:

- Last Name: Alford
- First Name: Ross
- Title: (empty)
- Department: Media Relations
- Date Hired: 03/02/2008
- Email: ross.alford@mycompany.com

Figure 9.11 Testing the `DataView` to `FormPanel` binding

You can test this by refreshing the page, selecting a department, and then choosing an employee. The Record should load and the fields should be set with the data accordingly, as shown in figure 9.11.

Excellent! You have your one-way binding from the `DataView` to the `FormPanel` in place. In order to commit the changes, the users will need a Save Button. To do this, you'll have to add a `buttons` property to the `FormPanel`'s configuration object with a single `Button`, whose text is "Save." The handler will be responsible for leveraging the recently set `FormPanel`'s `selectedRecord` and setting its value according to the changes made on the `FormPanel`.

Add the following snippet to the `FormPanel`:

```
buttons : [
    {
        text      : 'Save',
        handler   : function() {
            var formPanel = Ext.getCmp('updateform');
            if (formPanel.selectedRecord) {
                var vals  = formPanel.getForm().getValues();

                for (var valName in vals) {
                    formPanel.selectedRecord.set(valName, vals[valName]);
                }
                formPanel.selectedRecord.commit();
            }
        }
    }
]
```

The screenshot shows a browser window with the URL <http://ext2play - Ext JS in Action Chapter 9 : DataView and ListView>. On the left, there's a **All Departments** table with columns for Department Name and # Emp. On the right, there's a **Employees** section with a list of employees. One employee, **Alford, Ross Sr.**, is selected and highlighted in green. An arrow points from this record to a **Update Employee Data** form panel on the right. The form panel has fields for Last Name (Alford), First Name (Ross), Title (Sr.), Department (Media Relations), Date Hired (03/02/2008), and Email (ross.alford@mycompany.com). A 'Save' button is at the bottom. The browser status bar shows the URL http://ext2play/extjs/chapter09/listview_with_dataview_and_form.html#, the page title 'YSlow 1.422s S3', and the page number '1.422s'.

Figure 9.12 Testing the round-trip binding of the FormPanel to the DataView

When the newly configured Button is pressed, it will use `Ext.getCmp` to get a reference to the FormPanel. If it contains a `selectedRecord` property, it will loop through each value retrieved from the form and set the Record's corresponding property accordingly. Last, the Record's `commit` method is called, making the changes permanent and causing the DataView to repaint only the Node that was modified.

As illustrated in figure 9.12, clicking Media Relations and then Alford Ross will cause that employee's Record to populate the FormPanel. I added "Sr." to the Record, because the value was missing, and clicked the newly added Save Button. What you can immediately see is that the rendered Record is updated based on the data from the FormPanel, completing the two-way binding between the DataView and the FormPanel.

NOTE Because the exercises in this chapter leverage a remote data Store, we can't save data via Ajax because of the same-domain policy that the XHR object enforces. This is why this example doesn't invoke a form submission.

The last thing you need to do is code the clearing of the FormPanel when the Department ListView selection changes. This will help prevent exceptions that the user might cause if they attempt an update on a Record that might not be there because of a department selection change.

Replace the previously developed click handler with the following code:

```
click : function(thisView, index) {
    var record = thisView.store.getAt(index);
    if (record) {
        Ext.StoreMgr.get('employeeDv').load({
            params : {
                id : record.id
            }
        });
    }
}
```

```
        department : record.get('department')
    }
});
var formPanel = Ext.getCmp('updateform');
delete formPanel.selectedRecord;
formPanel.getForm().reset();
}
}
```

By studying the changes, you can see that all you had to do was add three lines to create a reference to the `FormPanel`, delete the `selectedRecord` reference, and then call the `BasicForm`'s `reset` method, clearing the data from the fields. You can observe this in action by selecting a department, an employee, and then a different department. The fields will clear, signaling that it works.

This concludes the deliverable of binding `DataView`, `ListView`, and `FormPanel`. When you encounter the need to implement a `DataView` or `ListView` for your application, remember that you can bind these two widgets to any other widgets by means of events. An example of this is a `rowclick` event of a `GridPanel`, which could trigger the data `Store` load of a `DataView` or `ListView` to provide a level of drill-down capability. Likewise, inverse binding can be applied as well.

9.5 Summary

In this chapter we explored two commonly used widgets, the `DataView` and its cousin the `ListView`. In doing so, we not only looked at how they work but also saw how to bind them together, applying advanced concepts that could be carried into any application.

We began by explaining what a `DataView` is and what it takes to configure one. While exploring the `DataView`, we took some time to discuss one of its supporting classes, the `XTemplate`. By an example, you saw that you're required to create the CSS to style the painted data onscreen.

Next, you learned about the `ListView` class and the features it provides. We discussed the rules of the column-sizing model, and you learned how to bind the `ListView` to a `DataView` by means of a `click` event.

Last, you learned how to create a two-way binding between a `FormPanel` and a `DataView` to allow your users to update the data for the employees. In doing so, you got to witness the efficiency of the `DataView` in updating only the DOM linked to the record that was updated.

Next, we'll tackle the use of Charts, and you'll learn how to configure them to respond to click gestures.

10

Charts

This chapter covers

- Learning the basics of Ext JS Charts
- Deconstructing the Chart class hierarchy
- Exploring the various Charts available in the framework
- Implementing each of the Charts
- Mixing a Chart series into a hybrid Chart
- Customizing the look and feel of your hybrid Chart

Many of the applications that I've developed in the past have required data visualization. Whether it was the amount of space used for a particular disk volume or the value of a stock over time, the problems were exactly the same and ultimately amounted to a couple of major factors: which charting package will be used, and how much is it going to cost to integrate and ultimately manage?

All of this introduces risk to the application and adds support costs, which dissatisfies customers. Thankfully, this is all now behind us. Ext JS 3.0 provides a charting package that handles the four most commonly used charts—line, bar, column, and pie—thus mitigating the risk of using and supporting a third-party charting package and reducing support costs.

In this chapter, you'll learn all about Ext.charts. We'll begin by exploring the anatomy of charts and discussing the various classes that compose the chart package. We'll also visually explore the different types of charts available to you.

Next, we'll take an exploratory approach when talking about the different charts in the framework. You'll begin by creating a basic LineChart and learn how to customize the colors used, create a custom ToolTip renderer method, and display legends.

Because the LineChart, ColumnChart, and BarChart are based on the same basic chart, you'll use your newly found knowledge to convert the LineChart to a ColumnChart and a BarChart by literally flipping the x- and y-axis configurations. You'll also learn how to create hybrid charts, such as ColumnCharts with embedded LineSeries.

In the final section, you'll learn all about the PieChart and how it differs from the three other basic charts. You'll also learn how to add context to the PieChart ToolTip by means of a custom tip-renderer function, making it much more useful.

10.1 Defining the four charts

Charts provide the ability to visualize statistical data in a graphic format. There are four basic types of charts: line, bar, column, and pie. LineChart, BarChart, and ColumnChart are similar because they're based on the same *Cartesian*-style chart, where points of data are plotted in a two-dimensional X-Y coordinate plane system.

This is why you can mix the Bar and LineSeries in the same chart. Likewise, you can mix the LineSeries with the ColumnSeries in a Chart. But column and BarSeries can't exist in the same Chart.

The PieChart is kind of a black sheep of the chart classes. Because it isn't based on the CartesianChart system, it can only leverage the PieSeries and is designed to display data representing percentages.

What makes using charts in the framework so cool is that you need not have any Flash experience to get this stuff to work for you. As you'll see, everything will be done via JavaScript.

Let's look at a line chart in action and analyze it; see figure 10.1.



Extcharts are based on the YUI Charts library and are wired to consume data from a data Store, much like the `GridPanel` and `DataView` classes. Because Charts follow the same pattern as every other data store consumer class, providing data for this widget requires no additional knowledge. This binding also provides the benefit of automatic Chart updates when data in the store changes, which could be displayed with or without animation.

Users have the ability to interact with Charts with the mouse by means of `mouseover` and `click` gestures. A `mouseover` gesture can provide useful information by means of a `ToolTip`, which can be customized, as shown in figure 10.1.

The `click` gesture can provide powerful user interaction with your Charts, allowing users to click a point in the `LineSeries`, a bar in the `BarSeries`, a column in the `ColumnSeries`, or a slice in the `PieSeries` to make stuff happen in the UI, such as drilling down into that data point for a more fine-grained view of the data. This works by means of the Chart's `itemclick` event, which we'll explore and use when we start to build our first Charts.

Next, we'll look under the hood and peek at the components that make Charts work.

10.2 Charts deconstructed

Like everything else UI, Charts can be rendered to any `div` on the page or configured as a child item of any parent Container widget. This is because the Chart classes are descendants of the `BoxComponent` class, which, if you recall, gives any Component the ability to take part in a layout.

Figure 10.2 shows a hierarchy diagram for the Chart classes.

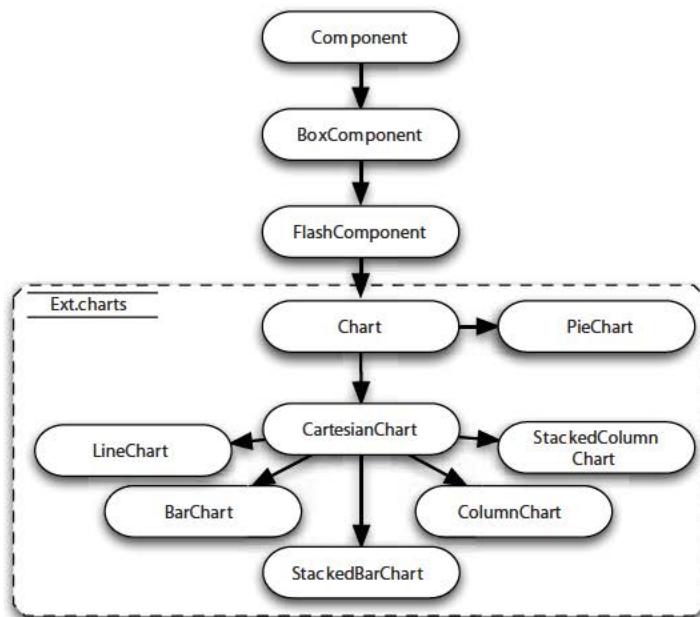


Figure 10.2 The Chart class hierarchy

Charts are Adobe Flash-based and require special handling when compared to generic HTML objects. For instance, if Flash is to be displayed on a page, logic needs to be in place to detect whether the browser has Flash and, if so, whether it's the correct version. If Flash isn't installed or if the version is less than what's required, a link to install Flash is rendered in the area where the Flash content is to be; otherwise, the Flash widget is rendered onscreen and all is well. Managing this type of logic, in addition to the cross-browser markup differences, can be quite a hassle on your own.

Luckily, the `FlashComponent` takes care of this for us and serves as the base class for the Charts. The `FlashComponent` is a special class because it leverages the `SWFObject` to handle just about all Flash-specific issues and can be extended to allow Ext JS to manage any Flash-based content. It's for this reason that the `Chart` class subclasses `FlashComponent`.

Focusing on the `Chart` class, which exists in the `Ext.charts` namespace, you can see that it has two descendants, `PieChart` and `CartesianChart`. The `Chart` class is what wraps the YUI Charts and is what binds the data Store and mouse gesture events to the framework. It's the most heavyweight class in the entire hierarchy. Most of the work is done in the YUI Chart's compiled SWF, which is beyond the scope of this book.

Looking at the descendants of `CartesianChart`, you can see three major categories of charts: `LineChart`, `BarChart`, and `ColumnChart`. This is important to know when deciding how to implement them, because they're the three main Cartesian chart options available.

The `LineChart` is used to plot dots of intersecting data on the X-Y plane, and a line is drawn connecting those dots. Figure 10.3 illustrates a `LineChart` implementation that contains two `LineSeries`.

The `BarChart` displays horizontal bars of data. Multiple `BarSeries` can be added to the chart, where each category of data will be flush against another, as illustrated in figure 10.4.

Sometimes data to be displayed is cumulative. For instance, the total number of employees for a given year can be calculated as the sum of the previously hired and newly hired for a given year. This data must be displayed in a single horizontal line but segmented with the `StackedBarChart`, as shown in figure 10.4 (right). The data used for both of these charts is exactly the same.

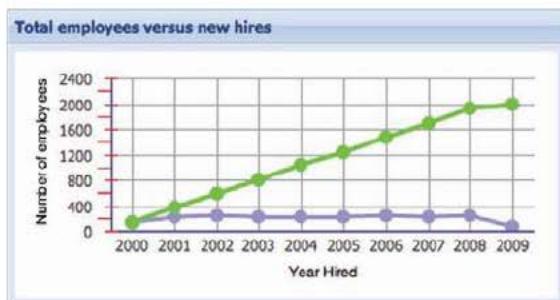


Figure 10.3 The LineChart with two LineSeries

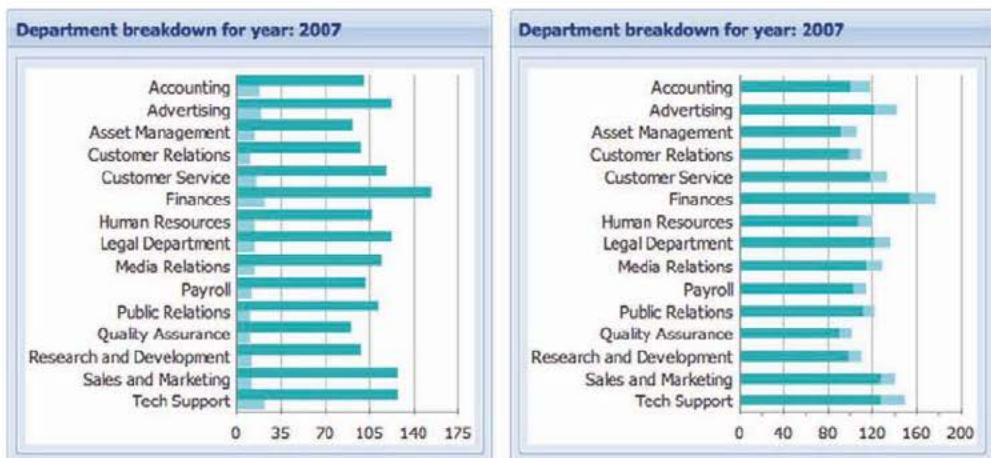


Figure 10.4 BarChart (left) and StackedBarChart (right) examples

The ColumnChart is used to plot the chart data in vertical bars. The columns can be stacked via the StackedColumnChart. Just like in figure 10.4, the data for figure 10.5 is the same in both charts.

In contrast to the Cartesian-style charts, the PieChart is used only to display percentages of data. Figure 10.6 is an illustration of a PieChart in action.

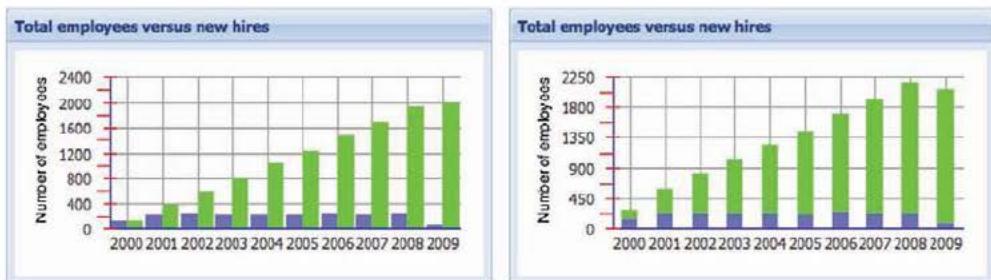


Figure 10.5 The ColumnChart (left) and StackedColumnChart (right)

Just as with the LineChart, ColumnChart, and BarChart, the Series for the PieChart (slices) can display a ToolTip when a mouseover gesture occurs. The Series can also be clicked, which will generate the useful itemclick event.

You now have a high-level understanding of which Charts are available and how they work, which means that we can begin the code exploration of the different Charts. We'll kick it off with the construction of a LineChart, where you'll learn the basics of Chart creation.



Figure 10.6 A PieChart

10.3 Building a LineChart

Our first chart will be a single-series LineChart that plots the total number of employees for a company for the years 2000–2009. Remember that this type of Chart is based on X and Y coordinates, which means that we'll have to configure the Chart to utilize a data Store-mapped data field for each Axis.

But before we begin writing the code for this Chart, let's look at the data the Chart will consume. Relatively speaking, this is an easy task, because we're dealing with only two data points: year and total employees for each year.

The server side has been crafted for us, and the JSON will look like this:

```
[
  {
    "newHires" : 135,
    "year"     : 2000,
    "total"    : 136,
    "prevHired": 1
  },
  ...
]
```

The JSON contains an array of objects representing records in the database. We can see the year and total attributes for each record. This means that we need to craft a JsonStore that will map these two fields. There are two other attributes per record that report the number of new hires (newHires) and previously hired (prevHired) employees, which we'll ignore for the time being.

Before we move on to construct our first chart, we need to configure the location of the charts.swf file, which defaults to the Yahoo! URL: <http://yui.yahooapis.com/2.7.0/build/charts/assets/charts.swf>.

Although leaving the default location of this URL is generally okay, many would prefer not to depend on the availability of Yahoo! to host the SWF content. Not to mention that if the application you're developing is going to be riding on HTTPS, this URL would most likely cause the browser to display a security warning, which can send the false message that your application is less secure.

Also, if your application is within a secured intranet, the client's browser may not have access to outside web servers, thus rendering Charts completely unusable. Configuring charts to require the SWF file from the local intranet server will help mitigate this issue.

To configure Ext JS to use a particular SWF for Charts, set the CHART_URL property on the Chart class as follows:

```
Ext.chart.Chart.CHART_URL = '<path to extjs>/resources/charts.swf';
```

You want to place this line of code just after the Ext JS base libraries. This will ensure that the property is set before your code begins to get parsed by the JavaScript interpreter. This is similar to setting the BLANK_IMAGE_URL ('s.gif') configuration property earlier in this book.

With that out of the way, you can move on to create the LineChart that will plot this data onscreen, as follows.

Listing 10.1 Constructing a basic LineChart

```
var employeeStoreProxy = new Ext.data.ScriptTagProxy({
    url : 'http://extjsinaction.com/getNewHireData.php'
});

var remoteStore = {
    xtype     : 'jsonstore',
    root      : 'records',
    autoLoad  : true,
    storeId   : 'employeeDv',
    proxy     : employeeStoreProxy,
    fields    : [
        { name : 'year', mapping : 'year' },
        { name : 'total', mapping : 'total' }
    ]
};

var chart = {
    xtype      : 'linechart',
    store      : remoteStore,
    xField    : 'year',
    yField    : 'total'
};

new Ext.Window({
    width  : 400,
    height : 400,
    layout  : 'fit',
    items   : chart
}).show();
```

In listing 10.1, you create the data Store that maps the year and total fields that are provided by the server-side code and the line chart that lives in a Window. As you can see, creating a basic Chart is extremely simple to do. Here's how it works.

When creating the LineChart XType configuration object ①, you set the mandatory `xtype` property and required JSON data Store. The next two properties, `xField` and `yField` ②, are used to automatically create the x-axis and y-axis and map the data from the Store. That's pretty much it.

To display the Chart, you create a Window with the FitLayout, which hosts the LineChart. Figure 10.7 shows what our first LineChart looks like.

As illustrated in figure 10.7, our LineChart renders inside an `Ext.Window` plotting the statistical data. If you hover your mouse cursor over one of the points in the line, you'll see the two values for the point in a tip. But this presents a problem.

For this Chart, the data in the tip provides no context to the figures being presented, thus providing little value. Likewise, the x-axis and y-axis have the same dilemma. It's obvious that the number on the x-axis represents years. But you can't tell what the y-axis represents. This is precisely a situation where you'd want to customize the Chart.

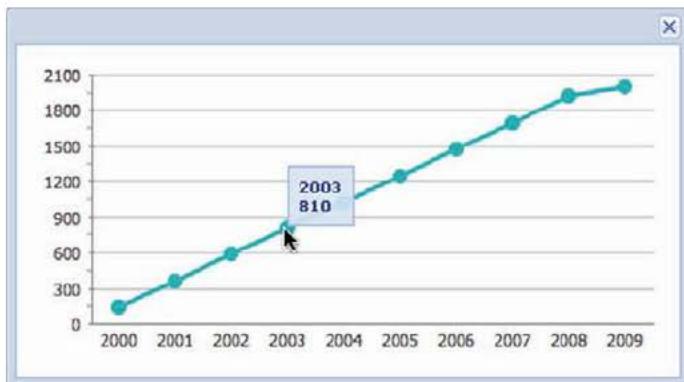


Figure 10.7
Our first LineChart

10.3.1 Customizing the ToolTip

The first problem we'll tackle is providing context for the ToolTip. To do this, you'll have to add a tipRenderer to your LineChart configuration object, as follows:

```
tipRenderer : function(chart, record, index, series){  
    var yearInfo = 'Year: ' + record.data.year;  
    var empInfo = 'Num. employees: ' + record.data.total;  
  
    return yearInfo + '\n' + empInfo ;  
}
```

In this tipRenderer method, you create two strings, `yearInfo` and `empInfo`, which insert a meaningful label in front of the data. The method returns a concatenation of the `yearInfo` and `empInfo` with a `\n`, to introduce a line break between the two data fields. Why a newline character and not a standard `
`, you ask?

The `tipRenderer` function works similarly to the column renderer of the GridPanel, where the method is expected to return a string to be displayed onscreen; however, although the column renderer allows HTML, the `tipRenderer` doesn't. This is because the ToolTip is rendered inside Flash and doesn't support HTML. In order to introduce a line break between lines of data, the only way to do so is by means of the standard UNIX-style newline string (`\n`).

Figure 10.8 shows what the new ToolTip will render.

With the addition of the custom `tipRenderer`, mouseover events now provide context to the tips. Next, we'll work on customizing the x- and y-axes to add labels.

10.3.2 Adding titles to the x- and y-axes

To add labels to a Cartesian Chart, you must manually configure and create an axis. But you must use the correct axis for the type of data you're displaying. There are three possible axes to use: `CategoryAxis`, `NumericAxis`, and `TimeAxis`. Based on the LineChart we've created thus far, which axis would you choose for each x- and y-axis?

The values for each axis are numeric. The obvious choice is `NumericAxis` for both—right? Wrong. Here's why.

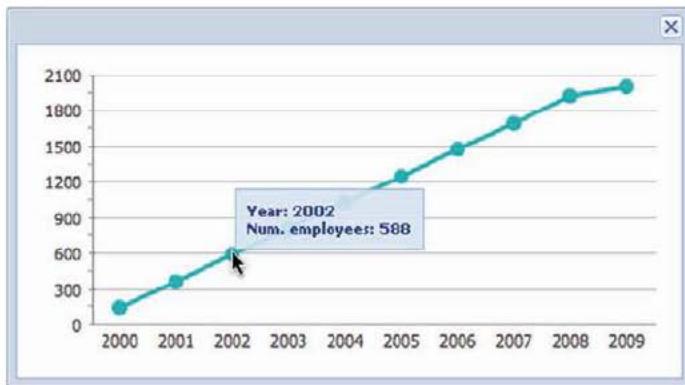


Figure 10.8
Our LineChart with
our custom ToolTip

If you take a good look at how the `CartesianCharts` process data, you can tell that the Charts display two types of values: measurements and something that's being measured. The thing that's being measured in each Chart is known as the category.

Applying this to the LineChart, you can see that the measurement for our chart is the number of employees and the category is the year. The same logic can be applied to a Chart that measures how many sales car manufacturers have made, as shown in figure 10.9.



Figure 10.9 Categories of data are clearly defined in this car sales LineChart.

With this knowledge, you can see that the `CategoryAxis` is logically the only choice for the x-axis. This means you'll have to reconfigure the Chart to utilize new x- and y-axes, as shown here.

Listing 10.2 Reconfiguring the Chart to utilize new x- and y-axes

```
var chart = {
    xtype      : 'linechart',
    store      : remoteStore,
    xField     : 'year',
    yField     : 'total',
    tipRenderer: function(chart, record, index, series){
        var yearInfo = 'Year: ' + record.data.year;
```

```

var empInfo = 'Num. employees: ' + record.data.total;
return yearInfo + '\n' + empInfo ;
},
xAxis: new Ext.chart.CategoryAxis({
    title : 'Year Hired'           ← Set the new x-axis
}),
yAxis: new
Ext.chart.NumericAxis({
    title : 'Number of employees' ← Title the x-axis
})
}

```

← Use NumericAxis for y-axis

In listing 10.2, you add the `xAxis` and `yAxis` properties to the main Chart configuration object. The `xAxis` is set to an instance of `CategoryAxis`, whereas the `yAxis` property is set to an instance of `NumericAxis`. Each new axis is configured with a `title` parameter.

Let's see what it looks like after adding the newly overridden axis (figure 10.10).

If you look at the y-axis label, you can see that it's clearly wasting space. The only way to mitigate this issue this is to rotate the text, which can be done only through custom styling of this widget.

Next, you'll learn how to stylize the Chart body. Later on, you'll learn how to stylize the Series as well.

10.3.3 Styling the Chart body

In contrast to the rest of the framework, JavaScript is the only vehicle to stylize Charts. This means that you must configure the styles of the Charts when you instantiate them. To me, this is one of the lengthier tasks when developing Charts because it requires a lot of testing and ultimately more code.

NOTE Quite a few style options are available to choose from. Because Ext JS uses YUI Charts, naturally the best source for documentation is going to be at YUI. Visit the following URL to get the most comprehensive list of styles: <http://developer.yahoo.com/yui/charts/#basicstyles>.

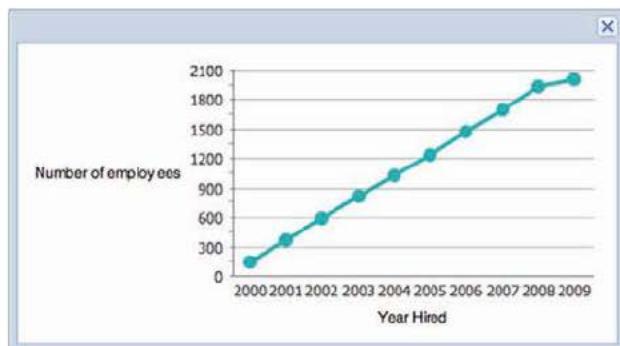


Figure 10.10 Adding y-axis titles without custom styling results in wasted screen space.

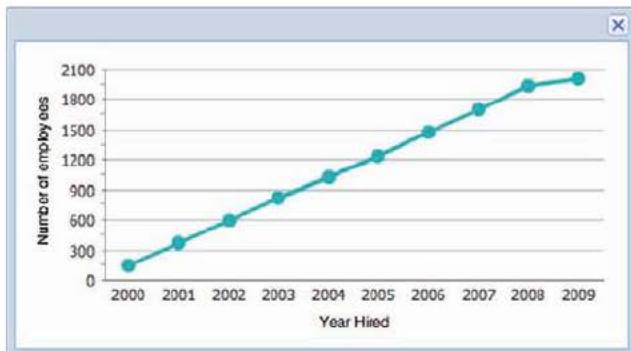


Figure 10.11 The yAxis is now rotated -90 degrees, which reduces wasted space.

In order to rotate the title, you need to include custom style configuration in your line Chart's configuration object. This is done by means of setting the extraStyle property like so:

```
extraStyle : {
    yAxis: {
        titleRotation : -90,
    }
}
```

In this code snippet, you create the extraStyle configuration object, which contains another configuration object for the y-axis. Inside the yAxis configuration object, the titleRotation property is set to -90 (degrees).

Figure 10.11 shows what the newly styled Chart looks like.

You can see that by adding the extraStyle configuration property and its contents to our LineChart, it renders with the y-axis title rotated, thus reducing the amount of wasted space.

Thus far, you've created a single LineChart and have provided some light styling to improve its readability. There are a few more measurement figures to add to the Chart. To show these on the screen, you'll need to refactor the Store and Chart configuration completely.

10.4 Adding multiple Series

When you looked at the data being provided by the server side, you saw multiple data points that are related to the number of employees for a given year. If you peek at the data again, you can see that the other two figures are newHires and prevHired.

```
[
  {
    "newHires" : 135,
    "year"      : 2000,
    "total"     : 136,
    "prevHired" : 1
  },
  ...
]
```

To make use of this data, you'll need to reconfigure the data store to map the fields. Luckily, all you have to do is add the two fields to the mappings list for the data store.

```
fields : [
    { name : 'year',      mapping : 'year'      },
    { name : 'total',     mapping : 'total'     },
    { name : 'newHires',  mapping : 'newHires'  },
    { name : 'prevHired', mapping : 'prevHired' }
]
```

Next comes the fun part: refactoring the Chart to add the extra Series. While you're at it, you'll apply custom styles to make the Chart much easier to read and more pleasing to look at. This is where you'll see that customizing Charts requires quite a bit of code, but it's easy once you understand it. This is why you'll break up the refactoring effort into smaller, more digestible chunks.

You'll begin with the configuration of the series, as follows.

Listing 10.3 Configuring the Series for our multiseries Chart

```
var series = [
    {
        yField      : 'prevHired',
        displayName : 'Previously Hired',
        style       : {
            fillColor   : 0xFFAAAA,
            borderColor : 0xAA3333,
            lineColor   : 0xAA3333
        }
    },
    {
        yField      : 'total',
        displayName : 'Total',
        style       : {
            fillColor   : 0xAAAAFF,
            borderColor : 0x3333FF,
            lineColor   : 0x3333FF
        }
    },
    {
        yField      : 'newHires',
        displayName : 'New Hires',
        style       : {
            fillColor   : 0xAFFFAA,
            borderColor : 0x33AA33,
            lineColor   : 0x33AA33
        }
    }
];
```

In listing 10.3, you create an array of configuration objects that are used to configure the three different Series. Here's what all of these properties do.

In each Series configuration object, you map the data points by means of the yField ① property. Setting the yField property replaces the yField property in the

main chart configuration object. It may be easier to think of it as mapping the dataIndex to GridPanel columns. You also set the displayName **②**, which is used in both the ToolTip and the legend, which you'll learn about in a bit.

Next, you set a custom style **③** configuration object for each series, which sets the color for the point's fill **④** and border **⑤** as well as the color for the lines **⑥**. Setting these styles will clearly distinguish each Series, enhancing Chart readability.

With the Series in place, you can move on to construct a tipRenderer that's much more flexible and create the extraStyle configuration, as shown in the following listing.

Listing 10.4 Creating a flexible tipRenderer and extraStyle

```
var tipRenderer = function(chart, rec, index, series) {
    var yearInfo = 'Year: ' + rec.get('year');
    var empInfo = series.displayName + ': '
        + rec.get(series.yField);
    return yearInfo + '\n' + empInfo;
};

var extraStyle = {
    xAxis : {
        majorGridLines : {
            color : 0x999999,
            size : 1
        }
    },
    yAxis: {
        titleRotation : -90
    }
};
```

In listing 10.4, you create the custom tipRenderer, which is much more flexible than the previous one. This is because this tipRenderer leverages the Series's displayName **①** to create the custom label for the Series. It also uses the Series's yField property to pull the mapped data, resulting in a truly dynamic tipRenderer.

Next, you create a configuration object to contain the custom style parameters. Along with the yAxis's titleRotation, you add an xAxis configuration object, which contains majorGridLines **②**. This configuration property instructs the Chart to display a vertical line for each category data point, resulting in intersecting lines across the entire grid area.

You now have all you need to configure the chart. Let's do that next.

Listing 10.5 Refactoring the Chart

```
var chart = {
    xtype : 'linechart',
    store : remoteStore,
    xField : 'year',
    tipRenderer : tipRenderer,
    extraStyle : extraStyle,
    series : series,
```

```

xAxis      : new Ext.chart.CategoryAxis({
    title : 'Year Hired'
}),
yAxis : new Ext.chart.NumericAxis({
    title : 'Number of employees'
})
);

```

To refactor the Chart configuration object, you remove the `yField` property. Remember that this is already present in each of the `Series` configuration objects and aren't needed in the Chart configuration. You also set the `tipRenderer`, `extraStyle`, and `series` properties to the variables that you created a bit earlier.

Figure 10.12 shows what the Chart now looks like rendered inside the Window you created earlier.

When looking at our multiseries LineChart you can see that each `Series` is colored differently and the vertical lines are now drawn at each x-axis data point. But you're left with a problem. In order to tell what figure each line represents, you have to mouse over a point on the graph, which isn't exactly user friendly.

The solution for this is to add a legend to the chart.

10.4.1 Adding legends

To add a legend to your Chart, you need only add the style configuration object to the `extraStyles` configuration object, like this:

```

legend : {
    display : 'bottom',
    padding : 5,
    spacing : 2,
    font   : { color : 0x000000, family : 'Arial', size   : 12 },
    border : { size : 1, color : 0x999999 }
}

```

When you set the `legend` style configuration object, the property that controls whether the legend will display or not is `display`. This property defaults to "none", which prevents it from displaying. In addition to "bottom", it can be set to "top", "right", or "left".

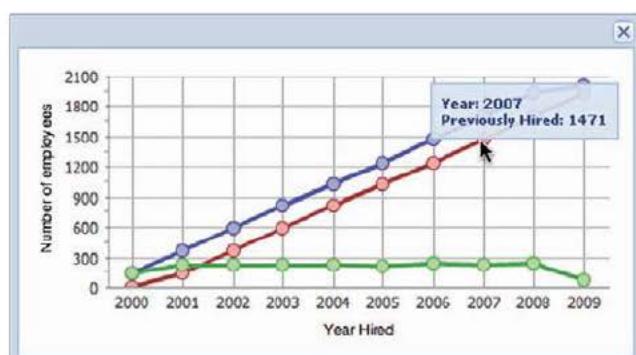


Figure 10.12 Our multiline Chart with much more custom styling



Figure 10.13 The addition of the legend enhances readability for multiseries Charts.

The padding property works much like the CSS padding style. The spacing property specifies how many pixels separate the Series. To configure the font and border, you have to create separate configuration properties for each. Remember that all of the possible styles are detailed in the YUI documentation.

The addition of the legend is shown in figure 10.13.

We've spent a lot of time on the LineChart, and you learned how to customize it quite a bit with the inclusion of a custom tipRenderer, multiple Series, and applicable styles. What about the Column and Bar Charts? How does the construction of each differ from the LineChart?

10.5 Constructing ColumnCharts

If you're comfortable with constructing LineCharts, then you'll be happy to learn that the construction of a ColumnChart is nearly identical. The biggest difference is that instead of setting the xtype to 'linechart', you set it to 'columnchart'.

Here's the LineChart refactored into a ColumnChart.

Listing 10.6 Creating a ColumnChart

```
var chart = {
    xtype      : 'columnchart',
    store      : remoteStore,
    xField     : 'year',
    tipRenderer: tipRenderer,
    extraStyle : extraStyle,
    series     : series,
    xAxis      : new Ext.chart.CategoryAxis({
        title : 'Year Hired'
    }),
    yAxis      : new Ext.chart.NumericAxis({
        title : 'Number of employees'
    })
};
```

It's that simple. Figure 10.14 shows what the ColumnChart looks like rendered onscreen.

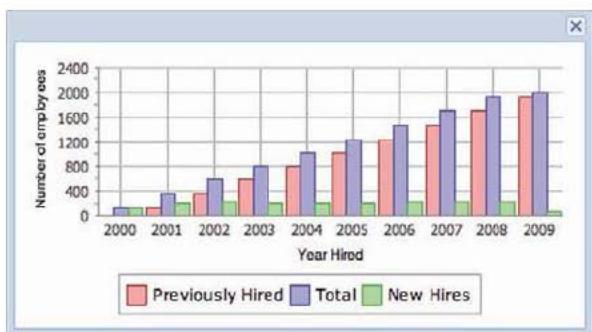


Figure 10.14
A multiseries ColumnChart

When looking at this Chart, it's hard to see that the number of newly hired plus previously hired employees equals the total number of employees. This is where the `StackedColumnChart` fits in.

10.5.1 Stacking columns

You just learned that the conversion from a `LineChart` to a `ColumnChart` is relatively simple. But to make this Chart much easier to read, you'll need to stack the columns. The conversion from a `ColumnChart` (or `LineChart` for that matter) is a bit more involved.

To make this conversion, you'll need to refactor the `series` array to remove the Series representing the total number of employees, because it's unnecessary:

```
var series = [
  {
    yField      : 'prevHired',
    displayName : 'Previously Hired',
    style       : {
      fillColor   : 0xFFAAAA,
      borderColor : 0xAA3333,
      lineColor   : 0xAA3333
    }
  },
  {
    yField      : 'newHires',
    displayName : 'New Hires',
    style       : {
      fillColor   : 0xAAFFAA,
      borderColor : 0x33AA33,
      lineColor   : 0x33AA33
    }
  }
];
```

Next you'll need to refactor the Chart configuration object a bit:

```
var chart = {
  xtype      : 'stackedcolumnchart',
  store      : remoteStore,
  xField     : 'year',
```

```

tipRenderer : tipRenderer,
extraStyle  : extraStyle,
series      : series,
xAxis       : new Ext.chart.CategoryAxis({
    title : 'Year Hired'
}),
yAxis : new Ext.chart.NumericAxis({
    stackingEnabled : true,
    title           : 'Number of employees'
})
);

```

In the newly refactored Chart configuration object, you set the xtype to 'stacked-columnchart'. The only other change you'll make is the addition of the stackingEnabled property to the y-axis, NumericAxis. These are the only changes necessary to construct a StackedColumnChart.

Here's what it looks like painted onscreen (figure 10.15).

When analyzing the results of the StackedColumnChart, you can see that the previously hired and newly hired employee figures appear stacked, amounting to the total number of employees for a given year. This is exactly what we wanted to do. But we introduced a problem. How do we find the total number of employees for a given year? Let's ponder the possibilities.

If we leave the total (StackedColumn) series in, then the sum of the columns will double, which is undesirable. Surely there has to be a way to allow the users to see the total.

One way to display the total is via the ToolTip. Although this would work, it's always best to keep the tip within the context of the Series being hovered over. We need something to tie the totals together.

A LineSeries would work perfectly for this situation.

10.5.2 Mixing a line with columns

Thus far, we've exercised the ability to leverage multiple Series in a Chart, but we haven't looked into configuring a hybrid Chart, that is, a chart with multiple types of Series. It's much easier than you'd think.



Figure 10.15
Our StackedColumnChart

To add a line Series, add the following LineSeries-style configuration object to the series array that you used to set up the StackedColumnChart:

```
{  
    type      : 'line',  
    yField    : 'total',  
    displayName : 'Total',  
    style     : {  
        fillColor  : 0xAAAAFF,  
        borderColor: 0x3333FF,  
        lineColor   : 0x3333FF  
    }  
}
```

Notice that the configuration object for this newly added Series is almost identical to that of the total Series you removed when initially configuring the StackedBarChart. The item to key in on here is the type property, which is set to 'line'.

Setting this property causes the framework to use a specific type of Series to display in a Chart. It's the XType equivalent for Charts and saves us time from having to directly instantiate an instance of LineSeries. To ensure that this line will render on top of the other Series, it's important that you add this LineSeries configuration as the last object of the series configuration object's array. How the Series are rendered onscreen is directly proportional to the order in which they're placed in the series array. To put this in context, think about z-order with CSS, and it will all make sense. The order of the Series also affects how they appear in the legend as well.

Look at the newly configured hybrid Linechart and Columnchart in action in figure 10.16.

After adding the LineSeries to the StackedColumnChart, you can easily access the total figure data by hovering the mouse cursor over the points rendered by the newly added LineSeries.

We've explored the depths of the ColumnChart and StackedColumnChart by means of converting the previously constructed Linechart. Along the way, we customized the StackedColumnChart by adding a LineSeries.

Next, we look at creating a BarChart by converting our StackedColumnChart.



Figure 10.16 Our hybrid LineChart and ColumnChart

10.6 Constructing BarCharts

To construct a BarChart, you can use all of the same plumbing that you created before, with some tweaks. When thinking about BarCharts, you just have to think about swapping the LineChart or ColumnChart x-axis and y-axis. Why?

Remember that the LineChart and ColumnChart use the category data on the x-axis, whereas the measurement figures are to be on the y-axis. The BarChart expects the category data to be on the y-axis and the measurement data to be on the x-axis.

Using this logic, you can refactor the StackedColumnChart to a StackedBarChart quite easily. This means that all you need to do is refactor the Series to leverage data on the x-axis and modify the Chart configuration object slightly, as shown here.

Listing 10.7 Configuring the Series for the StackedBarChart

```
var series = [
  {
    xField      : 'prevHired',
    displayName : 'Previously Hired',
    style       : {
      fillColor   : 0xFFAAAA,
      borderColor : 0xAA3333,
      lineColor   : 0xAA3333
    }
  },
  {
    xField      : 'newHires',
    displayName : 'New Hires',
    style       : {
      fillColor   : 0xAFFAA,
      borderColor : 0x33AA33,
      lineColor   : 0x33AA33
    }
  },
  {
    type        : 'line',
    xField      : 'total',
    displayName : 'Total',
    style       : {
      fillColor   : 0xAAAAFF,
      borderColor : 0x3333FF,
      lineColor   : 0x3333FF
    }
  }
];
```

In this listing, the Series and styles remain the same. The difference is that instead of setting the yField property for the configuration objects, you set xField ①. You also keep the LineSeries ② configuration object intact.

In order for the custom and dynamic tipRenderer to work, you'll need to modify it to read the xField property of the series configuration definitions:

```
var tipRenderer = function(chart, record, index, series){
    var yearInfo = 'Year: ' + record.get('year');
    var empInfo = series.displayName + ': ' + record.get(series.xField);
    return yearInfo + '\n' + empInfo ;
};
```

In this snippet, the `tipRenderer` method is nearly identical to the previous one with the replacement of `series.yField` with `series.xField`. Remember, you do this because of the series configuration changes you made.

Next, you'll refactor the Chart configuration object, completing the transformation.

Listing 10.8 Configuring the StackedBarChart

```
var chart = {
    xtype      : 'stackedbarchart',
    store      : remoteStore,
    yField     : 'year',
    tipRenderer: tipRenderer,
    extraStyle : extraStyle,
    series     : series,
    xAxis       : new Ext.chart.NumericAxis({
        stackingEnabled : true,
        title          : 'Number of employees'
    }),
    yAxis       : new Ext.chart.CategoryAxis({
        title          : 'Year Hired'
    })
};
```

To configure the configuration object for a `StackedBarChart`, you first set the `xtype` property ① to `'stackedbarchart'`. The next change is setting the `xAxis` property to ② to leverage the `NumericAxis`, with `stackingEnabled` set to `true` ③. Last, you set the `yAxis` property to an instance of `CategoryAxis` ④, removing the previously defined `stackingEnabled` property.

That's pretty much all that's needed to convert this Chart. Figure 10.17 shows what it looks like rendered in a browser.

Great, everything works as expected, including the dynamic ToolTip. How would you convert this to a generic BarChart? The steps are as simple as unraveling the configuration parameters to enable bar stacking.



Figure 10.17
The StackedBarChart



Figure 10.18 The BarChart with an integrated LineSeries

10.6.1 Configuring a BarChart

The steps to modify our StackedBarChart to a BarChart are short and simple. First, change the Chart configuration object xtype property to 'barchart', like this:

```
xtype : 'barchart',
```

Next, remove the stackingEnabled property from the x-axis (NumericAxis) configuration object:

```
xAxis : new Ext.chart.NumericAxis({
    title : 'Number of employees'
}),
```

And that's it. Figure 10.18 shows what the BarChart looks like with the integrated LineSeries.

With the changes you've made, you can see that the newHires and prevHired columns sit side by side on the line. If you want to remove the LineSeries for the total measurement, all you need to do is remove the type attribute, and Ext JS will use that configuration object to create a BarSeries.

You've just seen the similarities between the LineChart, ColumnChart, and BarChart. The PieChart, however, is completely different because it's not a descendant of the Cartesian line of Charts.

Next, we'll explore this final chart type, and you'll learn how to apply some customizations.

10.7 A slice of PieChart

As with all Charts, when considering the implementation of a PieChart, you must consider the data that the Chart will consume and display. The PieChart is relatively simple, because it works with only two pieces of information: the category and related numeric data. If you think of it in simplistic terms, the category is the name for the slice of pie, and the numeric data determines how large that slice will be relative to the other slices in the data set.

For the Piechart we're going to build, the data will look like this:

```
[  
  {  
    'total' : '42',  
    'range' : '20,000s'  
  }  
  ...  
]
```

We'll build a `PieChart` that will display data describing the number of employees for a particular salary range. In the JSON data, the category will be the salary range, and the data will be the `total` property of each record. To put this in plain English, in the example record, there are 42 employees within the 20,000s range.

With this knowledge at hand, constructing a data `Store` to consume this is trivial, as demonstrated here.

Listing 10.9 Creating the data Store for the PieChart

```
var remoteProxy = new Ext.data.ScriptTagProxy({  
    url : 'http://extjsinaction.com/salaryRanges.php'  
});  
  
var pieStore = new Ext.data.JsonStore({  
    autoLoad : true,  
    proxy    : remoteProxy,  
    id       : 'piestore',  
    root     : 'records',  
    fields   : [  
        { name : 'total', mapping : 'total' },  
        { name : 'range', mapping : 'range' }  
    ]  
});
```

Next, you can construct the `PieChart` to consume the data. You'll do so with some custom styling to depict the ranges with varying colors from green to red, as follows.

Listing 10.10 Creating the PieChart with a legend

```
var pieChart = {  
    xtype      : 'piechart',  
    store      : pieStore,    1 Set data field  
    dataField  : 'total',  
    categoryField : 'range',  
    series     : [ {  
        style : {  
            colors : [0xB5FF6B, 0xFFFF6B, 0xFFB56B, 0xFF6B6B]  
        }  
    },  
    extraStyle : {  
        legend : {  
            display : "bottom", 2 Set category field  
            padding : 5,  
            spacing : 2,  
            font   : { size : 12, color : 0x000000, family : "Arial" },  
            border : { size : 1, color : 0x999999 }  
        }  
    }  
},  
extraStyle : {  
    legend : {  
        display : "bottom", 3 Apply custom  
        padding : 5,          colors to Series  
        spacing : 2,  
        font   : { size : 12, color : 0x000000, family : "Arial" },  
        border : { size : 1, color : 0x999999 }  
    }  
};
```

- 1 Set data field
- 2 Set category field
- 3 Apply custom colors to Series
- 4 Extra styles to show legend

```
        }
    };

new Ext.Window({
    width : 400,
    height : 250,
    layout : 'fit',
    items : pieChart
}) .show();
```

To create the PieChart configuration, you first set the `xtype` property to '`piechart`', which Ext JS uses to configure an instance of `Ext.chart.PieChart`. The next two properties, `dataField` ① and `categoryField` ②, are crucial to the PieChart's operation. These are similar to the `xField` and `yField` properties of the basic Cartesian-style Chart you created earlier.

What makes these so important is that you can't configure a custom Series for the PieChart. Therefore, the only place to tell the Chart what Record Fields to map for the category and data is in the root configuration object for the PieChart.

You're probably wondering what the `series` property is doing in the PieChart configuration object if you can't configure the Series. It's there because the only way you can customize the colors used in the Series is by means of a nested colors array ③, and it's completely optional. If you configure a PieChart without custom colors, the framework will use its own custom palette of colors for the Series.

In the last configuration area, you reuse the `extraStyle` configuration object you created earlier to display a legend on the bottom of the chart ④. The PieChart doesn't display labels on the series, which means that a legend is important for users to decipher the data that the PieChart presents to them.

Finally, you place the PieChart inside an `Ext.Window` to be rendered on a resizable canvas.

Our PieChart looks like figure 10.19 when painted onscreen. Looking at the PieChart, you can see that the legend displays with the custom palette, ranging from green to red. If you hover the mouse cursor over the different Series, you see the out-of-the-box tip display, revealing the data that's used to draw the Chart. But just as in the other Charts, sometimes it doesn't provide much context to the data.

The only way to remedy this situation is to apply a custom `tipRenderer`, which is what we'll embark on next.

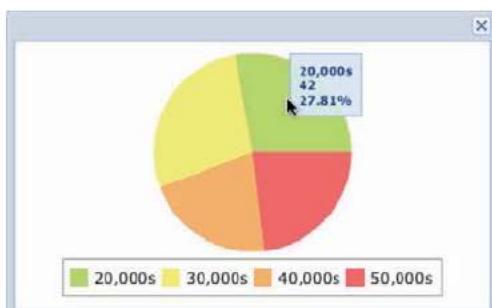


Figure 10.19 The PieChart rendered onscreen with custom colors and a generic ToolTip

10.7.1 Custom tipRenderer

When developing a custom tipRenderer for the PieChart, you're presented only the data used to draw the chart. When a configured tipRenderer is called, the information for the category and data fields is all that's provided. This means that unless the percentage is provided by the web service for each record, you'll have to code the calculation manually.

The following listing offers a quick recipe for how to do just that.

Listing 10.11 Creating the PieChart

```
var tipRenderer = function(chart, record, index, series) {
    var seriesData = record.data;
    var total = 0;                                ① Get reference to Series data

    Ext.each(series.data, function(obj) {
        total += parseInt(obj.total);            ② Calculate sum of all data
    });

    var slicePct = (seriesData.total/total) * 100;
    slicePct = (' ' + slicePct.toFixed(2) + '%');

    var rangeMsg = 'Salary Range : ' + seriesData.range;
    var empMsg = 'Num Emp. : ' + seriesData.total + slicePct;

    return rangeMsg + '\n' + empMsg;               ③ Calculate percentage for Series
};                                                 ④ Return custom tip text
```

In the tipRenderer method, you first create a reference of the Series data by using the passed Record's data object ①. Next, you use Ext.each to loop through the series.data array to get the sum of all of the records ② and calculate the percentage for the tip ③. Finally, you assemble the message for the ToolTip ④.

Next, you have to configure the PieChart to use the custom tipRenderer:

```
tipRenderer : tipRenderer,
```

With the custom tipRenderer in place, let's see what the new ToolTip looks like on the chart (figure 10.20).

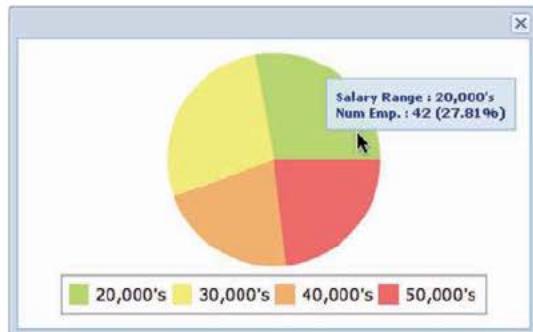


Figure 10.20 The PieChart with a custom ToolTip

As you can see, by taking some time to add a custom tipRenderer to a pieChart, you can add context to the information presented inside the ToolTip, making it more useful. One of the things to be careful of when developing custom tipRenderers is not to display too much information in that little tip balloon. Bombarding the user with too much information could reduce the usability of the ToolTip. I'd suggest using the itemclick event to display the data somewhere outside the Chart.

10.8 Summary

In this chapter, we took an in-depth look at the various charts provided by the framework, and you learned what it takes to configure the different kinds of charts. Along the way, you learned the basics of applying simple styling and a custom ToolTip.

We began by discussing the different Charts available to us in the framework. You learned that the `CartesianChart` is the base class for the `LineChart`, `ColumnChart`, and `BarChart` widgets. You also learned how the `PieChart` is different from the others, and we discussed the details while examining the `Chart` package class hierarchy.

Using an exploratory approach, we implemented each of the Charts available to us in the framework. While doing so, you saw what it takes to create a simple `LineChart`, customize it, and then modify it to create a `ColumnChart`. By flipping the x-axis and y-axis and modifying the configuration slightly, you were able to convert the `ColumnChart` to a `BarChart`. You also learned how to create hybrid Charts by adding a `LineSeries` to a `ColumnChart` and `BarChart`.

Finally, you learned how to create `PieCharts`, further noting their differences from the other `CartesianChart`-based Charts. Along the way, you learned how to add context and percentage data to the ToolTip, making it more useful.

In the next chapter, we'll explore how to leverage one of the more powerful UI widgets, the `TreePanel`, to display hierarchical data.

Taking root with trees

This chapter covers

- Dissecting the TreePanel widget
- Rendering in-memory data with TreePanels
- Implementing a remote-loading data TreePanel
- Adding a custom ContextMenu to TreePanel nodes
- Exercising full CRUD lifecycle for nodes
- Using a TreeEditor to edit node data

I can recall the first time I was tasked to create an application with what was known then as a TreeView. I had to allow for the navigation directory in a filesystem, which required that I allow users to modify the filenames easily. I was lucky that I had Ext JS in my toolbox to aid me in my task. Using the framework not only made things easier, but it also sped up the development time of this task dramatically.

In this chapter, you'll learn about the Ext JS TreePanel, which is used to display hierarchical data, much like a typical filesystem. You'll learn how to set up both static and dynamic implementations of this widget. After getting comfortable with this component, you'll work to set up CRUD operations by use of a dynamically updating context menu and `Ajax.requests` to send data. This is going to be a fun chapter.

11.1 What is a tree (TreePanel)?

In the UI world, the word *tree* is meant to describe a widget or control that displays hierarchical data, which generally begins at some central point, known as a *root*. And like the botanical tree, trees in UIs have branches, which means that they contain other branches or leaves. Unlike botanical trees, computer trees have only one root.

In the computer world, this paradigm is ubiquitous and lives under our noses without much thought. Ever browse your computer's hard disk? The directory structure is a tree structure. It has a root (any drive letter in Windows), branches (directories), and leaves (files). Trees are used in application UIs as well and are known by a few other monikers.

In other UI libraries, other names for this type of widget include TreeView, Tree UI, or simply Tree, whereas in Ext JS it's known as the TreePanel. The reason it's called TreePanel is because it's a direct descendant of the Panel class. And much like the GridPanel, it isn't used to contain any children except those it was designed for. The reason TreePanel extends from Panel is simple—convenience. This gives us the flexibility to leverage all of the Panel's UI goodness, which includes the top and bottom ToolBars and the footer button bar.

Like the EditorGrid, TreePanels can be configured to allow the edit data but don't have a DataWriter equivalent, which means that we must code our own Ajax.requests for CRUD actions. We'll explore how to make a TreePanel editable and how to code for CRUD actions.

Unlike the GridPanel, however, the number of the supporting classes is quite small, which makes the configuration of a TreePanel simple in contrast, as you'll see a little later on. On the flip side, many developers find that the server-side code and related SQL to support them are much more challenging due to the relational nature of the data.

Finally, the Ext.data classes don't apply to TreePanels; thus, Proxies and Readers are out of the picture. This means that the data for the TreePanel must come either from memory or remotely but is limited to the same domain. Before we get down to building our first TreePanel, we'll discuss how a TreePanel works.

11.1.1 Looking under the roots

TreePanels work by loading data via a TreeLoader class, which reads JSON-formatted data either from memory or remotely from the web server, or it can be a mixture of both. Each object in the JSON stream is converted to an instance of treeTreeNode, which is a descendant of the Ext.data.Node class. This data.Node class is the core of all of the TreePanel data logic and includes many of the utilities such as cascade, bubble, and appendChild.

In order for the TreePanel to display the nodes visually, the TreeNode class uses the TreeNodeUI class. The root Node gets some special attention, because it's the source of the entire structure and has its own RootTreeNodeUI class. If you want to customize the look and feel of Nodes, you extend this class.

Cool! You now have a high-level understanding of what a TreePanel is and how it works. We can start constructing our first TreePanel, which will load data from memory.

11.2 Planting our first TreePanel

As I mentioned before, coding a TreePanel, relative to the GridPanel, is pretty simple. You'll start out by constructing the TreePanel, which loads its data from memory. This will give you more insight into what you learned some time ago.

The following listing shows how to construct a static TreePanel.

Listing 11.1 Building a static TreePanel

```

var rootNode = {
    text      : 'Root Node',
    expanded  : true,
    children : [
        {
            text : 'Child 1',
            leaf : true
        },
        {
            text : 'Child 2',
            leaf : true
        },
        {
            text      : 'Child 3',
            children : [
                {
                    text      : 'Grand Child 1',
                    children : [
                        {
                            text : 'Grand... you get the point',
                            leaf : true
                        }
                    ]
                }
            ]
        }
    ]
}

var tree = {
    xtype      : 'treepanel',
    id         : 'treepanel',
    autoScroll : true,
    root       : rootNode
}

new Ext.Window({
    height     : 200,
    width      : 200,
    layout     : 'fit',
    border     : false,
    title      : 'Our first tree',
    items      : tree
}).show();

```

Yikes! Most of the code in listing 11.1 is the data to support the TreePanel. In walking through the `rootNode` ① JSON, you see that the root Node (object) has a `text`

attribute. This is important because the `text` property is what the `TreeNodeUI` uses to display the Node's label. When writing the server-side code to support this widget, be sure to keep this property in mind. If you don't set it, the Nodes may appear in the `TreePanel` but will have no labels.

You also see an `expanded` property, which is set to `true`. This ensures that, when rendered, the Node is expanded immediately, thus displaying its contents. You set this here so you can see the root's `childNodes` immediately upon the rendering of the `TreePanel`. This parameter is optional; leave it out to have the Node render initially collapsed.

A `children` property is set on the root node ②, which is an array of objects. When a Node has a `children` array, the objects in that array will be converted to `tree.TreeNodes` and populated in the parent Node's `childNodes` array. A similar paradigm can be found in the Container hierarchy, where a Container has children in its item's `MixedCollection`.

If you walk through the `rootNode`'s `children`, you see that the first and second children have no `children` property but have a `leaf` ③ property, which is set to `true`. Setting a Node's `leaf` property to `true` ensures that this node will never contain other child Nodes, thus making it a leaf and not a branch. In this case, 'Child 1' and 'Child 2' are leaf Nodes, whereas 'Child 3' is a branch because it doesn't have a `leaf` property set to `true`.

The 'Child 3' Node contains one child Node, which is a leaf because—yes. It's a leaf because its `leaf` property is set to `true`. Wow! You learn quickly. This Node has a single child, which also has a single child.

After configuring the supporting data, you move on to configure the `TreePanel` using an `XType` ④ configuration object. This is where you see the simplistic nature of the configuration of this widget. All of these properties should make sense to you but the `root`, which is what you use to configure the root Node. In this case, the topmost-level object of the `rootNode` JSON will be treated as the `TreePanel`'s root.

You can change your `TreeNode` icons by adding either an `icon` or `iconCls` property to the node's configuration object, where `icon` specifies a direct location for an image and `iconCls` is the name of a CSS class for an icon style. But the `iconCls` property for the `TreeNode` works like the `Panel`'s `iconCls` configuration object and is the preferred method for changing the icon.

The last thing you do in this listing is create an instance of `Ext.Window` to display your `TreePanel`. Figure 11.1 shows what our rendered `TreePanel` looks like.

After rendering your `TreePanel`, you can see the `TreeNodes` displayed as you laid them out in the JSON. You can expand 'Child 3' and its child Node to display the rest of the hierarchy. It's easy to exercise the selection model by clicking a Node. If you want to hide the root Node, set `rootVisible` in the `TreePanel` configuration object to `false`, as depicted in figure 11.1 (left).

And there you have it, a static `TreePanel` in action. Simple stuff, huh? Now that we have this out of the way, we'll move on to creating a remote `TreePanel`.



Figure 11.1 Our first (expanded) TreePanel with the root Node visible (left) and the root Node hidden (right)

11.3 Dynamic TreePanels grow

Because our previous TreePanel is static, there was no need to directly create a TreeLoader. This changes with a remote-loading TreePanel. We're going to develop a TreePanel that will use the same data that we used for our GridPanels in chapter 7, where we displayed people. It just so happens that those people are employees for "My Company" and belong to different departments. Here you'll configure the TreePanel to utilize the server-side component to list employees by department.

Listing 11.2 Building a static TreePanel

```
var tree = {
    xtype      : 'treepanel',
    autoScroll : true,
    loader     : new Ext.tree.TreeLoader({
        url : 'getCompany.php'
    }),
    root      : {
        text      : 'My Company',
        id       : 'myCompany',
        expanded : true
    }
}

new Ext.Window({
    height      : 300,
    width       : 300,
    layout      : 'fit',
    border      : false,
    title       : 'Our first remote tree',
    items       : tree
}).show();
```

1 TreeLoader for remote data calls
2 Configure root Node inline
3 Set ID of root Node

As you can see in listing 11.2, you configure a TreeLoader ①, which has a configuration object passed with a url property set to 'getCompany.php'. When configuring your TreePanel, replace this PHP file with your controller of choice. Before you start coding your controller, however, please allow me to finish walking through the request-and-response cycle, which follows shortly after we look at the rendered version of this TreePanel implementation.

The next thing you do when configuring this TreePanel is configure the root ② inline. It's extremely important to notice that you added an id ③ property to this

TreeLoaders can't talk across domains

Unlike the data Store, which backs the GridPanel and other views, the TreeLoader doesn't have the capability out of the box to connect to a remote data source. This is because the TreeLoader doesn't have the same internal architecture as the data Store.

Node. As you'll see, this property will be used to request the child data from the server. Also notice that you set expanded to true. This will ensure that the root Node expands and *loads* its children as soon as it's rendered.

Last, you configure a bigger instance of Ext.Window to contain your TreePanel. Configuring the window a bit bigger for this demonstration will both increase the TreePanel's viewing space and eliminate horizontal scrolling because of long names. Figure 11.2 shows what the rendered TreePanel looks like.

After rendering the TreePanel, you see the root Node (My Company) load immediately, as shown in figure 11.2 (left), displaying all of the departments in My Company. To view the employees in a particular department, click the expand icon (+), or double-click the label and you'll see the remote loading indicator appear in place of the folder icon, as shown in the center of figure 11.2. Once the employee nodes are loaded successfully, they'll appear below the department Node.

We went through this pretty fast. Let's recap a bit and look at the requests being fired. We'll discuss what the server-side controller is doing to support this implementation of the TreePanel.

11.3.1 Fertilizing the TreePanel

To analyze the client/server interaction model with the TreePanel, we'll start with the load request fired off by the automatic expansion of the root Node, as shown in figure 11.3. Remember that you set the root's expanded property to true and that this

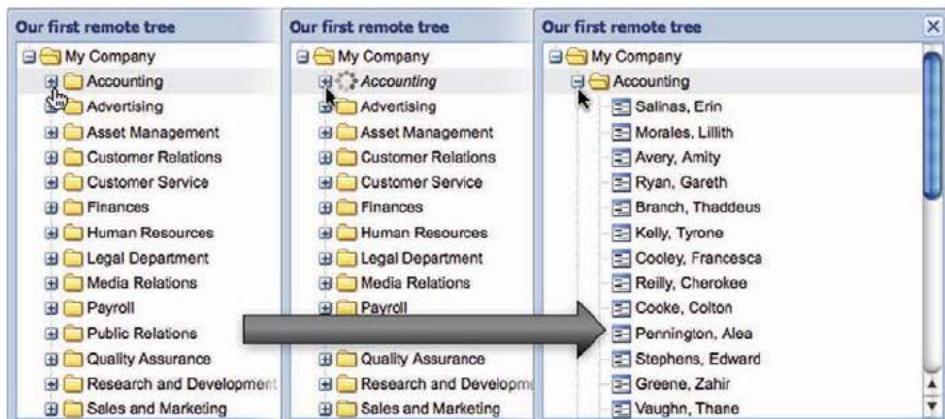


Figure 11.2 Our remote TreePanel displaying its ability to load data remotely



Figure 11.3 The post parameter of the initial Node request

expands a Node when it's rendered, thus either rendering the children if they're in memory or firing a load request.

As you can see, the first request to the getCompany.php controller was made with a single parameter, node, which has a value of myCompany. Can you remember where you set that value and which property you set it to? If you said "the id property root node," you're correct! When an asynchronously loading Node is being expanded for the first time, the loader will use its id property to pass the child data to the controller.

The controller will accept this parameter and query the database for all nodes associated with that id and return a list of objects, as illustrated in figure 11.4. In this figure, you see an array of objects that define a list of departments. Each object has both text and id properties. How does the text property apply to the NodeUI? You're correct! The text applies to the label of the NodeUI. Notice that the departments lack the leaf and children properties. Are these leaf or branch Nodes? Correct again. They're branch Nodes. Because neither property is defined, they're treated as branch Nodes. This means that when they're initially expanded, the TreeLoader will invoke an Ajax.request, passing the department's ID as the node parameter. The controller will accept the node parameter and return a list of employees for that department.

Using what you just learned, you can safely predict that when you expand the Accounting department Node, a request to the getCompany.php controller will be made with a single parameter, node, passed with a value of 'Accounting'. Let's take a quick look at the results from the controller request, shown in figure 11.5.

As you look at the JSON results, you see that a list of objects is returned, each with id, text, and leaf properties. Remember, that because the leaf property is set, the Nodes appear as non-expanding leaf Nodes.

Congratulations! You've successfully constructed static and dynamic TreePanels to display hierarchical data. You also now have a basic understanding of the client/server interaction model between the TreePanel and the web service feeding the TreePanel data.

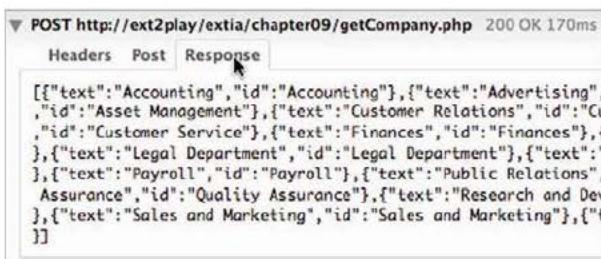


Figure 11.4 The results of the initial request to the getCompany.php controller

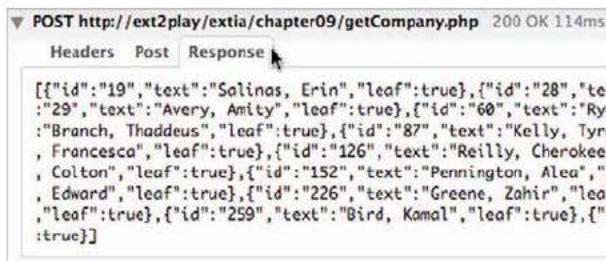


Figure 11.5 The results from the Accounting department Node request

Configuring a TreePanel for loading is just a small part of the job if you're tasked to build a UI that offers CRUD functionality for this type of widget. Next, we'll look at how to construct a TreePanel for these types of interactions.

11.4 CRUD on a TreePanel

To configure CRUD UI functionality, you'll need to add much more code to the mix. After all, the TreePanel doesn't support these features natively. Here's what you're going to do.

To enable CRUD actions, you'll modify your TreePanel by adding a contextmenu listener to it, which will call a method to select the Node that was right-clicked and create an instance of Ext.menu.Menu to be displayed at the mouse cursor's X and Y coordinates. This will be very similar to how you coded the EditorGridPanel's context menu handler in the last chapter.

You'll create three menu items: add, edit, and delete. Because you can only add employees to a department, you'll dynamically change text for the menu items and enable and disable the various menu items based on the type of node that was clicked: root, branch, or leaf.

Each of the handlers will perform an Ajaxrequest to mock controllers for each CRUD action. Again, much of this will function like the CRUD for the EditorGridPanel, but it will be adapted to the TreePanel to deal with Nodes instead of rows.

Get ready. This will be the most complicated code yet. You'll start by creating the context menu handler and the context menu factory method.

11.4.1 Adding context menus to a TreePanel

To add a context menu to the TreePanel, you must register a listener for the contextmenu event. This is super simple. Add a listeners configuration option to the TreePanel as follows:

```
listeners : {
    contextmenu : onCtxMenu
}
```

Adding the previous code will ensure that the onCtxMenu handler will be called when the contextmenu (or right-click) event is fired.

Cool! Your TreePanel is now set up to call the onCtxMenu handler. Before you code it, you should construct a factory method to generate an instance of Ext.menu.Menu.

This will help simplify `onContextMenu` quite a bit. You'll see what I mean once you've finished with the factory method.

The following listing walks through constructing a context menu factory method.

Listing 11.3 Configuring a context menu factory method

```

var onConfirmDelete = Ext.emptyFn;
var onDelete      = Ext.emptyFn;
var onCompleteEdit = Ext.emptyFn;
var onEdit        = Ext.emptyFn;
var onCompleteAdd = Ext.emptyFn;
var onAddNode     = Ext.emptyFn;

var buildCtxMenu = function() {
    return new Ext.menu.Menu({
        items: [
            {
                itemId : 'add',
                handler: onAdd
            },
            {
                itemId : 'edit',
                handler: onEdit,
                scope  : onEdit
            },
            {
                itemId : 'delete',
                handler: onDelete
            }
        ]
    });
}

```

In listing 11.3, you first set up a bunch of placeholder methods that point to `Ext.emptyFn`, which is the same thing as instantiating a new instance of a function but is easier on the eyes. We're adding them now so that when we circle back and fill in these methods, you'll know exactly where to place them.

Next, you generate the `buildCtxMenu` factory method, which returns an instance of `Ext.menu.Menu` and will be used by the `onContextMenu` handler that you'll generate next. If you've never seen or heard of a factory method, from a high level, it's a method that constructs (hence the name *factory*) something and returns what it constructed. That's all there is to it.

Notice that each of the menu items has no `text` property, but each has `itemId` specified. This is because the `onContextMenu` will dynamically set the `text` for each menu item to provide feedback to the user that something may or may not be allowed. It will use the `itemId` property to locate a specific item in the menu's `items` `MixedCollection`.

The `itemId` configuration property is similar to the `id` property of Components except it's local to a child Component's Container. This means that unlike the Component's `id` property, `itemId` isn't registered with `ComponentMgr`; thus only the parent Component has the ability to look into its item's `MixedCollection` to find a child Component with a specific `itemId`.

Each MenuItem currently has a hardcoded handler to Ext.emptyFn as a placeholder so you can see your menu display in the UI without having to code the real handler. You'll go on to create each handler after you develop and review the onContextMenu handler, which is next.

Listing 11.4 Configuring a context menu factory method

```

var onContextMenu = function(node, evtObj) {
    node.select();
    evtObj.stopEvent();

    if (!this.ctxMenu) {
        this.ctxMenu = buildCtxMenu();
    }

    var ctxMenu      = this.ctxMenu;
    var addItem     = ctxMenu.getComponent('add');
    var editItem    = ctxMenu.getComponent('edit');
    var deleteItem = ctxMenu.getComponent('delete');

    if (node.id == 'myCompany') {
        addItem.setText('Add Department');
        editItem.setText('Nope, not changing the name');
        deleteItem.setText('Can\'t delete a company, silly');

        addItem.enable();
        deleteItem.disable();
        editItem.disable();
    }
    else if (!node.leaf) {
        addItem.setText('Add Employee');
        deleteItem.setText('Delete Department');
        editItem.setText('Edit Department');

        addItem.enable();
        editItem.enable();
        deleteItem.enable();
    }
    else {
        addItem.setText('Can\'t Add Employee');
        editItem.setText('Edit Employee');
        deleteItem.setText('Delete Employee');

        addItem.disable();
        editItem.enable();
        deleteItem.enable();
    }

    ctxMenu.showAt(evtObj.getXY());
}

```

1 Use context menu factory method

2 Configure menu for each type of Node

In listing 11.4 you construct your onContextMenu handler, which does quite a bit to enable your context menu to be dynamic. The first task that this handler accomplishes is selecting the Node in the UI by firing the Node's select method. You select the Node

because you're going to need to query the TreePanel for the selected Node further on, after Ajax calls are made.

Every time the TreePanel's contextmenu event fires, it passes two arguments: the node that the event occurred on and the instance of EventObject that was generated. If bells are ringing in your ears, it's probably because this is very similar to the GridPanel's contextmenu event, where the row in which the event occurred and an instance of EventObject are passed to the handler.

Next, you stop the browser's default context menu from showing up by calling evtObj.stopEvent. You'll see this pattern repeat anywhere you need to display your own context menu in place of the browser's.

The handler then constructs the context menu by calling the buildCtxMenu factory method you created a bit ago ①. It stores the reference locally as this.ctxMenu so it doesn't have to reconstruct a menu for each subsequent handler call.

You then create a local reference to the context menu, ctxMenu, and each of the menu items. You're doing this for readability further on, where you manage the menu items.

After you create the local references, you move on to an if ② control block, where you detect the type of Node and modify the menu items accordingly. This is the bulk of the code for this handler. Here's how this logic breaks down.

If the node that was right-clicked is the root (`node.id == 'myCompany'`), you configure the menu items to allow the addition of departments but disallow the deletion and editing of the company text. You also disable those menu items so they can't be clicked. After all, you don't want anyone to destroy an entire company by a single mouse click, do you?

Moving on, you detect whether the Node is a leaf (department). You then modify the text to allow the addition of employees and deletion of the entire department. Remember, the company needs to be able to downsize by removing an entire department if need be. You also enable all menu items.

The code will encounter the else block if the Node that was right-clicked is a leaf item. In this case, the text for the add item is modified and disabled to reflect the inability to add an employee to an employee, which would be weird. Then you modify and enable the edit and delete menu item texts.

Last, you show the context menu at the coordinates of the mouse by calling the EventObject's getXY method. Figure 11.6 shows what the menu looks like customized for each node.

As illustrated in figure 11.6, our context menu displays and changes for each type of Node that is right-clicked, which demonstrates how you can use the same menu to perform similar tasks with some modifications. If you wanted to not show or hide the menu items instead of enabling and disabling them, you'd swap the MenuItem enable calls for show and disable for hide. We can now begin to wire up handlers for our context menus. We'll start with the easiest, edit.



Figure 11.6 Displaying our dynamic context menu for the company (left), department (center), and employee (right) Nodes

11.4.2 Wiring up the Edit logic

You probably noticed that clicking a MenuItem resulted in nothing more than the menu disappearing. This is because you have your context menu set but no real handlers for it to call. You'll start by creating the edit handler, which is by far the easiest to code.

This is where you'll instantiate an instance of TreeEditor to allow for inline edits of Node names. In order to get the TreeEditor to invoke an Ajax.request to submit the modified Node name, you'll have to set up a listener for the TreeEditor's published complete event, which indicates that an edit has completed and the value of the Node has been changed. You'll code for the complete handler first and then move on to create the onEdit handler, which you'll attach to the edit MenuItem.

Here's where you'll start filling in some of those placeholder methods.

Listing 11.5 Configuring a context menu factory method

```
var onCompleteEdit = function(treeEditor, newValue, oldValue) {
    var treePanel = Ext.getCmp('treepanel')
    treePanel.el.mask('Saving...', 'x-mask-loading'); TreeEditor complete event handler ①
    var editNode = treeEditor.editNode;
    var editNodeId = editNode.attributes.id;

    Ext.Ajax.request({ Invoke an Ajax.request ②
        url : 'editNode.php',
        params : {
            id : editNodeId,
            newName : newValue
        },
        success : function (response, opts) { Revert the change { success : false } ③
            treePanel.el.unmask();
            var responseJson = Ext.decode(response.responseText);
            if (responseJson.success !== true) {

```

```

        editNode.setText(oldValue);
        Ext.Msg.alert('An error occurred with the server.');
    }
},
failure : function (response, opts) {
    treePanel.el.unmask();
    editNode.setText(oldValue);
    Ext.Msg.alert('An error occurred with the server.');
}
});
}

var onEdit = function() {
    var treePanel = Ext.getCmp('treepanel');
    var selectedNode = treePanel.getSelectionModel().getSelectedNode();

    if (!this.treeEditor) {
        this.treeEditor = new Ext.tree.TreeEditor(treePanel, {}, {
            cancelOnEsc      :
true,
            completeOnEnter : true,
            selectOnFocus   : true,
            allowBlank      : false,
            listeners       : {
                complete : onCompleteEdit
            }
        });
    }

    this.treeEditor.editNode = selectedNode;
    this.treeEditor.startEdit(selectedNode.ui.textNode);
}
}

```

4 If request fails, revert change

5 Configure edit MenuItem handler

Create TreeEditor if it doesn't exist 6

In listing 11.5, you create two methods that take care of the edit functionality. The first is the handler that will be called when the edit event of the TreeEditor is fired and is responsible for firing off an Ajax.request to the server to save the modification. The second is the handler that's fired when the edit MenuItem is clicked. Here's how they work.

When the TreeEditor fires the complete event, it passes three parameters to the listeners: a reference to the TreeEditor that fired the event, the new value, and the old value. Our onCompleteEdit ① event handler uses all three parameters to do its job. This method first sets a local reference to the TreePanel that's being edited and masks its element. It then sets two more local references to the Node being edited and its ID.

Next, it fires of an Ajax.request ② to save the data. Notice that in the parameters configuration object of the Ajax.request, it's passing the ID of the Node and its new name. This would be important if you had to modify a value in a database where an ID identifies Nodes.

If there are other application-specific values for that Node that you were looking to send as parameters to the server, you can find them in the attributes property of the node. Any properties that are part of the Node to create the tree are tucked away for use in the attributes property. For instance, employee Nodes could have employee-specific personal attributes, such as DOB or sex, on each Node. Obviously, this depends

on the application you're developing for. Also, if you want to send an attribute from the Node's parent, you can access it by the Node's parentNode property and tack it on to the params configuration object for the Ajax.request.

In the request's success handler, the return JSON from the server is encoded and the success ③ property is tested. If the server returns a false success property, the method reverts the value of the Node. This is helpful if an invalid value is placed per the business rules processed on the server. Likewise, if the request fails for some reason, the failure handler ④ is triggered and the Node's text value will be reverted. Both handlers will unmask the TreePanel when they're triggered.

The second method in this listing, onEdit ⑤, will be called when the edit MenuItem is clicked. It first creates a local reference for the TreePanel and the selected Node. It then creates an instance of TreeEditor ⑥ and sets a self (this) reference if it doesn't exist. Notice that it configures the onCompleteEdit listener for the complete event. Last, it will set the editNode property as the selectedNode on the TreeEditor and trigger the editing of that Node by calling startEdit and passing the selectedNode's ui.textNode reference, which will tell the TreeEditor where to render and position itself.

Triggering the edit in this manner will ensure that the TreeEditor doesn't scroll the Node to the top of the list if the TreePanel is scrollable, thus preventing this undesired effect from happening.

Great! You have your edit logic all in place, which means you can see it in action! Refresh your page, right-click a Node, and click the edit MenuItem. I'll follow along and show you what I see. Refer to figure 11.7.

In figure 11.7, I changed the Accounting department's name to Legal by right-clicking it, which selected the Node. I then clicked the edit MenuItem, which rendered the TreeEditor where the text of the Node is. Remember that the TreeEditor knows where to render and position itself because we passed the textNode reference of the TreeNode's ui. I then changed the name from Accounting to Legal and pressed Enter.

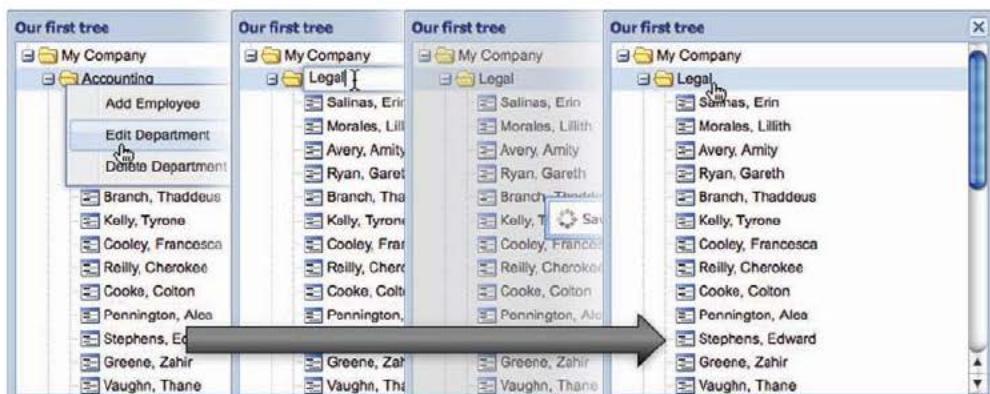


Figure 11.7 The results of editing a Node in the TreePanel using the TreeEditor with an Ajax.request to save the data

This caused the `Node` value to change and the `complete` event to fire, thus triggering the `onComplete` method. Because the server accepted the value, the `TreePanel`'s element was unmasked and the new value persisted in the UI. Remember that if the server had returned `{ success : false }` or if the request had failed, the text value of the `Node` would have been reverted.

This wraps up the easiest of the CRUD functionality for our `TreePanel`. Editing names in this widget is a common task among web applications. Naturally, how you implement it depends on the business requirements. Using the `TreeEditor` results in a cleaner application flow by saving you from having to use an input dialog box, such as `MessageBox.prompt`.

Next, we're going to ratchet up the level of difficulty by tackling the deletion of `Nodes`. This will be far more complex than what we've done previously in this chapter.

11.4.3 Tackling delete

To set up the delete functionality of your `TreePanel`, you'll create a handler for the `delete MenuItem`. Naturally, requirements usually dictate that a confirmation dialog box be presented to the user, so you'll have to code for user confirmation. To make things a bit easier, you'll use the out-of-the-box `MessageBox.confirm` dialog box. This means that you'll have to construct a callback method for the confirmation dialog box. The dialog box callback will trigger the `Ajax.request` and ultimately delete the `Node` if the server returns a favorable result.

Now that you have an idea of what you need to do, you can get on with coding the handler methods, as shown in the following listing.

Listing 11.6 Adding deletion functionality to your TreePanel

```
var onConfirmDelete = function(btn) {
    if (btn == 'yes') {
        var treePanel = Ext.getCmp('treepanel');
        treePanel.el.mask('Deleting...', 'x-mask-loading');

        var selNode = treePanel.getSelectionModel().getSelectedNode();

        Ext.Ajax.request({
            url      : 'deleteNode.php',
            params   : {
                id : selNode.id
            },
            success : function (response, opts) {
                treePanel.el.unmask();
                var responseJson = Ext.decode(response.responseText);

                if (responseJson.success === true) {
                    selNode.remove();
                }
                else {
                    Ext.Msg.alert('An error occurred with the server.');
                }
            }
        });
    }
}
```

1 Confirmation message box callback

2 Ajax.request to delete selected Node

3 Ajax.request success handler

4 Remove selected Node

```

        });
    }
}

var onDelete = function() {
    var treePanel = Ext.getCmp('treepanel');
    var selNode = treePanel.getSelectionModel().getSelectedNode();

    if (selNode) {
        Ext.MessageBox.confirm(
            'Are you sure?',
            'Please confirm the deletion of ' + selNode.attributes.text,
            onConfirmDelete
        )
    }
}

```

5 The delete MenuItem handler

6 Confirm Node deletion

In listing 11.6, you create the two methods that take care of the delete operations of your CRUD functionality. The first method, `onConfirmDelete` ①, is the handler for the confirmation dialog box that you'll create a little later on. If the Yes Button is clicked in the confirmation dialog box, it will mask the TreePanel and invoke an `Ajax.request` ② to delete the selected Node. Notice that you're passing only the ID of the Node to the server.

In our fictitious mini-application, the server would take the value of the Node ID and perform a delete operation in the database or filesystem and return something like `{success:true}`, which fires the request's success ③ handler. This removes the TreePanel's element mask and updates the UI by removing the Node ④ from the TreePanel by using the Node's remove method.

To reduce complexity for this listing, I left out the `Ajax.request` failure handler, which would post a failure message to the user. Naturally, when you develop your applications, you'll want to include it. In this case, it should remove the TreePanel's element mask and alert the user that a failure occurred.

The second method you create, `onDelete` ⑤, is the handler for the delete MenuItem. When this method is called, it presents a confirmation dialog box by using the out-of-the-box `MessageBox.confirm` ⑥ method and passes in three arguments: title, message body, and callback. This presents the user with a message and two options to proceed. Either Button will trigger the callback, but remember that to perform the deletion of the Node, the Yes Button has to be clicked.

Please refresh your UI and delete a Node. I'll do the same, and we'll discuss how things transpire. Figure 11.8 illustrates what happened when I refreshed my UI and deleted the Accounting department Node.

After I right-clicked the Accounting department Node, our customized context menu appeared. I then clicked the delete MenuItem, which triggered the `onDelete` handler. This immediately displayed the confirmation dialog box. I clicked Yes, which caused the TreePanel's element to mask, indicating that a request was being made to delete the Node. When the server returned a favorable result, the mask was removed and the Accounting department Node disappeared.



Figure 11.8 Deleting a Node with a confirmation box and an `Ajax.request` to the server

In a real-world application, deleting a branch Node would generally require the server to recursively gather a list of all of the child nodes and remove them from the database before removing the branch node itself. A clever way to do this could be to set up a trigger in the database to call a stored procedure to delete all associated child nodes when a delete operation is performed on a container node.

Deleting Nodes from our TreePanel required a bit more effort because of the typically required confirmation dialog box. Adding a Node, however, is equally difficult because the UI code needs to know what type of node is being added. Is it a branch or leaf Node? Next, you'll see how to code for this type of branch and have the UI react accordingly.

11.4.4 Creating nodes for our TreePanel

To create a Node using the TreeEditor, you're going to have to do a lot of work, which makes this the hardest listing in this chapter, but the results will be pretty sweet.

Because the TreeEditor needs to bind and display on top of a Node, you'll need to inject a Node into the TreePanel and trigger an edit operation on the Node. Once the edit of the new temporary Node is complete, an `Ajax.request` is fired off to the server with the name of the new Node. If the server returns favorably, the ID is set to the Node. This works similarly to the way rows are added to the EditorGrid we created last chapter.

Here's the code for the create Node functionally.

Listing 11.7 Adding create functionality to your TreePanel

```
var onCompleteAdd = function(treeEditor, newValue, oldValue) {
    var treePanel = Ext.getCmp('treepanel');

    if (newValue.length > 0) {
        Ext.Ajax.request({
            url : 'createNode.php',
            params : {
                1 TreeEditor complete event handler
                2 Invoke Ajax.request if new Node name
            }
        });
    }
}
```

```

        newName : newValue
    },
    success : function (response, opts) {
        treePanel.el.unmask();
        var responseJson = Ext.decode(response.responseText);

        if (responseJson.success !== true) {
            Ext.Msg.alert('An error occurred with the server.');
            treeEditor.editNode.remove();          ↪
        }                                     3 Remove temporary Node
        else {
            treeEditor.editNode.setId(responseJson.node.id);
        }
    });
}
else {
    treeEditor.editNode.remove();           ↪
}                                     4 Temporary Node is removed
}
}

var onAddNode = function() {
    var treePanel = Ext.getCmp('treepanel');
    var selNode = treePanel.getSelectionModel().getSelectedNode();

    if (!this.treeEditor) {
        this.treeEditor = new Ext.tree.TreeEditor(treePanel, {}, {
            cancelOnEsc : true,
            completeOnEnter : true,
            selectOnFocus : true,
            allowBlank : false,
            listeners : {
                complete : onCompleteAdd
            }
        });
    }

    selNode.expand(null, null, function() {
        var newNodeCfg = {
            text : '',
            id : 'tmpNode',
            leaf : (selNode.id != 'myCompany')
        }

        var newNode = selNode.insertBefore(newNodeCfg,
            selNode.firstChild);
        this.treeEditor.editNode = newNode;
        this.treeEditor.startEdit(newNode.ui.textNode);
    }, this);
}
}

```

3 Remove temporary Node

4 Temporary Node is removed

5 The add MenuItem handler

6 Insert Node and trigger edit

You're doing quite a bit of work in listing 11.7 to get the create functionality to work smoothly. Just like the code for the edit operations, to reduce complexity for the listing, we omit the Ajax.request failure handler. Here's how all of this stuff works.

The first method in the listing is the TreeEditor complete event handler, `onCompleteAdd` ①. This handler is arguably more complex than the edit TreeEditor complete event handler for a multitude of reasons. When this method is fired, if a new name has been entered for the Node, an `Ajax.request` will be fired ②. If the server responds favorably, it will return the database ID of the newly inserted node. The code will set the new Node's ID via its `setId` method. This is important because it will ensure that subsequent edits to this Node will occur against the proper database record. If the server returns unfavorably, the temporary Node is removed from the TreePanel ③. This also occurs if `onCompleteAdd` is called without a new name ④. Having the UI coded this way ensures that phantom Nodes can't exist in the TreePanel. If you plan on using this pattern to create Nodes, be sure to add a failure handler, which should alert the user of a failure and remove the temporary Node.

The second method, `onAddNode` ⑤, is the handler for your add MenuItem. This method does quite a bit of work as well to provide the user with a temporary Node to add to the TreePanel. It does this by instantiating an instance of TreeEditor if it does not exist and binding the `onCompleteAdd` handler to its `complete` event. Next, it expands the selected Node. You expand ⑥ the selected Node because the TreeEditor needs a home, which will be the soon-to-be-created Node.

Notice that you're passing nulls as the first two parameters. You pass null because you don't need to set them. They're for deep expansion (to expand branches of branches) and to enable animation. You do pass the third and fourth parameters, however, a callback method and scope for which it's to be called, which is the `onAddNode` method. You use a callback because the Ajax load is asynchronous, and you need to make sure that the load is complete for a branch Node and all of its children to be rendered before you can inject a new Node.

The callback method creates a Node configuration object with an empty string for the text, an `id` of '`tmpNode`', and uses JavaScript shorthand to set the `leaf` value if the selected Node's `id` isn't '`myCompany`'. This ensures that if the department has been selected to have a Node added to it, it will set the `leaf` property to true, meaning a person; otherwise it's false, meaning a department Node. It then uses the new Node configuration to create a new `TreeNode` using the selected Node's `insertBefore` method, passing the `newNode` configuration object and the selected Node's `firstChild` reference to specify where to insert the new Node. Last, an edit operation is triggered on the newly created Node, giving users the ability to add a name to it.

Wow, that was a long one! Let's refresh the UI and see our code in action, as shown in figure 11.9. In this figure, you can see the how we can use the TreeEditor to add Nodes to the TreePanel in a way that mimics operating system behavior.

When I right-clicked the Accounting department Node, the dynamic context menu appeared as expected. I clicked the add MenuItem, which triggered our `onAdd` handler. This caused the Accounting Node to expand. After the child Nodes were loaded, a new Node was inserted and an edit operation was immediately triggered on that Node using the TreeEditor. I typed in a new employee name and pressed Enter. This caused the

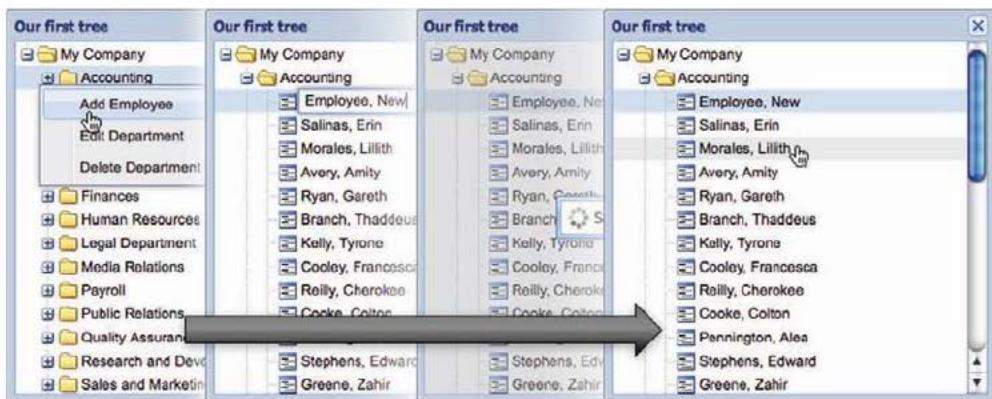


Figure 11.9 Adding a new Node to our TreePanel using the TreeEditor

complete event to be fired by the TreeEditor, thus invoking the onCompleteAdd handler, which masked the TreePanel and performed an XHR (XMLHttpRequest). The server returned favorably, so the new Node stayed in the UI, and the database ID of the newly inserted Node was applied to the TreePanel. You can also implement this code to add department Nodes to the tree and add employees to that.

Great work! You now know how to construct TreePanels, feed them data from the server, and apply CRUD workflows with them. You can now add these widgets to your applications.

11.5 Summary

In this chapter, we covered quite a bit of code when discussing TreePanels and how to set up really cool CRUD interaction for nodes.

We started by talking about the TreePanel and discussed supporting classes like the TreeLoader, TreeNode, and TreeNodeUI. Remember that the TreePanel is a direct descendant of Panel and can be configured as a child for any Container. You constructed a static TreePanel, where the Nodes were read by memory, and analyzed how the JSON should be formatted.

We then moved on to build a dynamic TreePanel that loaded data from a remote data source and spent lots of time enabling full CRUD operations. To enable CRUD, you learned how to dynamically modify, enable, and disable the reusable context menu. You saw what it took to set up adding and editing with the TreeEditor class, which gives the TreePanel the ability to edit node names inline.

Until now, we've only scratched the surface with some of the tools of the framework: the Toolbar, Menus, and Buttons. In the next chapter, we're going to dive deep, and you'll learn more about how they work and how you can better put them to work for your applications.

12

Menus, Buttons, and Toolbars

This chapter covers

- Learning about Menus and how they work
- Styling your Menus with freely available 16 x 16 gif icons
- Dealing with complex Menu Items
- Attaching a Menu to a Button
- Displaying and stylizing a custom Item in a submenu
- Grouping Buttons together
- Implementing Toolbars
- Using Ext.Action to configure Buttons

In the chapters leading up to this one, we've configured and used Menus, Buttons and Toolbars, but we never got to take a moment to really look at these widgets and learn more about them and what else they have to offer. You might ask, "Why are these three lumped into one chapter?" The answer is simple. Their use cases are

related in one way or another. For instance, a Button can be configured to display a Menu, and a Toolbar can contain that Button.

For this reason we'll take an in-depth look at the Ext.menu and Item classes, where you'll learn how to display menu-specific Items in a Menu. We'll even dive into displaying non-Menu Items.

Afterward, we'll focus on the Button class and its cousin the SplitButton, where you'll learn about things such as how to change the inner Button layout and how to attach a Menu to it.

Once you become more familiar with the Button class, we'll create clusters of buttons, known as ButtonGroups. We'll even take a moment to create a ButtonGroup that emulates one from Microsoft Word 2007's famous ribbon toolbar.

Last we'll tie all of this together in a Toolbar and discuss how to abstract like functionality with the use of Ext.Action to save us time when developing Buttons and Menus.

12.1 Menus at a glance

For a moment, let's take a step back and ask ourselves, "What is a menu?" In the simplest definition, a *menu* is something that displays a list of items to choose from. Menus are all around us, including your local coffee shop, where you choose the blend of java to indulge in. This, by the way, is my favorite kind of menu, because I am a self-proclaimed coffee addict.

If we think about it, in the computer world we use menus all the time. The most common are the typical file, edit, and view menus on your application toolbar, where you choose a menu item to open a document or copy something to the clipboard. Another common type of menu is a context menu, which is displayed within the *context* of an item that has been either clicked or right-clicked. This context menu displays only options that are available for the item that the menu was summoned for. Right-clicking anything on your computer displays a context menu. In Ext JS, you can use and display menus the same way.

In Ext JS, Menus typically contain one or more MenuItem s or descendants of MenuItem s. Although in 2.0 it was possible to embed another widget inside a menu, it was rather laborious to do so. In version 3.0 of Ext JS, accomplishing this task is so much easier because the Menu widget extends Container and uses the MenuLayout . This means that you get the power of the Container model managing your Menu, affording you the flexibility to manage the Menu's children much as you would any Container.

As in the desktop menu model, Ext JS Menus can be displayed a number of ways. In the previous GridPanel and TreePanel chapters, you learned how to configure an instance of Menu to display and replace the browser's context menu. Although this is a common use case for this Menu widget, it's not the only one.

You have complete flexibility when developing with Menus. For instance, Menus can be attached to a Button and displayed upon the click of that Button. Or they can be anchored to and shown by any element on demand. How you employ the Menu will be

based on the requirements of your applications, which means that you can employ Ext JS Menus much like menus are deployed in the desktop model.

I'm itching to start writing some code—aren't you?

12.1.1 Building a menu

Even though we've built and displayed a context menu in the past, we've only scratched the surface of how to use the Menu widget. In the coming sections, we're going to explore the different Menu items and how to use them.

In the following listing you begin by creating a plain-Jane menu with a single MenuItem with a newDepartment handler that you'll reuse.

Listing 12.1 Building your base Menu

```
var genericHandler = function(menu.Item) {
    Ext.MessageBox.alert('', 'Your choice is ' + menu.Item.text);
}

var newDepartment = {
    text      : 'newDepartment Item',
    handler   : genericHandler
};

var menuItems = [
    newDepartment
];

var menu = new Ext.menu.Menu({
    items      : menuItems,
    listeners  : {
        'beforehide' : function() {
            return false;
        }
    }
});

menu.showAt([100,100]);
```

In listing 12.1 you do a whole heck of a lot to set up your test bed, which contains a newDepartment handler and a base Menu with a single Item. You accomplish this with a few lines of code. Here's how it works.

The first thing you do is create a genericHandler **1** method, which you'll use for just about every Menu Item that you create and use. When clicked, Menu Items call handlers with two arguments, the instance of Menu Item that was clicked and the instance of Ext.EventObject that was generated by the click action of the user. In our new-Department handler, you only accept the Menu Item argument and use its text property to display a MessageBox alert window to provide you with feedback that the handler was called.

Next, you create a configuration object for a Menu Item, newDepartment ②, which has a text property and a handler property, which is a reference to our genericHandler. Notice that you're not specifying an xtype property for this configuration object. This is because the defaultType property for the Menu widget is 'menuitem' out of the box.

You then create an array referenced as menuItems ③. You do this so you can abstract the list of Menu Items that you're creating for our test Menu. As you continue, you'll add items to this list.

Next you create an instance of Ext.menu.Menu ④, which has two properties. The first is items, which is the reference to the menuItems array of items. Next is a listeners configuration object, which contains a beforehide event listener that you place here just for testing purposes ⑤. If you recall our Component model conversation from eons ago, you may remember that certain events can be vetoed, causing the cancellation of a specific behavior. By the listener explicitly returning false, you prevent the Menu from hiding. This keeps the Menu frozen onscreen, which is perfect for testing.

Last, you show the Menu by calling its showAt method and pass a single argument, which is an array of coordinates, top and left.

Figure 12.1 shows this thing in action. When you render your code, you see the Menu with the single menu Item (figure 12.1, left) and when you click it, the MessageBox appears (figure 12.1, right), providing feedback that the handler was called. Cool! Something is missing, however. The Menu seems, well, a bit plain to me. What do you think about adding some icon flare to the Menu? I like the idea too. Let's do it.

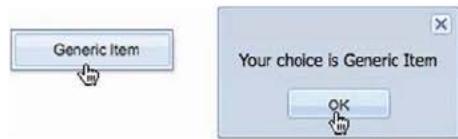


Figure 12.1 Our newDepartment Menu Item (left) and the Item handler (right) in action

12.1.2 Obtaining and using Icons

Early in the book, we discussed how to add icons to widgets by means of the iconCls configuration property. With so much material since then, I think it's relatively safe to say that a quick refresher is in order.

Most developers who use Ext JS use 16x16 icons in their applications. The preferred method to specify icons is by means of CSS rules. Here's an example:

```
.icon-accept {  
    background-image: url(icons/accept.png) !important;  
}
```

The icon-accept CSS class contains a background-image rule with an !important directive. That's it, no magic. Per the Ext JS CSS (unwritten) standard, I typically prefix all CSS icon rules with icon-. This ensures that there's no cross-pollution with any other CSS namespace in the CSS domain. I highly recommend you do the same.

By now you're probably wondering where you can get these icons. Well, the most widely used icon set is the famfamfam Silk icon set, which has over 1,000 16x16 icons at your disposal and was developed by Mark James. It's licensed under the Creative Commons Attribution 2.5 License. To download it, visit <http://famfamfam.com/lab/icons/silk/>.

If that's not enough, then you can add over 460 icons from developer Damien Guard, known as the Silk Companion icon set and containing many useful derivatives of the famfamfam Silk icons. To download this set, visit <http://damieng.com/creative/icons/silk-companion-1-icons>. The Silk Companion set is licensed under both the Creative Commons Attribution 2.5 and 3.0 licenses.

NOTE To read learn more about the Creative Commons Attribution 2.5 and 3.0 licenses, see <http://creativecommons.org/licenses> and click the 3.0 links.

If you've been doing your math, you've probably calculated over 1,460 icons from which to choose if you use both sets. This means 1,460 CSS rules to write. Let me tell you that there's absolutely no way I'd write those CSS rules by hand! How do we solve the problem of having to write all of those rules by hand?

12.1.3 Taming the icon madness

I solved this problem easily by downloading both icon sets, merging them into one directory, and writing a quick and dirty Bash shell script to compile a CSS file that contains a rule for each icon.

To use this compilation, you'll need to download the compiled set at <http://extjsinaction.com/icons/icons.zip>. When you extract the file, you'll find two CSS files, `icons.css` and `icons.ie6.css`, along with the directory `icons`, which contains the icon images.

The first CSS file is a compilation for all of the icons that are in their native PNG (Portable Network Graphics) format, which works well for Mozilla-based browsers as well as Internet Explorer 7 and 8. PNGs, however, don't get rendered properly in Internet Explorer 6 without some extensive JavaScript hacking, which I refuse to do.

To solve that problem, I created GIF versions (via a shell script) of the PNG icons to make them compatible with IE6 and compiled a list of the .gif files named `icons.ie6.css`.

To use any one of these, you must include the required CSS in the head of your browser, as follows:

```
<link rel="stylesheet" type="text/css" href="icons/icons.css" />
```

Next, you need to change the `newDepartment` configuration object to include the `iconCls` property:

```
var genericItem = {  
    text : 'Generic Item',  
    handler : genericHandler,  
    iconCls : 'icon-accept'  
}
```

Refresh the page and see the result of your change. Mine is shown in figure 12.2.

As you can see, the accept.png icon image file now displays to the left of our Menu Item as instructed in the iconCls configuration property. Remember that you can use any of these icons in any widget that accepts the iconCls property, which includes Buttons, TreeNodes, and Panels, to name a few.

You'll be using this icon set for the rest of this chapter and every chapter moving forward. Please remember to include the icons when you generate new pages to work with.

Now that we have this out of the way, we can move on to the next typical Ext JS Menu problem, which is adding submenus to our Menus.

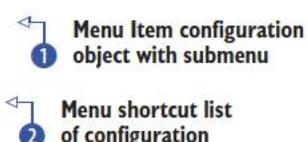
12.1.4 Adding a submenu

Developing submenus for Menus is something that's another pretty common task for Ext JS developers. They perform two useful functions at the same time. The first is the organization of like Menu Items and the second is a direct result of the grouping, which is cleanup of the parent Menu.

Let's add a submenu to our Menu. You'll want to add this code somewhere before the menuItems array you created earlier.

Listing 12.2 Adding a submenu to our base Menu

```
var newDepartment = {
    text      : 'New Department',
    iconCls   : 'icon-group_add',
    menu      : [
        {
            text      : 'Management',
            iconCls   : 'icon-user_suit_black',
            handler   : genericHandler
        },
        {
            text      : 'Accounting',
            iconCls   : 'icon-user_green',
            handler   : genericHandler
        },
        {
            text      : 'Sales',
            iconCls   : 'icon-user_brown',
            handler   : genericHandler
        }
    ]
}
```



In listing 12.2, you create another newDepartment Menu Item, newDepartment ①, that contains the typical configuration properties such as text and iconCls. What's new is the menu property ②, which contains a list of Menu Item configuration objects, each



Figure 12.2 The result of adding an Icon to a Menu Item via the iconCls configuration property

using our genericHandler. This `shortcut` method of adding a submenu to a Menu Item is common. In the spirit of Ext JS, there's more than one way to skin this cat. You could elect to set menu as an instance of `Ext.menu.Menu` or specify a Menu XType configuration object.

Here's what the code would look like if you specified an `xtype` instead of a shortcut array of Menu Items:

```
var newDepartment = {
    text      : 'New Department',
    iconCls   : 'icon-group_add',
    menu      : [
        xtype : 'menu',
        /* menu specific properties here */
        items : [
            /* menu Items here */
        ]
    }
}
```

Choosing the implementation method is up to you. I suggest creating a separate configuration object for a submenu only if you need to set menu-specific properties. Obviously, if you have no menu-specific properties to apply to a submenu, you'll set the `menu` property to an array of menu Items.

Next, you need to add your menu to the `menuItems` array:

```
var menuItems = [
    genericMenuItem,
    newDepartment
];
```

To see the fruits of your labor, you'll have to refresh your page. Mine is shown in figure 12.3.

Cool, you can now see the New Department Menu Item displayed in your Menu. Hovering over the MenuItem reveals the submenu.

Clicking any of the Menu Items in the submenu will result in the MessageBox alert dialog box displaying the text of the submenu.

Although this is usable, it can be improved somewhat. Next, we'll explore adding a `SeparatorItem` to the main Menu and a `TextItem` to the submenu, cleaning up the Menu UI a bit.



Figure 12.3 The addition of a Menu Item with a submenu

12.1.5 Adding a Separator and TextItem

Much like the Toolbar Separator widget is used to separate Toolbar items with a line, `menu.Separators` are used to physically separate menu Items. These are typically used to separate groups or clusters of like Menu Items from another group or cluster. Because all of the Menu Items moving forward will contain submenus, you should separate them with a Separator.

Modify the menuItems array as follows:

```
var menuItems = [
    genericMenuItem,
    '-',
    newDepartment
];
```

Add a string with a hyphen to the menu's items list, and it will get interpreted as menu.Separator. Figure 12.4 shows the change to our UI.

You can see now that a horizontal line separates the first and the second Menu Items. Although the Separator is generally used to group like items, it's much more powerful than a simple line.

Here we used the shortcut to generate the Separator. Technically, it extends menu.BaseItem, which means that you can make it clickable and assign a handler to it. Although it's technically possible to do this, in terms of UI design, I don't advocate using it in this manner.

We've added the Separator, but I think we can dress up the department submenu a bit. In the following listing, you'll add a menu TextItem. To do this, you'll have to create a configuration object to add it to the department submenu.

Listing 12.3 Adding a text item to the department submenu

```
{
    xtype : 'menutextitem',
    text : 'Choose One',
    style : {
        'border' : '1px solid #999999',
        'margin' : "0px 0px 1px 0px",
        'display' : 'block',
        'padding' : '3px',
        'font-weight' : 'bold',
        'font-size' : '12px',
        'text-align' : 'center'
        'background-color' : '#D6E3F2',
    }
},
```



1 Set xtype property

2 Set style of TextItem

In listing 12.3, you injected the new configuration object as the first element of the menu array for the newDepartment Menu. Remember that the defaultType for Menu is 'menuitem', so you have to override this setting by setting the xtype property to 'menutextitem' ①. You also set the style ② of this TextItem to ensure that it looks presentable. I'll show you in a bit what the unstyled TextItem looks like.

To see the TextItem in action, you need to refresh your page. My page is shown in figure 12.5.

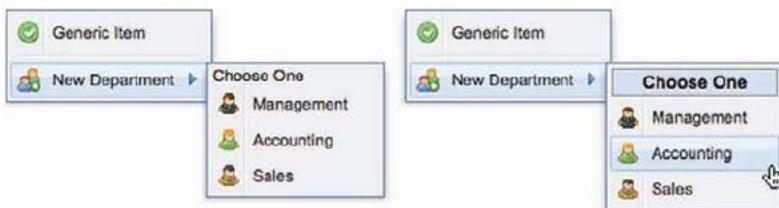


Figure 12.5 Choosing not to style a `TextItem` (left) will result in an incomplete look and feel for your Menu. Adding a touch of style (right) will clean up the Menu.

Looking at figure 12.5, it's easy to see the difference between the unstyled and styled `TextItems`. Obviously, the style of the item is left up to you and your requirements.

We've covered how to add the `menu.Separator` and `TextItem`, both of which aid in the visual styles of our Menu. There are two other types of Menus that I'd like you to become familiar with, `DateMenu` and `ColorMenu`.

12.1.6 Picking a color and choosing a date

As developers, we're often tasked to allow for the selection of a date or color, perhaps the start and end dates of an appointment or the color of text to be displayed. Ext JS provides two widgets that allow us to give this functionality to our users via Menus. They're the `ColorMenu` and `DateMenu`, which are both descendants of `Ext.menu.Menu`.

This means that you can create a direct instance of both and anchor and display them like their superclass. Unlike a traditional `Menu`, they don't manage any child items other than what they're designed for.

Instead of creating instances of these directly, let's add them to our test-bed `Menu`. But, in order to do that, you'll have to add `Menu Items` that you can anchor them to. Also, their handlers pass somewhat different arguments than `Menu Items`, so you'll need to create a generic handler specifically for these newly added `Menus`.

Here comes that itch to code again. Let's get started.

Listing 12.4 Using ColorMenu and DateMenu

```
var colorAndDateHandler = function(picker, choice) {
    Ext.MessageBox.alert('', 'Your choice is ' + choice);
}

var colorMenuItem = {
    text : 'Choose Color',
    iconCls : 'icon-color_swatch',
    menu : {
        xtype : 'colormenu',
        handler : colorAndDateHandler
    }
}

var dateMenuItem = {
    text : 'Choose Date',
    iconCls : 'icon-calendar',
```

1 Color and date handler

2 Menu Item to display the ColorMenu

3 Colormenu configuration Object

```

menu      : {
    xtype    : 'datemenu',
    handler  : colorAndDateHandler
}
}

var menuItems = [
    genericMenuItem,
    '-',
    genericWithSubMenu,
    colorMenuItem,
    dateMenuItem
];

```

4 DateMenu configuration Object

5 Add ColorMenu and DateMenu to array

In listing 12.4, you create a common handler ① for both the ColorMenu and DateMenu, which is similar to the genericHandler that you created earlier but accepts a second argument, choice. Here's how this stuff works.

When an item is chosen from either the ColorMenu or DateMenu, the handler is fired with two arguments. The first is the picker from which the item was selected, and the second is the value of the item that was selected, which we aptly named choice. This works the way it does because the ColorMenu uses the ColorPalette widget and relays its select event. Likewise, the DateMenu uses the DatePicker widget in the exact same way.

The next task listing 12.4 accomplishes is to create the configuration objects ② for the Menu Items that will be used to display the ColorMenu ③ and DateMenu ④. Notice that you register the colorAndDateHandler with both the ColorMenu and DateMenu. Also, you choose appropriate icons for these Menu Items.

Last, you append the newly created colorMenuItem and dateMenuItem references to the menuItems array ⑤. Let's refresh our UI and see the changes to our Menu, as shown in figure 12.6.

As illustrated in figure 12.6, our DateMenu and ColorMenu can be displayed via hovering over the respective Menu Item. Clicking a color or a date in the respective Menu will trigger the handler, resulting in a MessageBox alert displaying the value of the item selected.

The ColorPalette for the ColorMenu and DatePicker for the DateMenu can be customized by applying ColorPalette- or DatePicker-specific properties to their respective containers.

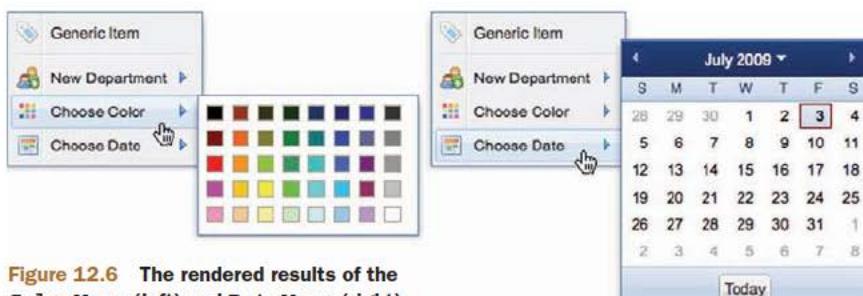


Figure 12.6 The rendered results of the ColorMenu (left) and DateMenu (right)

For instance, to show only the colors red, green, and blue on the ColorMenu, set the colors property with an array of color hex values as follows:

```
colors : ['FF0000', '00FF00', '0000FF']
```

Setting this property will result in the ColorMenu displaying three boxes, one for each of the colors we described in the array. To learn more about the ColorPalette- or DatePicker-specific properties to configure, check out their respective API documents.

We've just tackled using the ColorMenu and DateMenu widgets. We have yet one more Menu topic to discuss, and that's CheckItems, which allows you to configure a Menu Item that works like a Checkbox or RadioGroup.

12.1.7 Put that menu item in check

In forms, Checkboxes and RadioGroups allow users to select an item, and the selection is visibly persisted in the UI. In Microsoft Word for Apple OS X, for instance, I can choose how to view a document by clicking View and selecting a view to activate, as shown in figure 12.7.

In this figure, I selected the Print Layout view, and the selection is persisted for each and every subsequent viewing of this menu. The same paradigm could exist in an Ext JS application. One such paradigm could be where a user chooses between a GridPanel and a DataView to display data from a single Store.

First, I want to show you exactly how to leverage a single menu CheckItem and multiple CheckItems in a checkGroup. Afterward, we'll discuss a possible use for this widget in the hope that it will spark ideas on how to leverage it.

In the following listing you'll create a single CheckItem and add it to our menuItems array.

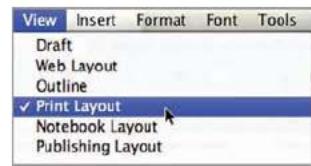


Figure 12.7 A check view menu in OS X, where the user selection is persisted

Listing 12.5 Adding a single CheckItem

```
var singleCheckItem = {
    text      : 'Check me',
    checked   : false,
    checkHandler : colorAndDateHandler
}

var menuItems = [
    genericMenuItem,
    '_',
    genericWithSubMenu,
    colorMenuItem,
    dateMenuItem,
    '_',
    singleCheckItem
];
```

① Create a CheckItem configuration
② Add checked Boolean value
③ Specify checkHandler
④ Add SeparatorItem and CheckItem to array

In listing 12.5 you create a single CheckItem ① using typical XType configuration. If you run down the list, you'll see only three properties, none of which is the xtype.

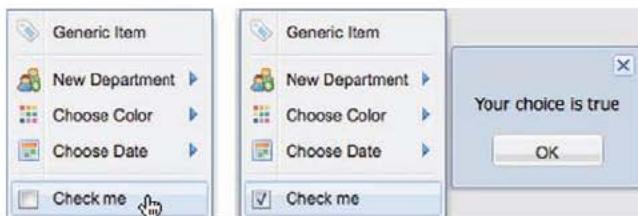


Figure 12.8 Clicking our `CheckItem` (left) makes a check icon appear and triggers the `checkHandler` (right).

This is because you can be extremely lazy with this widget and specify whether the item is checked or not. Ext JS will conveniently handle the instantiation of the `menu.CheckItem` widget for you if the checked **②** property is a Boolean and is present.

The next property of importance is `checkHandler` **③**, which is similar to the typical `Menu Item` handler property, except it passes whether the `CheckItem` has been *checked* or not, which is the second argument that's passed to this method. It's much like the arguments passed to the `ColorMenu` and `DateMenu` handlers. It's for this reason that we're reusing the `colorAndDateHandler`.

Finally, you add a menu `Separator` and our `singleCheckItem` to the `menuItems` array **④**. Figure 12.8 shows what the addition of the `CheckItem` looks like in our `Menu`.

Because you used the `menu.Separator`, you can see the physical separation of your menu `CheckItem`. Because you set the `checked` value to `false`, the `CheckItem` appears with an icon that's unchecked. Clicking it calls the `checkHandler`, which displays the `MessageBox` alert dialog box.

NOTE We didn't set the `iconCls` for the `CheckItem`, but you technically can. Setting the `iconCls`, however, means that you're responsible for programmatically changing the `iconCls` upon call of the `checkHandler`, which can be done by using the `Item.setIconClass` method. See the `Menu.Item` API documentation page for details.

The use and configuration of a single `CheckItem` are obviously pretty easy. Remember that `CheckItems` can be grouped, which allows users to select a single `CheckItem` out of that group, much like the Microsoft Word View menu you saw previously. Next, we'll construct such a group.

12.1.8 Select only one item at a time

The configuration of a single `CheckItem` is relatively trivial compared to that of a group of `CheckItems`. This is mainly because you're configuring multiple `CheckItems` at the same time. In the following listing you'll construct a cluster of grouped `CheckItems`.

Listing 12.6 Adding a cluster of `CheckItems`

```
var setFlagColor = function(menuItem, checked) {
    if (checked === true) {
        var color = menuItem.text.toLowerCase();
        var iconCls = 'icon-flag_' + color;
```

←
1 Common
checkHandler
for CheckItems

```

        Ext.getCmp('colorMenu').setIconClass(iconCls);
    }
}

var colorCheckMenuItem = {
    text      : 'Favorite Flag',
    id       : 'colorMenu',
    iconCls  : 'icon-help',
    menu     : {
        defaults : {
            checked      : false,
            group        : 'colorChkGroup',
            checkHandler : setFlagColor
        },
        items : [
            { text : 'Red' },
            { text : 'Green' },
            { text : 'Blue' }
        ]
    }
}

```

1 CheckHandler for CheckItems

2 Menu Item for CheckItems

3 Menu configuration object for CheckItems

In listing 12.6, you create a new common checkHandler, setFlagColor **1**, for the grouped CheckItems you'll create later. You do this because when CheckItems are grouped, they each call their respective checkHandler when any member in the group has been clicked, with each call passing the checked value of the respective CheckItem.

This shared checkHandler will test the value of the checked parameter. If it's true, it will call setIconCls on the parent Menu Item of the CheckItems Menu. This will effectively set the icon with a flag color that matches the selection of the grouped CheckItem. This is a fun way to provide visual feedback that something was selected and flex some of the Menu Item's muscle and flexibility.

You create the Menu Item colorCheckMenuItem **2**, which has a question mark icon as default. Notice that the menu configuration is an object **3** instead of an array. This is precisely what we were talking about before, where you can use an Object to configure a Menu instead of an array of Menu Item configuration objects.

You do this because you want to set the default on all Menu Items that are checked to false, the common group that each CheckItem will belong to, and the checkHandler. This means that the items array of the Menu configuration object can be simple objects with just a text property for each Item.

Now that you have that complete, please refresh the page and see this in action. It should look similar to figure 12.9.

Refreshing this page reveals our recently configured Favorite Flag Menu Item in our test Menu with a question mark icon. Hover over that Item and it will reveal the submenu with the three grouped color CheckItems. Notice that none of the items bears the check mark. Remember, this is because all items are set to checked : false per the defaults configuration object. You could have easily set any one item as checked : true.

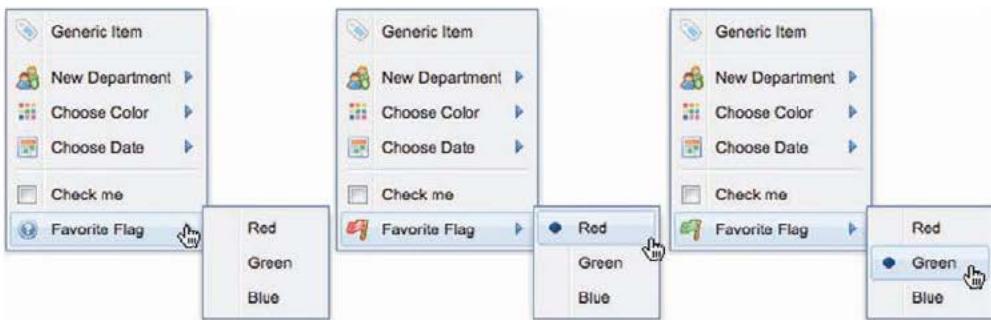


Figure 12.9 A group of CheckItems (left), where only one item can be selected (center and right)

Click a CheckItem and it will change the iconCls for the parent Menu Item. Revealing the Menu that contains the checked items again will result in a radio icon showing to the left of the selected item. Selecting a different Item will result in the relative changes occurring for that CheckItem.

This wraps up our long, detailed view into the world of the Ext JS Menu, where you learned about and exercised all of the Menu Items along with the color and date Menus. Next, we'll dive into the world of Ext Buttons and SplitButtons, where you'll learn how to configure them and associate Menus to them.

12.2 Users know how to push your Buttons

In this section, you'll learn how to implement Buttons and then learn about the SplitButton, which is a descendant of the Button widget.

Buttons in Ext JS 2.0 were rigid; they didn't scale well and the icon position couldn't be configured. It was also particularly difficult to have a Button take part in a layout as a managed child item.

Some of these limitations had to do with how the Button widget itself was constructed, where the Button class in 2.0 extended Component, which means that it's not meant to be used in a layout. Also, the Button sprite images were not designed to allow the Button to scale much larger than its intended size. In 3.0 of the framework, this changes for the better.

The Buttons in this version of the framework extend BoxComponent, which is where all of the child size-management methods are, meaning that Buttons are now fully capable of taking part in any layout. Likewise, the Button sprites were updated to allow for extremely large Buttons. You could have a single Button take one-half of the screen if you want to, though it would probably scare away your users.

As you transition to learning more about and constructing Buttons, you'll learn that Buttons have a lot in common with Menu Items.

12.2.1 Building Buttons

You'll start out by creating a simple handler and a Button that will call it, as shown in listing 12.7. Create a blank page that includes all of the required Ext JS files and the icon CSS file that you worked with a bit ago.

From our work with Menu Items earlier, a lot of this stuff will be familiar to you, which means that you can increase your pace a bit.

Listing 12.7 Building a simple Button with a generic handler

```
var btnHandler = function(btn) {
    btn.el.frame();
}

new Ext.Button({
    renderTo : Ext.getBody(),
    text     : 'Plain Button',
    iconCls  : 'icon-control_power',
    handler   : btnHandler
});
```

In listing 12.7, you create a generic Button handler, `btnHandler` ①, that will call the frame effect on the element of the Button that calls it. Next, you create an instance of an Ext Button ② and render it to the document.body by means of the `Ext.getBody` method call. You also set the text, `iconCls`, and `handler` properties, which are exactly like the menu Item configuration properties.

Load the page with this code and you'll see the Button in action, as shown in figure 12.10.

Our Button renders onscreen, seemingly just waiting to be pushed. Clicking it forces the handler to be called, which applies the frame effect to the Button's element, giving you visual indication that the handler fired properly. Simple, isn't it? Next, you'll attach a Menu to a Button, which is a common practice in Ext JS applications.



Figure 12.10 Our Button in action (left) and the frame effect (right), which is a visual indication that the handler was called

12.2.2 Attaching a Menu to a Button

You attach a Menu to a Button exactly the same way you attach a Menu to a Menu Item, which is specifying either a list of menu Item configuration objects or a complete Menu configuration object. For this exercise, shown in the following listing, you'll do the latter.

Listing 12.8 Attaching a Menu to a Button

```
var setFlagColor = function(menuItem, checked) {
    if (checked === true) {
        var color = menuItem.text.toLowerCase();
        var iconCls = 'icon-flag_' + color;
        Ext.getCmp('flagButton').setIconClass(iconCls);
    }
}
```

```

        }
    }

    new Ext.Button({
        renderTo : Ext.getBody(),
        text     : 'Favorite flag',
        iconCls  : 'icon-help',
        handler   : btnHandler,
        id       : 'flagButton',
        menu     : {
            defaults : {
                checked      : false,
                group        : 'colorChkGroup',
                checkHandler : setFlagColor
            },
            items : [
                { text : 'Red' },
                { text : 'Green' },
                { text : 'Blue' }
            ]
        }
    });
}

```

② Associate
menu to Button

In listing 12.8, you re-create the scenario for the previous CheckItems exercise but modify it to fit the Button. Here's how it works.

You first create the checkHandler, setFlagColor ①, which works exactly like the one you constructed earlier, except it changes the iconCls of the Button.

Next, you create another Button that's similar to the first Button you created and is rendered to the document.body. The main difference between this Button and the other is that you configure ② a Menu with three grouped CheckItems, all registered to call the setFlagColor handler.

Figure 12.11 shows what our code additions and changes bring forth.

At first glance at our newly configured Button, you can see that a little black arrow now appears to the right of the text. This is the visual indication to the user that this Button contains a Menu to be revealed by a click of the Button. To display the Menu, click the Button. What happens?

You see that the Menu appears and that the Button frame effect is shown as well. Wait. What? How can this be? Well, that's because you didn't remove the handler property, which means when the Button is clicked, the Menu shows *and the handler is called*. In some cases, this is desirable behavior, but in most cases, it's not. If all this Button is to do is display a Menu, then you should remove the handler. But if you want a handler to be called separately from the display of the associated Menu, this is where the SplitButton can be useful.



Figure 12.11 Adding a Menu to a Button, which contains a few menu CheckItems

12.2.3 Do a split (SplitButton)

Use of a SplitButton is similar to that of a Button. The main difference is that the SplitButton has a second handler that it can call when clicked, which is known as the arrowHandler.

To implement the SplitButton, you'll slightly modify listing 12.8 to the following.

Listing 12.9 Building a simple Button with a generic handler

```
new Ext.SplitButton({
    renderTo : Ext.getBody(),
    text     : 'Favorite flag',
    iconCls  : 'icon-help',
    handler   : btnHandler,
    id       : 'flagButton',
    menu     : {
        defaults : {
            checked      : false,
            group       : 'colorChkGroup',
            checkHandler : setFlagColor
        },
        items : [
            { text : 'Red' },
            { text : 'Green' },
            { text : 'Blue' }
        ]
    }
});
```

← Use SplitButton instead of Button

To exercise the SplitButton, you use the same setFlagColor handler you created in listing 12.8, and all of the code is the same except that you're instantiating an instance of SplitButton instead of Button. That's it. Let's render this onscreen so you can examine the visual and functional differences; see figure 12.12.

You can see that a Separator line has been added to the Button, which is the only visual difference between a regular Button and a SplitButton. But this visual difference depicts the functional difference between the Button and SplitButton.

This visual Separator between the arrow and the rest of the Button is an indication of two distinct zones for the SplitButton, whereas the Button has only one, which is why when you clicked the button, the handler was called and the Menu appeared.

Clicking what I like to call the “Button zone” in the SplitButton will call its registered handler. Likewise, clicking what I like to call its “Arrow zone” will display the menu and call an arrowHandler if it was registered.

As I said earlier, the 3.0 Button family is a lot more flexible in terms of layout and can scale well relative to its 2.0 ancestor. Next, we'll discuss how to modify the look of the button itself and examine some of the configuration options available to allow you to do just that.



Figure 12.12
Our SplitButton in action

12.2.4 Customizing the layout of your Button

Thus far, you've only configured Buttons and SplitButtons for use without altering the layout. With this version of the framework, you can elect to display the (Menu indication) arrow at the bottom of the button if you wish. You'd do this by configuring the Button via the arrowAlign property, which can have the value of right or bottom.

Likewise, the icons can be aligned at any side of the Button, but left is the default. Figure 12.13 demonstrates each of the arrowAlign and iconAlign options.

In this illustration, we used 16 x 16 icons, which fit perfectly in just about every portion of the framework where custom icons can be used. You can use larger icons if you wish. Also, even though you see the SplitButton being used in figure 12.13, remember that Buttons also can be configured in the same way.

The height of the Buttons and SplitButtons can be conveniently configured via the scale configuration property. This also controls the height of the icon that can be displayed in the Button. There are three possible values for this property: small (16 pixels high, the default), medium (24 pixels high), and large (32 pixels high). You'll see this configuration property in action when you work through ButtonGroups in a bit.

A great demonstration of larger icons in Buttons can be found in the examples in the SDK. You can see them by viewing the following page in your browser: <your_ext_dir>/examples/button/buttons.html.

You now have the necessary skills to employ Buttons and SplitButtons with any possible icon and arrow alignment. Now that you have those important skills, you can learn how to cluster buttons in what's known as a ButtonGroup.

12.3 Grouping your Buttons

New to Ext 3.0 is the ButtonGroup widget, which is an extension of Panel and has a sole purpose: grouping similar or like functionality into clusters for the user. Ext JS ButtonGroups do a pretty good job of emulating the button groups found in Microsoft Word 2007 for Windows.

Being an extension of Panel means that just about any layout can be employed to control the way the ButtonGroup looks. Please be aware that even though most layouts will work within the confines of the ButtonGroup, please heed to my advice and stay within the confines of well-known UI design patterns. Remember, we like to keep the users happy.

Here's a pop quiz. Ready?

What class does Button extend? Right! The Button widget extends BoxComponent. Next question. Why is this important? Right again! This is important because



Figure 12.13 Various implementations of the SplitButton with the possible icon and arrow alignments

BoxComponent contains the Component size-management methods that allow a Component to take part in a layout.

Next, you'll build your first ButtonGroup using the default layout. If you're following along and want to display the icons, please remember to include the icon CSS file.

Listing 12.10 Grouping Buttons with a ButtonGroup

```

new Ext.ButtonGroup({
    renderTo : Ext.getBody(),
    title    : 'Manage Emails',
    items    : [
        {
            text      : 'Paste as',
            iconCls   : 'icon-clipboard',
            menu     : [
                {
                    text      : 'Plain Text',
                    iconCls   : 'icon-paste_plain'
                },
                {
                    text      : 'Word',
                    iconCls   : 'icon-paste_word'
                }
            ]
        },
        {
            text      : 'Copy',
            iconCls   : 'icon-page_white_copy'
        },
        {
            text      : 'Cut',
            iconCls   : 'icon-cut'
        },
        {
            text      : 'Clear',
            iconCls   : 'icon-erase'
        }
    ]
});

```

1 Construct a new
ButtonGroup

2 Use SplitButton
instead of Button

In listing 12.10, you construct a new instance of ButtonGroup ① with four Buttons, one of which has an attached Menu ②. Like the Buttons that you created earlier, you render the ButtonGroup to the document body. That's all there is to it. Figure 12.14 shows what our ButtonGroup looks like rendered onscreen.

Here you see our first ButtonGroup, which contains three Buttons, the first of which is a Split-Button, in action. By default, the ButtonGroup uses the TableLayout, which is why the Buttons are arranged in a single row.

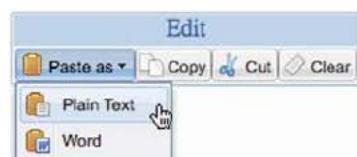


Figure 12.14 Our first
ButtonGroup in action

Next, you'll use your TableLayout ninja skills to rearrange these Buttons so they look a little more like the edit button group in Word 2007 for Windows. If you're unfamiliar with the toolbars of Microsoft Word 2007, figure 12.15 is a snapshot of what you're trying to achieve in listing 12.11.

Now that you know what you're going to replicate, let's get down to business.

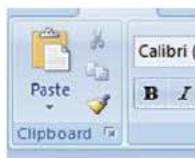


Figure 12.15 The Clipboard button group as found in MS Word 2007 for Windows

Listing 12.11 Visually reorganizing our ButtonGroup

```

new Ext.ButtonGroup({
    renderTo : Ext.getBody(),
    title    : 'Clipboard',
    columns  : 2,
    items    : [
        {
            text      : 'Paste',
            iconCls   : 'icon-clipboard_24x24',
            rowspan  : '3',
            scale    : 'large',
            arrowAlign: 'bottom',
            iconAlign : 'top',
            width    : 50,
            menu     : [
                {
                    text      : 'Plain Text',
                    iconCls   : 'icon-paste_plain'
                },
                {
                    text      : 'Word',
                    iconCls   : 'icon-paste_word'
                }
            ]
        },
        {
            iconCls : 'icon-cut'
        },
        {
            iconCls : 'icon-page_white_copy'
        },
        {
            iconCls : 'icon-paintbrush'
        }
    ]
});
```

1 Re-create the
ButtonGroup
 2 Specify 2 columns for
TableLayout config
 3 Paste Button
spans 3 rows
 4 Scale Button and
icon as large

In listing 12.11, you use all of your acquired knowledge to leverage the default TableLayout that the ButtonGroup 1 uses to create a Microsoft Word 2007-like button group. Here's how it works.

When re-creating the ButtonGroup, you instruct the TableLayout to render only two columns ②. This ensures that the Buttons within this group will be properly aligned.

You also modify how you create the first Button in the set. You set a TableLayout only-child configuration property, rowspan ③ to 3, which ensures that this Button spans the first three rows of the table. You also set the scale ④ to large, which ensures that the modified famfamfam clipboard icon that I stretched to fit the 24 x 24 form factor fits in the large Button nicely. Also notice that you set the arrowAlign to bottom, which helps you complete the look.

The rest of the Buttons have their text property removed, which means that their icon is the only visual representation of what the Button does. Let's see what our changes render, and compare the result to the Microsoft Word 2007 button group, as shown in figure 12.16.

Our latest implementation of the Ext ButtonGroup is similar, but obviously it's not a 100 percent match. It's close, though. And that's what is important to our users, right? The shallower the learning curve for the applications that you build for them, the happier they'll be.

The point of this exercise wasn't to exactly duplicate the Word 2007 button group but rather to show that you can, if you choose to, configure the Ext ButtonGroup to organize the buttons it contains however your application requires.

As you just learned, ButtonGroups are a good tool to leverage to group similarly functioning Buttons. The learning curve to using the ButtonGroup is relatively shallow because you already know how to use the various layouts and so on.

Now that you know how to use Menus, Buttons, and ButtonGroups, you can shift gears and learn how to apply them to Toolbars, where they're most commonly used.



Figure 12.16 Our modified ButtonGroup (left) versus the Microsoft Word 2007 Button group (right)

12.4 Toolbars

Toolbars are generally an area where you can lay out a cluster of items for the user to interact with. In Ext 3.0, Toolbars can easily manage just about anything you want to put in them. This is because of the recent enhancements to the Toolbar class and the introduction of the ToolbarLayout.

Toolbars, like any Component, can be renderedTo any element in the DOM but are most commonly used in Panels and any descendant thereof. This is where you'll keep your focus for this Widget.

In the next example, you'll create a Window that contains a Toolbar with quite a few items, including a ComboBox, as an exercise to show how easy it is to add Components other than Buttons to the Toolbar. The following listing is lengthy because of the number of child items that you're going to create for the Toolbar.

Listing 12.12 Building a Toolbar within a Window

```

var tbar = {
    items : [
        {
            text      : 'Add',
            iconCls   : 'icon-add'
        },
        '-',
        {
            text      : 'Update',
            iconCls   : 'icon-update'
        },
        '-',
        {
            text      : 'Delete',
            iconCls   : 'icon-delete'
        },
        '>',
        'Select one of these: ',
        {
            xtype     : 'combo',
            width    : 100,
            store    : [
                'Toolbars',
                'Are',
                'Awesome'
            ]
        }
    ]
};

new Ext.Window({
    width  : 500,
    height : 200,
    tbar   : tbar
}).show();

```

1 Create Toolbar configuration object: Points to the first line of the code, `var tbar = {`.

2 Shorthand for Toolbar Separator: Points to the separator character ` '-'` in the toolbar items array.

3 Shorthand for Toolbar greedy spacer: Points to the greedy spacer character ` '>'` in the toolbar items array.

4 Shorthand for Toolbar TextItem: Points to the string ` 'Select one of these: '` in the toolbar items array.

5 Configuration object for ComboBox: Points to the configuration object for the `ComboBox` xtype within the toolbar items array.

6 Add toolbar to Window: Points to the final line of the code, `}).show();`.

In listing 12.12, you create a Toolbar configuration object ①. This object has a single property, `items`, which is a list of configuration objects and some strings. Notice that you don't have to specify an `xtype` for the Toolbar configuration object. This is because when you associate it to the Window via the `tbar` or `bbar` property, Ext will automatically *assume* that the configuration object is for a Toolbar.

The `items` array contains quite a few, well, items that we should discuss. The first you've seen, which is a typical Button configuration with a `text` property and `iconCls`. The reason you don't see an `xtype` property for Buttons is that the `defaultType` for toolbars is `button`.

After the first Button is defined, you use the shorthand for the `Toolbar.Separator` class ②, which provides a vertical line dividing items in the Toolbar. Although you *could* write out the configuration of the Separator, I typically use the shorthand. If you wanted to have granular control over the Separator, you'd need to write out the complete configuration object for it, including the `xtype` property, which is `tbseparator`.

Moving on, you create two more buttons with another Separator between them. After that, you'll find this funny-looking string, '`'->`', which is shorthand for the `Toolbar.Fill` ③ widget. This little widget will instruct the `Toolbar` widget to place any item(s) defined thereafter on the right side of the toolbar. This effectively pushes the items to the right of the `Toolbar`.

NOTE Only one `Fill` item can be placed in the `Toolbar`. Think of it as an absolute divider, between the left side of the `Toolbar` and the right. Once you place that divider, any items following it will be placed to the right. Any other `Fill` definitions after the first will be ignored.

Next, you use the shorthand for the `Toolbar.TextItem` ④ widget. Like the other shorthand strings, the `TextItem` can be configured via a configuration object, which will give you greater control over it, including styling. I honestly only configure a `TextItem` via an object if I need this control. Otherwise, I use the string shorthand.

After the `TextItem` configuration, you set up a quick and dirty `ComboBox` ⑤ configuration object. You do this to demonstrate how easy it is to embed items other than `Buttons` in the `Toolbar`.

Last, you render a new instance of `Window` and affix our `Toolbar` configuration object to the top `Toolbar` position by referencing it via the `tbar` ⑥ property. Let's render it onscreen and see what it looks like (figure 12.17).

When you look at your rendered `Toolbar`, you'll see that the three `Buttons` appear with Separators between them, all of which are left aligned. Right aligned are the `TextItem` and `ComboBox`.

The placement of `Buttons` in a `Toolbar` is relatively common practice, but a `Toolbar` can quickly get overcrowded. Using `ButtonGroups` helps alleviate this situation. Adding `ButtonGroups` to a `Toolbar` is as simple as referencing it as a child item of the `Toolbar`.

Figure 12.18 is a great example of `ButtonGroups` being used in the experimental Ext Surf chat application.

As you've learned, using `Toolbars` is relatively straightforward, and you can add all types of stuff to the `Toolbar` to give your users the ability to effectively interact with your applications.



Figure 12.17 Our `Toolbar` rendered inside a `Window`

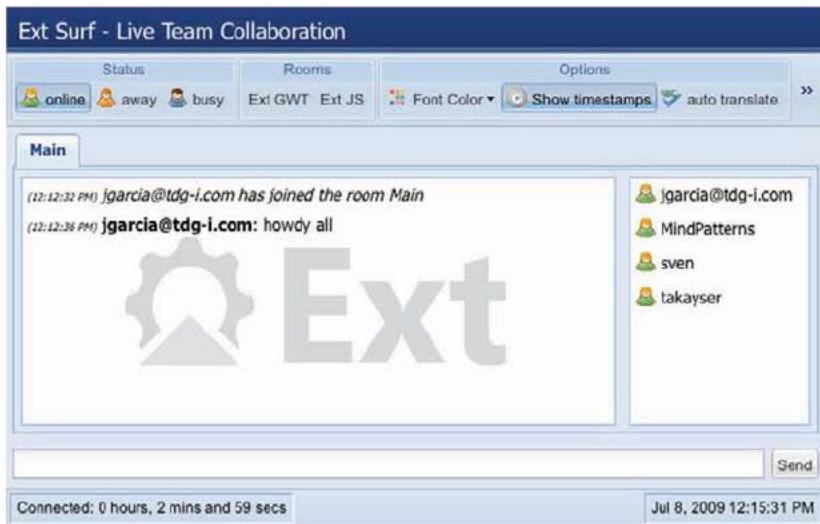


Figure 12.18 ButtonGroups used in a Toolbar as seen in the Ext Surf live chat application

The dangers of using a different layout

Remember that the Toolbar uses the ToolbarLayout. This layout is what gives the Toolbar a lot of its power, including responsiveness to the Toolbar.Fill widget. You need to exercise some caution when thinking about using another layout with a Toolbar. Although you *technically* can leverage another layout, you'll lose features like the Toolbar Fill 1 and automatic overflow protection, which are part of what make the Toolbar what it is.

This wraps up our discussion of Toolbars. We can now focus on the last topic, Ext.Action, which ties together everything you've learned and practiced thus far.

12.5 Read, set, Ext.Action!

Often, as developers, we're tasked to provide a means for the same functionality to be accessed by different methods. For instance, we may be asked to create an edit menu that contains the typical cut, copy, and paste Menu Items along with adding them directly to a Toolbar.

With that request, we have two options: either create instances of Button and MenuItem each with similar configurations or abstract them to an Ext.Action. I vote for the latter, because it's much easier.

You'll build out a couple of actions in the next listing, and we'll go into further detail about how this all works.

Listing 12.13 Using Ext.Actions

```

var genericHandler = function(menuItem) {
    Ext.MessageBox.alert('', 'Your choice is ' + menuItem.text);
}

var copyAction = new Ext.Action({
    text : 'Copy',
    iconCls : 'icon-page_white_copy',
    handler : genericHandler
});

var cutAction = new Ext.Action({
    text : 'Cut',
    iconCls : 'icon-cut',
    handler : genericHandler
});

var pasteAction = new Ext.Action({
    text : 'Paste',
    iconCls : 'icon-paste_plain',
    handler : genericHandler
});

var editMenuBtn = {
    text : 'Edit',
    menu : [
        cutAction,
        copyAction,
        pasteAction
    ]
}

new Ext.Window({
    width : 300,
    height : 200,
    tbar : [
        editMenuBtn,
        '->',
        cutAction,
        copyAction,
        pasteAction
    ]
}).show();

```

1 Create generic handler for actions

2 Create first Ext.Action

3 Add actions as menu items

4 Add actions as toolbar buttons

In listing 12.13 you do quite a lot to leverage `Ext.Action` to build out the hypothetically required UI. First you re-create the `genericHandler` ① that you used earlier in this chapter.

Next, you create three Actions ② for the copy, cut, and paste functionality that you desire. Notice that the properties set on each action are syntactically the same as those of the Button and Menu Items you've created in the past. This is part of the key to understanding what Actions are and how they work, which is why we're going to digress a little.

Action is a class that does nothing more than encapsulate the common configuration of a Button or MenuItem. That's it. When you create an instance of an Ext.Action and inspect it in Firebug, you'll see a bunch of methods and properties. When you (or Ext JS) go to instantiate an instance of Button or MenuItem using Action, the properties and methods of the Action that you're using are applied to the Button or MenuItem during the constructor call of either class.

Ext.Action is a configuration wrapper for either the Button or MenuItem, where many instances of each of those classes can share the Action configuration. Now that you know exactly what Actions are, understanding the rest of this listing will be a breeze.

After you create the Actions, you create a Button ③ configuration object and set a menu property, which is an array of each of the Actions. Next, you create and show an instance of Ext.Window, where you specify a tbar property, which is a list containing the Button with a Menu, a Separator, and the three Actions ④. This is where you can see the usability of Actions.

Without rendering this onscreen, you can predict what the code will construct. Go ahead and display the page and see if you're right; my page is shown in figure 12.19.

Ah-ha! The rendered UI from listing 12.13 is as we expected. You see three menu items appear under the Edit Button when clicked and three Buttons that are right-aligned in the Toolbar.

Unfortunately, Action is one of those classes that are commonly overlooked by developers. I have to admit that I'm guilty of this myself. When developing Buttons and Menus for your UI, try to remember that if the functionality is the same for two or more Buttons or MenuItem s, use Actions. Trust me, it will save you time in the long run.



Figure 12.19 The results of listing 12.13, where Actions are being used to configure Buttons and MenuItem s

12.6 Summary

In this chapter we covered quite a few topics, which revolve around Menus, Buttons, Toolbars, and Actions.

We started by exploring the ins and outs of Menus and all of the MenuItem s that can be used. In doing so, we digressed a little to show you more about where to get free 16 x 16 icons that lots of web 2.0 applications are using. You also learned how to nest Menus and even affix Color and Date menus to MenuItem s.

You also took time to learn about the Ext.Button and SplitButton, where you learned how to configure how they look and feel by setting the iconAlign and arrowAlign properties. Next, you learned how to leverage the ButtonGroup to cluster similar Buttons together and took the time to leverage the TableLayout to organize your

Buttons in a special way. Remember to set the scale property to medium or large if you're using an icon that's larger than 16 x 16.

Last, you began to tie together what you learned about Menus and Buttons when we discussed the Toolbar. You also learned about timesaving with the Ext.Action configuration wrapper class.

In the next chapter, we're going to tackle the challenge of implementing drag and drop with DOM nodes.

Part 4

Advanced Ext

T

he goal of this part is to take you up to the level of the Ext JS experts, where we'll take on the many ways to empower our applications with drag and drop. We'll also tackle how to extend Ext JS by creating extensions and plug-ins.

Chapter 13 is the introduction to the world of drag and drop with the framework, where we'll peek under the hood and learn about the various classes that make this user interaction possible. Along the way, we'll implement simple drag and drop with generic HTML divs.

Chapter 14 will springboard from chapter 13, as you learn how to implement drag and drop with the `DataView`, `GridPanel`, and `TreePanel` widgets.

This section ends in chapter 15 with an in-depth look at the world of creating Ext JS extensions and plug-ins, paving the way for you to create an application.

By the end of this section, you will have learned many of the secrets to implementing advanced features in the framework.

13

Drag-and-drop basics

This chapter covers

- Understanding the drag-and-drop workflow
- Dissecting the Ext JS drag-and-drop classes
- Implementing drag-and-drop override methods
- Exercising the full drag-and-drop lifecycle

One of the greatest advantages of using a graphical user interface is the ability to easily move items around the screen with simple mouse gestures. This interaction is known as *drag and drop*. We use drag and drop just about every time we use a modern computer without giving it a second thought. If you step back and think about it, you'll realize how this makes our lives a lot easier.

Want to delete a file? Click and drag the file icon and drop it on the trash or recycle bin icon. Easy, right? What if you didn't have drag and drop? How would you move a file from one location to the recycle bin? Let's quickly ponder the possibilities. You'd first click the file to provide it focus. You could then use a keyboard key combination to "cut" the file. You'd then have to find and focus the recycle bin window and use the keyboard key combination to "paste" it in. Another option would be to click to select the file to focus it and press Delete on your keyboard, but

if you're right handed, this would require you to take your hand off your mouse. In contrast, drag and drop is much simpler, isn't it? Now put yourself in the world of the RIA user. What if you could use drag and drop to simplify their experience?

Fortunately, Ext JS provides a means for you to do that. In this chapter, you'll see that with a bit of elbow grease and determination, you can achieve the goal of adding drag and drop to your applications. You'll start off by learning to apply drag and drop to basic DOM elements, which will give you the foundation for applying these behaviors to widgets such as the `DataView`, `GridPanel`, and `TreePanel`, which you'll learn about in the chapter following this.

13.1 Taking a good look at drag and drop

Before drag and drop can take place, the computer must decide what can and can't be dragged and what can or can't be dropped upon. For instance, icons on your desktop can generally be dragged around, but other items, such as the clock on your taskbar (Windows) or menu bar (OS X) can't. This level of control is necessary to allow the enforcement of certain workflows, as we'll discuss in a bit.

In order to really understand drag and drop, we need to discuss the entire workflow. We'll do this by dividing the workflow into what I like to call the drag-and-drop lifecycle, which can be broken up into three major categories: start of drag, the drag operation, and drop.

13.1.1 The drag-and-drop lifecycle

Using the desktop paradigm, any icon on the desktop can be dragged around, but only a select few can be dropped on (generally disk or folder icons) the trash or recycle bin, or icons for executables (applications). In Ext JS, the same registrations must occur for drag and drop to be possible. Any element that can participate in drag and drop must be initialized as such. For elements in the DOM to participate in drag and drop, they must, at the least, be registered as drag items and as drop targets. Once the items are registered, drag and drop can take place.

Drag operations are initiated by clicking and holding a mouse button over a UI element followed by mouse movement while the mouse button is being held. The computer decides, based on the registration described previously, whether the item that's being clicked is draggable. If it isn't, then nothing happens. The user can click and attempt a drag operation but with no results. But if an element is allowed to be dragged, the UI generally creates a lightweight duplicate of that object, known as a drag proxy, that's anchored to the movements of the mouse cursor. This gives the user the feeling that they're physically moving or dragging that item onscreen.

During each tick, or X-Y coordinate change, of the mouse cursor during the drag operation, the computer determines whether you can drop the item at that given position. If drop is possible, then some sort of visual invitation for a drop operation is displayed. In figure 13.1, you see a form of drop invitation where a file icon proxy is dragged over a folder icon on the desktop.

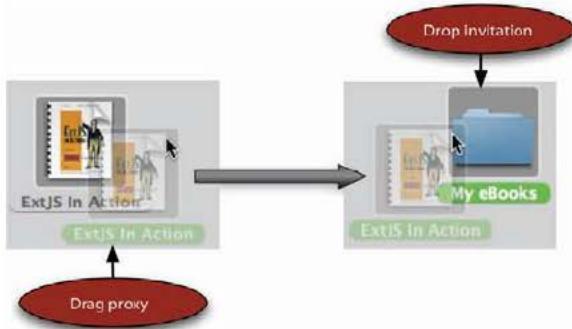


Figure 13.1 Desktop drag-and-drop interaction as seen in Mac OS X, where a drag proxy (left) is created upon an item drag event and a drop invitation is being displayed (right)

The drag-and-drop lifecycle ends when a drop operation occurs. A drop operation occurs when the mouse button is released after a drag operation has occurred. At this time the computer must decide what to do with the drop operation. Did the drop event occur on a valid drop target? If so, is the drop target part of the same drag-and-drop group as the drag element? Does it copy or move the item that was dragged? This decision is generally left to the application logic to decide and where you'll be doing most of your coding.

Although it's relatively easy to describe how drag and drop should behave, it's orders of magnitude more difficult to implement—but not impossible. One of the keys to being able to effectively implement drag and drop is a basic understanding of the class hierarchy and the jobs that each class performs. This holds true from implementing drag and drop from the basic DOM level, as you'll see in a bit, all the way to implementing it on Ext JS UI widgets.

Throttle up. We're going to climb up to 30,000 feet and take a bird's-eye view of the drag-and-drop class hierarchy.

13.1.2 A top-down view of the drag-and-drop classes

At first glance, the list of drag-and-drop classes can be a bit overwhelming. I know that when I first glanced at the list of classes in the API, I was taken aback by the options. With 14 classes, it can be considered a framework within a framework that provides functionality from the basic, such as the ability to make any DOM element draggable, to more complex features, such as the ability to drag and drop multiple nodes using what is called a *proxy*. The cool thing is that once you take a high-level look at the classes, it isn't that difficult to organize the supporting classes and understand their roles.

This is where we'll start our exploration. Figure 13.2 shows what the class hierarchy looks like. In this figure, you see the 11 drag-and-drop classes. All of the drag-and-drop functionality for the entire framework starts with the `DragDrop` class, which provides the base methods for everything drag and drop and is *meant* to be overridden. It provides only the basic tools for you to implement this behavior. It's up to you to write the code for the entire spectrum of the implementation.

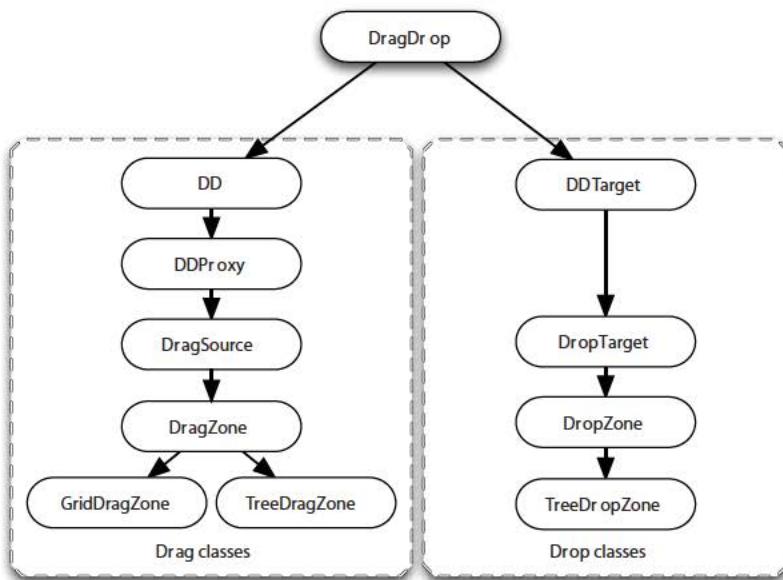


Figure 13.2 The drag-and-drop class hierarchy can be broken up into two major sections, drag (left) and drop (right).

This is the fundamental key to understanding how drag and drop works because this code design pattern is repeated throughout the drag-and-drop class hierarchy. This concept is extremely powerful because by having the basic tools to add this behavior to your application, you can easily ensure that drag and drop works for your application's needs.

As you look down the chain of inheritance, you can see that a split, which starts with `DD` (left) and `DDTarget` (right). `DD` is the base class for all drag operations, whereas `DDTarget` is the base class for all drop operations. Both provide the base functionality for their respective behaviors. Having this split in functionality allows you to focus on specific behaviors. You'll see this in action when we look at implementing drag and drop with DOM nodes a little later on.

As you move down the chain, you can see that Ext JS adds features progressively for the intended behavior. Table 13.1 enumerates the classes and provides a brief description of their designated task.

There you have it, each of the drag-and-drop classes and what they're designed to do. A drag item (DD class or subclasses) can be a drop target, but a drop target (DDTarget or subclasses) can't be a drag item. It's important to know this because if you ever decide on having an element being a drag item *and* a drop target, you must use one of the drag classes.

If you're implementing drag and drop with generic DOM nodes, where you need to allow for one drag node at a time, you'd use `DD` or `DDProxy`, as you'll see later in this chapter. If you're looking to drag more than one element, you'll want to use either

Table 13.1 Drag-and-drop classes

Drag classes		Drop classes	
Name	Purpose	Name	Purpose
DD	A base drag implementation where an element can be dragged around and dropped anywhere. This is where most DOM-level drag implementations take place.	DDTarget	The basic class to allow any element to participate in a drag-and-drop group, but it can't be dragged around, meaning it can only have items dropped on it.
DDProxy	A basic drag implementation where a lightweight copy of the drag element, known as a <i>drag proxy</i> , is dragged around instead of the source element. It's common practice to use this class for drag operations where a drag proxy is desired.	DropTarget	A base class that provides the empty plumbing for an element to take action when a draggable element is dropped onto this one. It's left up to the developer to finish the implementation by overriding the notify methods.
DragSource	Provides a base implementation for drag and drop using status proxies and is the base class for DragZone. This can be used directly, but it's more common to use the DragZone class (see below).	DropZone	A class that provides the means for multiple nodes to be dropped onto this element; it works best with the DragZone class. There is a TreePanel-specific implementation of this known as the TreeDropZone.
DragZone	This class allows for the drag of multiple DOM elements at a time and is commonly used with the DataView or ListView widget. To provide drag and drop with the GridPanel and TreePanel, each has its own implementations of this class known as the GridDragZone and TreeDragZone.		

the DragSource or DragZone classes. This is why the TreePanel and GridPanel have their own respective extensions or implementations of the DragZone class.

Likewise, if you're looking to drop a single node, the DDTarget will be your drop class of choice. For multiple-node drops, the DropTarget or DropZone is required because they have the necessary plumbing to interact with the DragSource, DragZone, and their descendant classes.

Knowing what the classes are is just one piece of the puzzle. The next piece that you'll need to know is what methods are to be overridden, which is the biggest key to successful deployment.

13.1.3 It's all in the overrides!

As we discussed earlier, the various drag-and-drop classes were designed to provide a base framework for various drag or drop behaviors and are only part of what's needed to make drag and drop useful. Each of the drag-and-drop classes contains a set of abstract methods that are meant to be overridden by you, the end developer.

Table 13.2 Commonly used abstract methods for drag and drop

Method	Description
onDrag	Called for each onMouseMove event while the element is being dragged. If you plan to do something before an item is dragged, you may elect to override the b4Drag or startDrag methods.
onDragEnter	Called when a drag element first intersects another drag/drop element within the same drag/drop group. This is where you can code for drop invitation.
onDragOver	Called while a drag element is being dragged over.
onDragOut	Called when a drag element leaves the physical space of an associated drag or drop element.
onInvalidDrop	Called when a drag element is dropped on anything other than an associated drag or drop element. It's a great place to inject notification to the user that they dropped a drag element in the wrong place.
onDragDrop	Called when a drag element is dropped on another drag/drop element within the same drag/drop group.

Although all of these methods are listed in the framework API for each drag/drop class, it's a good idea to at least briefly discuss a few of the more commonly used abstract methods that are to be overridden for the Ext.dd.DD class. This way you get a sense of what to look for in the API. Table 13.2 provides an overview of these methods.

Remember that Ext.dd.DD is the base class for all drag-specific elements, and as you move down the hierarchy, more features get added. The features added by the subclasses progressively override these methods for you.

For instance, there are a few “b4” (before) methods that Ext.dd.DD provides that allow you to code a behavior before something happens, such as before the mousedown event fires (b4MouseDown) and before the drag of an element occurs (b4StartDrag). Ext.dd.DDProxy, the first subclass of Ext.dd.DD, overrides these methods to create a draggable proxy just before the drag code begins to execute.

To figure out which methods you need to override to achieve a specific implementation, you'll need to consult the API for that specific drag or drop class. Because Ext JS has a more aggressive release cycle, obviously some methods may be added, renamed, or removed, so looking at the API regularly will help you stay fresh with the current changes.

The last bit of drag-and-drop theory we need to discuss is the use of drag-and-drop groups and what they mean for implementing this behavior in your application.

13.1.4 Drag and drop always work in groups

Drag-and-drop elements are associated with groups, which is the basic constraint that governs whether a drag element can be dropped on another element. A group is a label that helps the drag-and-drop framework decide whether a registered drag element should interact with another registered drag or drop element.

Drag or drop elements must be associated with at least one group but can be associated with more than one. They're generally associated with a group upon instantiation and can be associated with more via the `addToGroup` method. Likewise, they can be unassociated via the `removeFromGroup` method.

This is the last piece of the puzzle to understanding the basics of drag and drop with Ext JS. It's time to start using and reinforcing what you've learned. We'll start out simple by implementing drag and drop with DOM elements.

13.2 Starting out simple

We'll begin our exploration with a plot that mimics a swimming pool setting, complete with locker rooms, a swimming pool, and a hot tub. There are constraints that we must follow. For instance, men and women nodes can only be in their respective locker rooms. All can go in the swimming pool, but only a few like to go into the hot tub. Now that you understand what we must create, we can begin coding.

As you'll see, it's extremely simple to configure an element to be dragged around the screen. But before we can do that, we must create a workspace to manipulate. We'll do this by creating some CSS styles that govern how a specific set of DOM elements look and then apply drag logic to them. We'll keep things as simple as possible to focus on the subject matter.

13.2.1 Creating a small workspace

Let's create the markup to represent the locker rooms and people inside them. This listing is rather lengthy because of the HTML required to achieve the desired style and layout.

Listing 13.1 Creating our simple drag-and-drop workspace

```
<style type="text/css">
    body {
        padding: 10px;
    }
    .lockerRoom {
        width: 150px;
        border: 1px solid;
        padding: 10px;
        background-color: #ECECEC;
    }
    .lockerRoom div {
        border: 1px solid #FF0000;
        background-color: #FFFFFF;
        padding: 2px;
        margin: 5px;
        cursor: move;
    }
</style>
<table>
```

Annotations:

- 1 Drag element container styles
- 2 Child nodes look different

```

<tr>
    <td align='center'>
        Male Locker Room
    </td>
    <td align='center'>
        Female Locker Room
    </td>
</tr>
<tr>
    <td>
        <div id="maleLockerRoom" class="lockerRoom">
            <div>Jack</div>
            <div>Aaron</div>
            <div>Abe</div>
        </div>
    </td>
    <td>
        <div id="femaleLockers" class="lockerRoom">
            <div>Sara</div>
            <div>Jill</div>
            <div>Betsy</div>
        </div>
    </td>
</tr>
</table>

```

3 HTML markup for our drag items

In listing 13.1, you create the CSS styles and markup to set the stage for your exploration of basic DOM drag and drop. We begin by defining the CSS that will control the styles for the lockerRoom ① element containers and their (people) child nodes ②. Last, we set up the markup ③ to utilize the CSS.

Figure 13.3 shows what our locker HTML looks like rendered. In this figure, you see the HTML rendered onscreen. If you notice, when you hover the mouse cursor over a child node of a locker room element, the arrow will change into a hand. This is due to the CSS styling that we configured previously, and it provides a nice means of inviting a drag operation.

Next, we'll configure the JavaScript to allow these elements to be dragged around.

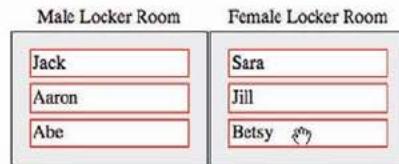


Figure 13.3 The locker room HTML rendered

13.2.2 Configuring items to be draggable

In the following listing, you'll configure the locker room child items to be draggable. You'll see exactly how easy it is to do this.

Listing 13.2 Enabling drag for our elements

```

var maleElements = Ext.get('maleLockerRoom').select('div');
Ext.each(maleElements.elements, function(el) {
    new Ext.dd.DD(el);
});
var femaleElements = Ext.get('femaleLockerRoom').select('div');
Ext.each(femaleElements.elements, function(el) {
    new Ext.dd.DD(el);
});

```

In listing 13.2, you configure the locker room child items to be dragged around the screen. To accomplish this, you gather a list of child elements in the `maleLockerRoom` element by chaining a `select` call (DOM query) to the results of the `Ext.get` call ①. You then utilize `Ext.each` to loop through the list of child nodes and create a new instance of `Ext.dd.DD` ②, passing the element reference, which enables that element to be dragged around the screen. You do the exact same thing for the elements in the `femaleLockerRoom`.

After refreshing the page, you can easily drag and drop the elements around the screen.

As you can see in figure 13.4, you can drag any of the child divs around the screen, without constraints.

Let's examine how `Ext.dd.DD` works and what it does to our DOM elements. To do this, we'll need to refresh the page again and open up Firebug's live HTML inspection tool. We'll focus on Jack.

13.2.3 Analyzing the `Ext.dd.DD` DOM changes

Figure 13.5 shows the HTML of our drag elements just after a page refresh along with the DOM inspection view in Firebug.

When looking at the Jack element (highlighted), the first thing you might notice is that it's assigned a unique ID of "ext-gen3". Recall that in our markup, we didn't assign an ID to this element. If the element already had its own unique ID, `Ext.dd.DD` would use it. But instead, in order to track this element by ID, it's assigned one by the `Ext.dd.DD`'s superclass, `Ext.dd.DragDrop`.

WARNING If the `id` of the element is changed after it has been registered for drag, the drag configuration for that element will cease to function. If you plan to change the `id` for a particular element, it's best to call the `destroy` method on the instance of `Ext.dd.DD` for that element and create a new instance of `Ext.dd.DD`, passing the new element ID as the first parameter.

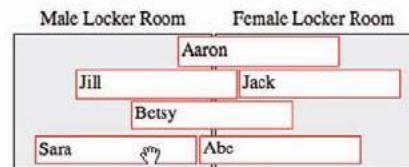


Figure 13.4 Drag enabled on the locker room elements without constraints

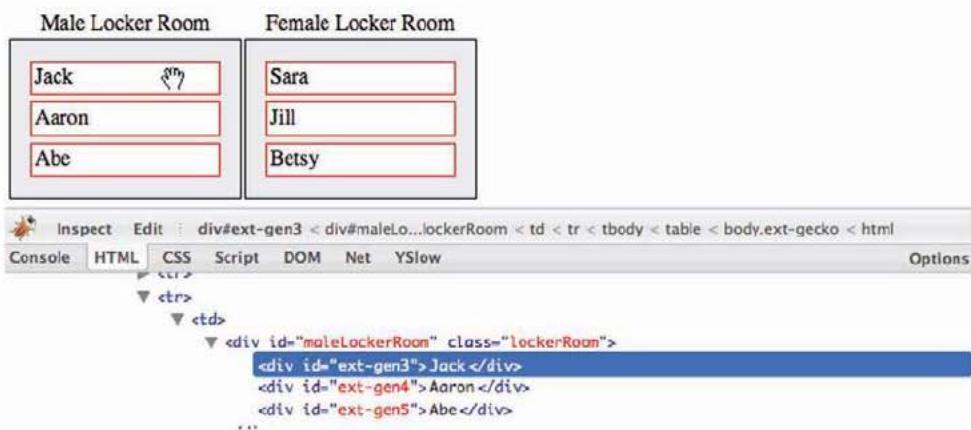


Figure 13.5 Inspecting the DOM for the Jack element (highlighted) before a drag operation takes place

Another thing that you'll notice from looking at the HTML inspection is that no other attributes are assigned to that element. Now, let's drag the element a little and observe the changes, as shown in figure 13.6.

You can see that I dragged the Jack element a little. Ext.dd.DD, in turn, added a style attribute to the element, which changes the position, top, and left CSS properties. This is important to know because using Ext.dd.DD will result in a change of positioning for the element onscreen and is one of the key differences between using the Ext.dd.DD and the Ext.dd.DDProxy, which we'll explore later on.

The last observation that we'll discuss is the ability for the dragged elements to be seemingly dropped anywhere. At first, this may seem cool, and it is! But it's hardly of use. In order to make this useful, we'll have to apply constraints.

To do this, we'll need to create some containers to drop them onto. This is where we'll generate the pool and hot tub for these people to enjoy.

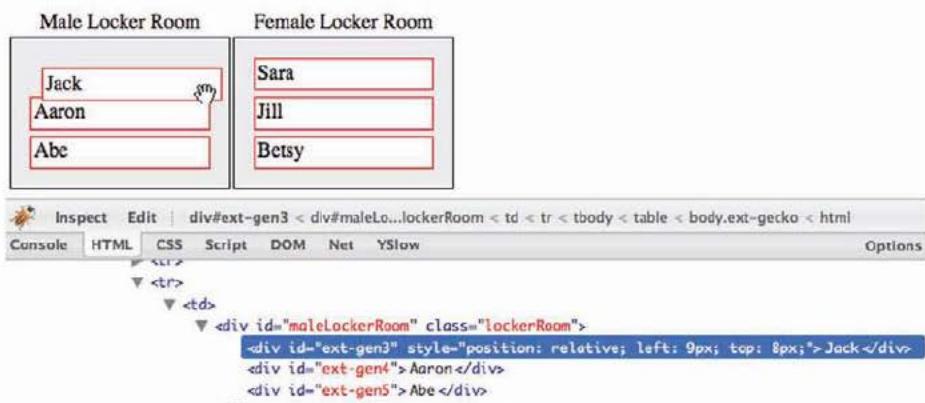


Figure 13.6 Observing the changes that the drag operation makes on the Jack element

13.2.4 Adding the pool and hot tub drop targets

As before, we'll add some CSS to stylize the HTML. Please insert the following CSS inside the style tags of your document. They'll set the background color of the pool and hot tub to blue and red, respectively.

```
.pool {
    background-color: #CCCCFF;
}

.hotTub {
    background-color: #FFCCCC;
}
```

Now we'll need to add the HTML to the document body. Append the following HTML markup below the locker room HTML table:

```
<table>
    <tr>
        <td align='center'>
            Pool
        </td>
        <td align='center'>
            Hot Tub
        </td>
    </tr>
    <tr>
        <td>
            <div id="pool" class="lockerRoom pool"/>
        </td>
        <td>
            <div id="hotTub" class="lockerRoom hotTub"/>
        </td>
    </tr>
</table>
```

This will give us the elements we'll need to set up drop targets. Figure 13.7 shows what the HTML now renders to.

We've added all of the HTML that we need for now. Next you must set up the Pool and Hot Tub elements as DropTargets, which will enable them to participate in the drop portion of the drag and drop. You'll add this code just after the JavaScript in listing 13.2.

```
var poolDDTarget = new Ext.dd.DDTTarget('pool', 'males');
var hotTubDDTarget = new Ext.dd.DDTTarget('hotTub', 'females');
```

Here you set up an instance of Ext.dd.DDTTarget each for the 'pool' and 'hotTub' elements. The first parameter for the DDTTarget constructor is the ID of the element (or DOM reference). The second parameter is the group the DDTarget is to participate in.

Male Locker Room	Female Locker Room
Jack	Sara
Aaron	Jill
Abe	Betsy

Pool Hot Tub

Figure 13.7 The Pool and Hot Tub HTML rendered onscreen

Now, refresh your page, and drag and drop a male node onto the pool node or a female node onto the hot tub node. What happens when you drop the item onto the target? Yes—nothing. Why is that? Well, you set up drag items and the drop targets, which set the stage for complete drag and drop, but remember that it's left up to you to follow through with the rest of the implementation. You must develop the code for the drop invitation and for valid and invalid drops. As you'll see, this is precisely where most of the drag-and-drop implementation code will take place and is what we'll do next.

13.3 Finishing our drag-and-drop implementation

As you just saw, setting up an element to be dragged around is simple, as is setting up a drop target. But unless you connect the dots, you're left with a source and destination but no way to get there.

In order to add the drop invitation and valid and invalid behaviors, you need to refactor how you configure the elements to be dragged around. We'll begin by adding one last CSS class, which you'll use to turn the drop target green for the drop invitation.

```
.dropZoneOver {
    background-color: #99FF99;
}
```

As you can see, this CSS is simple. Whatever element has this class will have a green background. Next, we'll work on refactoring the way you set up the male and female elements to be dragged around by setting up an overrides object that gets applied to each instance of Ext.dd.DD.

13.3.1 Adding the drop invitation

To add the drop invitation, you'll have to completely replace how you initialized the drop targets before. The following listing shows what you'll use and will set the stage for the valid and invalid drop behaviors.

Listing 13.3 Refactoring our implementation of Ext.dd.DD

```
var overrides = {
    onDragEnter : function(evtObj, targetElId) {
        var targetEl = Ext.get(targetElId);
        targetEl.addClass('dropZoneOver');
    },
    onDragOut : function(evtObj, targetElId) {
        var targetEl = Ext.get(targetElId);
        targetEl.removeClass('dropZoneOver');
    },
    b4StartDrag : Ext.emptyFn,
    onInvalidDrop : Ext.emptyFn,
    onDragDrop : Ext.emptyFn,
    endDrag : Ext.emptyFn
};

var maleElements = Ext.get('maleLockerRoom').select('div');
```

```

Ext.each(maleElements.elements, function(el) {
    var dd = new Ext.dd.DD(el, 'males', {
        isTarget : false
    });
    Ext.apply(dd, overrides);
});

var femaleElements = Ext.get('femaleLockerRoom').select('div');
Ext.each(femaleElements.elements, function(el) {
    var dd = new Ext.dd.DD(el, 'females', {
        isTarget : false
    });
    Ext.apply(dd, overrides);
});

```

The code is annotated with the following numbers:

- 4**: Male elements to be drag items. An arrow points from this number to the first call to `Ext.dd.DD` where `'males'` is specified.
- 5**: These won't be drop targets. An arrow points from this number to the `isTarget : false` property in the configuration object.
- 6**: Override methods to the DD instance. An arrow points from this number to the final `Ext.apply` statement.

In listing 13.3, you create an object, `overrides`, which will be *applied* to the instances of `Ext.DD` that will be created. You'll override a total of five methods to achieve the desired results, but for now you'll override only `onDragEnter` ① and `onDragout` ②.

Remember that `onDragEnter` will be called only when a drag element first intersects a drag or drop element with the same associated group. Your implementation of this method will add the '`dropZoneOver`' CSS class, which changes the background color of the drop element to green and provides the drop invitation that you want.

Likewise, the `onDragOut` method gets called when the drag element first leaves a drag-and-drop object with the same associated group. You use this method to remove the invitation from the background of the drop element ③.

You then stub four methods, `b4StartDrag`, `onInvalidDrop`, `onDragDrop`, and `endDrag`, which we'll fill in later on. We don't do these now because I want you to be able to focus on the behaviors and constraints that we add in layers. But, in case you're curious, we'll use `b4StartDrag` to get the original X and Y coordinates of the drag element. These coordinates will be used in the `onInvalidDrop` method, which will set a local property to indicate that this method was fired. The `onDragDrop` method will be used to move the drag node from its original container to the dropped container. Last, the `endDrag` method will reset the position of the drag element if the `invalidDrop` property is set to true.

In order to use this `overrides` object, you have to refactor how you're initializing the drag objects ④, for both male and female elements.

You do this because you need to prevent the drag element from being a drop target, which is why you add a third argument to the `DD` constructor, which is meant to be a somewhat limited configuration object. You'll see what I mean by *limited* in a bit. In that configuration parameter, you set `isTarget` ⑤ to `false`, which sets the controlling behavior for this drag item to not be a drop target.

Finally, you apply the `overrides` object to the newly created instance of `Ext.DD` ⑥. Earlier, I said that the configuration object is used only to set a limited number of properties. I said this because the drag-and-drop code that exists in Ext JS today was written back in the early Ext JS 1.0 days, before most constructors applied configuration properties to themselves. This is why you have to use `Ext.apply` to inject the

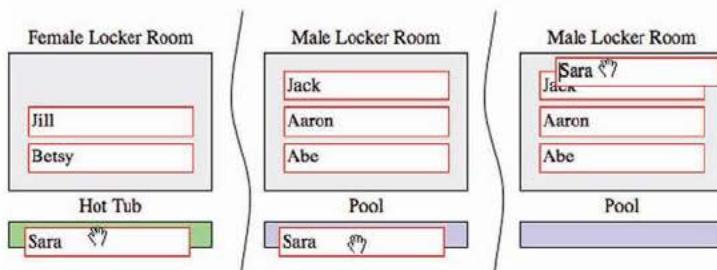


Figure 13.8 Condition al drop invitation for the male nodes

override methods instead of setting them on the configuration object as you would for most constructors in the framework.

We've just added the code for the invitation. Let's see what happens when we try to drag a male node over the pool or hot tub (figure 13.8).

As your knowledge of drag and drop and code dictates, dragging a male node over a drop target (think `onDragEnter`) with the same associated group will result in a drop invitation, which is the background of the drop target turning green, as shown in figure 13.8. When you drag the element out of the same drop target (think `onDragOut`), the background will return to its original state, removing the drop invitation.

Conversely, dragging a male element over any other drop target, such as the hot tub, will result in no invitation. Why does this happen? There's no drop invitation on the hot tub element because the hot tub is not associated with the males drop group.

Another thing you'll notice is that dragging a female element over the hot tub results in a drop invitation on the hot tub element but not the pool, as shown in figure 13.9. That's because the hot tub is associated only with females.

Although this demonstrates the drop invitation well, you still have the issue of the pool and the hot tub needing to be able to receive both male and female nodes. To do this, you must register them with an additional group. You need to call the `addToGroup` method, passing in an alternate group. Here's what the pool and hot tub element DDTTarget registration looks like with the addition of `addToGroup` calls:

```
var poolDDTarget = new Ext.dd.DDTTarget('pool', 'males');
poolDDTarget.addToGroup('females');

var hotTubDDTarget = new Ext.dd.DDTTarget('hotTub', 'females');
hotTubDDTarget.addToGroup('males');
```

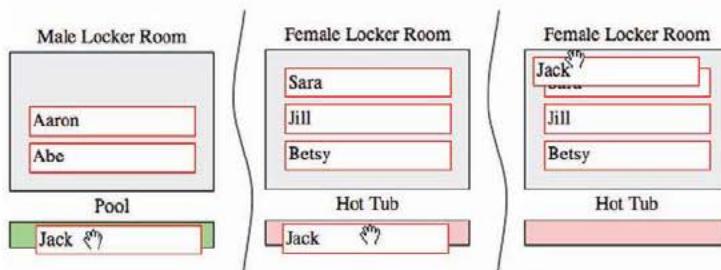


Figure 13.9
The conditional drop invitation for the female nodes

After injecting this into your example, refresh the page. You can see that the pool and the hot tub drop elements now invite the drop, but what happens when you drop a drag element onto a valid drop target? Absolutely nothing. That's because you didn't code for the valid drop operation.

You'll do this next.

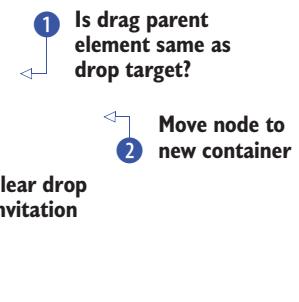
13.3.2 Adding valid drop

To add the valid drop behavior to your drag-and-drop implementation, you must replace the `onDragDrop` method in your `overrides` object, as follows.

Listing 13.4 Adding valid drop to your overrides

```
onDragDrop : function(evtObj, targetElId) {
    var dragEl = Ext.get(this.getEl());
    var dropEl = Ext.get(targetElId);

    if (dragEl.dom.parentNode.id != targetElId) {
        dropEl.appendChild(dragEl);
        this.onDragOut(evtObj, targetElId);
        dragEl.dom.style.position = '';
    }
    else {
        this.onInvalidDrop();
    }
}
```



In your `onDragDrop` method, you set up the code for a successful or valid drop operation. To do this, you first need to create local references for the drag and the drop elements.

Next, you hit a conditional `if` statement ①, where you test to see if the drag element's parent node's ID is the same as the drop target id and exercises the control where you don't want to perform a drop operation on a drop target where the drag element is already a child. If the drop target element is not the same as the drag element's parent, then you allow the drop operation to occur; otherwise, you call the `onInvalidDrop` method, which you'll code shortly.

The code to physically move the drag element from one parent container to another is simple. Call the drop element's `appendChild` ② method, passing in the drop element. Remember that even though `Ext.dd.DD` allows you to move the drag element onscreen, it only changes the X and Y coordinates. If you don't move the drag element to another parent node, it will still be a child of its original container element.

Next, you call the `onDragOut` override ③, which will clear the drop invitation. Notice that you're passing the `evtObj` and `targetElId` arguments to the `onDragOut` method. This is so the `onDragOut` method can do its job as designed.

Last, you clear the element's `style.position` attribute. Recall that `DD` sets the position to `relative`, which isn't needed after the node has been moved from one parent container to another.

This ends the override of the `onDragDrop` method. Figure 13.10 shows what this does to our page. As illustrated in this figure, we can successfully drop male and female elements onto both the pool and hot tub drop elements, which successfully demonstrates our `onDragDrop` method in action.

Although it's nice that males and females can now be dropped into the pool or hot tub, you can't let them stay in there forever or they'll prune. You need to be able to pull them out and put them back in the locker room. What happens if you try to drag them over their respective locker room? No invitation. Why? Correct. It's because you haven't registered the locker room elements as `DDTargets`. Let's do that now.

```
var mlrDDTarget = new Ext.dd.DDTar get('maleLockerRoom', 'males');
var flrDDTarget = new Ext.dd.DDTar get('femaleLockerRoom', 'females');
```

Adding this code to the bottom of your drag/drop implementation allows the male drag elements to be invited and dropped on every drop target except for the female locker room. Likewise, female drag elements can be dropped on any drop target except the male locker room. This follows the paradigm where most public places don't have coed locker rooms. We now have the drop operations completely developed. The last piece to this implementation is the invalid drop behavior set, which is what we'll work on next.

13.3.3 Implementing invalid drop

We've implemented drop invitation and valid drop to our example set. I'm sure by now you've noticed that when you drop a node anywhere onscreen other than a valid drop point, the element stays stuck where it was dropped. This is because you need to set up the invalid drop behavior that will place the element back in its original position.

We'll do this with style using the `Ext.fx` class. The following listing replaces the `b4StartDrag` and `onInvalidDrop` methods in the `overrides` object.

Listing 13.5 Cleaning up after invalid drop

```
b4StartDrag : function() {
    var dragEl = Ext.get(this.getEl());
    this.originalXY = dragEl.getXY();
},
onInvalidDrop : function() {
    this.invalidDrop = true;
},
endDrag : function() {
    if (this.invalidDrop === true) {
        var dragEl = Ext.get(this.getEl());
        // 1 Override b4StartDrag method
        // 2 Store original coordinates
        // 3 Set this.invalidDrop to true
        // 4 Animate drag element return
    }
}
```

```

var animCfgObj = {
    easing : 'elasticOut',
    duration : 1,
    callback : function() {
        dragEl.dom.style.position = '';
    }
};
dragEl.moveTo(this.originalXY[0], this.originalXY[1], animCfgObj) ←
delete this.invalidDrop;
},
}

```

5 Create animation config
6 Reset drag element's position
7 Animate reset of drag element

In listing 13.5, you first override the `b4StartDrag` ① method, which is called the moment a drag element is dragged. At this juncture you can store the drag element's original X and Y coordinates ②, which will be used for the repair operation. To *repair* an invalid drop means to reset the position of the drag element or proxy (as you'll see in a bit) to its position before the drag operation took place.

Next, you override `onInvalidDrop` ③, which is called when the drag item is dropped on anything other than a valid drop point, which is associated with the same group. In that method, all you do is set the local `invalidDrop` property to true, which will be used in the next method, `endDrag`.

Last, you override the `endDrag` method, which will perform the repair operation if the local `invalidDrop` property is set to true ④. It also uses the local `originalXY` property set by the `b4StartDrag` method. This method creates a configuration object for the animation ⑤.

In the configuration object, you set the `easing` to '`elasticOut`', which will give the element a nice springy or elastic end to the animation, and set the `duration` to one second. This ensures the animation is smooth and not jerky. You also create a callback method to reset the drag element's `style.position` attribute ⑥, which ensures that the drag element fits exactly where it needs to go.

NOTE If you wanted to forgo the animation and just reset the position of the drag element, all `onInvalidDrop` has to do is set the `style.position` to an empty string, like so: `dragEl.dom.style.position = '';`.

Next, you call the drag element's `moveTo` method, passing in the X and Y coordinates as the first and second parameters and the animation configuration object as the third. This invokes the animation on your drag element.

Last, you delete the local `invalidDrop` reference, because it's no longer needed. You'll need to refresh the page to see these three override methods at work.

When you drag an element and drop it anywhere other than an associated drop element, you see that it slides back to its original position and has a cool springy effect when it gets to its target X and Y coordinates ⑦.

You've now seen what it takes to implement drag and drop with the `Ext.dd.DD` and `Ext.dd.DDTTarget` classes. Next, you'll see how to implement the `DDProxy` class, which is similar.

13.4 Using the DDProxy

The use of drag proxies in drag-and-drop implementation is common and is worth going over because the implementation is similar to DD but not quite the same. This is because the DDProxy allows you to drag around a lightweight version of the drag element, which is known as the *drag proxy*. Using the DDProxy could result in huge performance savings if the drag element is complex. Part of the performance savings comes from the fact that every instance of DDProxy uses the same proxy div element in the DOM. Remembering that the drag proxy is the element being moved around onscreen will help you understand our implementation code.

In this exercise, we'll use the same HTML and CSS that we used before, and we'll provide the pattern that you'll need to use if you plan on using drag proxies in your drag-and-drop implementations.

The first thing you'll need to do is add one more CSS rule to your page, which will style the drag proxy with a yellow background:

```
.ddProxy {
    background-color: #FFFF00;
}
```

We'll follow the exact same flow as we did with implementing the DD class. In doing this, you'll see that implementing the DDProxy takes a bit more code than the DD class.

13.4.1 Implementing DDProxy and drop invitation

The DDProxy class is responsible for creating and managing the X and Y coordinates of the reusable proxy element, but it's up to you to style it and fill it with content. You'll do this by means of overriding the startDrag method instead of the b4Drag method as you did with the DD implementation.

In the following listing, you'll create the overrides object along with the instance of DDProxy. This listing is rather long, but you're accomplishing quite a bit.

Listing 13.6 Implementing the drop invitation

```
var overrides = {
    startDrag : function() {
        var dragProxy = Ext.get(this.getDragEl());
        var dragEl = Ext.get(this.getEl());

        dragProxy.addClass('lockerRoomChildren');
        dragProxy.addClass('ddProxy');
        dragProxy.setOpacity(.70);
        dragProxy.update(dragEl.dom.innerHTML);
        dragProxy.setSize(dragEl.getSize());
        this.originalXY = dragEl.getXY();
    },
    onDragEnter : function(evtObj, targetElId) {
        var targetEl = Ext.get(targetElId);
        targetEl.addClass('dropzoneOver');
    },
}
```

1 Override startDrag method

2 Stylize DragProxy

3 Add drop invitation

```

onDragOut : function(evtObj, targetElId) {
    var targetEl = Ext.get(targetElId);
    targetEl.removeClass('dropzoneOver');
},
onInvalidDrop : function() {
    this.invalidDrop = true;
},
onDragDrop : Ext.emptyFn
};

var maleElements = Ext.get('maleLockerRoom').select('div');
Ext.each(maleElements.elements, function(el) {
    var dd = new Ext.dd.DDProxy(el, 'males', {
        isTarget : false
});
Ext.apply(dd, overrides);
});

var femaleElements = Ext.get('femaleLockerRoom').select('div');
Ext.each(femaleElements.elements, function(el) {
    var dd = new Ext.dd.DDProxy(el, 'females', {
        isTarget : false
});
Ext.apply(dd, overrides);
});

```

4 Add onDragDrop stub

In listing 13.6, you accomplish the tasks of stylizing the proxy, adding the drop invitation, and instantiating the instances of `Ext.dd.DDProxy` for each of the elements. Here's how this all works.

The `startDrag` method ① takes care of stylizing the drag element by first adding the `lockerRoomChildren` and `ddProxy` CSS classes ② to the `DragProxy` element. Next, it sets the proxy's opacity to 70 percent and duplicates the HTML contents of the drag element. It then sets the size of the `DragProxy` to the size of the drag element. Then the `originalXY` property is set, which will be used for an invalid-drop repair operation down the road.

Next, you add the drop invitation by means of overriding the `onDragEnter` and `onDragOut` methods ③. This is exactly the same as the prior implementation. The `onInvalidDrop` override is the same as before as well. The last override is a stub for the `onDragDrop` method ④, which you'll fill out in just a bit.

Before you can use the drop invitation, you have to set up the drop targets for the pool, hot tub, and locker room elements:

```

var poolDDTarget = new Ext.dd.DDTTarget('pool', 'males');
poolDDTarget.addToGroup('females');

var hotTubDDTarget = new Ext.dd.DDTTarget('hotTub', 'females');
hotTubDDTarget.addToGroup('males');

var mlrDDTarget = new Ext.dd.DDTTarget('maleLockerRoom', 'males');
var flrDDTarget = new Ext.dd.DDTTarget('femaleLockerRoom', 'females');

```

Now that you have those set up, let's try out the `DDProxy` implementation we've cooked up thus far. Refresh your page and drag around a drag element.

Figure 13.11 illustrates what the drag proxy looks like in action.

As you can see, performing a drag gesture on a draggable element produces the DragProxy, which is dragged around while the drag element itself remains stationary. You can also see that the drop invitation works. What happens when you drop the drag element on a valid or invalid drop target?

In both cases, the drag element is moved to the DragProxy's last known coordinates, which mimics the behavior of the DD class without the valid and invalid drop behavior constraints.

Let's add those next. The following listing wraps up our DDProxy implementation.

Listing 13.7 Adding the valid and invalid drop behaviors

```
onDragDrop : function(evtObj, targetElId) {
    var dragEl = Ext.get(this.getEl());
    var dropEl = Ext.get(targetElId);

    if (dragEl.dom.parentNode.id != targetElId) {
        dropEl.appendChild(dragEl);
        this.onDragOut(evtObj, targetElId);
        dragEl.dom.style.position = '';
    }
    else {
        this.onInvalidDrop();
    }
},
b4EndDrag : Ext.emptyFn,
endDrag : function() {
    var dragProxy = Ext.get(this.getDragEl());

    if (this.invalidDrop === true) {
        var dragEl = Ext.get(this.getEl());

        var animCfgObj = {
            easing : 'easeOut',
            duration : .25,
            callback : function() {
                dragProxy.hide();
                dragEl.highlight();
            }
        };
        dragProxy.moveTo(this.originalXY[0],
                         this.originalXY[1], animCfgObj);
    }
    else {
        dragProxy.hide();
    }
    delete this.invalidDrop;
}
```

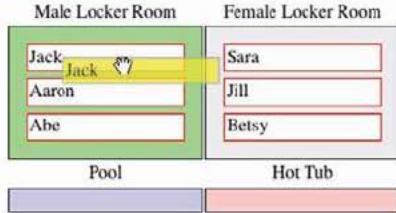


Figure 13.11 The DDProxy in action with one of our male drag elements

- 1 Override onDragDrop method
- 2 Prevent proxy from hiding before drag ends
- 3 Override endDrag method
- 4 Execute repair animation
- 5 Hide drag proxy if valid drop

In listing 13.7 you finish up the rest of our `DDProxy` implementation by adding the `onDragDrop`, `b4EndDrag`, and `endDrag` overrides.

The `onDragDrop` ① method is exactly the same as the `DD` implementation, where if the drop element is not the same as the drag element's parent, you allow the drop to occur, moving the node to the drop element. Otherwise, you call the `onInvalidDrop` method, which sets the `invalidDrop` property to `true`.

The `b4EndDrag` ② method is an intentional override using the `Ext.emptyFn` (empty function) reference. You do this because the `DDProxy`'s `b4EndDrag` method will hide the `DragProxy` before the `endDrag` method is called, which conflicts with the animation that you want to perform. And because it would be wasteful to allow the `DragProxy` to be hidden and then show it, you prevent it from hiding by overriding `b4EndDrag` with a function that does nothing.

As in the `DD` implementation earlier, the `endDrag` ③ method is tasked with doing the repair if the `invalidDrop` property is set to `true` ④. But instead of animating the drag element itself, it animates the `DragProxy`. The animation uses the `easeOut` easing to allow for a smoother animation finish. The callback will hide the `DragProxy` and then call the `highlight` effect method of the drag element, animating the background from yellow to white.

Last, if the `endDrag` was called with the `invalidDrop` property not set, it hides ⑤ the proxy element from view, completing your `DDProxy` implementation.

As you've seen, implementing the full gamut of drag and drop with generic DOM elements requires some work and understanding of basics of the drag-and-drop class hierarchy. The reward is a cool way to drag and drop elements across the screen, adding that extra bit of functionality for your users.

13.5 Summary

In this chapter we explored the basics of drag and drop and implemented two types of drag behaviors with DOM nodes, which pave the way for you to learn to implement this behavior with the UI widgets.

Along the way, we explored the basics of drag and drop and took some time to discuss its behavior model. We took a good look at the drag-and-drop mini-framework, and you learned that the classes can be grouped into two major categories: drag and drop. While discussing the class hierarchy you learned what each class is designed for.

Afterward, you learned what it takes to implement drag and drop with DOM nodes with constraints using drag groups. We discussed some of the common methods that need to be overridden to make this possible. You got to play with the cool "elastic" easing when developing the repair of the drag element.

In the last stretch, we took our basic drag-and-drop implementation and modified it to use drag proxies. You learned how to properly code a repair operation, which differs from the repair for the `DD`.

Next, we'll exercise our basic knowledge of drag and drop, and you'll learn to implement drag and drop with three UI widgets, `DataView`, `GridPanel`, and `TreePanel`, where you'll learn of the different vectors for implementing this behavior.

14

Drag and drop with widgets

This chapter covers

- Learning drag and drop with Ext JS widgets
- Implementing drag and drop with the `DataView`
- Exercising drag and drop between `GridPanels`
- Creating two drag-and-drop `GridPanels`
- Tackling drag and drop with the `TreePanel`
- Applying `TreePanel` drag-and-drop restrictions

When developing your projects, it's easy to produce context Menus and Buttons to perform certain actions, such as moving a Record from one grid to another. But users always crave an easier way to perform those actions. Providing drag and drop behavior to your applications will allow your users to accomplish these tasks much more effectively. The less mouse clicking users have to do, the happier they ultimately are.

In this chapter we'll explore applying this behavior to the three widgets that drag and drop is commonly used with: `DataView`, `GridPanel`, and `TreePanel`. As we

do that, we'll descend farther into the DragDrop class hierarchy and touch on the DragZone and DropZone classes and their descendants.

You'll learn about the different implementation patterns that are required to get drag and drop working with each of these widgets, and we'll discuss some of the hidden tricks and inner workings of the drag-and-drop classes.

Because the nature of this behavior is complex, this will be a code-heavy chapter.

14.1 A quick review of the drag-and-drop classes

Before we get down to implementing drag and drop with widgets, we'll do a quick review of the DragDrop class hierarchy, shown in figure 14.1. This will give you a good picture of the road ahead and help you understand what classes to use and why.

In the last chapter, we covered the DD and DDPProxy drag classes and the DDTTarget drop class. Recall that we utilized those classes because they were designed for single-node drag-and-drop applications, which met our requirements at that time.

Each of the widgets we'll use to employ drag and drop has selection models that allow for multiple node selections. This means that we'll leverage the classes designed for handling that. The DragSource and DropTarget classes are technically designed to handle this type of drag-and-drop behavior. But we're going to start with the DragZone and DropZone classes. Here's why.

Although the DragSource has all of the necessary mechanics to handle multinode drag operations, the DragZone class goes a few steps further and adds useful features like managing the scroll bar of a container if the container is scrollable. You'll see this in action when we employ drag and drop with DataViews in just a bit.

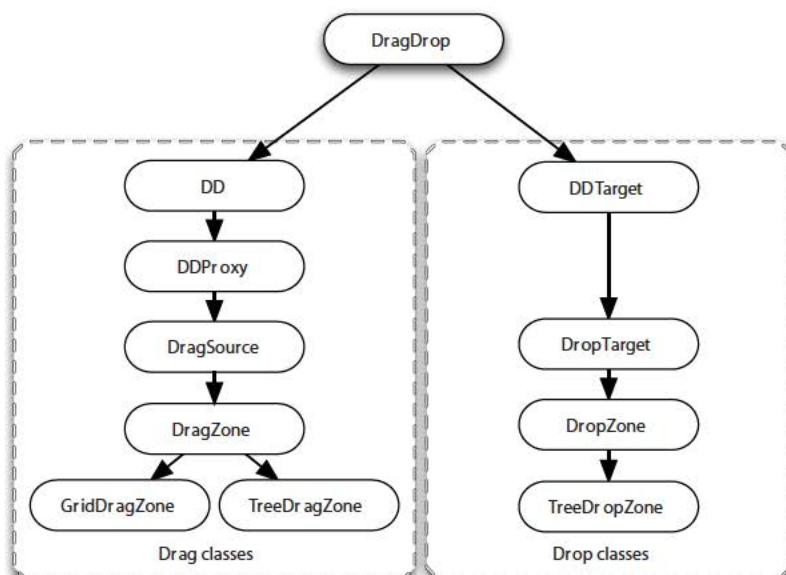


Figure 14.1 The DragDrop class hierarchy



Figure 14.2 The outcome of our `DataView` construction

The `DropZone` class adds features to the `DropTarget` class, such as being able to track the nodes that the drag element is currently hovering over, which makes it easy to allow for precision drop operations of a drag node to specific indexes. You'll get a chance to exercise this when we learn how to employ drag and drop with `GridPanels` a little later on.

You now know more about our starting point. Because the application of drag and drop with `DataViews` provides essential information for the `GridPanel` and `TreePanel` implementations, we'll begin with it.

14.2 Drag and drop with `DataViews`

We've been tasked to develop something that will allow managers to track employees who are on staff or on vacation using simple drag-and-drop gestures. We'll construct two `DataViews`, both of which are similar to the ones we constructed earlier. To use them, we'll make some slight modifications, which will include enabling multiple-node selection. Figure 14.2 shows the two `DataViews` encapsulated in an instance of `Ext.Window`.

Now that you know what we're going to build, let's begin.

14.2.1 Constructing the `DataViews`

You'll start by creating the CSS required to style the elements within the `DataView`. The drag-and-drop-related CSS will be included, so let's get it out of the way.

Listing 14.1 Setting up the CSS for our `DataViews`

```
<style type="text/css">
    .emplWrap {
        border: 1px #999999 solid;
        -moz-border-radius: 5px;
        -webkit-border-radius: 5px;
        margin : 3px;
        padding : 3px;
```

1 Style the entire employee template

```

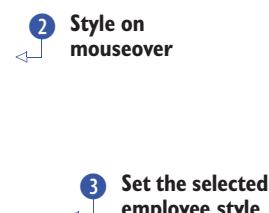
        background-color: #ffffcc;
    }

.emplOver {
    border: 1px #9999ff solid;
    background-color: #ccccff;
    cursor: pointer;
}

.emplSelected {
    border: 1px #66ff66 solid;
    background-color: #ccffcc;
    cursor: pointer;
}

.emplName {
    font-weight: bold;
    margin-left: 5px;
    font-size: 14px;
    text-decoration: underline;
    color: #333333;
}

.emplAddress {
    margin-left: 20px;
}
</style>
```



2 Style on mouseover

3 Set the selected employee style

In the CSS in listing 14.1, you style how each employee div will look in the DataViews. An unselected employee element will have a yellow background ①, similar to that of a manila folder. When the mouse hovers over the name of an employee, it will use the `emplOver` ② CSS class to style it blue. When selected, the employee will be colored green using the `emplSelected` ③ CSS class.

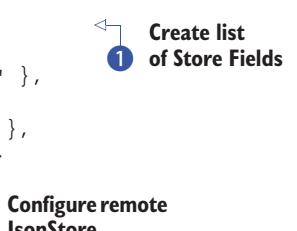
You now have the CSS in place for your future DataViews to use. Next, you'll configure the two stores that will be consumed by the different DataViews.

Listing 14.2 Configuring the stores for the DataViews

```

var storeFields = [
    { name : "id",           mapping : "id" },
    { name : "department",   mapping : "department" },
    { name : "email",         mapping : "email" },
    { name : "firstname",    mapping : "firstname" },
    { name : "lastname",     mapping : "lastname" }
];

var onStaffStore = {
    xtype      : 'jsonstore',
    autoLoad   : true,
    proxy      : new Ext.data.ScriptTagProxy({
        url : 'http://extjsinaction.com/examples/chapter12/getEmployees.php'
    }),
    fields    : storeFields,
```



1 Create list of Store Fields

2 Configure remote JsonStore

```

        sortInfo : {
            field      : 'lastname',
            direction : 'ASC'
        }
    };

var onVactaionStore = {
    xtype     : 'jsonstore',
    fields   : storeFields,
    autoLoad : false,
    sortInfo : {
        field      : 'lastname',
        direction : 'ASC'
    }
};

```



In listing 14.2, you create a list of fields ① and two configuration objects for JsonStores. The first JsonStore ② uses a ScriptTagProxy to fetch the list of employees, whereas the second JsonStore ③ sits quietly, waiting for Records to be inserted upon a drop gesture.

Now that you have the data Stores configured, you can create the DataViews, as shown in the following listing.

Listing 14.3 Constructing the two DataViews

```

var dvTpl = new Ext.XTemplate(
    '<tpl for=".">' ,
    '<div class="emplWrap" id="employee_{id}">',
        '<div class="emplName">{lastname}, {firstname}</div>',
        '<div><span class="title">Department:</span> {department}</div>',
        '<div>',
            '<span class="title">Email:</span><a href="#">{email}</a>',
        '</div>',
        '</div>',
    '</tpl>'
);

var onStaffDV = new Ext.DataView({
    tpl           : dvTpl,
    store         : onStaffStore,
    loadingText   : 'loading..',
    multiSelect   : true,
    overClass     : 'emplOver',
    selectedClass : 'emplSelected',
    itemSelector  : 'div.emplWrap',
    emptyText     : 'No employees on staff.',
    style         : 'overflow:auto; background-color: #FFFFFF;'
});

var onVactionDV = new Ext.DataView({
    tpl           : dvTpl,
    store         : onVactaionStore,
    loadingText   : 'loading..',
    multiSelect   : true,

```



```

overClass      : 'emplOver',
selectedClass : 'emplSelected',
itemSelector   : 'div.emplWrap',
emptyText     : 'No employees on vacation',
style         : 'overflow:auto; background-color: #FFFFFF;',
});

```

In listing 14.3, you configure and construct the two DataViews starting with a common XTemplate instance ①. The onStaffDV ② will consume the data from the onStaffStore to load the list of employees currently on staff, whereas the onVacationDV ③ will use the unpopulated onVacationStore.

We could render the DataViews onscreen, but I think they'd look better inside a Window and standing side by side with an HBoxLayout, as in the following listing.

Listing 14.4 Placing the DataViews inside a Window

```

new Ext.Window({
    layout      : 'hbox',
    height     : 400,
    width      : 550,
    border     : false,
    layoutConfig: { align : 'stretch' },
    items       : [
        {
            title  : 'Employees on staff',
            frame  : true,
            layout : 'fit',
            items  : onStaffDV,
            flex   : 1
        },
        {
            title  : 'Employees on vacation',
            frame  : true,
            layout : 'fit',
            id     : "test",
            items  : onVacationDV,
            flex   : 1
        }
    ]
}) .show();

```

1 Instantiate a Window for DataViews

2 Place DataViews inside Panels

In listing 14.4 you create an instance of `Ext.Window` ① that utilizes the `HBoxLayout` to place two panels side by side with an equal width and their height stretched to fit the Window's body. The panel on the left will contain the on-staff DataView ②, whereas the panel on the right will contain the DataView for vacationers, as shown in figure 14.3.

You can see that our DataViews have rendered properly, with the on-staff employees appearing on the left and no one currently on vacation. With that, we've set the stage for applying drag and drop.



Figure 14.3 Our rendered `DataViews` inside an `Ext.Window`

14.2.2 Adding drag gestures

The application of drag and drop with `DataViews` arguably requires the most effort when compared to the `GridPanel` and `TreePanel`. This is because, unlike those widgets, the `DataView` class doesn't have its own `DragZone` implementation subclass for us to build upon, which means that we'll have to craft our own implementation of `DragZone`. Likewise, we'll have to develop an implementation of `DropZone` to manage the drop gestures.

The `DragZone` class uses a special proxy known as a `StatusProxy`, which will use icons to indicate whether a successful drop is possible. Figure 14.4 shows what they typically look like.

The `StatusProxy` by default is extremely lightweight and efficient but somewhat boring. Although it provides useful information, it's far from fun to use. We'll take advantage of the ability to customize the `StatusProxy` look to spice up the drag gestures and make them much more enjoyable and informational. Another feature that `DragZone` adds is automated repair of an invalid drop scenario, which reduces the amount of code that we need to generate to get this stuff working.

We'll begin by creating the overrides that will be applied to the instance of `DragZone` that we'll create afterwards. Because the `DataViews` *must* be rendered in order to have drag and drop applied, you'll need to insert the following code below that of listing 14.4.

Listing 14.5 Creating the `DragZone` overrides

```
var dragZoneOverrides = {
    containerScroll : true,
    scroll          : false,
    getDragData     : function(evtObj) {
```

- 1 Automatically scroll destination container
- 2 Prevent document.body from scrolling
- 3 Override `getDragData` method



Figure 14.4 The `StatusProxy`, indicating that a drop is possible (left) or not (right)

```

var dataView = this.dataView;
var sourceEl = evtObj.getTarget(dataView.itemSelector, 10);      ↗
if (sourceEl) {                                                 4
    var selectedNodes = dataView.getSelectedNodes();
    var dragDropEl = document.createElement('div');

    if (selectedNodes.length < 1) {
        selectedNodes.push(sourceEl);
    }

    Ext.each(selectedNodes, function(node) {
        dragDropEl.appendChild(node.cloneNode(true));
    });
    return {
        ddel          : dragDropEl,
        repairXY     : Ext.fly(sourceEl).getXY(),
        dragRecords   : dataView.getSelectedRecords(),
        sourceDataView : dataView
    };
}

},
getRepairXY: function() {
    return this.dragData.repairXY;
}
};

```

In listing 14.5, you create the override properties and methods that will be applied to the future instances of DragZone. Even though the amount of code is relatively small, there's a lot going on that you need to be aware of. Here's how all of this works.

Initially, you set two configuration properties that help manage scrolling when a drag operation is under way. The first is `containerScroll` ①, which is set to `true`. Setting this property to `true` instructs the DragZone to call `Ext.dd.ScrollManager.register`, which will help manage the scrolling of a DataView when scrolling operations are in effect. We'll examine this in detail when we look at the DataView after the application of DragZone.

The next property, `scroll` ②, is set to `false`. Setting this to `false` prevents the `document.body` element from scrolling when the drag proxy is moved out of the browser's viewport. Keeping the browser canvas fixed during drag-and-drop operations will increase its effectiveness.

Next, you override `getDragData` ③, which is an extremely important method to the multinode drag-and-drop application. The purpose of `getDragData` is to construct what's known as the *drag data object* that you'll see returned toward the end of this method. It's important to note that the drag data object that will be generated and returned by the `getDragData` method will be cached on the instance of the `dropZone` and can be accessed via the `this.dragData` reference. You'll see this in action in the `getRepairXY` method later on.

In this method, you first set a reference to the element that the drag gesture was initiated with ④ `sourceEl`. You'll use it later to update the `StatusProxy` if the number

of selected nodes the `DataView` thinks it has is wrong. You also create a container element, `dragDropEl`, that will be used to contain copies of the selected nodes during drag, and it will be placed in the `StatusProxy`.

NOTE The presence of `sourceEl` is tested in order for the rest of the method to continue. `getDragData` is called upon the mouse-down event of the element that's registered with the `DragZone`. This means that `getDragData` will be called even if the `DataView` element itself is clicked instead of a record element, which would cause the method to fail.

Next, you interrogate the number of items the `DataView` thinks it has selected during the drag operation. If the number of `selectedNodes` ⑤ is less than 1, you append the element that the drag gesture was started with. You do this because sometimes a drag gesture is initiated before the `DataView` can register an element as visually selected. This is a quick fix to this odd behavior.

You then use `Ext.each` ⑥ to loop through the `selectedNodes` list, appending it to the `dragDropEl`. This will help customize the `StatusProxy` and give the appearance that the user is dragging over a copy of the selected node(s).

In the last chunk of this override, you return an object that will be used to update the `StatusProxy` and any drop operations. The only required property that's to be passed in this object is `dde1`, which will be placed inside the `StatusProxy`.

For this implementation, you add a few other useful properties to the custom drag data object. First is `repairXY`, which is an array of the X and Y coordinates of the element that the drag gesture was initiated on. This will be used later on to help the invalid drop repair operation.

Also included is `dragRecords`, which contains a list of instances of `Ext.data.Record` for each of the nodes selected and being dragged. Last, you set `source DataView` as the reference of the `DataView` for which this `DragZone` is being used. Both `dragRecords` and `source DataView` properties will help the application of `DropZone` to remove the dropped records from the source `DataView`.

The last method in the list of overrides is `getRepairXY`, which returns the locally cached data object's `repairXY` property and helps the repair operation know where to animate the `StatusProxy` on an invalid drop.

You've now set your overrides, so it's time to instantiate instances of `DragZone` and apply them to the `DataViews`, as shown in the following code.

Listing 14.6 Applying DragZone to the Dataviews

```
var onStaffDragZoneCfg = Ext.apply({}, {
    ddGroup      : 'employeeDD',
    dataView     : onStaffDV
}, dragZoneOverrides);

new Ext.dd.DragZone(onStaffDV.getEl(), onStaffDragZoneCfg);

var vacationDragZoneCfg = Ext.apply({}, {
```

Custom copy of
① dragZoneOverrides

```

ddGroup      : 'employeeDD',
dataView     : onVactionDV
}, dragZoneOverrides);

new Ext.dd.DragZone(onVactionDV.getEl(), vacationDragZoneCfg);

```

In listing 14.6, you use Ext.apply to create a custom copy of the dragZoneOverrides object for the employment of DragZone targeted at the on-staff DataView ①. The custom copy of the overrides will include a ddGroup property. Both DragZone implementations will share this. What makes each copy special is the dataView property, which references the DataView that's attached to the DragZone and is used by the getDragData method you created earlier. The same pattern is used to set up the DragZone for the vacation DataView.

One thing you may notice is that unlike the implementation of DDTarget in the last chapter, you don't apply the overrides to the instance of DragZone. This is because DragZone's superclass, DragSource, takes care of that for you automatically, as Ext.Component does.

Refreshing your project page will allow you to exercise drag operations. You can also see your customized StatusProxy in action. Mine is shown in figure 14.5.

You can see that selecting and dragging one or more Records in the on-staff DataView reveals the StatusProxy with the copies of the selected nodes, which makes the drag operation nicer and much more fun to use.

You can also see the getRepairXY method in action by dropping the drag proxy anywhere on the page. The animation will make the drag proxy slide toward the X-Y coordinates of the element where the drag operation was initiated.

To exercise the ScrollMgr's scroll-management capabilities, you'll need to initiate a drag gesture and hover the mouse over what I like to call the auto-scroll zones, as illustrated in figure 14.6.

As you can see in this figure, hovering the mouse in the zones highlighted by the boxes will result in the DataView automatically scrolling until it can no longer move.

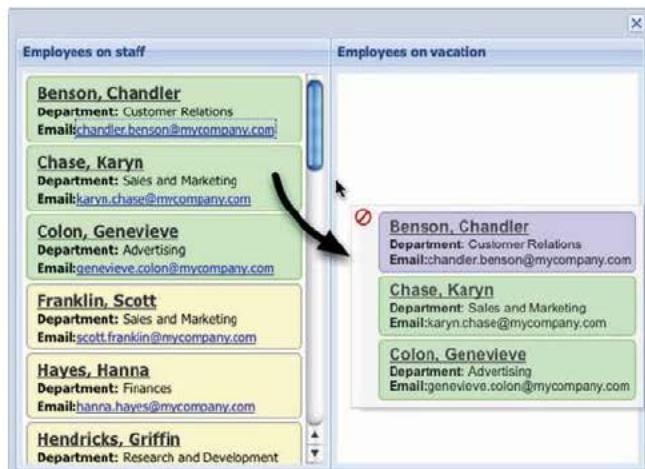


Figure 14.5 DragZone with a custom DragProxy

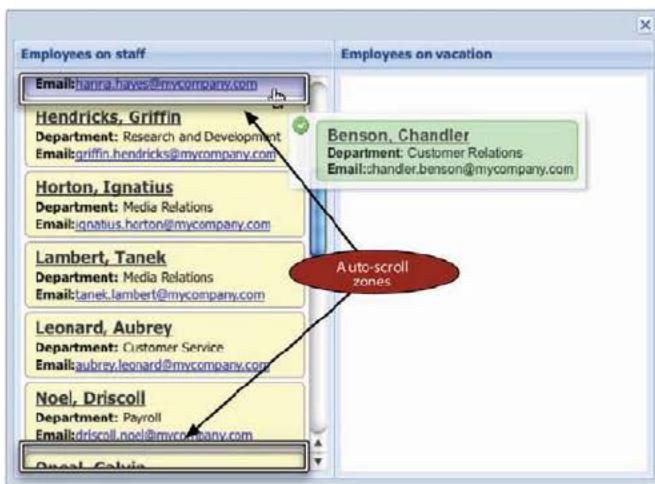


Figure 14.6 The areas where automatic scrolling will take place

You've probably already noticed that when you drag the nodes above the vacation DataView, the StatusProxy shows an icon indicating that the drop won't be successful. This is because we haven't employed a DropZone, which is what we'll do next.

14.2.3 Applying drop

Just like for our previous drag-and-drop applications, we must register a drop target of sorts for the drag classes to interact with. As we discussed before, we'll use the DropZone class. Following the pattern for this, you'll create in the following listing an overrides object, which will handle the drop gestures and is much easier to implement relative to drag gestures.

Listing 14.7 Creating the DropZone overrides

```
var dropZoneOverrides = {
    onContainerOver : function() {
        return this.dropAllowed;
    },
    onContainerDrop : function(dropZone, evtObj, dragData) {
        var dragRecords = dragData.dragRecords;
        var store = this.dataView.store;

        var dupFound = false;
        Ext.each(dragRecords, function(record) {
            var found = store.findBy(function(r) {
                return r.data.id === record.data.id;
            });

            if (found > -1 ) {
                dupFound = true;
            }
        });
    }
};
```

1 Update StatusProxy

2 Search for duplicate records

```
if (dupFound !== true) {  
    Ext.each(dragRecords, function(record) {  
        dragData.source DataView.store.remove(record);  
    });  
    this.dataView.store.add(dragRecords);  
    this.dataView.store.sort('lastname', 'ASC');  
}  
return true;  
}  
};
```

3 Remove all records from source

4 Add records to destination

5 Sort records by last name

6 Indicate successful drop

In listing 14.7, you create an override object with two methods, to enable drop gestures to successfully occur with the two `DataViews`. The first is `onContainerOver` ①, which is used to determine whether the drop should be allowed. In this application, no processing is needed, but you need to at least return the `this.droppedAllowed` reference, which is a reference to the CSS class `x-dd-drop-ok` that provides the green check icon. If you wanted to use a custom icon, this is where you'd return a custom CSS class.

The next method, `onContainerDrop`, is where you'll process the dropped nodes, and it will be called by the instance of `DragZone` when the `mouseup` event fires. Remember that `DragZone` won't interact with the `DropZone` if both aren't participating in the same drag/drop group.

In this method, you use the `dragData` object that you created in your `DragZone` `getDragData` override. A local reference to the selected records (`dragRecords`) and the destination `DataView`'s `Store` (`store`) are created for later utilization.

Next, `onContainerDrop` searches for duplicate Records **②**. This is useful if you're attempting a copy instead of a move. If no duplicates are found, `Ext.each` is used to loop through the drag Records to remove them from the `source DataView's Store` **③**. The records are then added **④** to the destination `DataView's Store` and sorted **⑤** by last name in ascending order.

After all of the Record management has taken place, the `onContainerDrop` returns the Boolean value `true`. By returning `true`, you convince the `DragZone` that the drop was successful ⑥, and it doesn't initiate a repair animation. Any other value would indicate that the drop was unsuccessful, and a repair would occur.

Now that the overrides are in place, it's time to apply them to the `DataViews`, as shown in the following listing.

Listing 14.8 Creating the DropZone overrides

```

var onStaffDropZoneCfg = Ext.apply({}, {
    ddGroup : 'employeeDD',
    dataView : onStaffDV
}, dropZoneOverrides);

new Ext.dd.DropZone(onStaffDV.ownerCt.el, onStaffDropZoneCfg);

var onVacationDropZoneCfg = Ext.apply({}, {
    ddGroup : 'employeeDD',

```

```

        dataView : onVactionDV
    }, dropZoneOverrides);

new Ext.dd.DropZone(onVactionDV.ownerCt.el, onVacationDropZoneCfg);

```

In listing 14.8, you create custom copies of the dropZoneOverrides object for the implementation of DropZone for each of the DataViews and follow the same pattern that you used in listing 14.6, where you created instances of DragZone.

You can now see your end-to-end drag/drop application in action. Refresh your page and attempt a drag operation from the on-staff DataView to the vacation DataView, as shown in figure 14.7.

Dragging nodes from the employee DataView to the vacation DataView produces a StatusProxy that contains a green checkmark to indicate a drop invitation. Dropping the nodes invokes the onContainerDrop method, moving the Records from left to right, as shown in figure 14.8.

There you have it, drag and drop from one DataView to another with a good-looking StatusProxy. Because each DataView has its own attached instance of DragZone and DropZone, you can drag and drop items from one to the other, and the Records will automatically be sorted by last name.

You've learned how to apply drag and drop to two DataViews and that you're responsible for employing the full end-to-end code for both gestures. Next, we'll dive into the world of drag and drop with GridPanels, where you'll learn that the implementation pattern is different from that of the DataView.

14.3 Drag and drop with GridPanels

We've been approached by management to create something that will allow them to track whether departments need computer upgrades. They want to be able to somehow flag the departments that require an upgrade and change the order in which the departments will get upgraded.

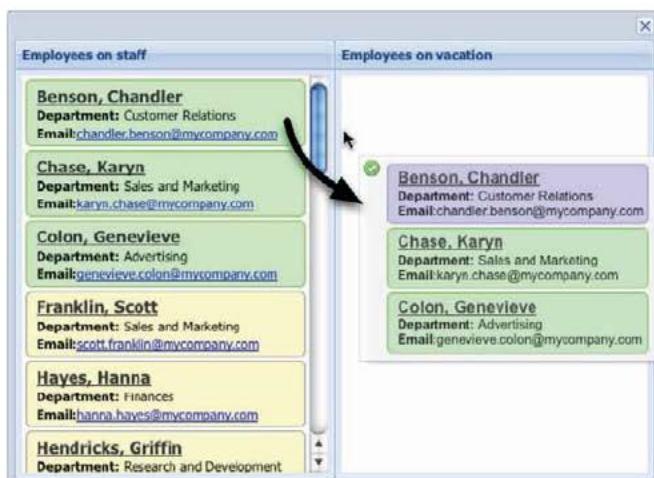


Figure 14.7
The StatusProxy now shows that a drop gesture can occur on the drop zone.



Figure 14.8
We've successfully dragged and dropped three Records from the left DataView to the right.

To get the job done, we'll use two GridPanels side by side, just like we did with the DataViews a short time ago. We'll put drag and drop into practice from GridPanel to GridPanel and allow for the reordering of departments in the list.

In this exercise, you'll learn that the application of drag and drop between two GridPanels is much simpler than for the DataView. This is mainly because GridPanels have their own DragZone subclass called GridDragZone, which takes care of half of the work for us. We're left to apply a DropZone and attach it to a good target element within the GridPanel.

In addition to exploring how to set up a DropZone with the GridPanel, we'll tackle one of the largest challenges that developers face, which is how to properly allow for drop gestures with the ability to select the index for the item to be dropped. This includes the ability for the GridPanel to allow for reordering self-drag-and-drop gestures.

We'll start by constructing two GridPanels that will live in a Window. The Window will manage the GridPanel dimensions by means of the HBoxLayout and is the same paradigm as the exercise we completed a short time ago.

14.3.1 Constructing the GridPanels

By now you should be comfortable with creating GridPanels and configuring their supported classes. In order to keep things moving, we'll pick up the pace a little. In the following listing you'll create the first GridPanel.

Listing 14.9 Creating the first GridPanel

```
var remoteProxy = new Ext.data.ScriptTagProxy({
    url : 'http://extjsinaction.com/examples/chapter12/getPCStats.php'
});

var remoteJsonStore = {
    xtype      : 'jsonstore',
    // ...
}
```

② Configuring
remote JSON store

Creating remote
ScriptTagProxy



```

proxy      : remoteProxy,
id        : 'ourRemoteStore',
root      : '',
autoLoad   : true,
totalProperty : 'totalCount',
fields     : [
    { name : 'department',      mapping : 'department' },
    { name : 'workstationCount', mapping : 'workstationCount' }
]
};

var depsComputersOK = new Ext.grid.GridPanel({
    title       : 'Departments with good computers',
    store       : remoteJsonStore,
    loadMask    : true,
    stripeRows : true,
    autoExpandColumn : 'department',
    columns    : [
        {
            header    : 'Department Name',
            dataIndex : 'department',
            id        : 'department'
        },
        {
            header    : '# PCs',
            dataIndex : 'workstationCount',
            width     : 40
        }
    ]
});

```

3 Instantiating first GridPanel

In listing 14.9, you create a remote ScriptTagProxy ①, which is utilized by the JsonStore ② and will fetch the data from extjsinaction.com. Next, you instantiate a GridPanel ③, which will use the previously created `remoteJsonStore` to display the departments.

In the next listing, you'll create the second GridPanel, which will be used to list the departments in need of an upgrade.

Listing 14.10 Creating the second GridPanel

```

var needUpgradeStore = Ext.apply({}, {
    proxy      : null,
    autoLoad   : false
}, remoteJsonStore);

var needUpgradeGrid = new Ext.grid.GridPanel({
    title       : 'Departments that need upgrades',
    store       : needUpgradeStore,
    loadMask    : true,
    stripeRows : true,
    autoExpandColumn : 'department',
    columns    : [
        {
            header    : 'Department Name',
            dataIndex : 'department'
        }
    ]
});

```

1 Copy of remoteJsonStore

2 Configure second GridPanel

```

        dataIndex : 'department',
        id         : 'department'
    },
    {
        header     : '# PCs',
        dataIndex : 'workstationCount',
        width     : 40
    }
]
});

```

In listing 14.10, you use `Ext.apply` ❶ to create a modified copy of the `remoteJsonStore`, which overrides the `proxy` parameter and sets `autoLoad` to `false`. This allows you to create a near duplicate of the `remoteJsonStore` but reuse most of the same properties, such as the fields.

Then you create the second instance of `GridPanel` ❷ for the departments that need to be upgraded. These `GridPanels` need a home. Next you'll create an `Ext Window` to display these in.

Listing 14.11 Giving the GridPanels a home

```

new Ext.Window({
    width     : 500,
    height    : 300,
    layout    : 'hbox',
    border    : false,
    defaults  : {
        frame   : true,
        flex    : 1
    },
    layoutConfig : {
        align : 'stretch'
    },
    items      : [
        depsComputersOK,
        needUpgradeGrid
    ]
}).show();

```

In listing 14.11 you create an `Ext Window`, which leverages the `HBoxLayout` to manage the two `GridPanels` that you configured earlier. Let's take them out for a test drive. The results are shown in figure 14.9.

The two `GridPanels` render perfectly in the `Window` as configured. Our next task is to configure them to enable drag and drop.

14.3.2 Enabling drag

To configure a `GridPanel` to enable drag gestures, all we need to do is add two properties to both of the `GridPanel` configuration objects, as follows:

```

enableDragDrop : true,
ddGroup       : 'depGridDD',

```

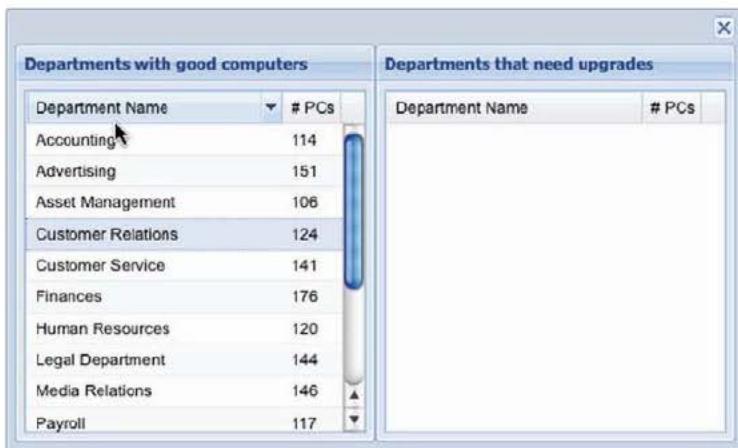


Figure 14.9
The two department
GridPanels
side by side

We can easily enable drag gestures with GridPanel because the GridView tests for the presence of the enableDragDrop (or enableDrag) in the GridPanel when it renders its UI. If the property is set, it will create an instance of GridDragZone and use the grid's ddGroup (drag/drop group) if present or a generic GridDD group.

When configuring drag and drop with GridPanels, I always like to specify a drag/drop group specific to the GridPanels that are to interact. If I don't, then all GridPanels with drag enabled would interact with one another, which could cause undesired effects and possibly lead to headaches down the road.

Refresh the GridPanel and see the drag gestures in action, as shown in figure 14.10. When attempting a drag gesture with the GridPanel on the left, you can see the StatusProxy appear with the number of rows selected. This is how the GridDragZone uses the getDragData method, where it displays the number of selected rows for the ddel property of the drag data object. Sound familiar?

You can see that the status proxy displays an unfavorable drop icon. This is because we haven't created a DropZone for the DragZone to interact with. Before we do that, we'll add some CSS styles that the DropZone will use to provide a better drop invitation.

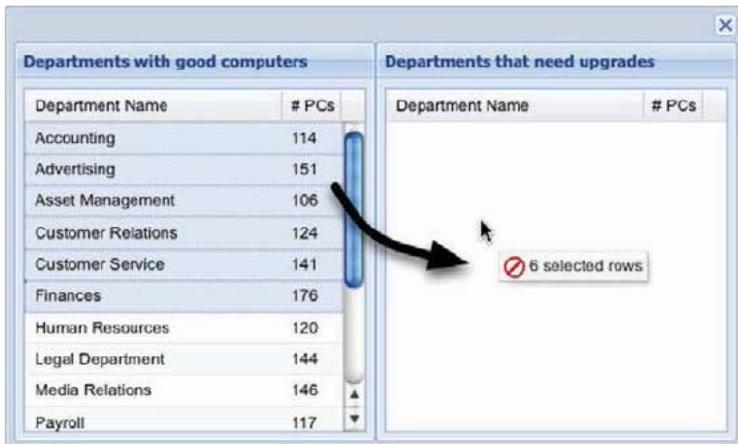


Figure 14.10
Drag gestures
enabled in the
GridPanel

14.3.3 Better drop invitation

Although the StatusProxy provides enough information to inform the user that a successful drop is possible, it doesn't provide feedback as to what index the drop operation will use, which is crucial to allow for the reordering of records.

We'll need some CSS rules to help us with this. Please add the styles in the following listing to the head of the page.

Listing 14.12 Adding some CSS styles to provide better drop invitation information

```
<style type="text/css">
    .gridBodyNotifyOver {
        border-color: #00cc33 !important;
    }
    .gridRowInsertBottomLine {
        border-bottom: 1px dashed #00cc33;
    }
    .gridRowInsertTopLine {
        border-top: 1px dashed #00cc33;
    }
</style>
```

Adding this CSS to the head of the document will enable you to provide a much better drop invitation to the user, which will allow them to accurately pinpoint which GridPanel they're going to be dropping on and in which row index they'll be inserting Records.

Now that we have that out of the way, we can begin the construction of the custom DropZone for our GridPanels.

14.3.4 Adding drop

Similar to the DataView drag-and-drop application, we can only instantiate instances of DropZone for the GridPanels after they're rendered. To simplify this process, add the code in listing 14.13 after the instantiation of Ext.Window.

You'll start by overriding the onContainerOver method, which will handle the necessary mouse movements to track what row the dragged Records are to be inserted on. The code to get the job done is pretty intense, but the results are well worth the effort.

Listing 14.13 Creating the Overrides object

```
var dropZoneOverrides = {
    ddGroup      : 'depGridDD',
    onContainerOver : function(ddSrc, evtObj, ddData) {
        var destGrid = this.grid;
        var tgtEl   = evtObj.getTarget();
        var tgtIndex = destGrid.getView()
            .findRowIndex(tgtEl);
        this.clearDDStyles();
        if (typeof tgtIndex === 'number') {
            var tgtRow      = destGrid.getView().getRow(tgtIndex);
            var tgtRowEl    = Ext.get(tgtRow);
```

 **Get index of element
on hover-over**

 **Is this a row?**

```

var tgtRowHeight = tgtRowEl.getHeight();
var tgtRowTop = tgtRowEl.getY();
var tgtRowCtr = tgtRowTop + Math.floor(tgtRowHeight / 2);
var mouseY = evtObj.getXY()[1];

if (mouseY >= tgtRowCtr) {                                ← 3 Is mouse
    this.point = 'below';
    tgtIndex++;
    tgtRowEl.addClass('gridRowInsertBottomLine');
    tgtRowEl.removeClass('gridRowInsertTopLine');
}
else if (mouseY < tgtRowCtr) {                            ← 4 Is it below
    this.point = 'above';
    tgtRowEl.addClass('gridRowInsertTopLine');
    tgtRowEl.removeClass('gridRowInsertBottomLine')
}
this.overRow = tgtRowEl;
}
else {
    tgtIndex = destGrid.store.getCount();                  ← 5 Append to
}
this.tgtIndex = tgtIndex;

destGrid.body.addClass('gridBodyNotifyOver');           ← 6 Add green
return this.dropAllowed;
},
notifyOut : function() {},
clearDDStyles : function() {},
onContainerDrop : function() {}
};

```

In listing 14.13, you create a `dropZoneOverrides` configuration object that contains the `ddGroup` property, `onContainerOver` implementation, and three stub methods that you'll fill in later. For now, we'll focus on the `onContainerOver` method. Here's how it works.

When the `DragZone` detects that the drag gesture is hovering over a like-group participating `DropZone`, it calls the `DropZone`'s `notifyOver` method, which calls `onContainerOver`. This occurs for each X and Y movement of the mouse while the mouse hovers over the `DropZone` element, which makes it perfect for detecting whether the drop gesture will result in an append, insert, or reorder operation.

In the `onContainerOver` implementation, you get the element that the mouse is hovering over (`tgtDiv`) and ask the `GridView` to find its index **1**. If `findRowIndex` returns a number, then you know that the mouse is hovering over a row that the `GridView` knows of, so the calculations to determine the insertion index can begin **2**.

To determine the exact coordinate of the target row, you must first get a reference to the row and wrap it with `Ext.Element`. From there, you use the helper methods to get the height and current coordinate. Next, you determine the center of the row and compare it to the mouse's Y position.

If the mouse's Y position is greater than or equal to the exact center of the target row's height, you know that the Record will be inserted *after* the target row **3**. You set

a local `this.point` property, increase the `targetIndex` value by one, and add the '`gridRowInsertBottomLine`' CSS class to the target row, providing the proper drop invitation to the user.

If the mouse's Y position is less than the target row's center, you know that the drop gesture will be an insert *above* the row ④. You set the `this.point` property accordingly and add the '`gridRowInsertTopLine`' CSS class to the row, which makes the top border green and dashed, providing the proper insertion index drop invitation.

When you drag over the `DropZone` element, the target index is set to the destination `GridPanel`'s Record count ⑤, which ensures that anything dropped is appended to the store.

Next, the target index is cached locally and the destination `GridPanel`'s body element has its border colored green, which assists with the drop invitation ⑥. Last, as for the `DataView` `DropZone` application, you return the `this.dropAllowed` reference to ensure the `StatusProxy` provides the correct drop invitation icon.

The last bit of this listing consists of three method stubs, `notifyOut`, `clearDDStyles`, and `onContainerDrop`, which will handle the clearing of the added drop invitation and handle the drop gesture. Let's fill in those method stubs with some functionality.

Listing 14.14 Creating the Overrides object

```
notifyOut : function() {
    this.clearDDStyles();
},
clearDDStyles : function() {
    this.grid.body.removeClass('gridBodyNotifyOver');
    if (this.overRow) {
        this.overRow.removeClass('gridRowInsertBottomLine');
        this.overRow.removeClass('gridRowInsertTopLine');
    }
},
onContainerDrop : function(ddSrc, evtObj, ddData) {
    var grid      = this.grid;
    var srcGrid   = ddSrc.view.grid;
    var destStore = grid.store;
    var tgtIndex  = this.tgtIndex;
    var records   = ddSrc.dragData.selections;

    this.clearDDStyles();

    var srcGridStore = srcGrid.store;
    Ext.each(records, srcGridStore.remove, srcGridStore);
    if (tgtIndex > destStore.getCount()) {
        tgtIndex = destStore.getCount();
    }
    destStore.insert(tgtIndex, records);
    return true;
}
```

1 Clear drop invitation upon drag out

2 Remove all drop invitation CSS

3 Complete the drop logic

4 Remove all Records

5 Insert dropped Records

In finalizing the `dropZoneOverrides` object, you add the clearing of the drop invitation that will appear on the destination `GridPanel` and rows (if applicable) and complete the code to move the Records from the source `GridPanel` to the destination. Here's how all of this works.

The `notifyOut` ① override is extremely simplistic and calls the `clearDDStyles` method defined underneath it. Remember that `notifyOut` is called when the dragged object is pulled away from the `DropZone`, which means you need to remove the drop invitation.

Next is the `clearDDStyles` ② method, which is custom and not a template method that's required to get drag and drop working. You add it because the `onContainerOver` method will add styles to the target row and target `GridPanel` body, which means you need a way to clear them, and it's always best to move commonly reused code to a separate method. You just saw that this method is being called by `notifyOut`, and it will be called by `onContainerDrop` as well.

The last method, `onContainerDrop` ③, works similarly to the employment of that method when you used `DropZones` for the `DataView`, where it's responsible for moving Records from one `Store` to another. Before it moves the Records, it calls `clearDDStyles` to remove any added drop invitation CSS rules. Next, it removes the dropped Records from the source `GridPanel` ④. Finally, it inserts the dropped Records into the destination `GridPanel` at the predetermined target index ⑤ and returns `true` to signal to the `DragZone` that the drop was successful.

Our `dropZoneOverrides` object is finished. In order to complete this picture, you need to employ instances of `DropZone` for the `GridPanels`, as shown in the following listing.

Listing 14.15 Employing DropZone for the GridPanels

```
var leftGridDroptgtCfg = Ext.apply({}, dropZoneOverrides, {
    grid : depsComputersOK
});
new Ext.dd.DropZone(depsComputersOK.el, leftGridDroptgtCfg);

var needdUpgradesDZCfg = Ext.apply({}, dropZoneOverrides, {
    grid : needUpgradeGrid
});
new Ext.dd.DropZone(needUpgradeGrid.el, needdUpgradesDZCfg);
```

In listing 14.15, you copy the `dropZoneOverrides` object ①, customizing it for each of the `GridPanels`, and then create instances of `DropZone` for each ②. If it looks familiar, that's because you instantiated instances of `DropZone` for the `DataViews` in the same way.

Our drag-and-drop implementation with `GridPanels` is now properly configured and ready to rock. Refresh the page and see how the drop invitations react, per the `onContainerOver` code, as shown in figure 14.11.

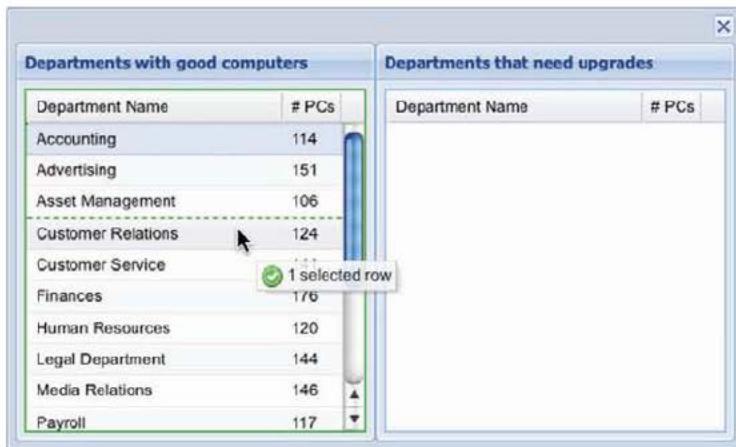


Figure 14.11
The drop invitation
with mouseover row-
tracking drop index

When you drag a Record above a Record in either of the two GridPanels, you see that the mouse movements are tracked properly, and when the mouse hovers over the top half of a row, that row's top border turns green and appears dashed.

Likewise, hovering the mouse below the bottom half of a row will make the row's bottom border appear green and dashed, indicating that a drop of the dragged Record will insert it below the row that you're currently hovering over, as demonstrated in figure 14.12.

And dropping the Record at the indicated position results in the Record being moved to that position. Likewise, dropping a Record from one grid to another results in the Record being moved as commanded, which concludes our GridPanel to GridPanel drag and drop. Notice that if a drop occurs on anything other than a row, the Record is appended to the destination Store.

You've learned that in order to make drag and drop between GridPanels possible, you don't have to instantiate a DragZone but instead only need to set enableDragDrop

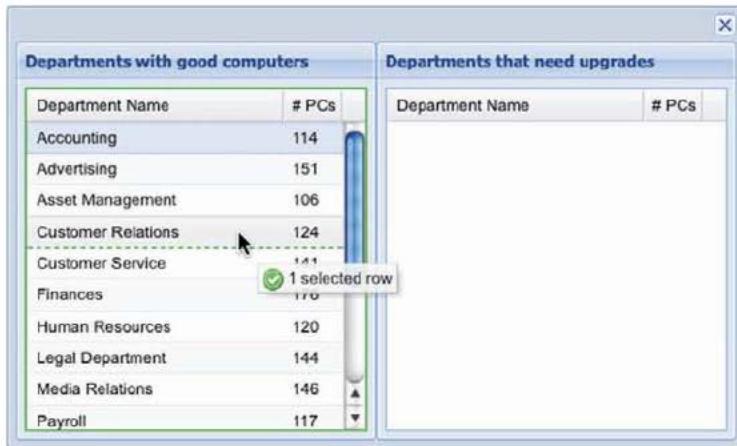


Figure 14.12
The below-row drop
invitation

on the `GridPanel`'s configuration object to `true`. Remember that setting that property instructs the `GridView` to instantiate an instance of `GridDragZone` when its UI renders. What you did have to implement, however, was the `DropZone`, and you did so with the ability to track the index of the record(s) to be dropped.

Next up is `TreePanel` to `TreePanel` drag and drop, where the implementation pattern changes somewhat again.

14.4 Drag and drop with TreePanels

Our company has purchased another company, and our management needs a way to track how to absorb employees from the purchased company's various departments. They requested that we develop something that will allow them to track the reassignment of employees using `TreePanels` and drag and drop.

The most important requirement is the ability to allow associates to be relocated to a specified set of similar departments. For instance, any associate from Accounting, Finances, or Payroll can be reassigned to any of those departments. Likewise, associates from Customer Relations, Media Relations, Customer Service, or Public Relations can be reassigned to any of those. Instead of building a valid drop matrix in JavaScript, the node list returned from the server will report a list of valid departments for each node. It will be up to us to somehow use that data to make the requirement a reality.

In this section, you'll not only learn how to enable drag and drop between trees, but you'll also tackle one of the most common challenges, which is to constrain the dropping of nodes. We'll begin by constructing the `TreePanels` and the `Window` that they'll live in.

14.4.1 Constructing the TreePanels

As with the `DataView` and `GridPanel` exercises before this, we'll configure two `TreePanels`, both of which will be managed by an instance of `Ext.Window` utilizing the `HBoxLayout`.

Because we've built a few `TreePanels` already, we're going to move through this pretty fast. The following listing sets the stage.

Listing 14.16 Setting the stage for TreePanel drag and drop

```
Ext.QuickTips.init();  
var leftTree = {  
    xtype      : 'treepanel',  
    autoScroll : true,  
    title      : 'Their Company',  
    animate    : false,  
    loader     : new Ext.tree.TreeLoader({  
        url : 'theirCompany.php'  
    }),  
    root       : {  
        text : 'Their Company',  
    }  
};  
var rightTree = {  
    xtype      : 'treepanel',  
    autoScroll : true,  
    title      : 'Your Company',  
    animate    : false,  
    loader     : new Ext.tree.TreeLoader({  
        url : 'yourCompany.php'  
    }),  
    root       : {  
        text : 'Your Company',  
    }  
};  
Ext.create('Ext.Window', {  
    title : 'Employee Transfer',  
    width : 800,  
    height: 600,  
    layout : 'HBoxLayout',  
    items : [  
        {  
            tree : leftTree,  
            flex : 1  
        },  
        {  
            tree : rightTree,  
            flex : 1  
        }  
    ]  
}).show();
```



Their company's
TreePanel

```

        id      : 'theirCompany',
        expanded : true
    }
};

var rightTree = {
    xtype      : 'treepanel',
    title      : 'Our Company',
    autoScroll : true,
    animate    : false,
    loader     : new Ext.tree.TreeLoader({
        url : 'ourCompany.php'
    }),
    root      : {
        text      : 'Our Company',
        id       : 'ourCompany',
        expanded : true
    }
};

new Ext.Window({
    height      : 350,
    width       : 450,
    layout      : 'hbox',
    border      : false,
    layoutConfig : {
        align : 'stretch'
    },
    defaults    : {
        flex : 1
    },
    items       : [
        leftTree,
        rightTree
    ]
}).show();

```

In listing 14.16, you create two TreePanels and an Ext Window, which will contain them and manage their sizes using the HBoxLayout. The left TreePanel ① will load a list of departments for the other company. Each department will have to be expanded to reveal the child items.

The right TreePanel ② will load up a list of departments for our company, which, lucky for us, aligns with the company being sold. For simplicity, we won't display the employees currently in our company's departments.

Last, the Ext Window is created ③ to manage the two TreePanels side by side. Figure 14.13 shows our TreePanels rendered onscreen.

We have the two TreePanels rendered within the Ext Window. It's time to get the party started with drag and drop.

14.4.2 Enabling drag and drop

When exploring how to employ drag and drop with DataViews, we were required to implement both the DragZone and DropZone classes. When applying this feature to



Figure 14.13
The two TreePanels

GridPanels, you learned that you were required to implement only DropZone because the GridView automatically creates GridDragZone if the GridPanel has the enableDragDrop property set.

With the TreePanel, drag and drop is much easier. All we have to do is set the following property on both of the TreePanel configuration objects:

```
enableDD : true
```

The TreePanel takes care of instantiating the TreeDragZone and TreeDropZone classes for us. To specify the drag/drop group that the TreePanel is to participate in, set the ddGroup configuration parameter as follows:

```
ddGroup : 'myTreeDDGroup'
```

Figure 14.14 shows what drag and drop with the two TreePanels looks like in action. As you can see, enabling drag and drop on TreePanels is simple to do. But wait a minute. Everything can be dragged and dropped, which can be useful for, let's say, a file-system management tool, but for what we need, it just won't cut it.

Out of the proverbial box, the TreeNode class allows for some constraints to be applied to the dragging and dropping of nodes when drag and drop is applied to their owner TreePanel. The two parameters that help control these behaviors are allowDrag and allowDrop, both of which are configured on each node of the tree and default to true even if the properties don't exist. We could have the returning JSON include these properties, but they're rigid. With these two properties, you can either allow drag or not, or allow drop or not. Clearly this won't help us fulfill the requirement to allow any associate from a set group of departments to be dropped on those departments. For this, we'll need to craft something much more flexible.

We'll tackle this intense procedure next. Are you ready?



Figure 14.14 Drag and drop enabled on TreePanels

14.4.3 Employing flexible constraints

Thus far, when implementing drag and drop, we created objects to override the required template methods, which gave us the control we desired for the drag-and-drop classes. With the TreePanel, we can apply template overrides by specifying dragConfig or dropConfig objects in the TreePanel's configuration object.

To have better control of what nodes can be dragged around, we'll create a dragConfig object, which overrides the onBeforeDrag template method. You'll need to place this code *before* the TreePanel configurations:

```
var dragConfig = {
    onBeforeDrag : function(dragData, eventObj) {
        return dragData.node.attributes.leaf;
    }
};
```

In this snippet, we create a dragConfig object that contains the onBeforeDrag override method. All it does is return the dragged node's leaf attribute. This will prevent all branch nodes from being dragged around the screen. To apply the drag constraint, set the dragConfig object on both TreePanels as follows:

```
dragConfig : dragConfig,
```

Refresh the page and you'll see that the department nodes can no longer be dragged around. This completes half of the requirement. As of now, any employee nodes can be dragged to any department, which means we need to work on the code to provide better drop point constraints.

Listing 14.17 is rather large because many tests need to take place in order to ensure that the desired drop operation is completely correct. Any slipup and nodes can be dropped where they don't belong. Please don't be alarmed; we'll go into an in-depth discussion about it.

As with the dragConfig object creation, you'll need to place the following code *before* the TreePanel configuration.

Listing 14.17 Applying better drop constraints

```

var dropConfig = {
    isValidDropPoint : function(nodeData, pt, dd, eventObj, data) {
        var treeDropZone = Ext.tree.TreeDropZone;
        var isVldDrpPnt = treeDropZone.prototype.isValidDropPoint;

        var drpNd          = data.node;                                ← 1 Gather
        var drpNdPrntDept = drpNd.parentNode.attributes.text;           drop node
        var drpNdOwnerTreeId = drpNd.getOwnerTree().id;                  references
        var validDropPoints = drpNd.attributes.validDropPoints || [];

        var tgtNd          = nodeData.node;                                ← 2 Gather target
        var tgtNdPrnt      = tgtNd.parentNode;                            node references
        var tgtNdOwnerTree = tgtNd.getOwnerTree();                         ← 2 Gather target
        var tgtNdOwnerTreeId = tgtNdOwnerTree.id;                          node references

        var isSameTree = drpNdOwnerTreeId === tgtNdOwnerTreeId;

        if (!tgtNdPrnt || isSameTree) {                                     ← 3 Return false if
            return false;                                                 not droppable
        }

        var tgtNdPrntDept = tgtNdPrnt.attributes.text;
        var tgtNdTxt      = tgtNd.attributes.text;

        if (drpNdPrntDept === tgtNdPrntDept) {                           ← 4 Create more
            return isVldDrpPnt.apply(tgtNdOwnerTree.dropZone, arguments); target node
        }                                                               references

        else if (Ext.isArray(validDropPoints)) {                           ← 5 Return true
            var isVldDept = false;                                         if droppable
            var drpPoint = treeDropZone.getDropPoint(                      ← 6 Does node have valid
                eventObj, nodeData, dd);                                    DropPoints array?
            Ext.each(validDropPoints, function(dpName) {                   ← 7 Loop through
                if (tgtNdTxt === dpName) {                                 valid drop
                    isVldDept = dpName;                                     points
                }
            });
            if (isVldDept && drpPoint === 'append') {                     ← 8 Allow drop
                return isVldDrpPnt.apply(tgtNdOwnerTree.dropZone, arguments);
            }
        }

        return false;
    };
}

```

In listing 14.17, you create a dropConfig object and work hard to constrain what nodes can be dropped where. You utilize the TreeDropZone.prototype.isValidDropPoint method to finish the processing when you deem that the drop point is valid. Here's how all of this stuff works.

First, you create a reference to the `TreeDropZone.prototype.isValidDropPoint`. You do this because even though this `isValidDropPoint` method will *override* the targeted `TreeDropZone` instance, you still need the processing that's provided by the original `TreeDropZone` `isValidDropPoint` method. You need it because it's responsible for appending some important properties to the drag data object that the `TreeDragZone` creates. In order not to duplicate the code, you call it when you're comfortable with the current mouseover situation.

Next, you create quite a few drop node-related references ①, such as the drop node's parent (department) text, the drop node's owner tree, and its `id`. Similarly, you gather references for the target node ②. These references will be the backbone to help determine whether the target node is a valid drop target.

Moving on, you reach your first test, where you determine whether the drop target is a root node by detecting the absence of the target's parent node. If the target node has no parent, then it's a root node. You also try to see if the drop node's owner tree is the same as the target node's. If either test case is true, then you return `false` ③.

Looking ahead, you create references for the target node's parent (department) text and the target node text ④. You'll use both to determine whether the drop node is a valid drop point based on the possible drop scenarios.

You then reach your first major test, where you look to see if the drop node's parent text matches that of the target node ⑤. This test is useful in the scenario where you're dropping a node on another leaf element that exists within a similar parent. For example, you drag "Salinas, Erin" from Accounting from their company and drop Erin on another associate node that exists within Accounting in our company. If this condition is true, you call on the `TreeDragZone`'s `isValidDropPoint` to properly process the drop and return the results, which ultimately results in a favorable possible drop condition.

If that test fails, you then determine whether the target node is a branch node and matches any of the drop points in the `validDropPoints` array ⑥. You do this by testing the return of the utility method `Ext.isArray` to verify that the drop node's `validDropPoints` array is valid ⑦.

If the test is favorable, then you get the drop point. The `TreeDropZone` performs similar calculations to the ones you did when determining whether the drag operation was occurring above or below a row, except it's concerned with nodes. Because drop nodes can be *appended* ⑧ to a target branch as well as dropped *above* or *below* a target node, the `TreeDropZone` `getDropPoint` method returns any one of the values just mentioned.

This is important to know because when the drag node is hovering over a branch element, the drop point could be above or below, which means that the drop node could be dropped below or above a branch node. If you allowed this to occur, you'd have associates that would be placed *outside* a department, which is unfavorable.

Moving on, you loop through the `validDropPoints` array and test to see if any of the drop points in the array match the target (department) node text. If so, then you

return the value of the TreeDragZone's `isValidDropPoint` call to indicate that a successful drop is possible.

If none of these tests pass, then a `false` value is returned, and the TreeDragZone knows to update the StatusProxy indicating that a favorable drop isn't possible.

You've done a lot of work to get these constraints configured. In order to take advantage of this code, you need to reconfigure the TreePanels with the `dropConfig` object as follows:

```
dropConfig : dropConfig
```

Adding this configuration parameter to your TreePanels will ensure that an instance of TreeDropZone is created and bound to the TreePanels. Refresh your page and see the constraints in action; mine are shown in figure 14.15.

You can test your constraint logic by attempting to drag a department branch node. You'll see that it's impossible. This tells you that the `onBeforeDrag` override method is working as designed.

Next, to determine where the associate can be dragged, hover over it and you'll see a ToolTip appear with the values that are in the `validDropPoints` array. In hovering over Erin, we found that she can be dropped on Accounting but not Advertising. When we drag Erin over Accounting on the right-hand TreePanel, the StatusProxy displays a valid drop icon (figure 14.15). But if we hover her over Advertising, we see

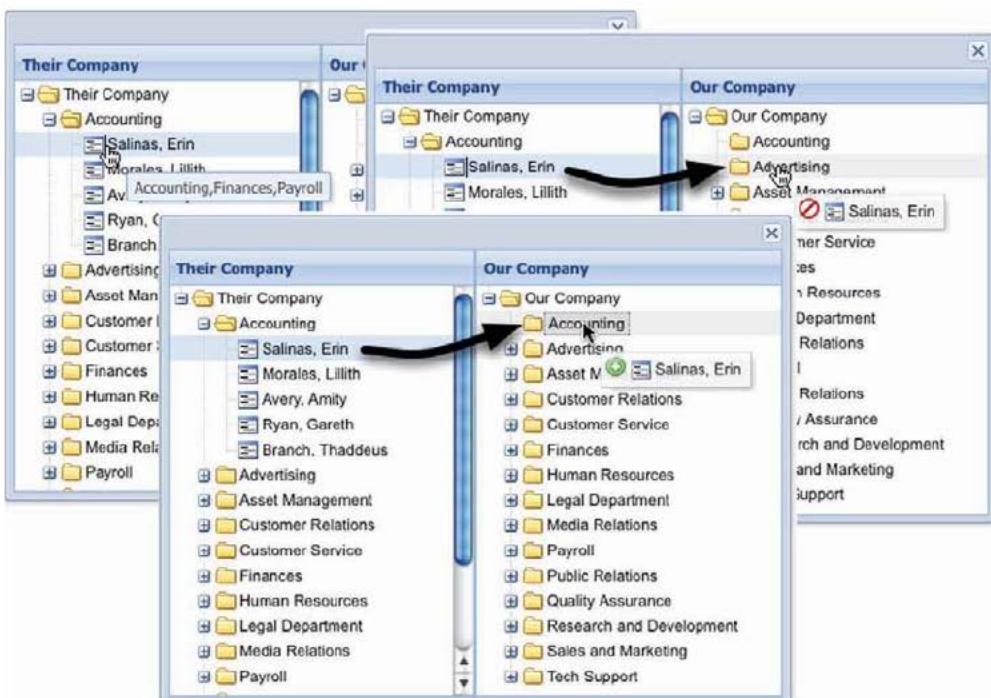


Figure 14.15 Testing our drop target constraint logic

an invalid drop icon in the StatusProxy. As extra credit, you can try to hover Erin over Finances and Payroll, and you'll see a valid drop icon there too.

The last test you can perform is to drop an associate or two onto a valid department. You can test the ability to drop leaf nodes above or below other leaf nodes within a valid department as well.

There you have it: drag and drop with two tree panels with a complex but somewhat flexible drop constraint system. I'm sure our managers will be pleased that we delivered what they were asking for.

14.5 **Summary**

We spent a lot of time in this chapter looking at different ways to implement drag and drop with the three most commonly used widgets within the framework, and you learned a lot while doing it.

We started with implementing this behavior with `DataViews`, where you learned that you're responsible for configuring both the `DragZone` and `DropZone` classes. While employing this behavior, we developed a custom and more useful way to display the `Records` being dragged around.

Next, you learned how to employ this behavior with two `GridPanels` and learned that you're mainly responsible for implementing a `DropZone` to handle the drops. In doing so, you tackled the hard problem of detecting the index of a node drop to allow `Records` to be inserted in any desired index.

Finally, we explored drag and drop with `TreePanels`. In this implementation, you discovered that enabling this behavior with `TreePanels` is the easiest task, and the application of somewhat complex constraints on the drop gestures is the most difficult task.

In the next chapter, you'll learn about plug-ins and extensions and how they work. You'll start to use object-oriented techniques with JavaScript and will have a lot of fun.

15

Extensions and plug-ins

This chapter covers

- Understanding the basics of prototypal inheritance
- Developing your first extension
- Getting to know how plug-ins work
- Developing a real-world plug-in

Every Ext JS developer faces the challenge where reusability becomes an issue. Oftentimes, a component of an application is required to appear more than once within the application's usage lifetime. In much larger applications, reusability of components is paramount to performance as well as maintainability of the code itself. This is why we'll focus on the concept of reusability with the use of framework extensions and plug-ins.

In the first section of this chapter, you'll learn the basics of extending (subclassing) with Ext JS. You'll begin by learning how to create subclasses with JavaScript, where you'll get to see what it takes to get the job done with the native language tools. This will give you the necessary foundation to refactor your newly created subclass to leverage `Ext.extend`, implementing two different popular design patterns.

Once you've gotten familiar with creating basic subclasses, we'll focus our attention on extending Ext JS Components. This is where you'll get to have fun learning

about the basics of framework extensions and solve a real-world problem by extending the `GridPanel` widget and seeing it in action.

When we finish the extension, you'll learn how extensions solve problems but can create inheritance issues where similar functionality is desired across multiple widgets. Once you understand the basic limitations of extensions, you'll convert your extension into a plug-in, where its functionality can easily be shared across the `GridPanel` and any descendant thereof.

15.1 Inheritance with Ext JS

JavaScript provides all of the necessary tools for class inheritance, but we as developers must take many manual steps in order to achieve this. The net result is wordy code. Ext JS makes inheritance much easier with its `Ext.extend` utility method. To begin learning about inheritance, you'll create a base class.

To help you along, envision we're working for an automobile dealership that sells two types of car. First is the base car, which serves as a foundation to construct the premium model. Instead of using 3-D models to describe the two car models, we'll use JavaScript classes.

NOTE If you're new to object-oriented JavaScript or are feeling a bit rusty, the Mozilla foundation has an excellent article to bring you up to speed or polish your skills. You can find it at the following URL: https://developer.mozilla.org/en/Introduction_to_Object-Oriented_JavaScript.

We'll begin by constructing a class to describe the base car, as shown in the following listing.

Listing 15.1 Constructing our base class

```
var BaseCar = function(config) {
    this.octaneRequired = 86;
    this.shiftTo = function(gear) {
        this.gear = gear;
    };
    this.shiftTo('park');
};

BaseCar.prototype = {
    engine : 'I4',
    turbo : false,
    wheels : 'basic',
    getEngine : function() {
        return this.engine;
    },
    drive : function() {
        return 'Vrrrroooooom - I'm driving!';
    }
};
```



1 Create constructor

2 Assign prototype object



Figure 15.1 Instantiating an instance of `BaseCar` and exercising two of its methods

In listing 15.1, you create the `BaseCar` class constructor ①, which when instantiated sets the instance's local `this.octaneRequired` property, adds a `this.shiftTo` method, and calls it, setting the local `this.gear` property to '`park`'. Next, you configure the `BaseCar`'s prototype object ②, which contains three properties that describe the `BaseCar` and two methods.

You could use the following code to instantiate an instance of `BaseCar` and inspect its contents with Firebug:

```
var mySlowCar = new BaseCar();
mySlowCar.drive();
console.log(mySlowCar.getEngine());

console.log('mySlowCar contents:');
console.dir(mySlowCar)
```

Figure 15.1 shows what the output of this code looks like in the Firebug multiline editor and console.

With our `BaseCar` class set, we can now focus on subclassing the `BaseCar` class. We'll first do it the traditional way. This will give you a better understanding of what's going on under the hood when we use `Ext.extend` later on.

15.1.1 Inheritance with JavaScript

Creating a subclass using native JavaScript is achievable with multiple steps. Rather than simply describing them, we'll walk through the steps together. The following listing creates `PremiumCar`, a subclass of the `BaseCar` class.

Listing 15.2 Creating a subclass the old-school way

```
var PremiumCar = function() {
    PremiumCar.superclass.constructor.call(this);
    this.octaneRequired = 93;
};

PremiumCar.prototype = new BaseCar();
PremiumCar.superclass = BaseCar.prototype;
PremiumCar.prototype.turbo = true;
```

```

PremiumCar.prototype.wheels = 'premium';

PremiumCar.prototype.drive = function() {
    this.shiftTo('drive');
    PremiumCar.superclass.drive.call(this);
};

PremiumCar.prototype.getEngine = function() {
    return 'Turbo ' + this.engine;
};

```

To create a subclass, you begin by creating a new constructor, which is assigned to the reference `PremiumCar` ❶. Within this constructor is a call to the `constructor` method of the `PremiumCar.superclass` within the scope of the instance of `PremiumCar` ❷ being created (`this`).

You do this because, unlike other object-oriented languages, JavaScript subclasses don't natively call their superclass constructor ❸. Calling the superclass constructor gives it a chance to execute and perform any constructor-specific functions that the subclass might need. In our case, the `shiftTo` method is being added and called in the `BaseCar` constructor. Not calling the superclass constructor would mean that our subclass wouldn't get the benefits provided by the base class constructor.

Next, you set the `prototype` of `PremiumCar` to the result of a new instance of `BaseCar` ❹. Performing this step allows `PremiumCar.prototype` to inherit all of the properties and methods from `BaseCar`. This is known as *inheritance through prototyping* and is the most common and robust method of creating class hierarchies in JavaScript.

In the next line, you set the `PremiumCar`'s `superclass` reference to the `prototype` of the `BaseCar` class ❺. You then can use this `superclass` reference to do things like create so-called extension methods, such as `PremiumCar.prototype.drive`. This method is known as an extension method because it *calls* the like-named method from the superclass prototype but from the scope of the instance of the subclass it's attached to.

TIP All JavaScript functions (JavaScript 1.3 and later) have two methods that force the scope execution: `call` and `apply`. To learn more about `call` and `apply` visit the following URL: <http://www.webreference.com/js/column26/apply.html>.

With the subclass now created, you can test things out by instantiating an instance of `PremiumCar` with the following code entered into the Firebug editor:

```

var myFastCar = new PremiumCar();
myFastCar.drive();

console.log('myFastCar contents:');
console.dir(myFastCar);

```

Figure 15.2 shows what the output would look like in the Firebug multiline editor and console.

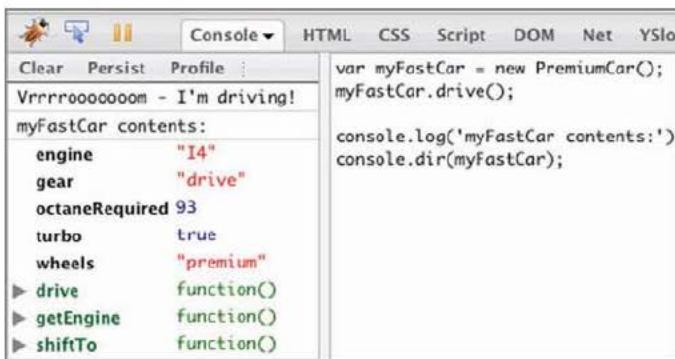


Figure 15.2
Our PremiumCar subclass in action

This output shows that our subclass performed as desired. From the `console.dir` output, you can see that the subclass constructor set the `octaneRequired` property to 93 and the `drive` extension method even set the `gear` method as "drive".

This exercise shows that you're responsible for all of the crucial steps in order to achieve prototypal inheritance with native JavaScript. First, you had to create the constructor of the subclass. Then, you had to set the prototype of the subclass to a new instance of the base class. Next, for convenience, you set the subclass's superclass reference. Last, you added members to the prototype one by one.

You can see that quite a few steps need to be followed in order to create subclasses with the native language constructs. Next, we'll show how `Ext.extend` makes creating subclasses much easier.

15.1.2 Extending with Ext JS

There are two common patterns in using `Ext.extend`. The first is an older method, whose roots stem from the 1.0 days of the framework, and involves first creating the subclass constructor and then calling on `Ext.extend` to finish the work. The second is a more modern method, stemming from the 2.0 days of the framework, and involves having `Ext.extend` do all of the work.

We'll begin by exploring the older pattern of `Ext.extend`. Knowing both patterns will benefit you when reading extension code from other Ext JS developers, because the usage between the two patterns varies from developer to developer. We'll be using the previously created `BaseCar` class for this exercise, shown in the following listing.

Listing 15.3 Creating our first extension

```

var PremiumCar = function() {
    PremiumCar.superclass.constructor.call(this);
    this.octaneRequired = 93;
};

Ext.extend(PremiumCar, BaseCar, {
    turbo      : true,
    wheels     : 'premium',
    getEngine  : function() {

```

1 Create PremiumCar constructor
2 Scope call of superclass constructor
3 Extend BaseCar

```

        return this.engine + ' Turbo';
    },
    drive      : function() {
        this.shiftTo('drive');
        PremiumCar.superclass.drive.call(this);
    }
});

```

In listing 15.3, you create the `PremiumCar` class, which is an extension (subclass) of the `BaseCar` class using the `Ext.extend` tool. Here's how this works.

First, you create a constructor for the `PremiumCar` ①. This constructor is an exact duplicate of the previously created `PremiumCar` constructor.

When thinking about extending classes, you must consider whether prototypal methods in the subclass will share the same name as prototypal methods in the base class. If they will share the same symbolic reference name, you must consider whether they'll be extension methods or overrides.

An extension method is a method in a subclass that shares the same reference name as another method in a base class. What makes this an extension method is the fact that it includes the execution of the base class method within itself. The `PremiumCar` constructor ② is an extension of the `BaseCar` constructor because of the included execution of the `BaseCar` constructor method. The reason you'd want to extend a method would be to reduce code duplication, reusing the code in the base class method.

An override method is a method in a subclass that shares the same reference name as another method in a base class but doesn't execute the same-named method from the base class. You override a method if you wish to completely discard the code that's in the like-named method in the base class.

To complete the extension process, you call on `Ext.extend` ③, for which you're passing three parameters: subclass, base class, and what's known in the community as an *overrides object*. Here's how this works.

`Ext.extend` first sets the subclass's prototype to the result of a new instance of the base class, which is like what we did when creating our subclass manually. `Ext.extend` then applies the symbolic references of the `overrides` object to the prototype of the subclass. The symbolic references in the `overrides` object take precedence over those in the base class's prototype. This is similar to us manually adding the members when we created our subclass earlier.

You can see that it took only two steps to extend the `BaseCar` class: create the constructor for the subclass and use `Ext.extend` to tie everything else together. It not only took less work on your part, but the amount of code you had to write was much smaller and easier to digest, which is one of the lesser-known benefits of using `Ext.extend` to subclass.

Now that you have your `PremiumCar` configured using `Ext.extend`, you can see it in action using Firebug. You can do so using the exact same code you used when exercising your manually created subclass:

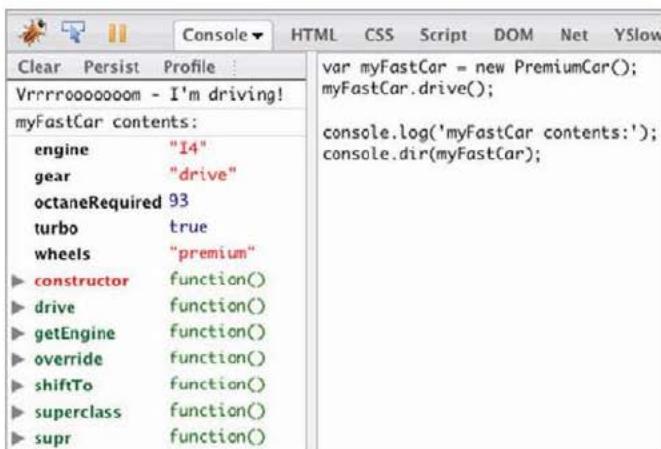


Figure 15.3 The results of the instantiation of the `PremiumCar` class

```
var myFastCar = new PremiumCar();
myFastCar.drive();

console.log('myFastCar contents:');
console.dir(myFastCar);
```

Figure 15.3 shows what it looks like in the Firebug console. Looking at that figure, you can see that `Ext.extend` adds some convenience references to the subclass. These can be useful from within the instance of the class. They're references to the constructor and superclass methods. The `override` method is useful if you want to change members for the instance of the class that you've instantiated.

You've just successfully extended a class using what's known as an old-fashioned method, which consists of creating a constructor and then calling on `Ext.extend` to copy the prototype from the base class to the subclass and apply the overrides object to the subclass's prototype. This pattern of extending works perfectly fine and many use it, but there's a much more modern pattern that we'll be using, which allows us to reduce the extension to a single step and provide the constructor inside the overrides object.

The following listing shows the exact same extension with the modern `Ext.extend` implementation pattern.

Listing 15.4 Implementing `Ext.extend` with the modern pattern

```
var PremiumCar = Ext.extend(BaseCar, {
    turbo      : true,
    wheels     : 'premium',
    constructor : function() {
        PremiumCar.superclass.constructor.call(this);
        this.octaneRequired = 93;
    },
    drive      : function() {
        this.shiftTo('drive');
```



1 Include constructor
in overrides

```

        PremiumCar.superclass.drive.call(this);
    },
    getEngine : function() {
        return this.engine + ' Turbo';
    }
});

```

In this implementation of `Ext.extend`, you pass two arguments. The first is a reference to the base class, and the second is the `overrides` object to be applied to the subclass's prototype. That's it. The biggest difference between the first implementation and this one is that you're including the constructor **①** method inside the `overrides` object. Ext JS is smart enough to know to use this method to create a constructor for you. Last, notice that the `PremiumCar` reference is the result of the `Ext.extend` method call.

By now, you're probably wondering what makes this pattern better than the first. The single and most compelling reason is code readability. For many, it's easier to digest and read code formatted in this way. For this reason, many developers have created classes from scratch by means of extending `Object`, instead of creating a constructor and then a prototype object.

Here's how you create a simple class using this newer pattern:

```

var NewClass = Ext.extend(Object, {
    someProperty : 'Some property',
    constructor : function() {
        NewClass.superclass.constructor.call(this);
    },
    aMethod : function() {
        console.info("A method has executed.");
    }
});

```

By now, you understand how to use the utility method `Ext.extend` to create subclasses. You learned that `Ext.extend` provides a means for creating subclasses with fewer steps compared to the traditional JavaScript method. You also got a chance to explore the two most common `Ext.extend` patterns used by Ext JS developers. For the rest of this book, we'll be using the modern pattern.

Next, you'll use your newly gained knowledge and learn how to extend Components.

15.2 Extending Ext JS Components

Extensions to the framework are developed to introduce additional functionality to existing classes in the name of reusability. The concept of reusability drives the framework, and when utilized properly it can enhance the development of your applications.

Some developers create preconfigured classes, which are constructed mainly as a means of reducing the amount of application-level code by stuffing configuration parameters into the class itself. Having such extensions alleviates the application-level code from having to manage much of the configuration, requiring only the simple instantiation of such classes. This type of class is great, but only if you're expecting to stamp out more than one instance of this class.

Other extensions add features such as utility methods or embed behavioral logic inside the class itself. An example of this would be a `FormPanel` that automatically pops up a `MessageBox` whenever a save operation failure occurs. I often create extensions for applications for this very reason, where the widget contains some built-in business logic.

My favorite kind of extension is what I like to call a *composite* widget, which combines one or more widgets into one class. An example of this would be a `Window` that has an embedded `GridPanel` or a `FormPanel` that embeds a `TabPanel` to spread its fields over multiple panels.

This is the type of extension that we'll focus on now, where we'll merge a `GridPanel` with a `Menu`.

15.2.1 Thinking about what we're building

When I work to construct an extension, I often take a step back and try to analyze the problem from all facets, as I do with puzzles. I do this because I view the creation of extensions as a way to solve issues. Sometimes these problems can be extremely complex, such as the creation of a dynamic wizard-like widget that has numerous workflow rules that must be controlled by the UI. Oftentimes I use extensions to solve the problem of reusability. This will be our focus for the rest of the chapter.

When thinking about common tasks during application development, I often wonder how such tasks can be made easier through an extension. One task that comes to mind is that end developers must code for the destruction of loosely coupled widgets, such as `Menus` or `Windows`, when their parent component is destroyed.

You experienced this when we explored the creation of a `GridPanel`, where you attached a `Menu` and configured it to display when the grid's `contextmenu` event fires. Recall that you had to manually configure the `Menu` to destruct upon the `GridPanel`'s destruction. If you extrapolate this task over the span of an application where many `GridPanels` coupled with `Menus` are to be rendered onscreen, you can easily visualize the amount of code duplication required to make this work. Before you start coding, let's take a moment to analyze the problem and come up with the best possible solution.

In order to mitigate this code-duplication risk, we'll have to create an extension to the `GridPanel` that will automatically handle the instantiation and destruction of the `Menu`. But what other features can we add to this extension to make it more robust?

The first thing that comes to mind is the differences in the selection getter and setter methods for `RowSelectionModel` and `CellSelectionModel`. `RowSelectionModel` has `selectRow` and `getSelected` whereas `CellSelectionModel` has `selectCell` and `getSelectedCell`. It would be great if our extension could handle this variation in the `GridPanel`'s selection models. Such a feature would reduce the amount of code in the application layer.

With a clear picture of the issues we're going to solve, we can begin the construction of our first Ext JS extension.

15.2.2 Extending GridPanel

To extend the `GridPanel` class, we'll leverage the `Ext.extend` method, using the modern pattern. To give you an overview of our extension, the following listing contains the template for the extension that we'll create.

Listing 15.5 The template for our `GridPanel` extension

```
var CtxMenuGridPanel = Ext.extend(Ext.grid.GridPanel, {
    constructor : function() {
        },
        onCellContextMenu : function(grid, rowIdx,
                                     cellIdx, evtObj) {
        },
        getSelectedRecord : function() {
        },
        onDestroy : function() {
        }
});
```

1 Constructor extension
2 Custom contextmenu event handler
3 Convenience selection retrieval method
4 Extend `onDestroy` to do cleanup

Listing 15.5 contains the template for our extension and provides four methods that will be applied to the subclass's prototype. The first is the `constructor` **1**, which will be our vector to extend the `GridPanel`. Let's take a moment to analyze why we're extending via the `constructor` method. Because this is such an important topic, we'll discuss the differences in the hope that you can make an educated choice when you decide to create extensions in your projects.

Earlier in this book when we discussed the Component lifecycle, you learned of the `initComponent` method, which is meant to augment the `constructor` and is intended to be a place for developers to extend components. You learned that `initComponent` is executed inside the Component class's `constructor`, but only after a few crucial setup tasks for the Component have taken place. These tasks include the caching and application of the configuration object properties to the instance of the class, the setup of base events, and the registration of the instance of Component with the `ComponentMgr` class.

Knowing this, you can make an educated decision as to where to extend an Ext JS Component. To make this decision, you must figure out if configured instances of the subclass will ever need to be cloned via the `cloneConfig` utility method. If so, then extending via the `constructor` is the best choice. Otherwise, extending via the `initComponent` method will work. If you're unsure, then default to extending via the `constructor`. Also, it's important to point out that all non-Component classes don't have an `initComponent` method; extending via `constructor` is the only option.

If you look at the rest of the extension template, you'll see three other methods in the overrides configuration object. The first, `onCellContextmenu` **2**, is the method

that will respond to the `cellcontextmenu` events and will ultimately display the menu. The reason for choosing the `cellcontextmenu` event over the `rowcontextmenu` event is that with the `cellcontextmenu` event, you get the row and column coordinates for which the event occurred, which will help your extension understand how to select the row or cell. The `rowcontextmenu` event provides only the row where the event occurred and is unusable when taking the `CellSelectionModel` into consideration.

TIP The arguments passed to the `onCellContextMenu` utility method can be found in the `Ext.grid.GridPanel` API documentation, under the `cellcontextmenu` events section.

The next template method, `getSelectedRecord` ③, is a utility for getting the selected record despite the cell or row selected. This method takes into account the selection model and leverages the correct selection model getter method. Last, the `onDestroy` ④ method extends the `GridPanel`'s own `onDestroy` method. This is where you'll code the automatic destruction of the Menu.

Your template class is now set and ready to be filled in. You'll start with the constructor in the following listing.

Listing 15.6 Adding the constructor to our extension

```
constructor : function() {
    CtxMenuGridPanel.superclass.constructor.apply(this, arguments);
    if (this.menu) {
        if (! (this.menu instanceof Ext.menu.Menu)) {
            this.menu = new Ext.menu.Menu(this.menu);
        }
        this.on({
            scope           : this,
            cellcontextmenu : this.onCellContextMenu
        });
    }
},
```

Our constructor extension method takes care of automatically creating the instance of the Menu widget for us, but in an intelligent manner. The very first task is executing the superclass (`GridPanel`) constructor ① method within the scope of the instance of this subclass.

Next, in order to facilitate the automatic instantiation of the Menu widget, the method needs to know whether the local menu reference is present and if it's already an instance of `Ext.menu.Menu` ② or not. This simple test allows for three different implementation possibilities for this subclass.

You can pass either a Menu configuration object

```
new CtxMenuGridPanel({
    // ... (other configuration options)
    menu : {
        items : [
```

```

        { text : 'menu item 1' },
        { text : 'menu item 2' }
    ]
}
});

```

or an array of MenuItem configuration objects

```

new CtxMenuGridPanel({
// ... (other configuration options)
menu : [
    { text : 'menu item 1' },
    { text : 'menu item 2' }
]
});

```

or an instance of Ext.menu.Menu as the menu configuration

```

var myMenu = new Ext.menu.Menu({
items : [
    { text : 'menu item 1' },
    { text : 'menu item 2' }
]
});

new CtxMenuGridPanel({
    menu : myMenu
});

```

Having this type of flexibility for the implementation of the subclass plays into the framework's culture. Truth be told, part of this flexibility comes from the Menu widget itself, whose constructor will accept a configuration object or array of MenuItem configuration objects. Also notice that the local this.menu reference is overwritten if an instance of Ext.menu.Menu is created.

At the end of this constructor, you configure the local this.onCellContextMenu method as the cellcontextmenu event handler ③. Notice that the scope for the event handler is set to this, or the instance of your GridPanel subclass. Therefore, onCellContextMenu will need the local this.menu reference to manage the display of the Menu widget itself.

Next you'll construct an event handler method.

Listing 15.7 Constructing the onCellContextMenu event handler method

```
onCellContextMenu : function(grid, rowIndex, cellIndex, evtObj) {
```

```

    evtObj.stopEvent();

    if (this.selModel instanceof
        Ext.grid.RowSelectionModel) {
        this.selModel.selectRow(rowIndex);
    }
    else if (this.selModel instanceof Ext.grid.CellSelectionModel) {
        this.selModel.select(rowIndex, cellIndex);
    }
}
```



**1 Selection model
method calls**

```

        }
        this.menu.showAt(evtObj.getXY());
    },
}

```

In order to properly select the cell or row being right-clicked, the event handler method needs to determine which selection model the `GridPanel` is using. You can determine this by using the generic JavaScript `instanceof` operator. If the selection model is a `RowSelectionModel` ①, the `selectRow` method is being used; if it's a `CellSelectionModel`, the `select` method is being used.

Having such logic in the `contextmenu` event handler brings another level of flexibility to this extension. You can also use the same logic to determine what selection getter method to use, which is what you'll do in the following listing.

Listing 15.8 Creating the `getSelectedRecord` utility method

```

getSelectedRecord : function() {
    if (this.selModel instanceof Ext.grid.RowSelectionModel) {
        return this.selModel.getSelected();
    }
    else if (this.selModel instanceof Ext.grid.CellSelectionModel) {
        var selectedCell = this.selModel.getSelectedCell();
        return this.store.getAt(selectedCell[0]);
    }
},

```

In this `getSelectedRecord` utility method, the `Record` related to the currently selected cell or row will be returned. Again, you're using the `instanceof` operator to determine what type of selection model is being used and to return result of the proper getter method call.

At this point, you have all but one method filled in. The last method, `onDestroy`, will handle the automatic cleanup for your extension, calling for the destruction of the menu if it exists.

```

onDestroy : function() {
    if (this.menu && this.menu.destroy) {
        this.menu.destroy();
    }
    CtxMenuGridPanel.superclass.onDestroy.apply(this, arguments);
}

```

In this extension method, you inspect for the presence of a local `this.menu` reference and check to see if that reference contains a `destroy` reference. If both of these conditions are true, then you execute its `destroy` method. Recall that the `destroy` method initiates the destruction phase of a Component's lifecycle, purging any DOM nodes that the loosely coupled `Menu` might have created. Last, you execute the superclass `onDestroy` method within the scope of this instance of your subclass, completing the extension.

Like all of the ExtJS widgets, you should register the extension with `Ext.ComponentMgr` to allow for the lazy instantiation of our extension with XTypes. To perform this

registration, you'll execute `Ext.reg` and pass the XType string to identify your subclass and the reference to your subclass itself. These statements are placed at the very end of a class's creation:

```
Ext.reg('contextMenuGridPanel', CtxMenuGridPanel);
```

With our extension completed, we can next create an implementation of it and see it in action.

15.2.3 Our extension in action

When discussing the constructor to our `GridPanel` extension, we talked about the three different patterns for implementation, where the `menu` reference for the configuration object can be set to an array of `MenuItem` configuration objects, an instance of `Menu`, or a configuration object designed for an instance of `Menu`. For this implementation, we'll choose the first pattern, which is an array of `MenuItem` configuration objects. This will give us an opportunity to see an automatic instantiation of `Menu` as coded in our extension's constructor.

We'll start with the creation of the remote `JsonStore` in the following listing.

Listing 15.9 Creating the remote `JsonStore` for our extension implementation

```
var remoteProxy = new Ext.data.ScriptTagProxy({
    url : 'http://extjsinaction.com/dataQuery.php'
});

var recordFields = ['firstname','lastname'];

var remoteJsonStore = new Ext.data.JsonStore({
    proxy      : remoteProxy,
    id         : 'ourRemoteStore',
    root       : 'records',
    autoLoad   : true,
    totalProperty : 'totalCount',
    remoteSort : true,
    fields     : recordFields
});

var columnModel = [
{
    header     : 'Last Name',
    dataIndex : 'lastname'
},
{
    header     : 'First Name',
    dataIndex : 'firstname'
}
];
```

Next, you'll create a generic handler for the `MenuItems` and the implementation of our extension.

Listing 15.10 Implementing our extension

```

var onMenuItemClick = function(menuItem) {
    var ctxMenuGrid = Ext.getCmp('ctxMenuGrid');
    var selRecord = ctxMenuGrid.getSelectedRecord();
    var msg = String.format(
        '{0} : {1}, {2}',
        menuItem.text,
        selRecord.get('lastname'),
        selRecord.get('firstname')
    );
    Ext.MessageBox.alert('Feedback', msg);
};

var grid = {
    xtype      : 'contextMenuGridPanel',
    columns    : columnModel,
    store      : remoteJsonStore,
    loadMask   : true,
    id         : 'ctxMenuGrid',
    selModel   : new Ext.grid.CellSelectionModel(),
    viewConfig : { forceFit : true },
    menu       : [
        {
            text      : 'Add Record',
            handler   : onMenuItemClick
        },
        {
            text      : 'Update Record',
            handler   : onMenuItemClick
        },
        {
            text      : 'Delete Record',
            handler   : onMenuItemClick
        }
    ]
};

```

In listing 15.10, you first create a generic handler for the `MenuItem`s that you'll configure later. This will provide visual feedback that you've successfully clicked a `MenuItem`. Notice that it leverages the extension's `getSelectedRecord` ① utility method to gain a reference to the record selected by the right-click event.

Next, you create an XType configuration object for the extension by setting the generic object's `xtype` ② property to '`contextMenuGridPanel`', which is the string you registered with ComponentMgr. All of the configuration options are common to the GridPanel. Notice that you're using the `CellSelectionModel` instead of the default `RowSelectionModel`. This gives you an opportunity to test both the `onContextMenu` event handler and the `getSelectedRecord` utility method to see if they can leverage the correct selection getter and setter methods.

The very last configuration item, `menu`, is an array of objects. Recall that your extension's constructor will automatically create an instance of `Ext.menu.Menu` for you

if configured. This is the first time you get to see how taking the trouble to generate such an extension can save time.

To render this onscreen, let's wrap the extension in a Window:

```
new Ext.Window({  
    height : 200,  
    width : 300,  
    border : false,  
    layout : 'fit',  
    items : grid,  
    center : true  
}) .show();
```

To implement your extension, all you need to do is right-click any cell. This will invoke the display of the automatically instantiated Menu widget and select the cell that was right-clicked, using the `onCellContextMenu` event handler method. Next, click any of the `MenuItem`s, which will invoke the generic `onMenuItemClick` handler. This will exercise the extension's `getSelectedRecord` utility method.

The contents of the selected Record will be displayed in the MessageBox as coded in the `onMenuItemClick` handler method. See figure 15.4.

With this implementation of our extension, you didn't have to create an instance of `Menu` and set up an event handler to display the `Menu`. You didn't have to configure the destruction of the `Menu`, either. Our extension takes care of all of the dirty work for us, requiring only the configuration an array of `MenuItem` configuration objects.

You've just seen our extension in action. Clearly, we solved a problem where code duplication would occur often in a large application. The extension solves this problem and automates a few of our actions. Although our extension solved the problem of code duplication, it does have some limitations that may not be apparent but are important to understand.

15.2.4 Identifying the limitations of extensions

For a moment, put yourself into this situation: You're building an application that requires the `GridPanel`, `EditorGridPanel`, and `PropertyGridPanel`. You're required to attach context menus to each of these types of widgets. You already made an extension to `GridPanel` to make the task of attaching menus easier.

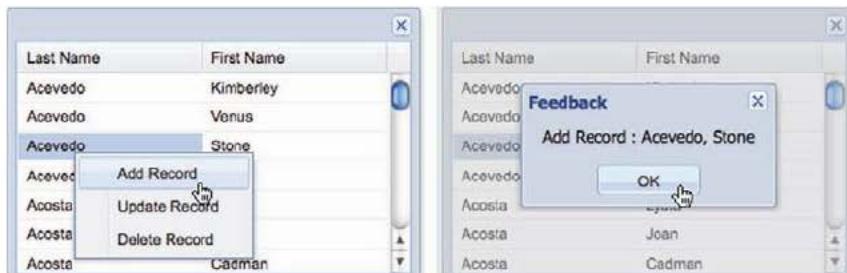


Figure 15.4 Our extension

So here's the question: How do you get the same easy menu functionality across the other types of grids? To put this into context, figure 15.5 illustrates the `GridPanel` class hierarchy, including our `ContextMenuGridPanel` extension.

This diagram illustrates that the `EditorGridPanel` and `ContextMenuGridPanel` both extend `GridPanel`. How can we solve this problem? One solution would be to extend `EditorGridPanel` and `PropertyGridPanel` to carry over this functionality. That would make the class hierarchy look like that shown in figure 15.6.

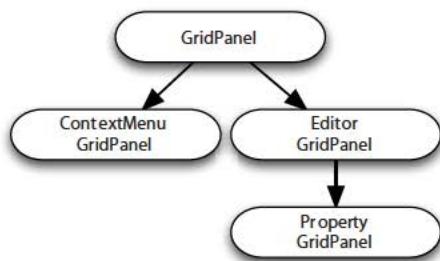


Figure 15.5 The `GridPanel` class hierarchy with our `ContextMenuGridPanel` extension

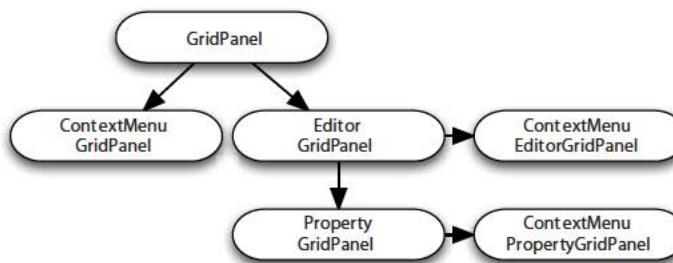


Figure 15.6 A proposed class hierarchy, where code duplication is possible

To achieve this solution, you could either elect to duplicate code or perhaps even stitch together some type of cross-inheritance model. No matter what the solution, it's not going to be elegant or useful.

The only real solution to this problem is a plug-in.

15.3 Plug-ins to the rescue

Plug-ins solve this exact problem by allowing developers to distribute functionality across widgets without having to create extensions; they were introduced in Ext JS version 2.0. What also makes plug-ins powerful is the fact that you can have any number of them attached to a Component.

The basic anatomy of a plug-in is simple and can be defined as a generic object with an `init` method:

```

var plugin = {
    init : function(parent) {
    }
}
  
```

If you can recall the initialization phase of the Component lifecycle, you'll remember that at the end of the Component constructor execution, any configured plug-ins are

brought to life. The Component executes each plug-in's init method and passes itself (this) as the only argument.

From a plug-in's perspective, I like to think of the Component that a plug-in is attached to as the plug-in's parent. When a plug-in's init method is executed the first time, it's aware of its parent Component, and this is a crucial time for the plug-in to perform any work that may be required before a Component is rendered. An example of this is the attaching of event handlers.

Before we convert our extension to a plug-in, I want to show you a much more flexible and powerful plug-in design pattern.

15.3.1 A robust plug-in design pattern

When I develop plug-ins, I use a more complex but thorough pattern compared to the simple example shown previously. I do so because there are times where it's necessary to add methods to the parent Component itself. Also, it's our responsibility to code any cleanup actions, such as the destruction of any loosely coupled widgets.

Before we implement this pattern on a large scale, we should look at a skeleton and discuss it; see the following listing.

Listing 15.11. A thorough plug-in design pattern

```
var plugin = Ext.extend(Object, {
    constructor : function(config) {
        config = config || {};
        Ext.apply(this, config);
    },
    init : function(parent) {
        parent.on('destroy', this.onDestroy, this);
        Ext.apply(parent, this.parentOverrides);
    },
    onDestroy : function() {
    },
    parentOverrides : {
    }
});
Ext.preg('myPlugin', plugin);
```

1 Apply any passed configuration
2 Set up automatic cleanup
3 Apply overrides to parent

As you can see, this plug-in pattern is a bit more involved than the first but is much more robust. You start out with the extension of Object and have a full constructor, where the configuration properties passed are applied to the instance of the class ①. This works *exactly* like most of the classes in the framework.

Next is the init method, which automatically registers the local onDestroyMethod as a handler ② for the parent Component's destroy event. onDestroy is where you'd want to place your plug-in's cleanup code. Also, notice that you're applying the local parentOverrides ③ object to the parent Component. Having this capability means that you can extend on the fly, or add methods and properties to the parent

Component. Not all plug-ins add members to the parent Component, but this mechanism provides a means to do so if you need to.

NOTE All methods *applied* to the parent Component will execute with the scope of the parent Component.

In the last bit, you execute Ext.preg, which registers the plug-in with Ext.ComponentMgr as what's known as a *PType*, or plug-in type, and is exactly like an XType. Although this last step isn't necessary for a plug-in to be used, it allows for lazy instantiation by the framework.

Now that you know the basics of plug-ins, we can begin work to convert our extension to a plug-in.

15.3.2 Developing a plug-in

Our plugin needs to be able to do exactly what the extension was capable of. This includes the instantiation of a Menu and attaching the cellcontextmenu to the parent Component to be able to display the Menu. It also needs to manage the destruction of the Menu when the parent Component is destroyed. We can't leave out the getSelectedRecord utility method, which means we'll get to exercise the application of the parentOverrides object of our plug-in design pattern.

A lot of the code we'll assemble will come from the extension we created earlier. This means that we can move a bit faster, focusing on how the plug-in works. The following listing is the template for our plug-in.

Listing 15.12 The template for our plug-in

```
var GridCtxMenuPlugin = Ext.extend(Object, {
    constructor : function(config) {
        },
        init : function(parent) {
            },
            onCellContextMenu : function(grid, rowIndex, cellIndex, evtObj) {
                },
                onDestroy : function() {
                    },
                    parentOverrides : {
                        getSelectedRecord : function() {
                            }
                        }
                    });
Ext.preg('gridCtxMenuPlugin', GridCtxMenuPlugin);
```

In the plug-in template in listing 15.12, you add the onCellContextMenu handler method, which, just like in our extension, will handle the display of the menu and proper selection. You also add the getSelectedRecord utility method to the

`parentOverrides` object. This will give you an opportunity to exercise adding a method to a parent Component on the fly.

Our template is set. We can begin filling in the methods. We'll start with the constructor and the init methods, shown in the following listing.

Listing 15.13 Adding the constructor and init methods to our plug-in

```
constructor : function(config) {
    config = config || {};
    Ext.apply(this, config);
},
init : function(parent) {
    this.parent = parent;
    if (parent instanceof Ext.grid.GridPanel) {
        if (! (this.menu instanceof Ext.menu.Menu)) {
            this.menu = new Ext.menu.Menu(this.menu);
        }
        parent.on({
            scope           : this,
            cellcontextmenu : this.onCellContextMenu,
            destroy         : this.onDestroy
        });
        Ext.apply(parent, this.parentOverrides);
    }
},
```

For the constructor method, you use the constructor from the pattern where you apply the passed configuration object to the instance of the plug-in. This will be useful because when you implement this plug-in, you'll be configuring the menu on the plug-in itself.

In the init method, you set a local `this.parent` ① reference to the parent Component. This is useful for methods on the plug-in itself that need to do something to or with the parent Component.

Next, an if block tests to see if the parent Component is an instance of the GridPanel widget ②. This type of test allows this plug-in to work only with GridPanels or any descendant thereof and is the type of control pattern to use to prevent the accidental use of plug-ins for widgets that they aren't designed for.

Inside this block, the creation of a Menu widget and registration of related event handlers ③ will occur just like for our extension. The difference is that a `destroy` handler is added to allow the plug-in to destroy the Menu widget.

The first two methods are filled in. In the next listing, you'll fill in the last three.

Listing 15.14 Adding the last three methods to our plug-in

```
onCellContextMenu : function(grid, rowIndex, cellIndex, evtObj) {
    evtObj.stopEvent();
    if (grid.selModel instanceof Ext.grid.RowSelectionModel) {
        grid.selModel.selectRow(rowIndex);
    }
}
```

```

        else if (grid.selModel instanceof Ext.grid.CellSelectionModel) {
            grid.selModel.select(rowIndex, cellIndex);
        }
        this.menu.stopEvent(evtObj.getXY());
    },
    onDestroy : function() {
        if (this.menu && this.menu.destroy) {
            this.menu.destroy();
        }
    },
    parentOverrides : {
        getSelectedRecord : function() {
            if (this.selModel instanceof Ext.grid.RowSelectionModel) {
                return this.selModel.getSelected();
            }
            else if (this.selModel instanceof Ext.grid.CellSelectionModel) {
                var selectedCell = this.selModel.getSelectedCell();
                return this.store.getAt(selectedCell[0]);
            }
        }
    }
}

```

The first of the last three methods, `onCellContextMenu`, will be called within the scope of the instance of the plug-in as registered in the `init` method. It works almost exactly like the similarly named method on our extension, except it references the parent Component via the first argument.

The `onDestroy` method too will execute within the scope of the instance of the plug-in and will destroy the menu accordingly. The `parentOverrides` object contains the `getSelectedRecord` utility method that's applied to the parent Component by the plug-in's `init` method. Remember that this method will execute within the scope of the parent Component.

The construction of the plug-in is now complete. It's time to put it into action.

15.3.3 Our plug-in in action

To exercise our plug-in, we'll construct a `GridPanel` that will use a lot of the same code from the previous `GridPanel` implementation. The difference is that we'll configure the plug-in, which will contain the Menu configuration. Replacing the Menu configuration on the `GridPanel` will be the plugin.

We'll begin by creating the data Store. A lot of this is repeat code, so we'll be moving relatively fast.

Listing 15.15 Constructing the data Store

```

var remoteProxy = new Ext.data.ScriptTagProxy({
    url : 'http://tdgi/dataQuery.php'
});

var recordFields = ['firstname', 'lastname'];

var remoteJsonStore = new Ext.data.JsonStore({
    proxy           : remoteProxy,

```

```

        id          : 'ourRemoteStore',
        root       : 'records',
        autoLoad    : true,
        totalProperty : 'totalCount',
        remoteSort   : true,
        fields      : recordFields
    });
}

```

In the next listing, we'll create the generic MenuItem handler and configure a plug-in.

Listing 15.16 MenuItem handler and plugin

```

var onMenuItemClick = function(menuItem) {
    var ctxMenuGrid = Ext.getCmp('ctxMenuGrid');
    var selRecord = ctxMenuGrid.getSelectedRecord();
    var msg = String.format(
        '{0} : {1}, {2}',
        menuItem.text,
        selRecord.get('lastname'),
        selRecord.get('firstname')
    );
    Ext.MessageBox.alert('Feedback', msg);
};

var ctxMenuPlugin = {
    ptype : 'gridCtxMenuPlugin',
    menu : [
        {
            text     : 'Add Record',
            handler : onMenuItemClick
        },
        {
            text     : 'Update Record',
            handler : onMenuItemClick
        },
        {
            text     : 'Delete Record',
            handler : onMenuItemClick
        }
    ]
};

```

Along with the creation of the generic MenuItem handler, we configure the plug-in using a PType configuration object. ExtJS will use this to lazy-instantiate an instance of the plug-in we created and registered with the string "gridCtxMenuPlugin". Again, this is just like XTypes for Components.

Last, we'll create the GridPanel that will use the plug-in and display it onscreen.

Listing 15.17 Configuring and showing the GridPanel

```

var columnModel = [
    {
        header     : 'Last Name',
        dataIndex : 'lastname'
    },

```

```

    {
        header      : 'First Name',
        dataIndex  : 'firstname'
    }
];

var grid = {
    xtype       : 'grid',
    columns    : columnModel,
    store      : remoteJsonStore,
    loadMask   : true,
    id         : 'ctxMenuGrid',
    viewConfig : { forceFit : true },
    plugins    : ctxMenuPlugin
};

new Ext.Window({
    height : 200,
    width  : 300,
    border : false,
    layout  : 'fit',
    items   : grid,
    center  : true
}).show();

```

In listing 15.17, we configure a GridPanel XType object that uses the ctxMenuPlugin that we configured earlier and display it via an Ext.Window. In this implementation, we configured only one plug-in via the plugins reference. If we had more than one, we'd configure an array of plug-ins such as plugins : [plugin1, plugin2, etc].

Rendering this onscreen, you can see that we have the exact same functionality as our GridPanel extension, as shown in figure 15.7.

If you want to read the source code for other plug-ins, you can look at the Ext JS SDK examples/ux directory, which has a few examples of plug-ins. Using the pattern that we just implemented, I contributed two plug-ins.

The first, shown in figure 15.8, is known as the TabScrollerMenu (TabScrollerMenu.js), which adds a Menu to scrolling TabPanels, allowing users to select and focus a TabPanel much easier than having to scroll. To see this plug-in in action, navigate to the <your extjs dir>/examples/tabs/tab-scroller-menu.html URL in your browser.

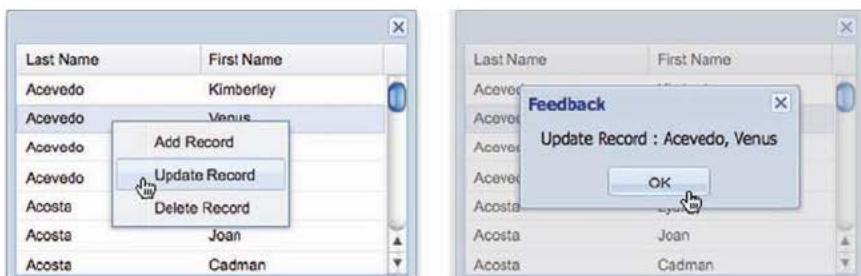


Figure 15.7 Our first plug-in

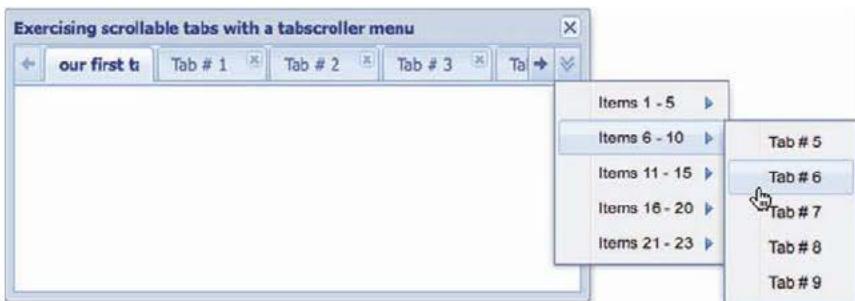


Figure 15.8 The TabScrollerMenu

The second, shown in figure 15.9, is known as the ProgressBar PagingToolbar (ProgressBarPager.js), which adds an animated ProgressBar to the PagingToolbar widget, making the PagingToolbar much nicer to look at. To view this plug-in in action, point your browser to <your extjs dir>/examples/grid/progress-bar-pager.html.

This concludes the exploration of plug-ins. By now, you have the necessary basics to create plug-ins that can enhance functionality in your projects. If you have an idea for a plug-in and aren't too sure if it's been done before, visit us at the Ext JS forums via <http://extjs.com/forum>. An entire section is dedicated to user extensions and plug-ins, where fellow community members have posted their work, some of which is completely free to use.

15.4 Summary

In this chapter, you learned how to implement the prototypal inheritance model using the basic JavaScript tools. During that exercise you got to see how this inheritance model is constructed step by step. Using that foundational knowledge, we

Sliding Pager				
Company	Price	Change	% Change	Last Updated
Intel Corporation	\$19.88	0.31	1.58%	09/01/2009
Microsoft Corporation	\$25.84	0.14	0.54%	09/01/2009
Pfizer Inc	\$27.96	0.4	1.45%	09/01/2009
Alcoa Inc	\$29.01	0.42	1.47%	09/01/2009
General Motors Corporation	\$30.27	1.09	3.74%	09/01/2009
AT&T Inc.	\$31.61	-0.48	-1.54%	09/01/2009
General Electric Company	\$34.14	-0.08	-0.23%	09/01/2009
The Home Depot, Inc.	\$34.64	0.35	1.02%	09/01/2009
Verizon Communications	\$35.57	0.39	1.11%	09/01/2009
Hewlett-Packard Co.	\$36.53	-0.03	-0.08%	09/01/2009

1	2	3	Page	1 of 3	>	>>	Displaying 1 - 10 of 29
---	---	---	------	--------	---	----	-------------------------

Figure 15.9 A plug-in that adds an animated ProgressBar to the PagingToolbar

refactored our subclass using the `Ext.extend` utility method and implemented the two most popular extend patterns.

Next, we took all of our foundational knowledge and applied it to the extension of an Ext JS `GridPanel` and created a composite `GridPanel` and `Menu` component. This gave us an opportunity to discuss which vector to extend from, constructor or `initComponent`, and you learned how extensions can assist with reusability in your applications.

Last, we analyzed how extensions can be limited when reusability needs to span multiple widgets. You got to see this in action when we studied how the added features found in our newly created `GridPanel` extension could not be easily applied to descendants of the `GridPanel`, such as the `EditorGridPanel`. In order to mitigate this problem, we converted the code in our `GridPanel` extension into a plug-in that could be applied to a `GridPanel` or any descendant thereof.

Next, you'll learn how to use all of the knowledge we've gathered thus far in this book and learn the trade secrets of building complex applications.

Part 5

Building applications

T

he final part of *Ext JS in Action* is dedicated to developing applications with the framework. It not only covers key topics like reusability and code organization but also walks through some of the thought processes required to program effectively.

In chapter 16, you'll learn about the importance of developing applications with reusability in mind and put this concept into practice. We'll also walk through the requirements of programming an application, including discussions of workflows.

Chapter 17 will focus on implementing the widgets that you created and tying them together to create the structure of your application.

By the end of this section, you'll know the fundamentals of creating an extensible and maintainable Ext JS application.

16

Developing for reusability

This chapter covers

- Learning to develop with reusability in mind
- Organizing your code via namespace
- Discovering how to layer code
- Reviewing basic application requirements
- Developing reusable components

To me, developing an application is more of an art than a science. The methods and patterns chosen for application construction vary based on many factors, some of which may be completely out of your control.

For example, what if the requirements dictate that the server-side controller either includes or excludes one or more JavaScript modules or files based on security rules? Such a requirement isn't uncommon in larger role- or permission-based applications. The implications of this type of requirement are rather large because the view changes based on the user role. Knowing how to build extensible applications that can be easily changed over time can be a rewarding experience for the developer and customers alike.

In this chapter, we'll take on the challenge of developing a relatively large application using a pattern that allows it to be easily extended or modified in the future.

You'll be learning about the JavaScript namespace and a segmented pattern that will give this application room to grow.

Before we get down to coding, we'll take an extensive look at the requirements and analyze each bit of the wireframes presented to us. I'll walk you through the decision process of constructing the application namespace for the reusable components that you'll construct.

After you've digested the requirements, we'll begin constructing the reusable components, some of which will be implemented in this chapter. In constructing these classes, we'll work to abstract any reusable methods to reduce code complexity and duplication.

This chapter is the longest thus far, with listings longer than any other you've encountered here. Let's get started with some of the basic concepts behind developing extensible applications with Ext JS. Instead of spending a lot of time copying the code in the following listings, you can download the entire application by pointing your browser to <http://app.extjsinaction.com/app.zip>.

16.1 *Developing for the future*

When developing applications with Ext JS, I strive to continue the spirit of reusability that the framework promotes. No matter what the size of the application, I employ the module pattern, which is popular among other veteran Ext JS developers. The basis for the module pattern is simple—organize components using namespace. That's it.

Reusability

Developing reusable code is something that's taught in universities and talked about often, but not practiced by many. Developing without reusability in mind will ensure that you create a brittle and frail application, where the slightest change can cause catastrophic failure, costing you time and frustration. Ultimately, it will also cost your customers more for the extra time spent on simple changes. For these reasons this chapter will heavily emphasize reusability.

Because the concept of *namespace* is new to some JavaScript developers, we'll take a moment for you to understand what it is and how it can benefit your application development.

16.1.1 *Namespaces*

Because JavaScript is a “globals” language, you use namespaces to reduce the likelihood of a collision with other code. With the rising use of code developed by other parties, if namespaces were not used, there could be a bunch of function- or variable-naming collisions that could break your code.

You might not realize it, but Ext JS itself is organized in this way. For instance, almost all of the framework's classes are contained within the Ext namespace. The only exceptions to this rule are the additions to the JavaScript language itself, such as

Namespaces

Namespaces in JavaScript are merely a way of grouping classes into one or more logical containers. In simplest terms, a namespace is an object whose keys point to references of classes or other objects, known as packages.

`String.format`. Some of the classes are further organized and grouped by their similarity of functionality. For instance, all classes that are dedicated to the presentation of charts are located in the `Ext.chart` namespace. Likewise, form widgets are located in the `Ext.form` namespace, and so on.

When developing applications, it's important to create at least one namespace for your application. You can elect to use this namespace for the entire application if you wish. To create a namespace, I use the `Ext.ns` method, which is shorthand for `Ext.Namespace` and takes care of concerns such as namespace collisions automatically.

To create a namespace, use the following syntax:

```
Ext.ns('MyApp');
```

Then you can add classes via

```
MyApp.MyWindow = Ext.extend(Ext.Panel, { /*...*/ });
MyApp.MyGridPanel = Ext.extend(Ext.grid.GridPanel, { /*...*/ }); // etc...
```

Then you can instantiate them via

```
var myWindow = new MyApp.MyWindow({/*config params*/});
myWindow.show();
```

Placing your classes inside a uniquely named namespace will reduce the chance of conflict. If you were developing a relative small app, keeping all of the classes inside the `MyApp` namespace would be easy. But you can readily envision a scenario where it could get rather difficult to manage on medium-to-large applications, where it may be cumbersome to keep all of your classes inside one namespace. Although there's no technical disadvantage to having lots of classes inside a single namespace, there is an organizational toll that's placed on the developer(s) working on the project.

This is where proper namespace segmentation can aid in class organization and even development.

16.1.2 Namespace segmentation

For medium-size applications I advise segmenting the namespace at least by the type of widget extension. For instance, let's say you have an application that requires at least two `GridPanel`, `FormPanel`, or `Panel` extensions and is expected to grow after the first release.

To meet this requirement, you could lay out the namespace as shown in figure 16.1. Following the namespace segmentation, I organize the JavaScript files in my project and computer's filesystem accordingly. For instance, to create the two `GridPanel`

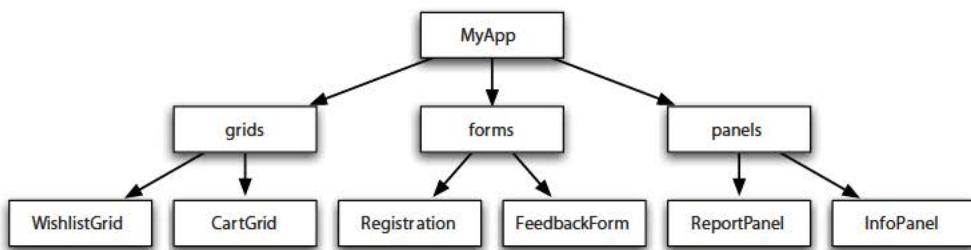


Figure 16.1 An example namespace with little segmentation

extensions shown, I'd create a directory in my project space called `MyApp` and then a subdirectory named `grids`. Inside the `grids` subdirectory, I'd create the files `WishlistGrid.js` and `CartGrid.js`.

Arranging your JavaScript in this manner is an organizational practice that's common with backend languages such as Java. Even though the location of the JavaScript *technically* doesn't matter to the browser's interpreter, it's something that I practice and encourage nonetheless.

To create a namespace like this, I add an `Ext.ns` declaration at the top of each file that contains a class. This ensures that the namespace for each class is properly defined before the class is constructed.

For example, inside `WishlistGrid.js` I'd insert the following:

```
Ext.ns("MyApp.grids");
MyApp.grids.WishlistGrid = Ext.extend(Ext.grid.GridPanel, { /*...*/});
```

By passing the string `"MyApp.grids"` to `Ext.ns`, the `MyApp` and `MyApp.grid` namespaces are created. This is because the utility is smart enough to split the string and create the necessary namespace objects in the global pool.

To create the fictitious `CartGrid` class, I'd add the following inside the `CartGrid.js` file:

```
Ext.ns("MyApp.grids");
MyApp.grids.CartGrid = Ext.extend(Ext.grid.GridPanel, { /*...*/});
```

We can use `Ext.ns` and pass a redundant namespace specification because it's smart enough to prevent the overwriting of any preexisting namespace objects.

This method of namespace segmentation works well for small- to medium-size applications, where application-specific code (business and workflow logic) can coexist with the extension classes. But I find that it's cumbersome for larger applications, where the separation of reusability from application-specific logic is necessary for ease of development and organization.

This is where further segmentation of code can be beneficial to larger application development efforts.

16.1.3 Namespace segmentation for large applications

For larger applications I divide the application code into two layers, logically separated by a root-level namespace. Figure 16.2 shows how I envision the JavaScript code stack.

Everything uses Ext JS, so it sits at the bottom and isn't aware of any of the code stacks above that implement it. This layer would also include your base framework of choice (Ext JS, YUI, jQuery, Prototype, and Scriptaculous) and any global overrides that you may want to put in place to fix any framework-related bugs or alter the way it operates.

The middle layer is a layer of reusability that you develop, and it contains custom widgets that extend Ext JS classes and Components. It can also contain plug-ins that can be used by either the top or middle layer to enhance application functionality or usability. This layer contains little to no application-specific code and has no visibility into the application logic layer above. All of the extensions that this layer contains should provide events whenever things occur, such as a Button press.

The application logic is the top of the stack and implements the bottom two layers. It contains everything from the application bootstrap code (think `Ext.onReady()`) to all of the workflow-specific logic.

I favor this method of code separation and organization because I believe that it offers the greatest flexibility. Because the code is separated in this way, you can focus on a particular piece relatively easily.

For instance, whenever I have to add a screen or custom widget to an application, I generally work on the custom component outside the application on a vanilla HTML page. This lets me work outside the clutter of the application and keep my attention on what I'm working on. Once I've completed all of the necessary logic for the reusable component, I add it to the application and then stitch it into the application/business logic layer.

Another added benefit of this approach is smaller overall JavaScript file size. If you were to embed application and workflow logic inside the code while you're building components, the number of lines in your class files could easily exceed 1,000, which can be difficult to debug and digest.

For these reasons we'll develop our application using this method. We'll begin by analyzing the requirements and then move on to developing the middle layer.

16.2 Analyzing the application requirements

For the remainder of this chapter, you'll need to use a little imagination. Pretend we're working together on a project, where we're tasked to work on only the frontend of a new application. Lucky for us, the backend API has already been completed. Requirements have been provided along with application mockup screens. Also, the

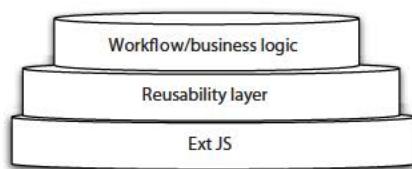


Figure 16.2 The different layers of a larger application

designer is aware of the framework's capabilities and can provide mockups that will mimic how the Ext JS Components will be rendered onscreen.

Before we begin developing, we'll quickly review the requirements so we can figure out where we can construct and implement reusable components.

16.2.1 Abstracting reusability

The application we're going to develop will service a small company whose initials are TKE, so all of the reusable components will live in this namespace. The goal of this application is to allow the company to manage full CRUD on departments and employees. According to the available documentation, the application will be presented using 100 percent of the available browser's canvas. It will contain three main screens, each with an instance of Ext.Window.

Management has stated that they'll be extending this application after its initial production drop, so whatever can be abstracted to the middle layer should be. In order to do this properly, we need to review the screens that the design team has provided.

When the application launches, the user will be greeted with a login screen, shown in figure 16.3.

We'll call this class UserLoginWindow. Because it's so small, we won't spend time constructing and reviewing its code. This will allow us to focus on the more intense classes later on. The fully documented code is available in the downloadable source code.

Because this widget will live in the reusability layer, we'll add it the TKE namespace, encapsulated in a window package, shown in figure 16.4.

Next, we'll look at the Dashboard screen.

16.2.2 The Dashboard screen

After a successful login, the login window will disappear, revealing the application screen underneath. This is where the user will be able to access each of the three main application screens. The first of these is a dashboard containing two graphs and is shown in figure 16.5.

Before we discuss the Charts, we should talk about the way the application screen is laid out and configured.

Recall that the application will be required to take 100 percent of the viewable space in the browser. With this requirement, the first thought that's probably running through your mind is that we need to use a Viewport, which is correct.

Instead of using a typical widget like the TabPanel to allow users to switch between screens, the designer has elected to use the toolbar buttons as the main navigational



Figure 16.3 The application login screen window



Figure 16.4
The UserLoginWindow inside the TKE namespace

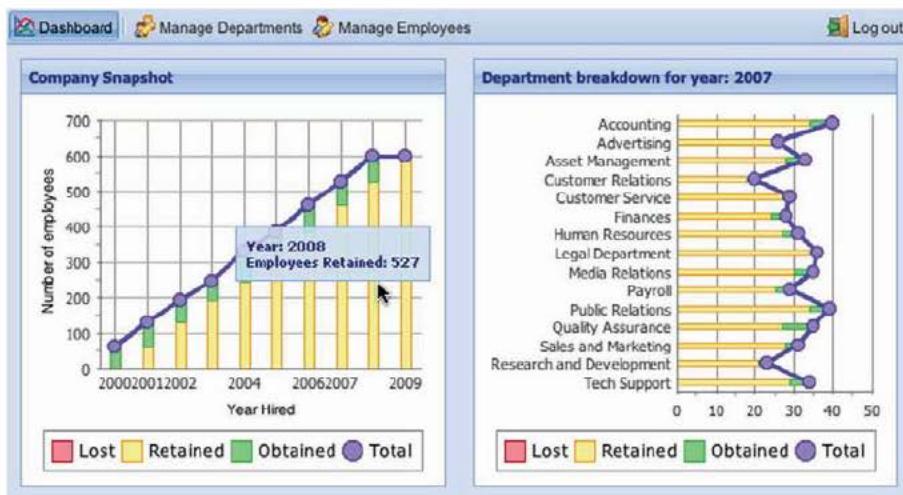


Figure 16.5 Analyzing the application layout and Dashboard screen

component. This decision is made based on the fact that the requirements dictated that a logout button must be present and visible at all times. The designer didn't want to waste the space of an entire toolbar for one button because implementing this type of CardLayout-based navigation doesn't require much work.

Because the Viewport is a Container that uses 100 percent of the browser's canvas and doesn't have luxuries such as Toolbars, we'll have to wrap the entire visible portion of the application in a Panel and embed it inside the Viewport, which leverages the FitLayout. Each of the screens will be a child of this Panel.

Focusing on the Dashboard screen, you can see that we have two Panels, each of which has a single chart. This screen is designed to give management a historical view of the company's growth based on the number of employees obtained, retained, and lost.

The Company Snapshot Chart (left) will plot the entire lifespan of the company from creation to the present. The requirements dictate that when the Company Snapshot Chart is clicked, the Department Breakdown Chart (right) will load, providing the user with a drill-down view of the statistics for the year, organized by department.

Looking at both of these charts, you can see a few reusable aspects. The first obviously is styles, and given the inherent nature of how styles are defined with Charts, we certainly need to have a base class that will contain the reusable factory and utility methods for these two Charts. Given all of this, we can modify the TKE namespace to contain a chartpanel object, which will contain our three Chart classes.

Figure 16.6 illustrates how it will be laid out.

The ChartPanelBaseCls will abstract all of the construction of the instances of Ext.chart.Chart and embed them into a Panel leveraging the FitLayout. Having the base class wrap the Chart into a Panel alleviates the application layer from having to configure the Panel, thus reducing the amount of code in that layer.

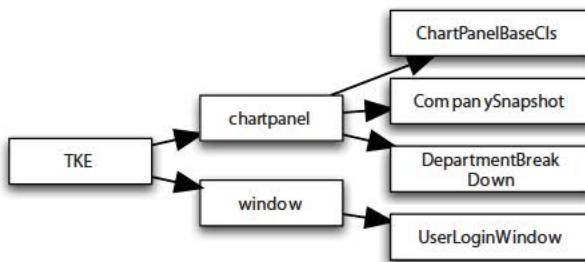


Figure 16.6
The `TKE.chartpanel` namespace configuration

This base class will also contain all of the reusable styles and utility methods. Configuring the Chart classes in this manner will ensure that the amount of code that's duplicated is kept to a minimum and will make the construction of the `TotalEmployees` and `DepartmentBreakDown` classes easy, because they will inherit from the `ChartPanelBaseCls`.

When users decide to view the Manage Departments screen, all they need to do is click the associated Button. Let's spend a few moments discussing this screen, because it's the busiest in the entire application.

16.2.3 The Manage Departments screen

Refer to figure 16.7 as we discuss the Manage Departments screen.

The designer has generated a rather complex layout. This design allows for easy CRUD operations on departments and employees. The screen is split into two major sections. The ListView sits on the left (west region), displaying departments and a

Last Name	First Name	Email	Date Hired	Rate
Austin	Fleur	neque.non@nascetur.org	06/18/2002	\$126.00
Barrera	Germane	pede.Cras@bibendum.org	08/23/2000	\$104.00
Baxter	Zelenia	ante@commodoautoclip.com	10/06/2006	\$69.00
Berger	Nevada	Phasellus.null@Aliquam.org	06/28/2007	\$41.00
Booth	Porter	quis@Cras.edu	06/30/2002	\$105.00
Boyer	Summer	Suspendisse@Nunc.com	07/06/2006	\$54.00
Brady	Kalia	Duis.dignissim@dispar.org	07/12/2004	\$88.00
Brewer	Branden	eleifend.vitae@estMaior.org	09/02/2002	\$109.00
Burnett	Blaze	Phasellus.null@ipsur.org	08/06/2005	\$122.00
Clarke	Quon	Donec.solicitudin@es.org	01/15/2008	\$83.00
Francis	Amal	risus.In.mi@luctusetulli.org	12/09/2001	\$21.00

Figure 16.7 The Manage Departments screen

FormPanel, and a GridPanel sits on the right (center region), displaying the details for the selected department.

The form input items in the top part of the center Panel allow users to modify a selected department, such as the department's name, activation date, and any details or notes. The GridPanel that's neatly embedded underneath the form lists all of the employees for the department selected on the left ListView Panel. Its purpose is to allow for full CRUD operations on employees along with the ability to associate (move) existing employees from other departments.

To make this screen possible, we'll create three separate components, which will all live in the reusability layer. They are the departments ListView, employees GridPanel, and a composite component, DepartmentForm, that will contain the department form input elements and the employees GridPanel.

Figure 16.8 illustrates how I'd envision the TKE namespace looking with the added ListView, GridPanel, and FormPanel extension classes.

To accommodate the reusable components in the Manage Departments screen, I've added three new namespace objects: listpanel, grid, and form. Looking at the listpanel object, you can see that there are two classes in that namespace, ListPanelBaseCls and DepartmentsListView. We're creating the ListPanelBaseCls for all of the same reasons as the ChartPanelBaseCls and will reap the same benefits.

The grid and form namespaces are areas where those related reusable components will be tucked away. The EmployeeGridPanel will extend from Ext.grid.GridPanel, whereas the DepartmentForm will extend from Ext.form.FormPanel and will implement the EmployeeGridPanel component.

Examining the last two areas of functionality for this screen, you can see that to add or edit employees for a particular department, the user is expected either to click the New Employee Button or double-click a Record in the EmployeeGridPanel,

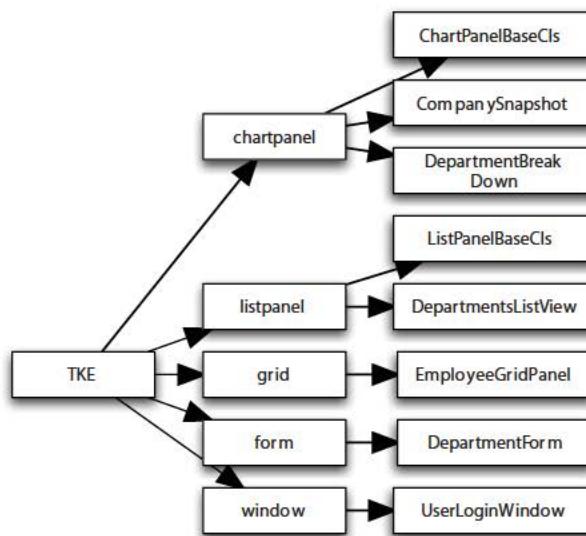


Figure 16.8 Adding the listpanel, grid, and form namespace objects to the TKE namespace



Figure 16.9 The Edit employee form embedded and displayed in a Window

which will display a modal Ext.Window containing the Edit employee form, as shown in figure 16.9.

Once this Window is displayed, the user can click the Cancel or Save Button to cancel or accept any changes. Given this requirement, we need to add a reusable FormPanel component to our namespace. The Window class, however, will require a lot of application-specific logic and thus will stay in the application logic layer.

I like to add reusable utility methods to my FormPanel classes, so we'll have to add a base class that the DepartmentForm and EmployeeForm can extend from. Figure 16.10 shows TKE namespace with the added FormPanelBaseCls and EmployeeForm classes.

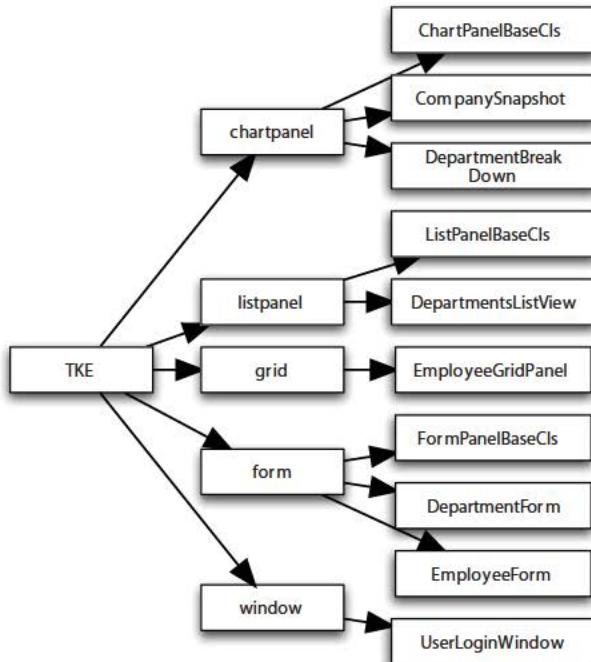


Figure 16.10 The TKE namespace with the added EmployeeForm and FormPanelBaseCls classes

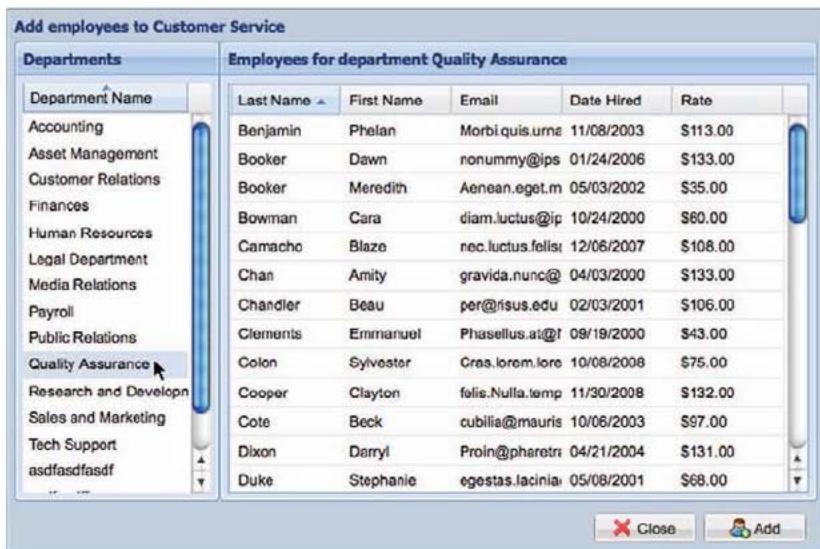


Figure 16.11 The employee association Window

The last Manage Departments requirement dictates that employees are to be associated with a selected department. When the Associate Employee(s) Toolbar Button is clicked, a Window will appear, as shown in figure 16.11.

If you examine the layout of the employee association Window, you'll see that the previously created `DepartmentsListView` and `EmployeeGridPanel` are reused. Because the `EmployeeAssociationWindow` class doesn't require application-specific rules, such as form-validation messages, it will live in the reusability layer and can be implemented by the `EmployeeGridPanel` located in the Manage Departments screen.

Figure 16.12 shows what our TKE namespace looks like with the added window object and `EmployeeAssociationWindow` class.

This wraps up our coverage of the Manage Departments screen. Next, we'll look at the Manage Employees screen and see if there are any reusable components that can be abstracted.

16.2.4 The Manage Employees screen

The Manage Employees screen is meant to allow fast and easy CRUD operations for employees. But unlike the Manage Departments screen, users won't be able to directly modify departments. Instead, they'll only be able to modify Employee data.

Figure 16.13 shows what it looks like rendered onscreen.

The workflow requirements for this screen are simple relative to the Manage Departments screen before it. Users will interact with this panel in a left-to-right fashion, clicking a department to set the context of the Employees list. To load the `EmployeeForm` on the right, they will click an employee Record.

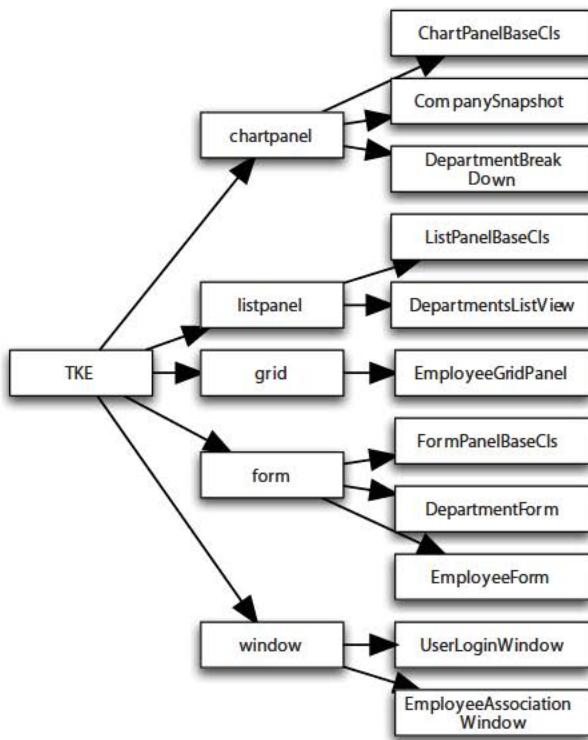


Figure 16.12
The TKE namespace with the added window namespace object and EmployeeAssociationWindow class

If you examine the layout, you'll see that all but one of the components for this screen are already developed. The layout contains the DepartmentsListView (left) and the EmployeeForm Panel (right). This means that we still need to create a ListView for the Employees Panel (center).

Figure 16.14 shows the TKE namespace with the newly added EmployeeList extension.

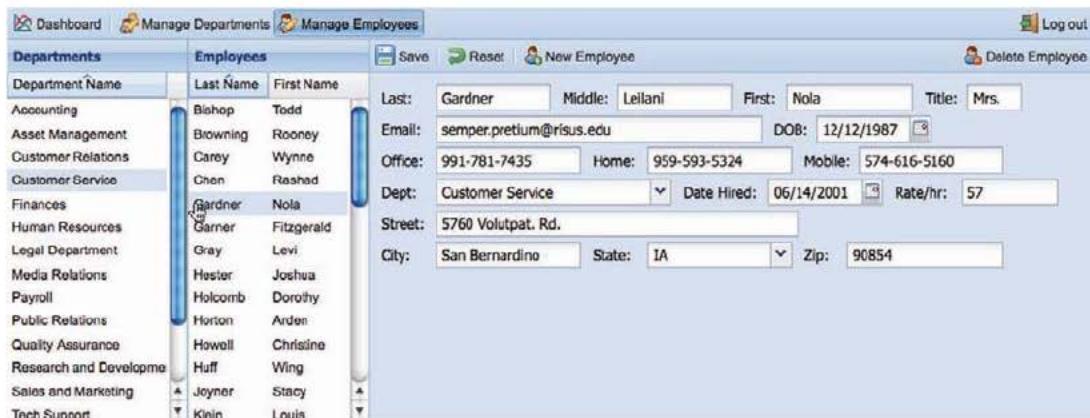


Figure 16.13 The Manage Employees screen

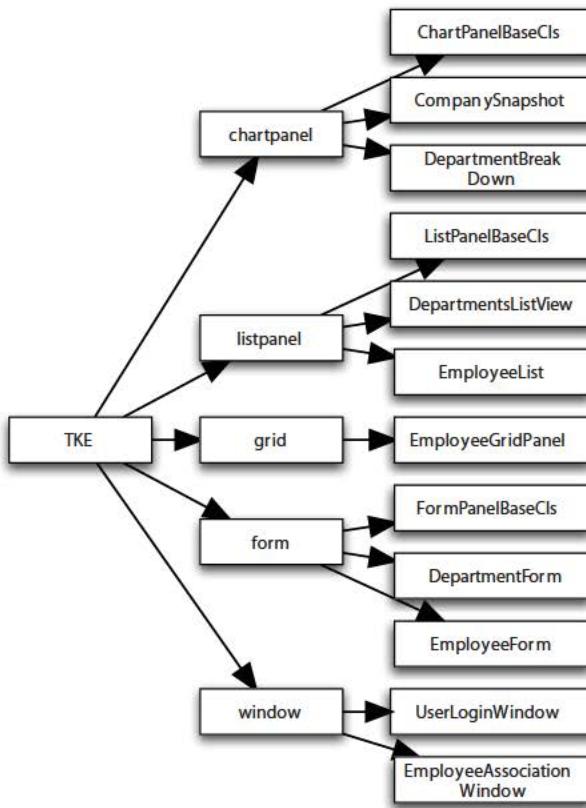


Figure 16.14 The TKE namespace modified to include the `EmployeeList` class

NOTE The classes for this application are designed to use the icon CSS file that we leveraged in chapter 12 of this book. You'll want to include it when constructing the HTML body for this application.

We've just completed a comprehensive review of the requirements for our application, which means we can get to work developing classes that will belong in the TKE namespace. We'll begin with the chart namespace.

16.3 Constructing the *ChartPanel* components

Recall that the Dashboard screen requires two Charts, wrapped by Panels, sharing the same styles and factory methods. This means that we'll need to create a base class to hold all of these shared items.

16.3.1 The *ChartPanelBaseCls*

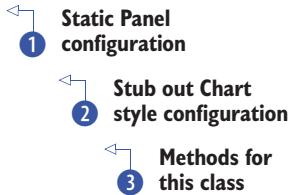
In order to fulfill its role as a base class, the `ChartPanelBaseCls` must allow for the easy creation of extensions, with minimal configuration. In order to ensure easy extensibility, this base class will require the following features:

- Stub or template methods to create the Chart and Store along with so-called accessor methods
- All of the styles for the Chart
- The ability to relay the internal Chart's itemclick event
- A reusable tip renderer method
- Our first listing provides the template for the class we'll create.

Listing 16.1 Constructing the ChartPanelBaseCls

```
Ext.ns('TKE.chartpanel');

TKE.chartpanel.ChartPanelBaseCls = Ext.extend(Ext.Panel, {
    frame      : false,
    layout     : 'fit',
    chartExtraStyles : {},
    seriesStyles : {},
    initComponent : function() {},
    buildChart   : function() {},
    buildSeries  : function() {},
    buildStore   : function() {},
    getChart     : function() {},
    getStore     : function() {},
    loadStoreByParams : function() {},
    tipRenderer  : function() {}
});
```



1 Static Panel configuration

2 Stub out Chart style configuration

3 Methods for this class

The ChartPanelBaseCls extends Ext.Panel. You place all of the static Panel-specific configurations in the prototype of the extension ① along with the chart-specific styles ②. You do this because the prototype is shared among all instances of this class, subclasses, and any instances of any subclasses. Under the initComponent extension method are the necessary factory and utility methods ③ to make extending this class simple.

In the following listing, we'll focus on filling in the chart-style configuration objects and all methods for this base class.

Listing 16.2 Adding the styles to the ChartPanelBaseCls

```
chartExtraStyles : {
    xAxis : {
        majorGridLines : {color: 0x999999, size : 1}
    },
    yAxis: {
        titleRotation : -90
    },
    legend : {
        display : "bottom",
        padding : 5,
        spacing : 2,
        font   : { color : 0x000000, family : "Arial", size : 12 },
        border : { size : 1, color : 0x999999 }
    }
}
```



1 Chart extra styles object

```

},
seriesStyles : {
    red : {
        fillColor   : 0xFFAAAA,
        borderColor : 0xAA3333,
        lineColor   : 0xAA3333
    },
    yellow : {
        fillColor   : 0xFFFFAA,
        borderColor : 0xFFAA33,
        lineColor   : 0x33AA33
    },
    green : {
        fillColor   : 0xAFFFAA,
        borderColor : 0x33AA33,
        lineColor   : 0x33AA33
    },
    blue : {
        fillColor   : 0xAAAAFF,
        borderColor : 0x3333FF,
        lineColor   : 0x3333FF
    }
},
}

```

 **Style Series
in Charts**

The extra chart styles configuration object ① and the chart series style configuration object ② will be used when the instances of Chart are created. Because this is an abstract base class, you'll have to wait for the extensions of this class to see the style usage.

In the next listing, we'll add the initComponent extension method as well as the template and utility methods.

Listing 16.3 Adding the methods to the ChartPanelBaseCls

```

initComponent : function() {
    this.items = this.buildChart();
    TKE.chartpanel.ChartPanelBaseCls.superclass.initComponent.call(this);
    this.relayEvents(this.getChart(), ['itemclick']);
},
buildChart : function() {
    return {};
},
buildSeries : function() {
    return [];
},
buildStore : function() {
    return {};
},
getChart : function() {
    return this.items.items[0];
},
getStore : function() {
    return this.getChart().store;
},
loadStoreByParams : function(params) {
}

```

 **Relay the Chart
itemclick event**

 **② A Store loader
utility method**

```

params = params || {};
this.getStore().load({
    params : params
}),
tipRenderer : function(chart, record, index, series){
    var yearInfo = "Year: " + record.get('year');
    var empInfo = 'Employees ' + series.displayName + ': '
        + record.get(series.yField);
    return yearInfo + '\n' + empInfo ;
}

```



The reusable tip renderer

In listing 16.3, a lot is going on. First is the `initComponent` method, which sets the `this.items` reference to the results of the `this.buildChart` stub method. It also relays the internal Chart component's `itemclick` event ①, which means for any application logic that decides to implement this or any subclass, this class can set up an `itemclick` ② event listener as if it was originating from the `ChartPanelBaseCls` itself. You won't see this used until we build the application logic.

The `buildChart` template method returns an empty object. It does so to allow this class to be instantiated if a developer decided to do so. Even though no instance of `Ext.chart.Chart` will exist when this class is implemented, it will at least be rendered as an empty Panel onscreen and not throw any exceptions. Even though this base class doesn't call the `buildSeries` and `buildStore` methods, they're there to remind developers that these are stub methods to be implemented. The rest of the methods are meant for utility methods, with the exception of the reusable `tipRenderer` method ③, which will be implemented by subclasses.

You can test to see if it works by inserting the following code into a vanilla page:

```

new Ext.Window({
    width : 100,
    height : 100,
    layout : 'fit',
    items : new TKE.chartpanel.ChartPanelBaseCls()
}) .show();

```

This code will result in a Window being rendered onscreen with a blank Panel inside its body and no exceptions thrown. This is a clear indication that our abstract base class works as designed and is ready to be extended, which is what we'll do next.

16.3.2 The CompanySnapshot class

We've just completed our `ChartPanelBaseCls`, which contains quite a bit to make extending this class extremely simple. In this section, we'll create an extension to the `ChartPanelBaseCls`, which will be used to easily configure a Chart to display all of the company's obtained, retained, and lost employees since it was created. We'll name it `TotalCompany`.

Here's the template for our class:

```

Ext.ns('TKE.chartpanel');
TKE.chartpanel.CompanySnapshot =
    Ext.extend(TKE.chartpanel.ChartPanelBaseCls, {

```

```

url : 'stats/getYearlyStats',
buildChart : function() {},
buildStore : function() {},
buildSeries : function() {}
});

Ext.reg('total_employees_chart', TKE.chartpanel.CompanySnapshot);

```

Because the ChartPanelBaseCls does all of the heavy lifting, the CompanySnapshot extension consists of only three overrides to the stub methods to create the internal Chart. Let's fill those in.

First, we'll configure buildChart, as shown in the following listing.

Listing 16.4 The CompanySnapshot class template

```

buildChart : function() {
    return {
        xtype      : 'stackedcolumnchart',
        store      : this.buildStore(),
        xField     : 'year',
        tipRenderer : this.tipRenderer,
        series     : this.buildSeries(),
        extraStyle : this.chartExtraStyles,
        xAxis      : new Ext.chart.CategoryAxis({
            title : 'Year Hired'
        }),
        yAxis      : new Ext.chart.NumericAxis({
            stackingEnabled : true,
            title           : 'Number of employees'
        })
    };
},

```

The buildChart method returns an Ext.chart.Chart configuration object, which is called and used by the ChartPanelBaseCls initComponent method. To reduce the complexity of this method, it uses the this.buildStore and this.buildSeries factory methods to generate the data Store and series configurations. It also configures the Chart to leverage the tipRenderer method provided by the ChartPanelBaseCls as well as the chartExtraStyles.

In the next listing, we'll complete the buildStore and buildSeries factory methods.

Listing 16.5 Completing the buildStore and buildSeries factory methods

```

buildStore : function() {
    return {
        xtype      : 'jsonstore',
        autoLoad   : true,
        url       : this.url,
        fields    : [
            'year', 'numFired', 'prevHired', 'total', 'newHires'
        ]
    };
},
buildSeries : function() {

```

```

var seriesStyles = this.seriesStyles;
return [
{
    yField      : 'numFired',
    displayName : 'Lost',
    style       : seriesStyles.red
},
{
    yField      : 'prevHired',
    displayName : 'Retained',
    style       : seriesStyles.yellow
},
{
    yField      : 'newHires',
    displayName : 'Obtained',
    style       : seriesStyles.green
},
{
    type       : 'line',
    yField     : 'total',
    displayName: 'Total',
    style       : seriesStyles.blue
}
];
}

```

The buildStore method returns an Ext.data.JsonStore XType configuration object that will be used by the internal instance of Ext.chart.Chart. Because this component will serve only one purpose in the application, I decided that it was okay to statically configure the Store's URL and series configuration. Doing this will reduce the code in the application layer that will instantiate instances of this class.

With this class complete, we can work on the other ChartPanelBaseCls extension.

16.3.3 The DepartmentBreakdown class

The construction of the second ChartPanelBaseCls extension will be nearly identical to its cousin, the CompanySnapshot extension class. Instead of providing you with a template and then filling it in later, I'll show you the entire class in one fell swoop.

Listing 16.6 The DepartmentBreakdown class

```

Ext.ns('TKE.chartpanel');
TKE.chartpanel.DepartmentBreakdown =
    Ext.extend(TKE.chartpanel.ChartPanelBaseCls, {
        url : 'stats/getDeptBreakdown',
        buildChart : function() {
            return {
                xtype      : 'stackedbarchart',
                store      : this.buildStore(),
                yField    : 'name',
                series    : this.buildSeries(),
                extraStyle : this.chartExtraStyles,
            }
        }
    });

```

```

        xAxis      : new Ext.chart.NumericAxis({
            xField      : 'newHires',
            stackingEnabled : true
        }),
        yAxis      : new Ext.chart.CategoryAxis({
            xField : 'newHires',
            yField : 'name'
        })
    );
},
buildStore : function() {
    return {
        xtype      : 'jsonstore',
        autoLoad  : false,
        url       : this.url,
        fields    : [
            'name','numFired', 'prevHired', 'total', 'newHires'
        ]
    };
},
buildSeries : function() {
    var seriesStyles = this.seriesStyles;
    return [
        {
            xField      : 'numFired',
            displayName : 'Lost',
            style       : seriesStyles.red
        },
        {
            xField      : 'prevHired',
            displayName : 'Retained',
            style       : seriesStyles.yellow
        },
        {
            xField      : 'newHires',
            displayName : 'Obtained',
            style       : seriesStyles.green
        },
        {
            type       : 'line',
            xField    : 'total',
            displayName : 'Total',
            style       : seriesStyles.blue
        }
    ];
}
);
Ext.reg('department_breakdown_chart', TKE.chartpanel.DepartmentBreakdown);

```

This concludes the construction of the Chart classes. With this exercise, you've seen what it takes to create a base class that can contain lots of reusable configuration parameters and do the heavy lifting for intended extensions.

Following the same base class pattern, we'll create the components that belong in the listpanel namespace.

16.4 Constructing the *listpanel* components

When reviewing our application requirements, you learned that at least two instances of Ext.list.ListView are to be implemented and are to live inside an instance of Ext.Panel. Because these are similar requirements to the Charts in the application, we'll use the same base class approach.

16.4.1 The *ListPanelBaseCls*

The purpose of this base class is to allow the easy creation of Ext.list.ListView instances that are wrapped in a Panel. It will relay the click event from the internal ListView class and the load event from the internally created Ext.data.Store class. Recall that the purpose of relaying these events is to make implementation of this class or any subclass leveraging these events as easy as possible.

Because we've been through this exercise before, I'll show you the entire base class. In this listing you'll find many similarities to the ChartPanelBaseCls, such as the construction of the view and the relaying of events from child components.

Listing 16.7 Constructing the *ListPanelBaseCls*

```
Ext.ns('TKE.listpanel');

TKE.listpanel.ListPanelBaseCls = Ext.extend(Ext.Panel, {
    layout : 'fit',
    initComponent : function() {
        this.items = this.buildListView();

        TKE.listpanel.ListPanelBaseCls.superclass.initComponent.call(this);

        this.relayEvents(this.getView(), ['click']);
        this.relayEvents(this.getStore(), ['load']);
    },
    buildListView : function() {
        return {};
    },
    buildStore : function() {
        return {};
    },
    clearView : function() {
        this.getStore().removeAll();
    },
    createAndSelectRecord : function(o) {
        var view = this.getView();

        var record = new view.store.recordType(o);
        view.store.addSorted(record);
        var index = view.store.indexOf(record);
        view.select(index);
        return record;
    },
    clearSelections : function() {
        return this.getView().clearSelections();
    },
    getView : function() {
        return this.items.items[0];
    }
});
```

```

},
getStore : function() {
    return this.getView().store;
},
getSelectedRecords : function() {
    return this.getView().getSelectedRecords();
},
getSelected : function() {
    return this.getSelectedRecords()[0];
},
loadStoreByParams : function(params) {
    params = params || {};
    this.getStore().load({params:params});
},
refreshView : function() {
    this.getView().store.reload();
},
selectById : function(id) {
    var view = this.getView();
    id = id || false;
    if (id) {
        var ind = view.store.find('id', id);
        view.select(ind);
    }
}
});

```

Just as the ChartPanelBaseCls does a lot of the heavy lifting for the chartpanel classes, the ListPanelBaseCls does the hard work for the listpanel classes, where there are many reusable utility methods.

Most of these utility methods revolve around managing the selection, loading the view, or clearing and even requesting the selection of a Record by ID. Some of them help get a reference to an underlying component, such as the `getView` and `getStore` methods. Having such utility methods can reduce the amount of code in your application layer significantly.

You can appreciate how much work this base class does by creating the first extension, which will be known as `DepartmentsListView`, because there are only two factory methods that the subclasses are meant to implement: `buildListView` and `buildStore`.

16.4.2 The DepartmentsListView and EmployeeList classes

The `DepartmentsListView` class is meant to extend from the `ListPanelBaseCls` and display the departments in the company. The following listing shows the `DepartmentsListView` class in its entirety.

Listing 16.8 The DepartmentsListView class

```

Ext.ns("TKE.listpanel");
TKE.listpanel.DepartmentsListView =
Ext.extend(TKE.listpanel.ListPanelBaseCls, {
    url : 'departments/getList',

```

```

buildListView : function() {
    return [
        xtype      : 'listview',
        singleSelect : true,
        store       : this.buildStore(),
        style       : 'background-color: #FFFFFF;',
        columns     : [
            {
                header   : 'Department Name',
                dataIndex : 'name'
            }
        ]
    ];
},
buildStore : function() {
    return {
        xtype      : 'jsonstore',
        autoLoad  : this.autoLoadStore,
        url       : this.url,
        fields    : [ 'name', 'id' ],
        sortInfo : {
            field : 'name',
            dir   : 'ASC'
        }
    };
}
);
Ext.reg('departmentlist', TKE.listpanel.DepartmentList);

```

As you can see, extending the `ListPanelBaseCls` to create the `DepartmentsListView` class is extremely easy, because all we needed to do was override the `buildListView` and `buildStore` factory methods, which each return their intended configuration objects.

In the next listing, we'll construct the `EmployeeList` class, which will follow the exact same pattern as the `DepartmentsListView` class we just created.

Listing 16.9 The EmployeeList class

```

Ext.ns("TKE.listpanel");

TKE.listpanel.EmployeeList = Ext.extend(TKE.listpanel.ListPanelBaseCls, {
    url : 'employees/listForDepartment',
    buildListView : function() {
        return [
            xtype      : 'listview',
            singleSelect : true,
            store       : this.buildStore(),
            style       : 'background-color: #FFFFFF;',
            columns     : [
                {
                    header   : 'Last Name',
                    dataIndex : 'lastName'
                },
            ]
        ];
    }
});

```

```

        {
            header    : 'First Name',
            dataIndex : 'firstName'
        }
    ],
},
buildStore : function() {
    return {
        xtype     : 'jsonstore',
        autoLoad : this.autoLoadStore || false,
        url      : this.url,
        fields   : [ 'lastName', 'firstName', 'id'],
        sortInfo : {
            field   : 'lastName',
            direction : 'ASC'
        }
    };
}
);
Ext.reg('employeelist', TKE.listpanel.EmployeeList),

```

We've just created all three of the classes that compose the listpanel namespace using the same base class pattern that we used when constructing the chartpanel namespace classes. In using this pattern, you got a chance to see how architecting a namespace that has a common abstract base class can reduce the effort required when creating classes that are meant to be instantiated.

Looking ahead, we're going to create the EmployeeGridPanel class, which the department form and employee association window need.

16.5 Constructing the EmployeeGridPanel class

The EmployeeGridPanel component will be the only GridPanel extension to live in the application. This means that there's no real need to create a base class at this time, so it will have to contain all of the methods and configuration parameters. But it's constructed in such a way as to allow for easy abstraction of common methods and configuration properties in the future.

Because this class is rather lengthy, first I'll show you the template, and then we'll fill in the portions step by step later on.

Listing 16.10 The EmployeeGridPanel class

```

Ext.ns('TKE.grid');

TKE.grid.EmployeeGridPanel = Ext.extend(Ext.grid.GridPanel, {
    url          : 'employees/listForDepartment',
    viewConfig   : { forceFit : true },
    columns      : [],
    initComponent : function() {},
    buildStore   : function() {},
    add          : function() {},
    loadData     : function() {},

```

```

        load      : function() {},
        removeAll : function() {},
        remove   : function() {},
        getSelected : function() {}
    });

Ext.reg('employeesgridpanel', TKE.grid.EmployeeGridPanel)

```

In the next listing, we'll fill in the columns array, which will be used by the Ext.grid.ColumnModel automatically instantiated by the Ext.grid.GridPanel class.

Listing 16.11 columns array

```

columns      : [
{
    header      : 'Last Name',
    dataIndex : 'lastName',
    sortable   : true
},
{
    header      : 'First Name',
    dataIndex : 'firstName',
    sortable   : true
},
{
    header      : 'Email',
    dataIndex : 'email',
    sortable   : true
},
{
    header      : 'Date Hired',
    dataIndex : 'dateHired',
    sortable   : true
},
{
    header      : 'Rate',
    dataIndex : 'rate',
    sortable   : true,
    renderer   : Ext.util.Format.usMoney
}
],

```

Next, we'll fill in the rest of the methods for the class.

Listing 16.12 EmployeeGridPanel class methods

```

initComponent : function() {
    this.store = this.buildStore();
    TKE.grid.EmployeeGridPanel.superclass.initComponent.call(this);
},
buildStore : function() {
    return {
        xtype      : 'jsonstore',
        url       : this.url,
        autoLoad  : false,
        fields    : [

```

```

        'id', 'lastName', 'firstName', 'email',
        'dateHired', 'rate', 'departmentId'
    ],
    sortInfo : {
        field : 'lastName',
        dir   : 'ASC'
    }
},
};

add : function(rec) {
    var store = this.store;
    var sortInfo = store.sortInfo;

    if (Ext.isArray(rec)) {
        Ext.each(rec, function(rObj, ind) {
            if (! (rObj instanceof Ext.data.Record)) {
                rec[ind] = new this.store.recordType(rObj);
            }
        });
    }
    else if (Ext.isObject(rec) && ! (rec instanceof Ext.data.Record)) {
        rec = new this.store.recordType(rec);
    }

    store.add(rec);
    store.sort(sortInfo.field, sortInfo.direction);
},
loadData : function(d) {
    return this.store.loadData(d);
},
load : function(o) {
    return this.store.load(o);
},
removeAll : function() {
    return this.store.removeAll();
},
remove : function(r) {
    return this.store.remove(r);
},
getSelected : function() {
    return this.selModel.getSelections();
}
}

```

Because this is a `GridPanel` extension, any of the native `GridPanel` events, such as `rowdblclick`, will be available upon instantiation of this class. But we'll work to make things easier for the application layer by adding a few convenience methods, such as `getSelected`, `removeAll`, and `load`.

The `add` method, which allows for the easy addition of one or more Records to the `Store`, is a bit more involved. It's relatively flexible, because it'll accept an array or a single object. If it detects an array, it'll perform a check on each element, converting each to an instance of a `Ext.data.Record`, to be inserted into the `Store`. Likewise, if it detects a plain object being passed to this method, it'll use it to instantiate a new instance of `Ext.data.Record` and add it to the `Store`. The `Store`'s `sort` method will be manually called to ensure the Record is visually placed properly onscreen.

NOTE The Ext.data.Store's addSorted method works with only a single record at a time. Because our add utility method can accept multiple items, it's much faster to add the record and then manually call the Store's sort method.

Next, we'll create the EmployeeAssociationWindow class, which implements the EmployeeGridPanel and the DepartmentsListView classes.

16.6 The EmployeeAssociationWindow class

Recall that the EmployeeAssociationWindow composite widget is designed to allow the user to move employees from one department to another. It does this by means of a layout, which displays the DepartmentsListView on the left side and the EmployeeGridPanel on the right side of the Window body. Because the EmployeeGridPanel class is context sensitive to the department that's selected in the DepartmentsListView class, we'll have to set up some rudimentary event handling.

This class is rather lengthy, so we'll start with the template in the following listing and then fill in the methods later.

Listing 16.13 The EmployeeAssociationWindow class

```
Ext.ns("TKE.window");
TKE.window.EmployeeAssociationWindow = Ext.extend(Ext.Window, {
    width          : 600,
    height         : 400,
    maxWidth       : 600,
    maxHeight      : 500,
    modal          : true,
    border         : false,
    closable       : false,
    center         : true,
    constrain      : true,
    resizable      : true,
    departmentName: '',
    departmentId   : null,
    layout         : {
        type  : 'hbox',
        align : 'stretch'
    },
    initComponent   : function() {},
    buildButtons    : function() {},
    buildListViewPanel: function() {},
    buildGridPanel  : function() {},
    onClose         : function() {},
    onAddToDepartment: function() {},
    onDepartmentListClick: function() {},
    onDepartmentStoreLoad : function() {}
});
```



Custom
configuration
parameters

The EmployeeAssociationWindow class template shown in listing 16.13 contains a lot of configuration parameters for its base class, Ext.Window. It's worth noting that there

are two configuration properties, `departmentName` ① and `departmentId`, that are specific to this class.

The `departmentName` configuration property will be used to automatically set the Window title. Also, this entire window is context sensitive to the selected department in the application's Manage Departments screen. This means that once this window renders and its own `DepartmentsListView` class loads, we'll use the `departmentId` to automatically remove the Record for the selected department from the DepartmentManager screen. This will ensure that the source department and destination department for the employee move operation are not the same.

In the following listing, we'll fill in the details for the `initComponent` method along with the three factory methods, each designed to construct the Buttons for the Window `DepartmentsListView` and `EmployeeGridPanel`.

Listing 16.14 The `initComponent` and factory methods

```
initComponent : function() {
    Ext.apply(this, {
        title : 'Add employees to ' + this.departmentName,
        buttons : this.buildButtons(),
        items : [
            this.buildListViewPanel(),
            this.buildGridPanel()
        ]
    });
    TKE.window.EmployeeAssociationWindow.superclass.initComponent.call(this);
    this.addEvents({
        assocemployees : true
    });
    buildButtons : function() {
        return [
            {
                text : 'Close',
                iconCls : 'icon-cross',
                scope : this,
                handler : this.onClose
            },
            {
                text : 'Add',
                iconCls : 'icon-user_add',
                scope : this,
                handler : this.onAddToDepartment
            }
        ];
    },
    buildListViewPanel : function() {
        return {
            xtype : 'departmentlist',
            itemId : 'departmentList',
            ...
        };
    }
};
```

① Add custom event

```

        title      : 'Departments',
        frame      : true,
        width      : 150,
        autoLoadStore : true,
        listeners   : {
            scope : this,
            click : this.onDepartmentListClick,
            load  : this.onDepartmentStoreLoad
        }
    );
},
buildGridPanel : function() {
    return {
        xtype     : 'employeegridpanel',
        itemId   : 'employeeGrid',
        loadMask : true,
        frame    : true,
        title    : 'Employees',
        flex     : 1
    };
}
,
```

In listing 16.14, we create the contents for the `initComponent` and related factory methods. Before we continue, there are some things I should highlight and elaborate on, so that you're aware of what was running through my mind when I designed this.

The Buttons are configured to call two of our so-called `on` methods, which, if you can recall, are so named because they're generally called when a user-driven or system-driven event occurs. The `onClose` method will destroy the instance of this class, whereas the `onAddToDepartment` method will fire the custom `assocoemployees` ① event that was configured in `initComponent`.

The class in the application layer that's responsible for instantiating this component will be listening for this event. When the event is fired, it will send the selected Records from the `EmployeeGridPanel`, allowing the class in the application layer to make the web service call and remove the Records from the `EmployeeGridPanel` if the employee move operation is successful. The removal of the Records from the `EmployeeGridPanel` upon successful reassignment of employees from one department to another provides visual feedback to the user that the move request was successful.

Finally, the code `buildListViewPanel` method configures the instance of `DepartmentsListView` to call upon `this.onDepartmentListClick` and `this.onDepartmentStoreLoad` when it relays its `click` and `load` events. These event bindings will allow the `EmployeeAssociationWindow` class to load the `EmployeeGridPanel` when a department in the `DepartmentsListView` class is selected as well as remove the Record department that the employees are being moved to using the `this.departmentId` configuration parameter.

Let's go ahead and construct the rest of the class.

Listing 16.15 The event listener methods

```

onClose : function() {
    this.close();
},
onAddToDepartment : function() {
    var employeeGrid = this.getComponent('employeeGrid');
    var selectedRecords = employeeGrid.getSelected();

    if (selectedRecords.length > 0) {
        this.fireEvent(
            'assocemployees',
            selectedRecords,
            employeeGrid,
            this
        );
    }
},
onDepartmentListClick : function(listView) {
    var record = listView.getSelectedRecords()[0];
    var employeeGrid = this.getComponent('employeeGrid');
    employeeGrid.load({
        params : {
            id : record.get('id')
        }
    });
    employeeGrid.setTitle('Employees for department ' +
        record.get('name')
    );
},
onDepartmentStoreLoad : function(store) {
    var deptRecInd = store.find('id', this.departmentId);
    store.remove(store.getAt(deptRecInd));
}
}

```

The four on methods will react to various events. onClose will be executed when the EmployeeAssociationWindow's close Button is clicked and will call the inherited this.close method, which will destroy the Window instance and all contained child Components. The onAddToDepartment method will gather the selected Records from the internal instance of EmployeeGridPanel and will fire the custom assocemployees event when one or more employee Records are selected.

The onDepartmentListClick will be executed when a department record from the internal instance of DepartmentsListView is selected by the user and will request that the EmployeeGridPanel's Store load using the selected department's ID to fetch the employees for that department. It will also dynamically set the title for the instance of EmployeeGridPanel based on the department selected by the user. Giving the user this type of feedback isn't necessary, but it's nice to have and something I recommend doing wherever possible.

Last, the onDepartmentStoreLoad method is responsible for removing the record for the department that's currently selected in the DepartmentManager screen. Recall

that this is to prevent the user from trying to associate one or more employees to and from the same department.

The EmployeeAssociationWindow class is now fully configured. Next, we'll work on the last two components and their base class, which belong in the `form` namespace.

16.7 The form namespace

Inside the `form` namespace are two classes that extend from `FormPanelBaseCls`: `DepartmentForm` and `EmployeeForm`. `DepartmentForm` will implement an instance of `EmployeeGridPanel` in the center of its layout, whereas `EmployeeForm` will employ a bunch of form elements and a Toolbar. Both classes are lengthy because of the amount of configuration parameters required for the form elements.

We'll begin with `FormPanelBaseCls`, which will add a few reusable utility methods and reduce code duplication.

16.7.1 The `FormPanelBaseCls` class

The `FormPanelBaseCls` template shown in listing 16.16 will help us reduce the amount of duplicate code that will exist in the `DepartmentForm` and `EmployeeForm` subclasses that we'll produce after this. It will do this by allowing us to place static reusable methods in an abstract class that's not to be implemented directly, just extended.

Listing 16.16 The `FormPanelBaseCls` template

```
Ext.ns('TKE.form');
TKE.form.FormPanelBaseCls = Ext.extend(Ext.form.FormPanel, {
    constructor : function(config) {
        config = config || {};
        Ext.applyIf(config, {
            trackResetOnLoad : true
        });
        TKE.form.FormPanelBaseCls.superclass
            .constructor.call(this, config)
    },
    getValues : function() {
        return this.getForm().getValues();
    },
    isValid : function() {
        return this.getForm().isValid();
    },
    clearForm : function() {
        var vals      = this.getForm().getValues();
        var clrVals = {};

        for (var vName in vals) {
            clrVals[vName] = '';
        }

        this.getForm().setValues(clrVals);
        this.data = null;
    },
});
```



```
loadData : function(data) {
    if (data) {
        this.data = data;
        this.getForm().setValues(data);
    }
    else {
        this.clearForm();
    }
},
setValues : function(o) {
    return this.getForm().setValues(o || {});
}
});
```

When constructing the base class in listing 16.16, we extend from `Ext.form.FormPanel`, create an extension to the constructor, and add four methods that will make implementation in the application layer a little more flexible. These utility methods are designed, like the classes we constructed previously, to allow the implementation code to not have to worry about interacting with the internal `BasicForm` instance.

One of those hidden traps

We're applying `trackResetOnLoad` to the config object ❶ for the constructor because `Ext.form.BasicForm` depends on this property to know how to handle calls to its `reset` method. This dependency is one of those not-well-known pitfalls of extending `FormPanel`.

The `clearForm` and `loadData` methods are designed to manually manage data on the form, much more so than the framework does. Because the form's data can be changed on the fly, we need that granular control. The `this.data` reference will be set whenever the `loadData` method is called and will be used in the extension classes to know whether the form is being used for a new Record or to modify an existing one. The `clearForm` method will manually purge the values in the form and set the `this.data` reference to null.

This base class is simple, as you can tell. Because we're just adding methods, we needn't configure a constructor. Remember, `Ext.extend` takes care of that for us when extending in this way.

Now that we have that out of the way, we can move on to the `DepartmentForm` class, which will extend this class.

16.7.2 The DepartmentForm class

Recall that the `DepartmentForm` will allow users to edit department information as well as display the employees for the department being displayed. They will be given the opportunity to perform full CRUD operations on employees via Buttons in this widget and also associate employees with the department loaded. All of the employee-related actions will be driven by an implementation `EmployeeGridPanel` with a top Toolbar.

Each of the Buttons will fire custom events so that the application-layer code can react accordingly.

Because this is a large class, we'll begin with the template in the following listing and circle around, filling in the methods.

Listing 16.17 The DepartmentForm class template

```
Ext.ns("TKE.form");

TKE.form.DepartmentForm = Ext.extend(TKE.form.FormPanelBaseCls, {
    style : 'border-top: 0px;',
    layout : {
        type : 'vbox',
        align : 'stretch'
    },
    initComponent : function() {},
    buildGeneralInfoForm : function() {}, 1 Factory methods
    buildTbar : function() {},
    buildGeneralInfoFormLeftHalf : function() {},
    buildEmployeeGrid : function() {},
    onGridRowDblClick : function() {},
    onSave : function() {},
    onReset : function() {},
    onNewEmployee : function() {},
    onEditEmployee : function() {},
    onAssociateEmployees : function() {},
    onDeleteEmployees : function() {},
    onDeleteDepartment : function() {},
    loadData : function() {},
    loadEmployeeGrid : function() {},
    addRecordsToEmployeeGrid : function() {},
    getEmployeeGridSelections : function() {},
    reset : function() {}
});

Ext.reg('dept_form', TKE.form.DepartmentForm);
```

To reduce the size of the `initComponent` method, we use four factory methods ①. In addition to those factory methods, there are eight event-driven methods ② and five utility methods ③, all of which will make this composite widget easier to use and implement in the application.

Because this class is large, we'll construct the methods in small and digestible chunks, beginning with the `initComponent` and `buildGeneralInfoForm` factory methods.

Listing 16.18 The `initComponent` and `buildGeneralInfoForm` methods

```
initComponent : function() {
    this.items = [
        this.buildGeneralInfoForm(),
        this.buildEmployeeGrid()
    ];
    TKE.form.DepartmentForm.superclass.initComponent.call(this);
```

```

this.addEvents({
    save          : true,
    newemployee   : true,
    editemployee  : true,
    deletemployee : true,
    deletedepartment : true
}),
},
buidGeneralInfoForm : function() {
    var leftHalf = this.buildGeneralInfoFormLeftHalf();

    var rightHalf = {
        xtype      : 'container',
        title     : 'Description',
        flex       : 1,
        bodyStyle  : 'padding: 1px; margin: 0px;',
        layout    : 'form',
        labelWidth: 70,
        items      : {
            xtype      : 'textarea',
            fieldLabel : 'Description',
            name       : 'description',
            anchor     : '100% 100%'
        }
    };
    return {
        tbar      : this.buildTbar(),
        layout    : 'hbox',
        height    : 100,
        bodyStyle  : 'background-color: #DFE8F6; padding: 10px',
        layoutConfig: { align : 'stretch' },
        border    : false,
        items      : [
            leftHalf,
            rightHalf
        ]
    };
},
}
,
```

In the initComponent method, we set the this.items property as an array containing the results of the this.buildGeneralInfoForm and this.buildEmployeeGrid methods as well as configure five custom events for this class. The save, newemployee, deleteemployee, and deletedepartment events will be fired when the user clicks a Button in a Toolbar. The editemployee event will be fired when a row is doubleclicked in the EmployeeGridPanel instance.

The this.buildGeneralInfoForm method will construct the form input elements as well as the containers and layout implementations to display them side by side, as illustrated earlier. Because the amount of configuration is rather large, I broke up the construction of the form and Toolbar items into separate factory methods for easier consumption.

In the next listing, we'll construct those form elements and the Toolbar configuration.

Listing 16.19 The buildTbar and factory methods

```
buildTbar : function() {
    return [
        {
            text      : 'Save',
            iconCls   : 'icon-disk',
            scope     : this,
            handler   : this.onSave
        },
        {
            text      : 'Reset',
            iconCls   : 'icon-arrow_undo',
            scope     : this,
            handler   : this.onReset
        },
        '->',
        {
            text      : 'Deactivate Department',
            iconCls   : 'icon-delete',
            scope     : this,
            handler   : this.onDeleteDepartment
        }
    ];
},
buildGeneralInfoFormLeftHalf : function() {
    return {
        xtype      : 'container',
        layout     : 'form',
        flex       : 1,
        labelWidth : 60,
        defaultType: 'textfield',
        defaults   : { anchor: '-10' },
        items      : [
            {
                xtype      : 'hidden',
                name      : 'id'
            },
            {
                fieldLabel : 'Name',
                name      : 'name',
                allowBlank : false,
                maxLength  : 255
            },
            {
                xtype      : 'datefield',
                fieldLabel : 'Activated',
                name      : 'dateActive'
            }
        ]
    };
},
```

The buildTbar method returns an array of configuration items that will be resolved into instances of Ext.Toolbar.Button and a single Ext.Toolbar.Fill. Notice that each of the Buttons has its handler set to local methods. The buildGeneralInfoFormLeftHalf method constructs a container with three fields, one of which is hidden.

Now that the form is configured, we can move on to code the grid factory method in the next listing.

Listing 16.20 The buildEmployeeGrid factory method

```
buildEmployeeGrid : function() {
    var tbar = [
        '<b>Employees</b>',
        '->',
        {
            text      : 'New Employee',
            iconCls   : 'icon-user_add',
            scope     : this,
            handler   : this.onNewEmployee
        },
        '-',
        {
            text      : 'Edit Employee',
            iconCls   : 'icon-user_edit',
            scope     : this,
            handler   : this.onEditEmployee
        },
        '-',
        {
            text      : 'Delete employee',
            iconCls   : 'icon-user_delete',
            scope     : this,
            handler   : this.onDeleteEmployee
        },
        '-',
        {
            text      : 'Associate Employee(s)',
            iconCls   : 'icon-link_add',
            scope     : this,
            handler   : this.onAssociateEmployee
        }
    ];
    return {
        xtype      : 'employeegridpanel',
        itemId    : 'employeeGrid',
        flex       : 1,
        loadMask  : true,
        tbar       : tbar,
        style      : 'background-color: #DFE8F6; padding: 10px',
        listeners  : {
            scope      : this,
            rowdblclick : this.onGridRowDblClick
        }
    };
},
```

This method will return a configuration object for the implementation of the EmployeeGridPanel class we created earlier. It adds a TopToolbar with a TextItem and Buttons to allow the user to interact with the EmployeeGridPanel widget but within the scope of this class. Each of the Buttons has its handlers set to a local method, which will fire the event.

We've just completed the factory methods, which means that we can move on to construct the on methods. We'll begin in this listing with the first four.

Listing 16.21 The first four on methods

```
onGridRowDblClick : function(grid, rowIndex) {
    var record = grid.store.getAt(rowIndex);
    this.fireEvent('editemployee', this, grid, record);
},
onSave : function() {
    if (this.getForm().isValid()) {
        this.fireEvent('save', this, this.getValues());
    }
},
onReset : function() {
    this.reset();
},
onNewEmployee : function() {
    var employeeGrid = this.getComponent('employeegrid');
    if (this.data) {
        this.fireEvent('newemployee', this, employeeGrid);
    }
},
```

In listing 16.21, we complete four of the on methods. The `onGridRowDblClick` method will be called when the `EmployeeGridPanel`'s own `rowdblclick` event is fired, and it'll obtain a reference to the Record that the event occurred on and fire the custom `editemployee` event.

NOTE We could have chosen to relay the grid's `rowdblclick` event, but by firing a custom event we describe the requested action by the user, making it more meaningful to the implementation layer. This is why we implement custom events for simple user-driven actions, such as the click of a Button in a Toolbar.

Looking at the rest of the methods, `onSave` and `onNewEmployee` will fire events of their own, whereas `onReset` will reset the state of the form. Recall that we set the `trackResetOnLoad` property in the `FormPanelBaseCls` constructor, which enables `BasicForm`'s `reset` method to restore the form to its original state after being modified by a user.

There are four more on methods to finish developing, which we'll cover in the next listing.

Listing 16.22 The last four on methods

```
onEditEmployee : function() {
    var employeeGrid = this.getComponent('employeeGrid');
    var selectedEmployeeRec = employeeGrid.getSelected()[0];
    if (selectedEmployeeRec) {
        this.fireEvent('editemployee', this,
                      employeeGrid, selectedEmployeeRec);
    }
},
onAssociateEmployees : function() {
    var selectedRecords = this.getEmployeeGridSelections();
    if (this.data && this.data.id) {
        var empSelectionWindow =
            new TKE.window.EmployeeAssociationWindow({
                departmentId : this.data.id,
                departmentName : this.data.name
            });
        this.relayEvents(empSelectionWindow, ['assocemployees']);
        empSelectionWindow.show();
        empSelectionWindow = null;
    }
},
onDeleteEmployees : function(btn) {
    var selectedRecs = this.getEmployeeGridSelections();
    var employeeGrid = this.getComponent('employeegrid');
    if (selectedRecs.length > 0) {
        this.fireEvent(
            'deleteEmployees',
            selectedRecs,
            employeeGrid,
            this
        );
    }
},
onDeleteDepartment : function() {
    if (this.data) {
        this.fireEvent('deletedepartment', this.data.id);
    }
},
```

In listing 16.22, we tackle the last four event handler methods, starting with `onEditEmployee`. This method is bound to the Edit Employee Button, which is located on the top Toolbar of the `EmployeeGridPanel`. When invoked, `onEditEmployee` will fire the custom `editemployee` if at least one Record in the `EmployeeGrid` is selected. If more than one Record is selected, only the first will be modified.

`onAssociateEmployees` will be called when the related Toolbar Button is clicked. This method instantiates a new instance of `EmployeeAssociationWindow` and passes the `departmentId` and `departmentName` as configuration parameters of the currently loaded department. It will do so only if this class's form is properly loaded via the inherited `loadData` method. Before the new `EmployeeAssociationWindow` is shown,

we relay its `assocemployees` event. Relaying this event will give any implementation logic an opportunity to perform the Ajax request to allow employees to be associated with the department that's currently loaded.

The last two methods, `onDeleteEmployees` and `onDeleteDepartment`, will both fire related events, each sending required data along with the event. `onDeleteEmployees` will fire its event only if there are selected Records in the grid. `onDeleteDepartment` will fire its event when the Delete Department Button is clicked.

In the next listing, we'll look at the utility methods, starting with the ones responsible for data management for this class.

Listing 16.23 The data management utility methods

```

loadData : function(data) {
    TKE.form.DepartmentForm.superclass.loadData.apply(this, arguments);
    this.loadEmployeeGrid();
},
loadEmployeeGrid : function(data) {
    if (this.data && this.data.id) {
        this.getComponent('employeegrid').load({
            params : {
                id : this.data.id
            }
        });
    }
},
addRecordsToEmployeeGrid : function(records) {
    this.getComponent('employeegrid').add(records);
},
getEmployeeGridSelections: function() {
    return this.getComponent('employeegrid').getSelections();
},
reset : function() {
    this.getForm().reset();
}
}

```

In listing 16.23, we complete the rest of the methods for this class. The `loadData` extension method will be called when the implementing code in the application layer detects that a user has selected a department from the `DepartmentsListView` class. In addition to calling the `superclass.loadData` method, it will perform a load of the `EmployeeGridPanel`.

The `loadEmployeeGrid` method will call the `EmployeeGridPanel`'s `load` utility method. Recall that we added the `load` method to the `EmployeeGridPanel` extension to prevent any implementing code from having to directly call methods on its `Store` instance.

Similarly, the `getEmployeeGridSelections` is a utility method for this class that uses the `EmployeeGridPanel` `getSelections` utility method. Having this type of utility method prevents any implementations of this class from having to call methods directly on the `EmployeeGridPanel`.



Figure 16.15 The Edit employee form embedded and displayed in a Window

This concludes the construction of the `DepartmentForm` composite widget. During this exercise, we explored how to construct a composite widget and both wire up event handlers and create utility methods to make implementing this widget easier. Next, we'll look at the last class, `EmployeeForm`, which will require a lot more configuration than any of the other custom widgets thus far.

16.7.3 The EmployeeForm class

The `EmployeeForm` consists mostly of form input configuration code. This is because of the number of fields that the requirements dictate and the field arrangement desired by the designer. To refresh your memory, figure 16.15 shows a snapshot of the `EmployeeForm` class implemented inside a window that we'll create in the next chapter, when we work on the application layer logic.

Because this is another large class, we'll begin by analyzing the class template.

Listing 16.24 The EmployeeForm class template

```
Ext.ns("TKE.form");

TKE.form.EmployeeForm = Ext.extend(TKE.form.FormPanelBaseCls, {
    border          : true,
    autoScroll      : true,
    bodyStyle       : 'background-color: #DFE8F6; padding: 10px',
    labelWidth     : 40,
    defaultType    : 'textfield',
    defaults        : {
        width      : 200,
        maxLength  : 255,
        allowBlank : false
    },
    initComponent      : function() {},
    buildTbar         : function() {},
    buildFormItems    : function() {},
    buildNameContainer : function() {},
    buildDepartmentInfoContainer : function() {},
    buildEmailDobContainer : function() {},
    buildCityStateZipContainer : function() {}
});
```

```

buildPhoneNumbersContainer : function() {},
onNew : function() {},
onSave : function() {},
onReset : function() {},
onDelete : function() {},

loadFormAfterRender : function() {}
});

Ext.reg('employee_form', TKE.form.EmployeeForm);

```

If you look at the `EmployeeForm` class template, you'll see that there are seven factory methods in addition to the four event handlers and a single utility method. Each of the factory methods is designed to construct a different row of the form; these methods are the bulk of this class. Designing the class like this ensures that you have code that's segmented in such a way that it's easy for humans to digest and easy to modify.

For instance, let's say that in the future we get a change request to swap the First and Last name fields in the top row of this form. All we'll need to do is focus our editor on the `buildNameContainer` method and modify the returned object accordingly.

Too often, you'll find developers who create massive configuration objects, which can span many printed pages (even when using a small font). I highly discourage developing in such a way as this, because it makes code maintenance much more difficult and troubleshooting the layout of the widgets orders of magnitude more time intensive: you'll find yourself scrolling up and down the pages to figure out what's wrong. For these reasons I encourage you to consider developing using factory methods.

We'll begin the construction of this class by working through the `initComponent` and `buildTbar` methods.

Listing 16.25 The `initComponent` and `buildTbar` methods

```

initComponent : function() {
    Ext.applyIf(this, {
        tbar : this.buildTbar(),
        items : this.buildFormItems()
    });
    TKE.form.EmployeeForm.superclass.initComponent.call(this);

    this.addEvents({
        newemp : true,
        saveemp : true,
        delemp : true
    });

    if (this.record) {
        this.on({
            scope : this,
            render : {
                single : true,
                fn : this.loadFormAfterRender
            }
        })
    }
}

```

```

        });
    }
},
buildTbar : function() {
    return [
        {
            text      : 'Save',
            iconCls   : 'icon-disk',
            scope     : this,
            handler   : this.onSave
        },
        '-',
        {
            text      : 'Reset',
            iconCls   : 'icon-arrow_undo',
            scope     : this,
            handler   : this.onReset
        },
        '-',
        {
            text      : 'New Employee',
            iconCls   : 'icon-user_add',
            scope     : this,
            handler   : this.onNew
        },
        '->',
        {
            text      : 'Delete Employee',
            iconCls   : 'icon-user_delete',
            scope     : this,
            handler   : thisonDelete
        }
    ];
},

```

The `initComponent` method does a lot to prepare the class for use. It uses `Ext.applyIf` to apply the `items` and `tbar` parameters *only* if the class doesn't have them configured. This allows us to implement the class and modify its behavior by implementing it either with items or via the Toolbar. Although we'd most likely implement this class without altering its items, we'll need to instantiate it without a top Toolbar, as illustrated a few pages ago.

After calling the superclass `initComponent` method, it adds four new events, each fired by a Button event handler method. Finally, if a `Record` property is set, it'll register an event handler, `this.loadFormAfterRender`, for the internal render event. This method will ensure that the internal `BasicForm` is loaded after the form is rendered.

In the next listing, we'll look at the `buildFormItems` method, which will leverage some of the other factory methods.

Listing 16.26 The buildFormItems method

```
buildFormItems : function() {
    var nameContainer = this.buildNameContainer(),
        departmentSalaryContainer = this.buildDepartmentInfoContainer(),
        emailDobContainer = this.buildEmailDobContainer(),
        cityStateZip = this.buildCityStateZipContainer(),
        phoneNumbers = this.buildPhoneNumbersContainer();

    return [
        {
            xtype : 'hidden',
            name : 'id'
        },
        {
            xtype : 'hidden',
            name : 'departmentId'
        },
        nameContainer,
        emailDobContainer,
        phoneNumbers,
        departmentSalaryContainer,
        {
            fieldLabel : 'Street',
            name : 'street',
            width : 300
        },
        cityStateZip
    ];
}
```

This method will return an array of items, which will be rendered into the form. Because the FormPanel uses the FormLayout by default, each element of this array will be rendered into its own row, with the exception of the hidden input widget, which is injected into the DOM but not visible to the user.

Next, we'll fill out the rest of the form factory methods. These are all rather large, so we're going to move through them one at a time and somewhat quickly, because all they do is configure a container with rows of form input elements.

We'll begin with the buildNameContainer method.

Listing 16.27 The buildNameContainer method

```
buildNameContainer : function() {
    return {
        xtype : 'container',
        layout : 'column',
        anchor : '-10',
        defaultType : 'container',
        defaults : {
            width : 150,
            labelWidth : 40,
            layout : 'form'
        },
    };
}
```

```

        items      : [
          {
            items      : {
              xtype      : 'textfield',
              fieldLabel : 'Last',
              name       : 'lastName',
              anchor    : '-10',
              allowBlank : false,
              maxLength  : 50
            }
          },
          {
            items      : {
              xtype      : 'textfield',
              fieldLabel : 'Middle',
              name       : 'middle',
              anchor    : '-10',
              maxLength  : 50
            }
          },
          {
            labelWidth : 30,
            items      : {
              xtype      : 'textfield',
              fieldLabel : 'First',
              name       : 'firstName',
              anchor    : '-10',
              allowBlank : false,
              maxLength  : 50
            }
          },
          {
            labelWidth : 30,
            width      : 90,
            items      : {
              xtype      : 'textfield',
              fieldLabel : 'Title',
              name       : 'title',
              anchor    : '-10',
              maxLength  : 5
            }
          }
        ]
      };
    },
  ],
};


```

Because of the nature of the framework, in order to configure form input elements into columns, you need to encapsulate them in containers, which use the `FormLayout`. This will ensure the `fieldLabel` is rendered alongside the form input element, ensuring the proper association of the label element to the input element. You'll see this pattern used in the rest of the factory methods for this class.

We'll construct the `buildDepartmentInfoContainer` method in the next listing.

Listing 16.28 The buildDepartmentInfoContainer method

```

buildDepartmentInfoContainer : function() {
    return {
        xtype      : 'container',
        layout     : 'column',
        anchor     : '-10',
        defaultType: 'container',
        defaults   : {
            width   : 200,
            layout  : 'form'
        },
        items     : [
            {
                labelWidth : 40,
                width      : 250,
                items      : {
                    xtype      : 'combo',
                    fieldLabel : 'Dept',
                    hiddenName : 'departmentId',
                    displayField: 'name',
                    valueField  : 'id',
                    triggerAction: 'all',
                    editable    : false,
                    anchor     : '-10',
                    store      : {
                        xtype      : 'jsonstore',
                        url       : 'departments/getList',
                        fields   : [ 'name', 'id' ]
                    }
                }
            },
            {
                labelWidth : 65,
                width      : 175,
                items      : {
                    xtype      : 'datefield',
                    fieldLabel : 'Date Hired',
                    anchor     : '-10',
                    name      : 'dateHired'
                }
            },
            {
                labelWidth : 50,
                width      : 145,
                items      : {
                    xtype      : 'numberfield',
                    fieldLabel : 'Rate/hr',
                    name      : 'rate',
                    allowDecimals: true,
                    anchor     : '-10',
                    decimalPrecision: 2
                }
            }
        ]
    };
},

```

In listing 16.28, we create a factory method, like the one prior, where we construct a Container that contains a row of Containers, which implement a form input field using the FormLayout. We have three more of these factory methods left to construct.

Next is the buildEmailDobContainer method.

Listing 16.29 The buildEmailDobContainer method

```
buildEmailDobContainer : function() {
    return {
        xtype      : 'container',
        layout     : 'column',
        defaultType: 'container',
        anchor     : '-10',
        defaults   : {
            layout : 'form'
        },
        items     : [
            {
                labelWidth : 40,
                width      : 325,
                items      : {
                    xtype      : 'textfield',
                    fieldLabel : 'Email',
                    name       : 'email',
                    anchor     : '-10',
                    maxLength  : 50
                }
            },
            {
                width      : 140,
                labelWidth : 30,
                items      : {
                    xtype      : 'datefield',
                    fieldLabel : 'DOB',
                    name       : 'dob',
                    allowBlank : true,
                    anchor     : '-10'
                }
            }
        ]
    };
},
```

By now, you should be able to see the pattern emerging from these factory methods, where we create a Container that represents a single horizontal row. Inside these Containers are other Containers that use the FormLayout to display a field element.

We use such deeply nested Containers because the FormLayout takes care of creating the Field element for us and linking its click to focus the associated form element. Also, in laying out the form in this way, we benefit from an automatic tab index, where the user can press the Tab key, and the browser will focus all of the fields from left to right in the order in which they're defined.

The next listing shows the buildCityStateZip method.

Listing 16.30 The buildCityStateZip method

```
buildCityStateZipContainer : function() {
    return {
        xtype      : 'container',
        layout     : 'column',
        defaultType : 'container',
        anchor     : '-10',
        defaults   : {
            width      : 175,
            labelWidth : 40,
            layout     : 'form'
        },
        items     : [
            {
                items : {
                    xtype      : 'textfield',
                    fieldLabel : 'City',
                    anchor     : '-10',
                    name       : 'city'
                }
            },
            {
                items : {
                    xtype      : 'combo',
                    fieldLabel : 'State',
                    name       : 'state',
                    displayField : 'state',
                    editable   : false,
                    valueField : 'state',
                    triggerAction : 'all',
                    anchor     : '-10',
                    store      : {
                        xtype  : 'jsonstore',
                        url   : 'states/getList',
                        fields: ['state']
                    }
                }
            },
            {
                labelWidth : 30,
                items     : {
                    xtype      : 'numberfield',
                    fieldLabel : 'Zip',
                    name       : 'zip',
                    anchor     : '-10',
                    minLength  : 4,
                    maxLength  : 5
                }
            }
        ]
    };
},
```

Last, we'll construct the buildPhoneNumbersContainer method.

Listing 16.31 The buildPhoneNumbersContainer method

```
buildPhoneNumbersContainer : function() {
    return {
        xtype      : 'container',
        layout     : 'column',
        anchor     : '-10',
        defaultType: 'container',
        defaults   : {
            width      : 175,
            labelWidth : 40,
            layout     : 'form'
        },
        items     : [
            {
                items : {
                    xtype      : 'textfield',
                    fieldLabel : 'Office',
                    anchor     : '-10',
                    name       : 'officePhone'
                }
            },
            {
                items : {
                    xtype      : 'textfield',
                    fieldLabel : 'Home',
                    anchor     : '-10',
                    name       : 'homePhone'
                }
            },
            {
                items : {
                    xtype      : 'textfield',
                    fieldLabel : 'Mobile',
                    anchor     : '-10',
                    name       : 'mobilePhone'
                }
            }
        ]
    };
},
```

We've finished the factory methods. Next, we'll finish this class with the four on methods and the single utility method.

Listing 16.32 The final five methods for the EmployeeForm class

```
onNew : function() {
    this.clearForm();
    this.fireEvent('newemp', this, this.getValues());
},
onSave : function() {
```

```

        if (this.isValid()) {
            this.fireEvent('saveemp', this, this.getValues());
        }
    },
    onReset : function() {
        this.reset();
    },
    onDelete : function() {
        var vals = this.getValues();
        if (vals.id.length > 0) {
            this.fireEvent('delemp', this, vals);
        }
    },
    loadFormAfterRender : function() {
        this.load({
            url      : 'employees/getEmployee',
            params   : {
                id     : this.record.get('id')
            }
        });
    }
}

```

In the final listing of this chapter, we construct the final five methods of the EmployeeForm class. Like the other classes we've constructed thus far, the on methods will be executed when the Buttons in the Toolbar are clicked. Also, as discussed, the loadFormAfterRender method will invoke an Ajax load of the form via its own load method. Recall that we configured the initComponent to register loadFormAfterRender only if this.record is set.

This concludes the construction of the final and largest class in our reusability layer. Although it didn't contain a lot of class-specific logic or utility methods, it contained a whole lot of configuration for the form elements, which is expected for large forms such as this. Because this class has so much configuration, you can rest assured that it'll require less code to implement this class, allowing our application layer to be more focused on user interaction and workflow.

16.8 Summary

In this chapter, you learned a lot about what it takes to construct an application that's easily maintained and extensible.

We began by discussing namespaces in JavaScript and some patterns to use when developing different sized applications with Ext JS. We chose to use the segmented namespace pattern for the application that we began building, which allowed us to create a layer for the reusable widgets and a layer for the application logic. We did this because it gave us an area to place our reusable widgets, reducing the clutter of the application layer.

Before constructing the application code, we took an in-depth look at the application requirements and executed some decision branches to lay out the reusable layer namespace. While doing this exercise, you learned how to decide when to create abstract base classes, reducing code complexity and code duplication.

After reviewing the requirements, we constructed all of the classes in the reusable layer. You learned how to create classes that generate their own events and relay events from internal instances of widgets. We also gained experience in constructing base classes, and you learned two different patterns for creating classes that promote reusability within this layer.

In the next chapter, we'll pull everything together as we construct the application layer. This is where you'll see it all come together.

17 *The application stack*

This chapter covers

- Laying out the application layer namespace
- Developing the workflow components
- Completing the application

In the last chapter, we discussed how to develop a scalable and maintainable application architecture with Ext JS by dividing the code into layers and segmenting by namespace. We examined mockups of the application, identified and created all of the reusable widgets, and placed them in the reusable layer of our application stack.

In this chapter, we'll implement those reusable components and see the benefits of segmenting reusable components from the workflow components that we'll soon create. We'll begin with a quick review of the application screens, designing and laying out the application layer namespace architecture as we determine what classes to create. This will give you a holistic view of how the application stack will be constructed and guide you through the development process.

After the application analysis, we'll develop the application in layers, screen by screen, starting each with an in-depth analysis of the desired interaction model that comes from the requirements. We'll use this knowledge to implement our reusable classes and "wire up" and construct the workflow logic.

In the end, we'll tie things together by developing our own custom navigation and authentication controller. This chapter will be the most challenging thus far. On the flipside, I think it'll also be the most rewarding because you'll get to experience firsthand how all of the work you did in the last chapter will allow you to focus on the setup of the application workflow, which is the majority of the application layer code.

If you want to take a break at any time along the way and see how all this is supposed to work, you can visit the application online at <http://app.extjsinaction.com>.

17.1 Developing the application namespace

To kick things off, we'll begin with a quick review of the application screen mockups. This exercise will give you a good understanding of how to lay out the application namespace and refresh your memory.

17.1.1 Reviewing the application screens

After the user is successfully logged in, they will be greeted with the company Dashboard screen shown in figure 17.1. This screen will implement the CompanySnapshot and DepartmentBreakdown custom ChartPanel implementation classes. We'll do a deep analysis of each screen before we begin construction. We'll call this class Dashboard.

Users will be able to navigate between screens by pressing the Buttons located in the top Toolbar. This Toolbar will also contain a Button to allow users to log out of the application. To visit the other two screens, they will have to press the associated Toolbar Button.

Figure 17.2 shows the Manage Departments screen.

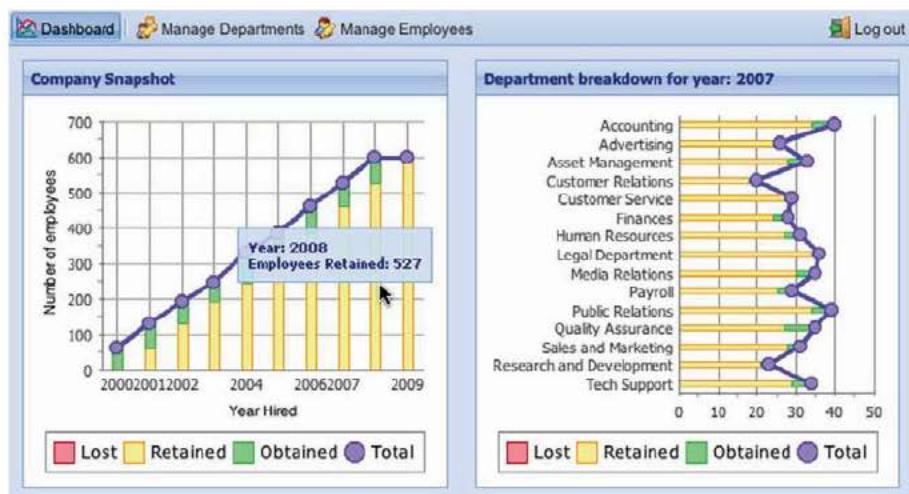


Figure 17.1 The Dashboard screen

The screenshot shows a software interface titled "Manage Departments". On the left, there is a sidebar with a tree view of departments: Accounting, Asset Management, Customer Relations, Customer Service (which is selected), Finances, Human Resources, Legal Department, Media Relations, Payroll, Public Relations, Quality Assurance, Research and Development, Sales and Marketing, and Tech Support. The main area has tabs for "Manage Departments" and "Manage Employees". Below these tabs, there are buttons for "Save", "Reset", and "Deactivate Department". The "Manage Employees" tab is active, showing a grid of employee data. The grid columns are: Last Name, First Name, Email, Date Hired, and Rate. The data in the grid is as follows:

Last Name	First Name	Email	Date Hired	Rate
AAAA	BBBBB		01/24/2010	\$0.00
AAAA	BBBBB		01/24/2010	\$0.00
Klein	Louis	dapibus.gravida.Aliq	05/23/2001	\$63.00
Lawrence	Mallory	sem@etiacinia.org	08/07/2001	\$22.00
Lawson	Leo	congue.elit.sed@ultr	01/22/2006	\$104.00
Mcbride	Zachary	pulvinar@eugiatSe	02/14/2004	\$59.00
Middleton	.Inv.	orci.adiniscino.non@	01/03/2006	\$82.00

Figure 17.2 The Manage Departments screen

This screen will allow users to perform full CRUD operations for employees as well as move (associate) employees from other departments to the department selected on the left. This class will be named `DepartmentManager`.

When the user wishes to create or update employee records, the system will present a Window with an embedded `EmployeeForm`, as shown in figure 17.3.

When we discussed this widget in the last chapter, we decided that it would live in the application layer because of the necessary workflow logic, such as field checking. This widget will also have custom events to allow the `DepartmentManager` screen to know when an employee is created or updated so it can create or update Records in the `EmployeeGridPanel`. This class will be aptly named `EmployeeEditorWindow`.

The last screen, shown in figure 17.4, is designed to allow for quick CRUD operations of employees, and the class will be called `EmployeeManager`.

This screen implements three of our reusable widgets and has a context-sensitive left-to-right workflow, which means that we'll have to code quite a few event listeners to make this happen. Every function that this screen provides is contained within the screen itself.

This concludes the application UI refresher. We can now move on to lay out the application namespace.

The screenshot shows a modal window titled "Edit Chen, Rashad". It contains the following form fields:

- Last: Chen
- Middle: Roary
- First: Rashad
- Title: (empty)
- Email: Sed.congue.elit@pedeNuncsed.org
- DOB: 12/22/1975
- Office: 776-998-1060
- Home: 947-905-4900
- Mobile: 692-260-2578
- Dept: Customer Service
- Date Hired: 04/27/2001
- Rate/hr: 130
- Street: Ap #720-1827 Nunc Av.
- City: Burlington
- State: AL
- Zip: 60223

At the bottom right are "Cancel" and "Save" buttons.

Figure 17.3 The Edit employee Window

The screenshot shows a web-based application interface. At the top, there are three tabs: 'Dashboard', 'Manage Departments', and 'Manage Employees'. The 'Manage Employees' tab is active. On the left, there is a vertical list of department names: Accounting, Asset Management, Customer Relations, Customer Service, Finances, Human Resources, Legal Department, Media Relations, Payroll, Public Relations, Quality Assurance, Research and Development, Sales and Marketing, and Tech Support. To the right of this list is a table titled 'Employees' with columns 'Last Name' and 'First Name'. The table contains 14 rows of employee data. On the far right of the screen is a large, detailed form for editing an employee. The form fields include: Last: Gardner, Middle: Leilani, First: Nola, Title: Mrs.; Email: semper.premium@risus.edu, DOB: 12/12/1987; Office: 991-781-7435, Home: 959-593-5324, Mobile: 574-616-5160; Dept: Customer Service, Date Hired: 06/14/2001, Rate/hr: 57; Street: 5760 Voluptat. Rd.; City: San Bernardino, State: IA, Zip: 90854. There are also 'Save', 'Reset', and 'New Employee' buttons at the top of the form area.

Figure 17.4 The Manage Employees screen

17.1.2 Designing the application namespace

The purpose of this application is to manage a company's department and employee association and is named Company Manager by the business. I generally like to name the application namespace in accordance with the application name, so we'll call our application namespace `CompanyManager`.

Using the information we gathered when reviewing the application, we can properly arrange the namespace layout, as shown in figure 17.5.

Each of the application screens is represented by a class; in addition, the workspace class manages the presentation of the three main screens, as well as navigation and authentication. Because this class is the glue that ties together the entire application, we'll work on it last.

You now have a good idea of how we'll organize our application namespace. We'll begin construction of this stack with the Dashboard screen.

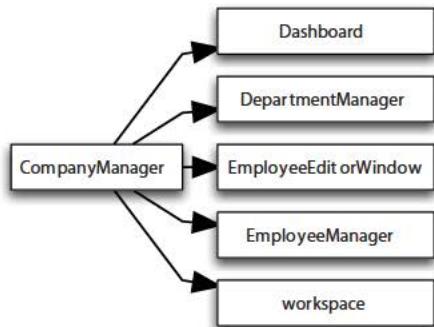


Figure 17.5 The application namespace layout

17.2 Building the Dashboard screen

Recall that the Dashboard screen will be presented to the user after a successful login. It'll implement the two ChartPanel extension classes, `CompanySnapshot` on the left and `DepartmentBreakdown` on the right. Because this screen doesn't contain anything other than these two widgets, we'll use a Container and implement the `HBoxLayout`.

Per the requirements, users can click a chart series node in the `CompanySnapshot` and view the department statistics for the selected year. This means that we'll have to configure an `itemclick` event listener to cause the `DepartmentBreakdown` store to load.

Now that you have an understanding of the UI and workflow requirements for the Dashboard screen, we can begin construction of the Dashboard class, shown in the following listing.

Listing 17.1 The Dashboard class

```
Ext.ns('CompanyManager');

CompanyManager.Dashboard = Ext.extend(Ext.Container, {
    border : false,
    layout : {
        type : 'hbox',
        align : 'stretch'
    },
    defaults : {
        style : 'background-color: #DFE8F6; padding: 10px',
        flex : 1
    },
    msgs : {
        deptBreakdown : 'Department breakdown for year: {0}'
    },
    initComponent : function() {
        this.items = [
            {
                xtype : 'companysnapshot',
                title : 'Company Snapshot',
                listeners : {
                    scope : this,
                    itemclick : this.onCompanySnapshotItemClick
                }
            },
            {
                xtype : 'departmentbreakdown',
                itemId : 'departmentbreakdown',
                title : 'Department Breakdown'
            }
        ];
        CompanyManager.Dashboard.superclass.initComponent.call(this);
    },
    onCompanySnapshotItemClick : function(evtObj) {
        var record = evtObj.component.store.getAt(evtObj.index);
        var dptBrkDwnChart = this.getComponent('departmentbreakdown');

        dptBrkDwnChart.loadStoreByParams({
            year : record.get('year')
        });
        var msg = String.format(
            this.msgs.deptBreakdown,
            record.get('year')
        );
        dptBrkDwnChart.setTitle(msg);
    }
});
Ext.reg('dashboard', CompanyManager.Dashboard);
```

1 itemclick event handler

2 Load the Chart Store

The entire Dashboard class fits inside listing 17.1. This is the first time that you can see and enjoy the benefits of a well-designed reusability layer. To create the Dashboard class, we only needed to implement the preconfigured CompanySnapshot and DepartmentBreakdown classes via XType configuration objects. In addition to the layout of these two classes, we set up the itemclick ① event handler, which will cause the instance of DepartmentBreakdown to send a request ② to the server based on the year that was clicked in the CompanySnapshot panel.

That's all there is to it. There are a few reasons why this code is so short. The first is that the ChartPanelBaseCls does most of the heavy lifting for the Charts. Another is that the CompanySnapshot and DepartmentBreakdown classes are preconfigured, so we needn't put any of that gunk in our application layer. Last, this screen, relative to its cousins, doesn't contain a lot of interactivity.

NOTE If you want to test this screen in a browser, you can place it in an Ext.Viewport with the FitLayout.

As you'll see with the next screen, writing the code for user interactivity can take a lot of effort, when there are a few workflows to enforce in the application. We'll continue our application construction with the Manage Employees screen because its workflow is much smaller than that of the Manage Departments screen.

17.3 The Manage Employees screen

The Manage Employees screen is designed for easy CRUD operations for employee records for the company. Before we can begin coding, you'll need to understand the UI workflow requirements for this screen. This will guide us in making the proper decisions for coding UI interactions, such as the context sensitivity of the different widgets.

17.3.1 Discussing the workflow

The Manage Employees screen implements a common left-to-right workflow, where the two rightmost widgets are context sensitive to the leftmost. Please look at figure 17.6, because it illustrates the selection workflow for the screen.

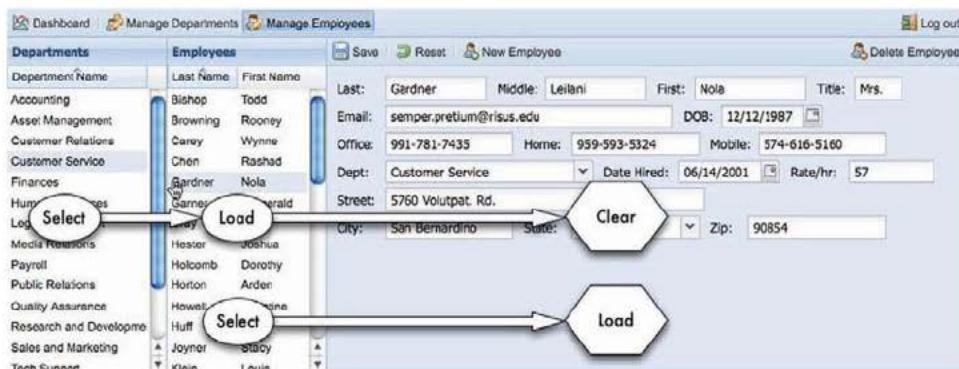


Figure 17.6 The Manage Employees screen context sensitivity

When this screen is shown, the `DepartmentsListView` (left) will load, gathering a list of the departments within the company, and the `EmployeeList` (middle) and `EmployeeForm` (right) are cleared of any loaded data. To load or create an employee Record, the user must first select a department. This sets the first context, where the selection of a department will trigger the `EmployeeList` class load, displaying all employees for the selected department on the left.

From here, the user can update or delete an employee by selecting an employee Record in the `EmployeeList`. Selecting an employee Record sets the second context, triggering the `EmployeeForm` to remotely fetch and load the data for the selected employee.

Along with the event model for the three widgets, we have to be concerned with capturing any successful CRUD operation made against an employee Record. For instance, when a new employee is added to a department, instead of reloading the `EmployeeList`, we'll use the `createAndSelectRecord` utility method (defined in the `ListPanelBaseCls`) to create a new `data.Record` and set its values accordingly. This will ensure that the traffic to the server is minimized and the UI is much snappier.

The same goes for editing or deleting an employee Record. To update a Record, the user must select an employee from the `EmployeeList`, make changes to the form, and then click Save. If the save is successful, we'll refresh the Record with the new data. When a user deletes an employee, the Record is removed from the data Store of the `EmployeeList` and the form is purged of its data.

Whenever the user makes a change that has been successfully committed by the server, we'll prompt them with a successful change alert. This will give them ample notification that their change was successful.

TIP Some application developers are fine with just silently making changes to the UI whenever a CRUD operation occurs, but I like to give feedback to users in the form of an alert dialog box. This ensures that they're aware of the status of the requested change.

We'll post a confirmation dialog box when a user decides to delete an employee. This application has no undo, so prompting the user to confirm the deletion of a Record is a good idea, because this gives the user an opportunity to verify that they're performing a delete operation on the intended employee.

Last, the reset will cause the form to reset based on the last state the form was in. For instance, if data was loaded, pressing the reset Button should undo any changes that the user made. If the form was cleared, reset should wipe the form again, returning it to a virgin state. This all will come from the framework via the `trackResetOnLoad` configuration option that we set in the `FormPanelBaseCls` constructor extension that we configured in the last chapter.

We can now begin construction of this component.

17.3.2 Constructing EmployeeManager

This class will have quite a few methods and configurations. We'll begin by defining and examining the template. Afterward, we'll code clusters of methods until we've finished.

Listing 17.2 The EmployeeManager screen class

```
Ext.ns("CompanyManager");

CompanyManager.EmployeeManager = Ext.extend(Ext.Panel, {
    border : false,
    layout : {
        type : 'hbox',
        align : 'stretch'
    },
    msgs : {},
    initComponent : function() {

        buildDepartmentListView : function() {},
        buildEmployeeListView : function() {},
        buildEmployeeForm : function() {

            onDepartmentListClick : function() {},
            onEmployeeListClick : function() {},
            onEmployeeFormLoadFailure : function() {},
            onNewEmployee : function() {},
            onDeleteEmployee : function() {},
            onConfirmDeleteEmployee : function() {},
            onAfterDeleteEmployee : function() {},
            onSaveEmployee : function() {},
            onEmpFormSaveSuccess : function() {},
            onEmpFormSaveFailure : function() {}

            setDeptIdOnForm : function() {},
            clearMask : function() {},
            cleanSlate : function() {}
        });
    }
});

Ext.reg('employeemanager', CompanyManager.EmployeeManager);
```

1 Object for reusable messages

2 Factory methods

3 Event handler methods

4 Utility methods

If you examine listing 17.2, you'll see a `msgs` configuration object ①, in addition to the typical factory ②, event handler ③, and utility methods ④. The purpose of the `msgs` object is to place reusable strings, most of which contain placeholders that can be filled in with the little-known `String.format` utility method. As you'll see when implementing the CRUD operation workflows, having this type of centralized container for messages to the user will help rid us of the dependency of having to manually concatenate strings, cleaning up our code quite a bit.

Last, this class implements the `HboxLayout` with the `align:'stretch'` configuration. Looking forward, the following listing contains the `msgs` object and `initComponent` method.

Listing 17.3 The msgs object and initComponent method

```

msgs : {
    immediateChanges : 'Warning! Changes are'
        + '<span style="color: red;">immediate</span>.',
    errorsInForm : 'There are errors in the form.'
        + 'Please correct and try again.',
    empSavedSuccess : 'Saved {0}, {1} successfully.',
    fetchingDataFor : 'Fetching data for {0}, {1}',
    couldNotLoadData : 'Could not load data for {0}, {1}!',
    saving : 'Saving {0}, {1}...',
    errorSavingData : 'There was an error saving the form.',
    deletingEmployee : 'Deleting employee {0}, {1}...',
    deleteEmpConfirm : 'Are you sure you want to delete'
        + 'employee {0}, {1}?',
    deleteEmpSuccess : 'Employee {0}, {1} was deleted successfully.',
    deleteEmpFailure : 'Employee {0}, {1} was not deleted'
        + 'due to a failure.'

},
initComponent : function() {
    this.items = [
        this.buildDepartmentListView(),
        this.buildEmployeeListView(),
        this.buildEmployeeForm()
    ];
    CompanyManager.DepartmentManager.superclass.initComponent.call(this);
},

```

 **Message string templates**

 **Factory methods**

Listing 17.3 contains our `msgs` object along with the `initComponent` method. If you examine the contents of the `msgs` object ①, you'll see that some of the strings have so-called tokens, which `String.format` will use to fill in portions of the string later on.

TIP Ext JS adds a few more utility methods to the `String` class that are useful for managing string format. To read about them, visit the API documentation at <http://www.extjs.com/deploy/dev/docs/?class=String>.

The `initComponent` method calls upon the three factory methods ② to construct the `EmployeeForm`, `DepartmentsListView`, and `EmployeeListView` configurations and sets them all as the local `this.items` array.

In the next listing, we'll construct the three factory methods described previously.

Listing 17.4 The three factory methods

```

buildDepartmentListView : function() {
    return {
        xtype      : 'departmentlist',
        itemId    : 'departmentList',
        width     : 190,
        border    : false,
        style     : 'border-right: 1px solid #99BBE8;',
        title     : 'Departments',
        listeners : {

```

 **DepartmentList View XType object**

```

        scope : this,
        click : this.onDepartmentListClick
    }
},
buildEmployeeListView : function() {
    return {
        xtype      : 'employeeelist',
        itemId     : 'employeeList',
        width      : 190,
        border     : false,
        style      : 'border-right: 1px solid #99BBE8;',
        title      : 'Employees',
        listeners   : {
            scope : this,
            click : this.onEmployeeListClick
        }
    };
},
buildEmployeeForm : function() {
    return {
        xtype      : 'employeeform',
        itemId     : 'employeeForm',
        flex       : 1,
        border     : false,
        listeners   : {
            scope : this,
            newemp : this.onNewEmployee,
            delemp : thisonDeleteEmployee,
            saveemp : this.onSaveEmployee
        }
    };
}
,
```

2 Listener for relayed click event

3 EmployeeListView XType configuration

4 Listener for relayed click event

5 EmployeeForm XType object

6 Listeners for CRUD operations

Listing 17.4 contains the three factory methods used to configure the three custom widgets implemented by this screen. They all follow the same pattern, where the component is configured and event listeners are registered.

The `buildDepartmentListView` method will configure a `DepartmentsListView` XType 1, which will have a static width and a listener for the relayed click event 2. When fired, the `onDepartmentListClick` method will be responsible for loading the `EmployeeListView` and clearing the `EmployeeForm`.

Following the pattern above it, `buildEmployeeListView` will configure an `EmployeeListView` XType 3 and register the relayed click event 4 with the `onEmployeeListClick` handler. This method will call upon the `EmployeeForm` to remotely load via Ajax.

Finally, the `buildEmployeeForm` method will configure the `EmployeeForm` 5 and register three event listeners for each of the CRUD operations 6. `onNewEmployee` will clear the form of its values, whereas `onSaveEmployee` will submit the data contained in the form. `onDeleteEmployee` is somewhat of a special case, because it'll request confirmation from the user via `Ext.MessageBox.confirm`. As you'll see later, the callback

method, `onConfirmDeleteEmployee`, will be used to perform the Ajax request if the user clicked Yes.

With our factory methods complete, we can move on to developing the 10 event handler methods. We'll first focus on the `ListView` click event handlers, starting with `onDepartmentListClick`, shown in the following listing.

Listing 17.5 `onDepartmentListClick`

```
onDepartmentListClick : function() {
    var selectedDepartment =
        this.getComponent('departmentList').getSelected();

    this.getComponent('employeeList').loadStoreByParams({
        id : selectedDepartment.get('id')
    });
    this.getComponent('employeeForm').clearForm();
    this.setDeptIdOnForm(selectedDepartment);
},
```

Load list
and
clear form

In listing 17.5, quite a bit of work is being done to perform the desired left-to-right workflow and handle any exceptions that may occur from the `EmployeeForm` load operation.

Recall that `onDepartmentListClick` will be called whenever the `Departments-ListView`'s click event is fired and a Record is selected. We leverage the selection model from the `ListView` via the `getSelected` utility method introduced by the `ListPanelBaseCls` we constructed in the last chapter to set a reference to the selected department.

Once the Record reference is created, we use it to load the `EmployeeListView` via another utility method found in the `ListPanelBaseClass` named `loadStoreByParams`, where we pass an object with a single property, the `id` of the selected department. This causes the data `Store` of the `EmployeeListView` instance to request the employees for the selected department and refresh its views.

Last, this method calls the `EmployeeForm`'s `clearForm` method, which ensures any loaded data is purged. It then calls `this.setDeptIdOnForm`, which is a convenience method that will fill in the selected department and the current date. This allows the user to create a new user as soon as they select a department, reducing their workflow by one click.

In the next listing, we'll focus on the `EmployeeListView` click workflow.

Listing 17.6 Handling the `EmployeeListView` click and `EmployeeForm` load failure

```
onEmployeeListClick : function() {
    var record = this.getComponent('employeeList').getSelected();
    var msg = String.format(
        this.msgs.fetchingDataFor,
        record.get('lastName'),
        record.get('firstName')
);
```

Mask the page
and load the form

1

```

Ext.getBody().mask(msg, 'x-mask-loading');

this.getComponent('employeeForm').load({
    url      : 'employees/getEmployee',
    scope    : this,
    success  : this.clearMask,
    failure  : this.onEmployeeFormLoadFailure,
    params   : {
        id : record.get('id')
    }
}),
onEmployeeFormLoadFailure : function() {
    var record = this.getComponent('employeeList').getSelected();
    var msg = String.format(
        this.msgs.couldNotLoadData,
        record.get('lastName'),
        record.get('firstName')
    );
    Ext.MessageBox.show({
        title  : 'Error',
        msg    : msg,
        buttons: Ext.MessageBox.OK,
        icon   : Ext.MessageBox.WARNING
    });
    this.clearMask();
},

```

 **Handle load exceptions**

`onEmployeeListClick` ① is responsible for loading the `EmployeeForm` when an employee Record is clicked. It does this by obtaining a reference for the selected employee Record via the `getSelected` utility method. It uses this reference to dynamically format a string, which will be used to mask the entire document body, informing the user that the form is loading. By masking the entire body, we ensure that the users can't click anything else in the UI, which could cause another Ajax request and possibly an exception.

When the `EmployeeForm` load method is called, an object is passed, which contains the typical success and failure handler references. The success method is a reference to the local `this.clearMask` method, which we'll construct later. The failure method, `onEmployeeLoadFailure` ②, is more involved, providing a friendly exception to the user if the load request were to fail.

We've finished the `ListView` event handler model. Still to be created are the CRUD operation handlers, which we'll start next. We'll begin with create and delete in the following listing.

Listing 17.7 onNewEmployee and onDeleteEmployee

```

onNewEmployee : function(selectedDepartment) {
    this.getComponent('employeeList').clearSelections();
    this.prepareFormForNew();
},

```

 **Prepare for new employee**

```

onDeleteEmployee : function(formPanel, vals) {
    var msg = String.format(
        this.msgs.deleteEmpConfirm,
        vals.lastName,
        vals.firstName
    );
    Ext.MessageBox.confirm(
        this.msgs.immediateChanges,
        msg,
        this.onConfirmDeleteEmployee,
        this
    );
},

```

2 Display delete confirmation

To handle the creation of an employee, the `onNewEmployee` ① method accomplishes two tasks. First, it causes the `EmployeeListView` to purge its selected nodes. Purging the selection will allow us to determine what mode (create or update) the `EmployeeForm` is in down the road, when we work on the code that's fired after a successful save request.

The second task is clearing the form of any value and setting the `departmentId` and `dateHired` fields accordingly, which is what the yet-to-be-developed `prepareFormForNew` method will do. By clearing the form, we erase the ID hidden field, which tells the server-side code that this is a new Record. Setting the `departmentId` allows new employee Records to be associated properly to the correct department, and setting the `dateHired` field is a convenience for the user. Effectively, the form sits dormant in create mode until the user saves the data via the Save Button.

Recall that the `onDeleteEmployee` is bound to the Delete Button of the top Toolbar. It then presents a customized confirmation dialog box to the user using `MessageBox.confirm` ②. In order to capture and process the response from the user, we pass the yet-to-be-developed callback method, `this.onConfirmDeleteEmployee`, and the scope, `this`, as the second and third parameters to the `MessageBox.confirm` method.

Next, we'll code the `onConfirmDelete` callback method and `onAfterDeleteEmployee`, which is the success callback for the delete employee Ajax operation request.

Listing 17.8 `onConfirmDeleteEmployee` and `onAfterDeleteEmployee`

```

onConfirmDeleteEmployee : function(btn) {
    if (btn === 'yes') {
        var vals = this.getComponent('employeeForm').getValues();

        var msg = String.format(
            this.msgs.deletingEmployee,
            vals.lastName,
            vals.firstName
        );
        Ext.getBody().mask(msg, 'x-mask-loading');
    }
}

```

```

Ext.Ajax.request({
    url          : 'employees/deleteEmployee',
    scope        : this,
    callback     : this.workspace.onAfterAjaxReq,
    succCallback : this.onAfterDeleteEmployee,
    params       : {
        id : vals.id
    }
});
},
onAfterDeleteEmployee : function(jsonData) {
    var msg,
        selectedEmployee = this.getComponent('employeeList').getSelected();
    if (jsonData.success === true) {           ← 2 Post delete changes
        msg = String.format(
            this.msgs.deleteEmpSuccess,
            selectedEmployee.get('lastName'),
            selectedEmployee.get('firstName')
        );
        Ext.MessageBox.alert('Success', msg);
        selectedEmployee.store.remove(selectedEmployee);
        this.getComponent('employeeForm').clearForm();
    }
    else {
        msg = String.format(
            this.msgs.deleteEmpFailure,
            selectedEmployee.get('lastName'),
            selectedEmployee.get('firstName')
        );
        Ext.MessageBox.alert('Error', msg);
    }
    this.clearMask();
},

```

onConfirmDeleteEmployee checks to see if the passed button ID (btn) is equal to 'yes'. If so, it formats a friendly message and masks the entire page with it. It then performs an Ajax request ① to the server to perform the delete operation, passing the employee id as the only parameter.

Saving code when doing Ajax requests

The callback method reference passed to the Ajax.request method will perform a custom two-phase check to verify that the web transaction was successful, where only if the returning HTTP status code is favorable and the returning stream is valid JSON will the custom succCallback method get called, executing any after-request workflow logic. Performing this type of check can help prevent any duplicate code from performing the aforementioned verification steps during each Ajax request.



`onAfterDeleteEmployee` will be called after the server returns a valid JSON stream. If it returns at least `{success:true}` ②, a customized alert dialog box is displayed to inform the user that the delete operation was a success. Immediately afterward, the employee Record is removed from the Store and the form is purged of any values using the `clearForm` utility method. If for some reason the server returned valid JSON data but `success` was equal to `false`, then we'd alert the user that the delete operation failed, using a friendly formatted message.

TIP When developing the server-side code, there's no reason why you couldn't publish a failure code or a string explaining why it failed. For this, you can set something like a message string to the returning JSON stream and reference it via `jsonData.message` in the alert to the user located in the `else` block of `onAfterDeleteEmployee`.

This completes the create and delete portions of the workflow. In order to update or save a new Record, we need to develop the save portion of the workflow, which is what we'll do in the next listing.

Listing 17.9 Handling the save workflow

```
onSaveEmployee : function(employeeForm, vals) {
    if (employeeForm.getForm().isValid()) {
        var msg = String.format(
            this.msgs.saving,
            vals.lastName,
            vals.firstName
        );

        Ext.getBody().mask(msg, 'x-mask-loading');

        employeeForm.getForm().submit({
            url      : 'employees/setEmployee',
            scope    : this,
            success  : this.onEmpFormSaveSuccess,
            failure  : this.onEmpFormSaveFailure
        });
    }
    else {
        Ext.MessageBox.alert('Error', this.msgs.errorsInForm);
    }
},
onEmpFormSaveSuccess : function(form, action) {
    var record = this.getComponent('employeeList').getSelected();
    var vals = form.getValues();

    var msg = String.format(
        this.msgs.empSavedSuccess,
        vals.lastName,
        vals.firstName
    );
    if (record) {
        record.set('lastName', vals.lastName);
    }
}

```

```

        record.set('firstName', vals.firstName);
        record.commit();
    }
    else {
        var resultData = action.result.data;
        this.getComponent('employeeList').createAndSelectRecord(resultData);
        this.getComponent('employeeForm').setValues(resultData);
    }
    Ext.MessageBox.alert('Success', msg);

    this.clearMask();
},
onEmpFormSaveFailure : function() {
    this.clearMask();
    Ext.MessageBox.alert('Error', this.msgs.errorSavingData);
}

```



Create new employee Record

Listing 17.9 has three methods that will handle the save operation of a new or existing employee Record. `onSaveEmployee` is called when the `EmployeeForm`'s `saveemp` event is fired. If the `EmployeeForm` is valid, a submission ① of the data is attempted. If the form isn't valid, a friendly message is displayed to the user and no submission attempt is made. We set both the success and failure callback methods to manage the response from the server.

`onEmpFormSaveSuccess` is the submission success callback method. This method is responsible for figuring out whether the employee data was for a new Record or an existing one and has two branches of logic depending on each. Here's how it works.

Using the workflow to your advantage

This logic can determine whether the form is in edit mode or not by getting the selected Record from the `EmployeeListView`. Recall that to edit employees, a user must select a Record in the `EmployeeListView` widget, and when a new employee is created, any selections in the `EmployeeListView` are purged via the `onNewEmployee` method we created earlier.

For existing employees, all that needs to happen is an update of the Record data ② in the `EmployeeListView` to reflect any changes made for the last or first name. But for new employees, things get a little tricky and need to be handled accordingly to prevent duplicate Records from being created if any edits to a newly created employee needed to be made immediately after the Record was created.

For new employees, we need to get the data returned from the server, which contains the ID of the newly created employee row in the database. Instead of refreshing the `EmployeeListView` widget, use its `createAndSelectRecord` utility method, passing in the request result data. This will create the Record ③ and select it in the view. Next, we set the values of the form using that same result data. This allows us to apply any changes to the data that may have been made by the server, such as inappropriate word filtering.

In case you're wondering

The reason we're rolling out our own CRUD code instead of using the framework-supplied DataWriter is that at the time of this writing, DataWriter has some undesirable behaviors such as creating a Record for a Store even if the create action failed in the backend.

The last method, `onEmpFormSaveFailure`, will handle any failure conditions returned by the server. This could mean anything from a bad HTTP status code for the request or a good HTTPD status code along with JSON containing `{success:false}`. Because our backend doesn't currently support intelligent error messages, we show a static error message to the user if this condition is met.

The code to manage saving data is complete. We can now move on to develop the three utility methods, which will complete this screen.

Listing 17.10 Handling the full save cycle

```
prepareFormForNew : function(selectedDept) {
    selectedDept = selectedDept ||
        this.getComponent('departmentList').getSelected();

    if (selectedDept) {
        this.getComponent('employeeForm').setValues({
            departmentId : selectedDept.get('id'),
            dateHired    : new Date()
        });
    }
},
clearMask : function() {
    Ext.getBody().unmask();
},
cleanSlate : function () {
    this.getComponent('departmentList').refreshView();
    this.getComponent('employeeList').clearView();
    this.getComponent('employeeForm').clearForm();
}
```



1 Prepare form for new employee

Listing 17.10 contains two methods that will be used by various portions of the code that we developed thus far and one that will be used by the master application controller, workspace, which we'll develop at the tail section of this chapter.

As discussed earlier, `prepareFormForNew` ① will be called by `onNewEmployee` and is responsible for setting the `departmentId` and `dateHired` values in preparation for a new employee. It will do this only if a selected department is detected in the `DepartmentsListView` widget.

The `clearMask` method is used to remove the mask from the `document.body` element and is called from various points in the workflow code above. Finally, the `cleanSlate` method will be called by the workspace every time this screen is displayed, because it's responsible for refreshing the `DepartmentsListView` widget and clearing the `EmployeeListView` and `EmployeeForm` widgets.

NOTE This behavior is put in place to fulfill requirements for the application globally, where the Manage Employees and Manage Departments screens are to be placed in a virgin state when chosen for display.

This concludes the development of the Manage Employees screen. You learned how to implement three of the classes from our reusable layer and apply asynchronous workflow bindings and constraints to them. You also saw how the use of utility methods like `String.format` can help keep our code clean, eliminating the need for messy string concatenation to create dynamic text strings to inform the user.

Next, we'll tackle the most complex screen of this application, Manage Departments, where you'll learn how to utilize the workflow bindings we implemented in the `EmployeeManager` class. We'll take things a step further and show how to bind to this screen two of our custom Window widgets, one of which we created in the last chapter and another that we'll work on after the `DepartmentManager` class.

17.4 The Manage Departments screen

Out of all of the screens in this application, Manage Departments contains the most workflow logic. This is because the user can perform CRUD operations for department and employee Records as well as move (associate) employees from one department to another.

With the development of Manage Employees, you became familiar with coding complex CRUD workflows. Because Manage Departments employs many of the exact same techniques, we won't be reviewing the code but rather discussing how the workflow logic works, aided by workflow diagrams.

We'll start by stepping through the department CRUD workflows.

17.4.1 The navigation and department CRUD workflows

To refresh your memory and as a point of reference, figure 17.7 shows the Manage Departments screen in action.

The screenshot shows the 'Manage Departments' screen. At the top, there's a navigation bar with 'Dashboard', 'Manage Departments' (which is highlighted in blue), 'Manage Employees', 'Log out', and a 'Deactivate Department' button. On the left, a sidebar lists various departments: Accounting, Asset Management, Customer Relations, Customer Service (which is selected and highlighted in blue), Finances, Human Resources, Legal Department, Media Relations, Payroll, Public Relations, Quality Assurance, Research and Development, Sales and Marketing, and Tech Support. The main area has tabs for 'Employees', 'New Employee', 'Edit Employee', 'Delete employee', and 'Associate Employee(s)'. Below these tabs is a table with columns: Last Name, First Name, Email, Date Hired, and Rate. The table contains several rows of employee data, with the first row (Last Name: AAAA, First Name: BBBB, Email: dapibus.gravida.Aliq@atlacina.org, Date Hired: 01/24/2010, Rate: \$0.00) being highlighted in blue. The rest of the table rows are: AAAA, BBBB, 01/24/2010, \$0.00; Klein, Louis, dapibus.gravida.Aliq@atlacina.org, 05/23/2001, \$63.00; Lawrence, Mallory, sem@atlacina.org, 08/07/2001, \$22.00; Lawson, Leo, congue.elit.sed@ultraligula.org, 01/22/2006, \$104.00; McBride, Zachary, pulvinar@eugiatSec.com, 02/14/2004, \$59.00; Middleton, Inv., orci.adiniscinon@.com, 01/03/2006, \$82.00.

Figure 17.7 The Manage Departments screen

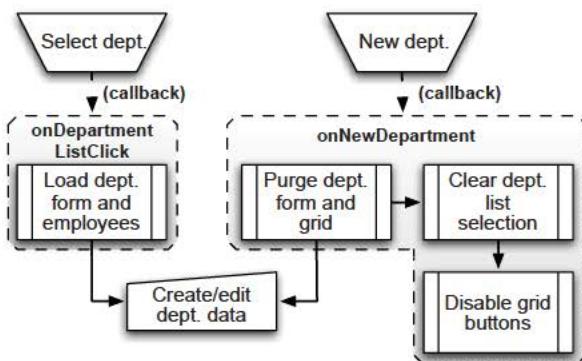


Figure 17.8 The Manage Departments navigation and new department workflows

The navigation and create department workflows both lead to the same point, where the screen is left in a state in which users can enter or edit data for a department. The new department workflow, however, is a lot more involved, including making some changes to the UI. To make discussion easier, I've included the flowchart in figure 17.8, which illustrates in a simple way how the navigation and new department workflows operate.

The navigation workflow is managed by `onDepartmentListClick` and is called whenever the user selects a department in the `DepartmentsListView`. This action causes the `DepartmentForm` to load, allowing the user to edit the data for the selected department.

`onNewDepartment` is invoked when the user clicks the New Department Button and purges the `DepartmentForm` of all of its data. Because the user is creating a department, the `DepartmentsListView` is cleared of any selections and the `EmployeeEditorGrid`'s Toolbar Buttons are disabled.

Both of these workflows place the screen in a state that allows users to create or edit information. From here, users can elect to save their changes. Figure 17.9 shows how the save workflows operate.

After the user modifies data in the `DepartmentForm`, they must click the Save Button to invoke the save workflow illustrated in figure 17.9. `onDeptFormSave` is called when the Save Button is clicked and first checks to see whether the form is valid. If it isn't, the user is alerted and is allowed to return to edit the data in the form to correct the problem. If the form is valid, the form is submitted, registering `onDeptFormSaveSuccess` and `onDeptFormSaveFailure` as respective success/failure handlers.

`onDeptFormSaveFailure` has the simple job of alerting the user that the submission failed, whereas `onDeptFormSaveSuccess` is much more involved. The success handler is responsible for determining whether the user is editing an existing Record and performs work accordingly.

If an existing Record is being modified, the selected Record is modified accordingly. Otherwise, a `DepartmentsListView` Record is created and selected in addition

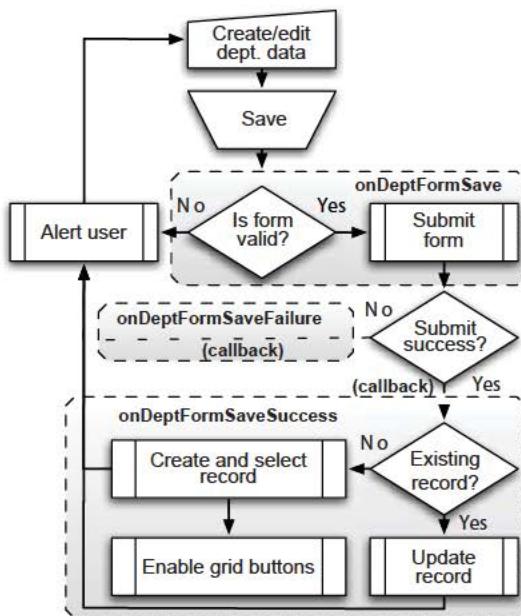


Figure 17.9 The department save workflows

to the EmployeeGridPanel Toolbar Buttons being enabled. Both result in the user being alerted to the successful save event.

The final workflow revolves around deleting a department and is illustrated in figure 17.10.

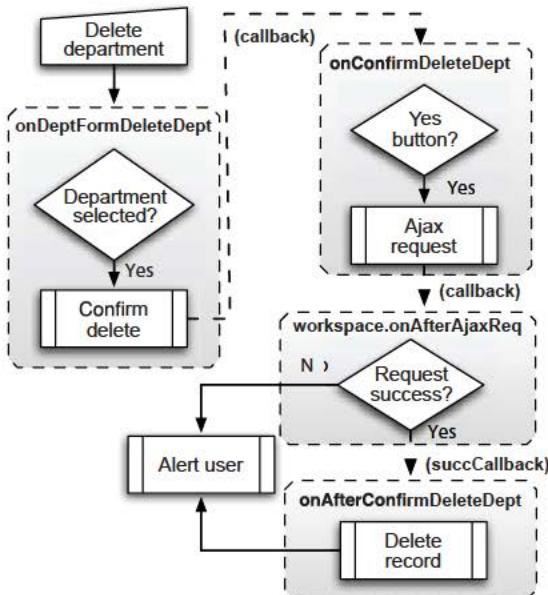


Figure 17.10 The delete department workflow

The delete department workflow for the DepartmentManager is identical to that of the delete employee workflow in the EmployeeManager, where only if a Record is selected will a confirmation dialog be presented when the Delete Department Button is clicked. To complete the deletion request, the user must click the Yes Button of the confirmation dialog box, which will invoke an Ajax request to perform the deletion of the department in the backend. If that request is successful, then the Record is deleted and the user is alerted of the successful transaction. Otherwise, the user is alerted of the failure and the selected Record is kept intact.

By now, you've started to see a pattern evolve, where confirmations in addition to status alerts coupled with UI changes make the UI interactive for the user. The employee CRUD workflows will follow similar patterns. But because creating and editing use an external editor, it's worth having a quick overview of how it all works.

17.4.2 Employee CRUD workflows

The Manage Departments screen is designed to allow CRUD operations for employees without requiring users to switch to the Manage Employees screen. To facilitate this requirement, three Buttons at the top of the EmployeeGridPanel are embedded in the DepartmentForm, one for each CRUD operation.

The class that gives the Manage Departments screen the ability to create and update employees is called EmployeeEditorWindow, and it has create and edit workflows that are similar to those of the Manage Employees screen, but greatly reduced.

NOTE In order to save you time, EmployeeEditorWindow is already developed and available in the downloadable source code.

As a visual reference, figure 17.11 shows what the EmployeeEditorWindow looks like when rendered onscreen.

For a user to create an employee, a department must exist in the database and be selected in the DepartmentsListView. When the New Employee Button is clicked, the EmployeeEditorWindow class will display an empty EmployeeForm, asking the user for data for the new employee Record. To edit employees, users will either double-click the Record or select a Record and click the Edit Employee Button, causing the EmployeeEditorWindow to be displayed with data.

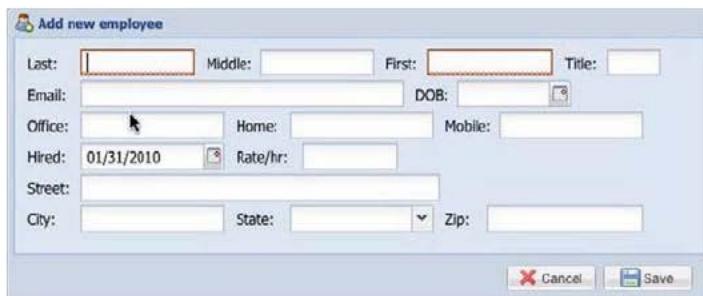


Figure 17.11 The EmployeeEditorWindow widget in action

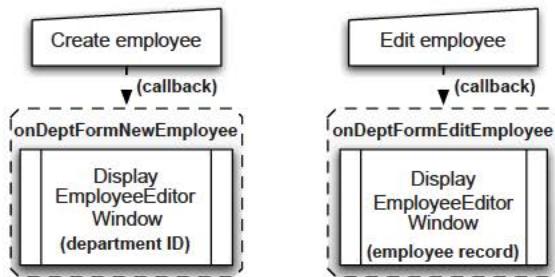


Figure 17.12 The create and edit employee workflows

Figure 17.12 shows the workflow diagram for this user interaction model.

As you can see in figure 17.12, both the create and edit employee user actions result in the display of the EmployeeEditorWindow, but each has a subtle difference. The difference is in two configuration properties set when EmployeeEditorWindow is being instantiated. EmployeeEditorWindow requires either the ID of the selected department (create) or the Record of the selected employee (edit) to know how to display the embedded form.

Because this widget is responsible for saving new or existing employee data, you should take a quick look at its internal workflows, shown in figure 17.13.

If the form is valid when the user clicks the Save Button in the window, it will submit the data via the implemented

Event communication for loosely coupled components

When the EmployeeEditorWindow is instantiated, DepartmentManager doesn't keep a reference to it, which is what I like to call a loosely coupled component. This means that DepartmentManager relies on the EmployeeEditorWindow's custom employeesaved event to be published so it can create or update a Record in the EmployeeGridPanel accordingly.

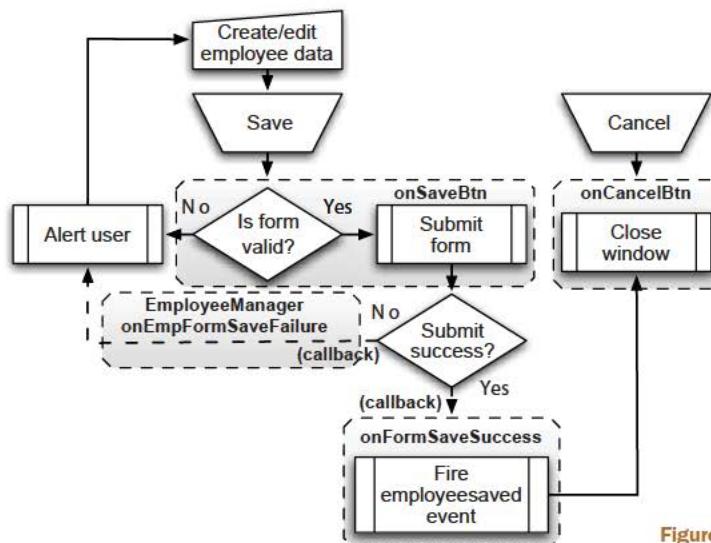


Figure 17.13 The employee save

`EmployeeForm`. Upon successful submission, the window will fire a custom `employeesaved` event, for which `DepartmentManager` will be listening.

When this event is fired, the `EmployeeEditorWindow` will automatically be dismissed, and `DepartmentManager` will determine whether the save operation was for a new employee so that it can create a Record or update an existing one.

Figure 17.14 is a quick workflow diagram of how this works. As illustrated in the figure, the `onEmployeeWindowSaveSuccess` method is a listener to the `EmployeeEditorWindow` `employeesaved` event, and when invoked, it will determine if action has been taken on an existing Record. If so, it's updated; otherwise, a new Record is created. Either way, the user is made aware of the successful change.

To delete an employee, the user can select one or more Records in the `EmployeeGridPanel` and click the Delete Employee Button, invoking the workflow shown in figure 17.15.

The act of clicking the Delete Employees Button while having one or more employees selected will result in a confirmation dialog box. If the person clicks the Yes Button, an Ajax request is invoked to delete the employee records from the database. If the server returns favorably, the selected Records are removed from the `EmployeeGrid` and the user is alerted to the success of the request. If the server

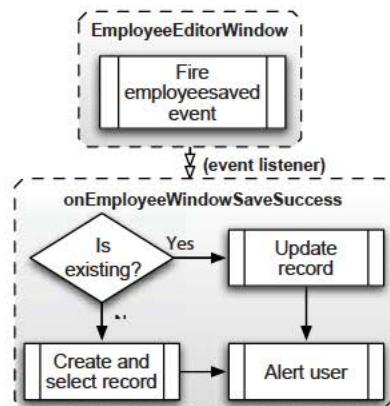


Figure 17.14
The `DepartmentManager`
employee save workflow

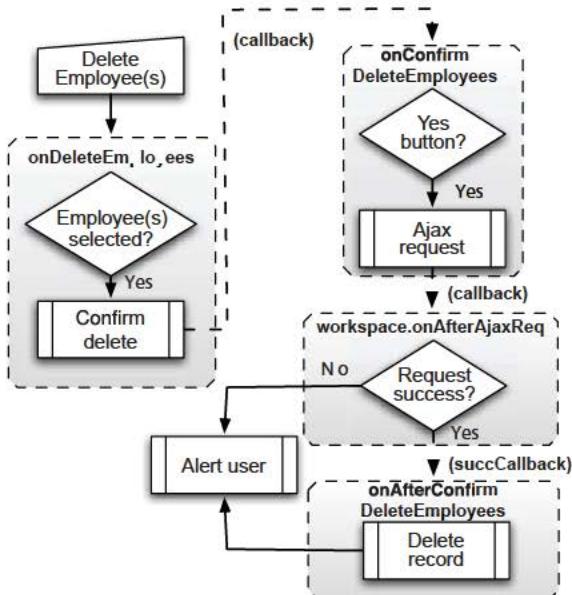


Figure 17.15 The delete employee workflow logic

returns unfavorably, the user is alerted of the failure. This workflow is nearly identical to the delete department workflow, except it deals with one or more selected Records in a grid.

We've completed the employee CRUD workflow. Next, we'll cover the final workflow for the Manage Departments screen, where users can associate one or more employees from one department to another.

17.4.3 Employee association workflow

The last bit of functionality that the Manage Departments screen will give to its users is the ability to associate employees from one department to another. To do this, users will have to select a department in the DepartmentsListView and click the Associate Employee(s) Record in the EmployeeGridPanel. This will display the AssociateEmployeeWindow, illustrated in figure 17.16.

When this window is rendered onscreen, it will display all of the departments via another instance of DepartmentsListView, except for the department selected in DepartmentManager. This will help prevent user requests from accidentally associating employees with a department to which they already belong.

The Window follows the same workflow as all others, where the context for the screen is set by the selection of a department. The department selection will trigger the loading of the EmployeeGridPanel in this window.

Figure 17.17 diagrams the workflow logic.

To associate employees, the user must select one or more Records and click the Add Button. This will cause the EmployeeAssociationWindow to fire its custom assocemployees event, for which DepartmentManager has a listener setup known as



Figure 17.16 The AssociateEmployeeWindow in action

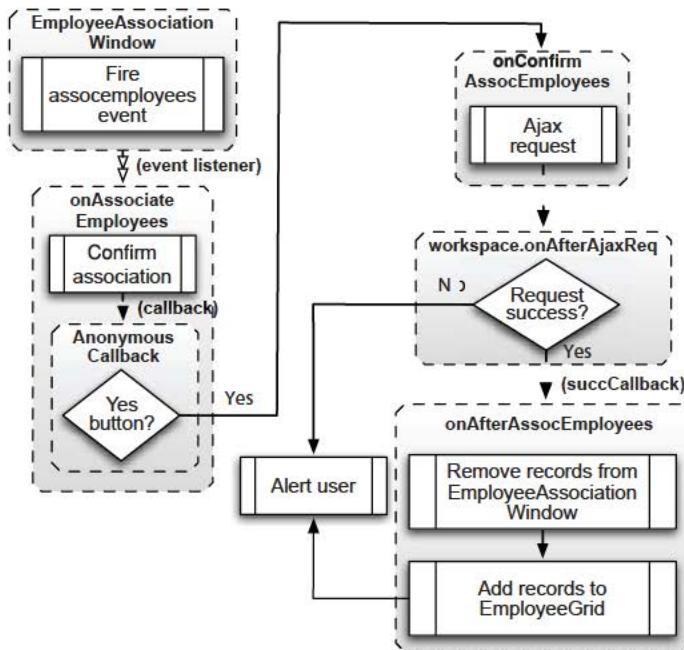


Figure 17.17
The employee association logic workflow

onAssociateEmployees. When this method is called, a confirmation dialog box will be displayed.

Only if the user presses the Yes Button will DepartmentManager invoke an Ajax request to the server to associate the employees with their new department. If the web server responds favorably, because the association operation is more of a move operation, the DepartmentManager will remove the Records from the EmployeeGridPanel inside the EmployeeAssociationWindow and add them to the GridPanel inside its own DepartmentForm.

Finally, it will inform the user that the operation was successful and will keep the EmployeeAssociationWindow alive so the user can associate more employees if desired. Unlike the EmployeeEditorWindow, the EmployeeAssociationWindow will never self-close; the user must click the Close Button in the window's bottom button bar to dismiss it. It's set up this way so users can loop through the association workflow more easily.

We've reached the end of our discussion of the DepartmentManager workflows. As you can see, this screen will offer a lot to the users and will require a lot of logic wiring to make it all possible. We can now move on to tie our three screens together by developing a workspace singleton controller, which will handle the global application workflow, including navigation and generic authentication. Hang in there. We're almost finished.

17.5 Piecing it all together

All of the work we've done thus far has led us up to this point, the grand finale, where we combine all the pieces of our application layer and see them come together as a single, unified application. To make this happen, we'll create a singleton that will be called upon to bootstrap the application, implement the screens we've created thus far, and control the navigation workflow.

Why use a singleton for the workspace class?

Recall that a singleton is a JavaScript design pattern where a class is constructed and can be instantiated only once, and it's referred to via a reference that can be accessed globally. Because that workspace needs to live only once per page load, this design pattern is perfect for placing all of the logic in one container, called a *closure*.

We'll begin by having a quick discussion of the various workflows and then move on to developing the singleton.

17.5.1 The workspace workflows

The workspace singleton, which will be referred to as workspace from now on, will be in charge of two rather simple but important areas of our application. The first is providing a lightweight authentication mechanism. This application will be used by a limited and static set of users in the company; their usernames and passwords have already been set up in the database, so we need not create a registration page.

To ensure users log in, workspace will check for the presence of a login cookie that will be created and provided by the server. Only if the login cookie is present will workspace display the application. Otherwise, a login window will be dynamically generated to request the user's credentials.

Once users are logged in, the login window will be destroyed and the viewport created, revealing the application dashboard as the first screen. From there, the user can refresh the page, and as long as the login cookie is still present in their browser, they'll be greeted with the application upon page load.

Users can then click the Log Out button at any time after a successful login. The logout handler will first request confirmation from the user. If the user confirms, the Viewport and all of its contents will be destroyed along with the login cookie, and the login window will be instantiated and displayed.

Invoking a sense of familiarity for the login process

If the authentication workflow we've just discussed seems familiar, it's because we're mimicking the current authentication design pattern that's implemented in modern UI desktops.

The navigation workflow is the other main piece of functionality that workspace provides. Instead of using a TabPanel as the main view controller, we elected to use a generic Panel with a top Toolbar with Buttons that, when clicked, reveal the screen to which they're bound. To make this happen, we'll implement the CardLayout.

With the workflows now covered, we can move on to create workspace.

17.5.2 Constructing the workspace singleton

Because this is the first time we've covered such a class, we'll walk through the code. We'll begin the construction of the workspace singleton in the following listing by observing the class template, and then we'll move on to code the various factory, workflow, and utility methods.

Listing 17.11 The workspace class template

```
CompanyManager.workspace = function() {
    var viewport, cardPanel, loginWindow,
        cookieUtil = Ext.util.Cookies;

    return {
        init : function() {},
        buildLoginWindow : function() {},
        buildViewport   : function() {},
        onLogin         : function() {},
        onLoginSuccess : function() {},
        onLoginFailure : function() {},
        onLogOut        : function() {},
        doLogOut        : function() {},
        onAfterLogout   : function() {},
        onSwitchPanel  : function() {},
        switchToCard   : function() {},
        onAfterAjaxReq : function() {},
        destroy        : function() {}
    };
}();

Ext.onReady(CompanyManager.workspace.init,
    CompanyManager.workspace);
```

1 Reusable variables

2 Application bootstrap method

3 Bootstrap the application

When reviewing the code in 17.11, you'll see four variables set at the top of the singleton ①. These are considered private, lexically scoped variables and they'll be used by the methods returned in the object below them.

In that return object is the `init` ② method, which will be the bootstrap method for the entire application and is registered with `Ext.onReady` ③. Along with the `init` method and factory methods are the login, logout, and navigation workflow controller methods. Additionally, there are two utility methods, one of which is `onAfterAjaxReq`, which is used extensively by the app tier.

We'll look at the shorter `init` and `buildLoginWindow` methods in the next listing, and then we'll move on, developing `buildViewport`, which is rather lengthy.

Listing 17.12 The workspace init method

```
init : function() {
    if (! cookieUtil.get('loginCookie')) {
        if (! loginWindow) {
            loginWindow = this.buildLoginWindow();
        }
        loginWindow.show();
    }
    else {
        this.buildViewport();
    }
},
buildLoginWindow : function() {
    return new TKE.window.UserLoginWindow({
        title : 'Login to Department Manager',
        scope : this,
        handler : this.onLogin
    });
},
```

The `init` method is responsible for bootstrapping the application. It first checks to see if a valid `'loginCookie'` exists. If the cookie doesn't exist, then a `loginWindow` is created and displayed. Otherwise, the `buildViewport` method is called, which constructs and renders the main application body onscreen.

The `buildLoginWindow` factory method will instantiate and return an instance of `TKE.window.UserLoginWindow`. This preconstructed class does something special, where it binds the Enter key from the form input fields to the pass handler (`this.onLogin`) method.

This is more of a convenience for the users, allowing them to press the Enter key when focused on any of the input elements to submit the contents of the form. I like to do this for login forms, but it can be implemented on any form. UserLoginWindow also binds the handler to the Login Button in the footer bar of the window.

With the login window complete, we can construct the workspace viewport. This listing is lengthy but mainly consists of configuration, so it's an easy read.

Listing 17.13 The workspace buildViewport method

```
buildViewport : function() {
    cardPanel = new Ext.Panel({
        layout      : 'card',
        activeItem : 0,
        border      : false,
        defaults    : { workspace : this },
        items       : [
            { xtype : 'dashboard' },
            { xtype : 'departmentmanager' }
        ]
    });
}
```

Create Panel using CardLayout

Initial child component

```

        { xtype : 'employeemanager'      }
    ],
    tbar       : [
        {
            text          : 'Dashboard',
            iconCls       : 'icon-chart_curve',
            toggleGroup   : 'navGrp',
            itemType     : 'dashboard',
            enableToggle  : true,
            pressed       : true,
            scope         : this,
            handler       : this.onSwitchPanel
        },
        '-',
        {
            text          : 'Manage Departments',
            iconCls       : 'icon-group_edit',
            itemType     : 'departmentmanager',
            toggleGroup   : 'navGrp',
            enableToggle  : true,
            scope         : this,
            handler       : this.onSwitchPanel
        },
        '-',
        {
            text          : 'Manage Employees',
            iconCls       : 'icon-user_edit',
            itemType     : 'employeemanager',
            toggleGroup   : 'navGrp',
            enableToggle  : true,
            scope         : this,
            handler       : this.onSwitchPanel
        },
        '->',
        {
            text          : 'Log out',
            iconCls       : 'icon-door_out',
            scope         : this,
            handler       : this.onLogOut
        }
    ]
}) ;

viewport = new Ext.Viewport({
    layout : 'fit',
    items   : cardPanel
});
Ext.getBody().unmask();
},

```

3 Bind Buttons to screens

4 Logout Button

5 Create Viewport

In listing 17.13, a lot of configuration is stuffed into the buildViewport factory method. It's this way because I was trying to reduce the overall complexity of the workspace singleton. Here's how it works.

This method first constructs the main application Panel, which is the application, cardPanel ①, which implements the CardLayout. This Panel will also instantiate all of the screens as the child items ② as well as a top Toolbar with the three navigation Buttons and the logout Button ④.

NOTE Notice that we're setting all the workspace property child items as this, which is workspace. This is so all of the child items can use the workspace's onAfterAjaxReq utility method, reducing code duplication.

Because the Dashboard will be the first screen that users will see when the application renders, we need to ensure that the associated Button looks depressed (selected). To do this, we set the associated Button's pressed configuration option to true.

All of the screen-associated Buttons are bound to the onSwitchPanel method ③, which will act as the main navigation logic controller. We needed a way to somehow tell onSwitchPanel what type of class each of these Buttons should be associated with. Because xtype is a reserved option, I had to get a little creative, so I chose itemType.

This itemType property will be transposed into an xtype property in onSwitchPanel. When these screen-associated Buttons are clicked, onSwitchPanel will use the itemType to search cardPanel's child items for an instance of the class named in the itemType property. If the class exists, the active card is switched accordingly. Otherwise, a new instance of the class described by itemType is instantiated and then set as the active card.

The final task that this factory method will complete is instantiating a Viewport ⑤, whose only child item is cardPanel. In order to stretch cardPanel to the size of the browser's viewport, the Viewport will use the FitLayout.

That's it for the construction and configuration of the widgets and screens for this application. In the next listing, we'll work on the login workflow.

Listing 17.14 The workspace login workflow

```
onLogin : function() {
    var form = loginWindow.get(0);
    if (form.getForm().isValid()) {
        loginWindow.el.mask('Please wait...', 'x-mask-loading');

        form.getForm().submit({
            success : this.onLoginSuccess,
            failure : this.onLoginFailure,
            scope   : this
        });
    }
},
onLoginSuccess : function() {
    loginWindow.el.unmask();

    if (cookieUtil.get('loginCookie')) {
        this.buildViewport();
        loginWindow.destroy();
    }
}
```



```

        loginWindow = null;
    }
    else {
        this.onLoginFailure();
    }
},
onLoginFailure : function() {
    loginWindow.el.unmask();
    Ext.MessageBox.alert('Failure', "Login failed. Please try again");
},

```

3 Handle failed login

The login workflow in listing 17.14 is logically segmented into three methods. First is `onLogin`, which is bound to both the login form fields and the containing window button. Its job is to mask the login window and submit the login form ① if it's valid. The other two methods are callback methods that will handle the response of the submission.

`onLoginSuccess` ② will unmask the window and check for the presence of the login cookie. If it's there, then `this.buildViewport` is called, the login window is destroyed, and its reference is set to `null`. Otherwise, the `this.onLoginFailure` ③ method is called. I've configured this callback handler this way because even if the server returns the minimal response (`{"success":true}`), the response may not contain the `loginCookie`. This method is configured this way because the presence of the cookie is the only indication that the login was truly a success.

`onLoginFailure`, on the other hand, has a simple job: alert the user that the login attempt was a failure. Because the login window is already rendered, it only needs to be unmasked to allow the user to reattempt a login once the alert is dismissed.

The login workflow is now complete; we can move on to work through the logout workflow, shown in the following listing.

Listing 17.15 The workspace logout workflow

```

onLogOut : function() {
    Ext.MessageBox.confirm(
        'Please confirm',
        'Are you sure you want to log out?',
        function(btn) {
            if (btn === 'yes') {
                this.doLogOut();
            }
        },
        this
    );
},
doLogOut : function() {
    Ext.getBody().mask('Logging out...', 'x-mask-loading');
    Ext.Ajax.request({
        url          : 'userlogout.php',
        params       : { user : cookieUtil.get('loginCookie') },
        scope        : this,
        callback     : this.onAfterAjaxReq,

```

1 Request confirmation from user

2 Request to log out user

```

        succCallback : this.onAfterLogout
    });
},
onAfterLogout : function(jsonData) {
    this.destroy();
},

```

3 Call destroy after logout

The logout workflow in listing 17.15 is relatively simple. `onLogout` is bound to the Logout Button and when called will request confirmation from the user ①. If the user clicks the Yes Button, `this.doLogout` is called.

`doLogout` is charged with masking the document body and invoking an Ajax request ② to the backend to clear the user's session. The backend will return an expired cookie as well as `{"success": true}`, ultimately causing `onAfterLogout` to be invoked ③. `afterLogout` is simple; it will call `this.destroy` to destroy the Viewport and reinitialize the application workspace.

With the logout workflow finished, we can develop the navigation workflow methods in the following listing and then move on to code the utility methods, completing this class.

Listing 17.16 The workspace navigation workflow

```

onSwitchPanel : function(btn) {
    var xtype      = btn.itemType,
        panels    = cardPanel.findByType(xtype),
        newPanel = panels[0];

    var newCardIndex = cardPanel.items.indexOf(newPanel);
    this.switchToCard(newCardIndex, newPanel);
},
switchToCard : function(newCardIndex, newPanel) {
    var layout      = cardPanel.getLayout(),
        activePanel = layout.activeItem,
        activePanelIdx = cardPanel.items.indexOf(activePanel);

    if (activePanelIdx !== newCardIndex) {
        layout.setActiveItem(newCardIndex);
        if (newPanel.cleanSlate) {
            newPanel.cleanSlate();
        }
    }
},

```

1 Use button's itemType

2 Search for matching child

3 Add new component

4 Set reference to panel

5 Get index of active child

6 Switch to new index

Listing 17.16 contains the logic to handle the switching from one card to another. Recall that `onSwitchPanel` is bound to the three navigation Buttons. Because the Buttons pass themselves as references (`btn`) to their click handlers, we can set a reference to the `xtype` of the screen that's to be displayed via the custom `itemType` property ①.

Next, we use the Container `findByType` utility method to search the child items `MixedCollection` for anything that matches the `xtype` for the Button pressed ②. If

no matching child is found, then a new child is added to `cardPanel` using the `xtype` property ③ and is set to the `newPanel` reference. If there is a matching child, then the `newPanel` reference is to it ④. Last, the `index` of the newly added or existing child item is fetched and passed on to `this.switchToCard` ⑤ along with the reference for the child item to be displayed.

`switchToCard` is responsible for getting the index of the current active item ⑥ and testing to see if the current active panel index (`activePanelIdx`) matches the desired index (`newCardIndex`). If this test is true, then a switch to the desired card index is made via a call to the `CardLayout`'s `setActiveItem` utility method. Last, if the screen contains a `cleanSlate` (method) reference, then it's called, placing that screen in a virgin state.

That's all there is to the navigation workflow. In the following listing, we'll work on the two utility methods for the workspace.

Listing 17.17 The workspace utility methods

```
onAfterAjaxReq : function(options, success, result) {
    Ext.getBody().unmask();
    if (success === true) {
        var jsonData;
        try {
            jsonData = Ext.decode(result.responseText);
        }
        catch (e) {
            Ext.MessageBox.alert(
                'Error!',
                'Data returned is not valid!'
            );
        }
        options.succCallback.call(options.scope,
            jsonData, options);
    }
    else {
        Ext.MessageBox.alert('Error!', 'The web transaction failed!');
    }
},
destroy : function() {
    viewport.destroy();
    viewport = null;
    cardPanel = null;
    this.init();
}
```

- ① Is transaction successful?
- ② Try to convert text to JSON
- ③ Call custom succCallback
- ④ Destroy viewport and clean up
- ⑤ Show login window

In listing 17.17, we wrap up workspace by developing the last two methods in the singleton, which are utility methods. `onAfterAjaxReq` is often used throughout the Manage Employees and Manage Departments screens as well as workspace's logout workflow to perform a two-phase check on any Ajax request made within the application. Here's how it works.

After unmasking the document body, it tests to see if the `success` property is equal to `true` ①. Sometimes servers will respond unfavorably, returning a non-200-ish HTTP status code. If this is the case, then no further processing is necessary. We know something went wrong, so we'll post an alert to the user stating that the "web transaction failed."

If the transaction is successful (`success === true`), an attempt to convert (`decode`) the inbound string data into a JSON object is wrapped in a `try/catch` block ②. If there's no exception, the custom `options.succCallback` method is called, passing along the decoded `jsonData` and the options passed to the `Ajax.request` object. We use `succCallback` ③ instead of `success`, because `success` is a reserved key for the `Ajax` requests.

The last method, `destroy`, is in charge of the cleanup of the application after the logout workflow has completed. To make this happen, it destroys the `Viewport` ④ and sets the reference to the `Viewport` and `cardPanel` to `null`, because they're no longer needed. Finally, it calls the `workspace`'s `init` method, effectively bootstrapping the application again, causing the login window to display ⑤.

This concludes the `workspace` class and the rest of the application. Congratulations! Because you have a pluggable architecture in place, making improvements or changes should be a breeze now. For instance, to add another screen to this application, you'd follow the same pattern where you'd create the reusable components, placing them in the reusability layer. Then, you'd implement them in the application layer and finally plug them into the `workspace` by adding a `Button` with an associated custom `itemType` property.

17.6 Summary

In this chapter you learned how to implement the reusability layer, allowing you to focus on coding workflow logic for the application layer. We developed and implemented three screens as well as a custom navigation and authentication `workspace` controller.

We started by developing the `Dashboard` screen, where we enjoyed the benefits of having most of the hard work done by the reusability layer. Next, we developed the `Manage Employees` screen. This is where, after a deep analysis of the workflows, you got to see what it takes to develop navigation along with CRUD workflows. When discussing the construction of the `Manage Departments` screen, you saw how you could employ reusable CRUD patterns from `EmployeeManager`.

We tied everything together with a `workspace` singleton that served as both navigation and authentication controllers. While developing this class, you learned how to set up basic authentication and application bootstrapping.

There you have it, an application using Ext JS!

index

Symbols

!important directive 273
% Change column 154

A

AbsoluteLayout class 100–101
accept.png file 275
AccordionLayout class 102,
104
Action class 293–296
activeItem property 106
activeOnTop option 103
activeTab parameter 87
adapter folder 22
add method 64, 87, 401
addEvent method 52
Address column 167, 169
addSorted method 402
addToGroup method 305, 312
Adobe AIR. *See* AIR, support
of
afterLogout event 457
afterRender event 61
age data point 41
air folder 22
AIR, support of 7–8
Ajax
 submitting forms via
 145–146
 using with Element
 class 39–40
Ajax.request method 185,
197, 202, 264–267
deleting nodes with
263–264

deleting records with 195
and editing nodes 263
and node names 261, 266
and node parameters 256
and OnSave handler 193,
200
POST parameter 188
saving code 439
alert box 49
align parameter 110, 112
align property 110, 144
allowDrag property 344
allowDrop property 344
anchor element 50
anchor event handler 50
anchor parameter 95–97, 100,
103
anchor tag 49–50
AnchorLayout class 95, 97
and fields property 128
and render phase 61
animateEl property 77
anonymous method 185
API documentation 5–7
API Home tab 7
api property 198
appendChild method 313
apply method 353
applyTo attribute 57–58, 61
applyTo element 60
applyTo parameter 59–60
Array class 64
arrayData variable 159
ArrayReader class 159
ArrayStore class 128, 133,
159–161, 163–165

arrowAlign option 287, 290
arrowAlign property 287
arrowHandler handler 286
assocemployees event 404,
414, 449
attributes property 262
autoDestroy property 65
autoExpandColumn
 property 169
AutoLayout class 18
autoLoad property 208, 216,
335
autoSave property for
 DataWriter 203
autoScroll property 94,
107–109
autoShow property 61
axes, adding titles for 232–234

B

b4Drag method 304, 316
b4EndDrag method 319
b4MouseDown method 304
b4StartDrag method 304, 311,
314–315
Back Button 105–106
BarChart
 Cartesian chart option 228
 constructing 243–245
 similarity with
 ColumnChart 226
BarSeries class 226–228
BaseCar class 352–355
baseParams property 130
bbar property 74, 169, 291
before<action> event 61–62

- beforedestroy event 62
 beforeDestroy method 62
 beforehide listener 273
 beforeload event 132
 beforerender event 51, 60
 beforeshow event 59
BLANK_IMAGE_URL
 property configuring 25
BODY tag 26
body tag 31
BooleanColumn class 20
 border parameter 79
BorderLayout class 115, 120
BorderLayout layout
 manager 7
BorderLayout.Region class 115–116, 118
BorderLayout.SplitRegion class 116
BoxComponent class 205, 227, 287
boxLabel property 137
BoxLayout class 18–19
 browser compatibility, and
 icons for menus 274–275
btmHandler handler 284
 bubbling model 48
 build folder 22
buildChart method 392–393
buildCityStateZip method 422
buildCtxMenu factory
 method 258, 260
buildDepartmentInfo-Container method 419
buildDepartmentListView
 method 435
buildEmailDobContainer
 method 421
buildEmployeeForm
 method 435
buildFormItems method 417
buildGeneralInfoForm
 method 408
buildGeneralInfoForm-LeftHalf method 411
buildListView method 397–398
buildListViewPanel
 method 404
buildLoginWindow
 method 453
buildNameContainer
 method 416, 418
buildPhoneNumbersContainer
 method 423
buildSeries method 392
buildStore method 392, 394, 397–398
buildTbar method 411, 416
buildViewport method
 453–454
buildWindow method 26
Button class 283
buttonAlign property 79
ButtonGroup widget 287–290
Buttons
 attaching menu to 284–285
 building 284
 centering 79
 grouping of 287–290
 on toolbars 74
 overview 16
 and SplitButton layout
 of 287
 and SplitButton
 overview 286
 using Action class with
 293–296
buttons array 75
buttons parameter 81
buttons property 222
-
- C**
- cache buster parameter 170
call method 353
callback method 268
callback parameter 170, 200
callback property 165
Cancel Button 81
CardLayout class 84, 86, 104, 106
cars array 43–44
Cartesian chart 21
CartesianChart class 226, 228
CartGrid class 380
CartGrid.js file 380
Cascading Style Sheets. *See* CSS
CategoryAxis class 232, 234
categoryField property 247
cellcontextmenu event
 191–192, 360
cellcontextmenu method 192, 361
CellSelectionModel class 177, 192
CellSelectionModel selection
 model 12, 358, 360, 364
chaining 39
Change column 154
Chart class 228, 230, 395
CHART_URL property 230
chartExtraStyles class 393
ChartPanel class 427
chartpanel class 397
chartpanel namespace 399
ChartPanelBaseCls class, for
 TKE company
 example 389–392
charts 225–249
 are Flash-based 228
BarChart 243–245
 class hierarchy for 227
ColumnChart 239–242
 mixing line with 241–242
 stacking columns 240–241
LineChart 230–235
 adding titles to axes
 232–234
 customizing ToolTip
 for 232
 legends for 238–239
 multiple series in 235–239
 styling of 234–235
 overview of 226–227
PieChart 245–249
swf file 230
 types of 228–229
 version 3.0 improvements 21
CHART_URL property 230
Checkbox 136–138
Checkbox class 15, 280
CheckboxGroup class 138
checked parameter 282
checked property 281
checkHandler property 281
CheckItem, for menus
 overview 280–281
 selecting only one of
 group 281, 283
child nodes, and Element class
 creating 35–37
 removing 37–39
childNode class 38
children array 253
children property 253, 256
children, managing with
 Container class 64–66
class hierarchy for charts 227
cleanSlate method 442, 458
clear event 132
clearDDStyles method 339–340
clearForm method 407, 436, 440
clearMask method 442
click event 50–51, 217, 396, 435–436

click gesture 227
 clicksToEdit property 183
 closable option 79, 87
 close method 77
 close tool 77, 79
 closeAction option 77
 cls parameter 61
 collapseMode parameter 118
 collapsible attribute 74
 collapsible parameter 117
 color data point 41
 ColorMenu for menus 278–280
 ColorPalette widget 279
 colors property 280
 colorTextBlue method 166–167
 colspan attribute 114
 colspan parameter 113
 Column chart 21
 Column class 20, 155
 column parameter 130
 ColumnChart 239–242 example of use 229
 mixing line with 241–242
 similarity with BarChart 226
 stacking columns 240–241
 ColumnLayout class 107, 109
 ColumnModel class
 enhancements to version 3.0 improvements 19–20
 features of 163
 and GridPanel 155, 161
 with custom renderers 166, 168
 columnModel variable 168
 columns attribute 138
 Columns menu 167, 171
 columns property 168, 215
 ColumnSeries class 226–227
 columnWidth attribute 108
 ComboBox 127–134 components of 132
 customizing 132–133
 local 128–129
 remote 129–132
 TimeField for 134
 ComboBox class 14, 16
 ComboBox widget 40
 combo-result-item class 133
 commit method 223
 commitChanges method 185
 CompanyManager
 namespace 429

CompanySnapshot class
 Dashboard screen 427, 429, 431
 for TKE company application example 392–394
 complete event 261, 263–264, 268
 complete handler 261
 Component class
 add and insert methods 64
 initComponent method 359
 lifecycle for 58, 63
 model for 4, 54, 58
 searching for child components 66
 Component model 273
 ComponentMgr class 59, 62, 359, 364
 ComponentMgr.create method 55
 Conjoon application 4
 constrain parameter 77
 constructor method 353, 356, 359, 369
 Container class
 AbsoluteLayout for 100–101
 AccordionLayout for 102–103
 add and insert methods 64
 AnchorLayout for 95, 97
 BorderLayout for 115, 120
 building Container 63
 CardLayout for 104, 106
 child management 86
 ColumnLayout for 107, 109
 ContainerLayout for 93, 95
 FitLayout for 101–102
 FormLayout for 98, 100
 GridPanel in 169–171
 HBoxLayout for 109, 112
 managing children 64, 66
 onDestroy method 62
 in parent-child relationships 10–11
 querying hierarchy 66–67
 TableLayout for 112, 114
 UI widget 72
 VBoxLayout for 109, 112
 Viewport subclass 67–68
See also Component class
 Container hierarchy 253
 Container model 271
 Container, div element 50
 ContainerLayout class 10, 93, 95

containers 10–12
 containerScroll property 327
 context menu handler 257
 context menu method 257
 context menus in TreePanel for CRUD requests 257–260
 contextmenu event 50–51, 171, 257, 260, 358
 contextmenu listener 257
 ContextMenuGridPanel extension 366
 Core for Ext JS framework 9
 create method 160
 create, read, update, and delete. *See* CRUD
 createAndSelectRecord method 432, 441
 createChild method 35–37
 Crockford, Douglas 185
 CRUD, requests
 in DataWriter 200–202
 in DataWriter, automating 203
 in EditorGridPanel 183–196
 create method for 189–192
 creating record 192–196
 delete method for 189–192
 deleting record 192–196
 reject method for 184–186
 rejecting changes 187–188
 save method for 184–186
 saving changes 187–188
 in TreePanel 257–269
 adding context menus for 257–260
 create methods for 266–269
 delete methods for 264–266
 edit methods for 261–264
 CSS, use by Ext JS 8
 custom renderers, Column-Model with 166–168

D

Dashboard class 427, 430–431
 Dashboard screen, for TKE company example 382–384, 429–431
 data classes and version 3.0 improvements 18
 data fields 155

data property 128, 147
 data services
 area of purpose for Ext JS
 classes 8–9
 for Ext JS framework 9
 data Store class 128, 154, 159,
 165
 and ComboBox 128, 132
 and fields property 128
 and GridPanel 154–155
 data Store.loadData
 method 157
 data Store.reload method 157
 data.Record class 160, 164, 432
 data.Record.create
 method 160
 data.Tree class 13
 data.txt file 146
 datachanged event 51, 132,
 162
 dataField property 247
 dataIndex property 155, 161
 DataProxy class 156
 DataView
 binding to
 FormPanel 221–224
 ListView 216–218
 drag and drop with 322–332
 drag gestures for 326–330
 drop target for 330–332
 implementing 206–214
 JsonStore for 207–208
 in Viewport 211, 214
 XTemplate for 208–211
 overview 132, 205
 See also ListView
 DataView class 13, 20
 DataWriter 196–203
 adding to JsonStore 197–200
 autoSave property for 203
 CRUD requests in 200–202
 overview of 196–197
 date property 136
 Date.parseDate method 134
 DateColumn class 20
 DateField widget 136
 dateHired field 438
 DateMenu for menus 278–280
 DatePicker widget 136, 279
 _dc parameter 170
 dc parameter 200
 DD class for drag and drop
 DOM changes made by
 307–308
 drop invitation for 310–313
 drop targets for 309–310
 invalid drop method
 314–315
 making items draggable
 306–307
 valid drop method 313–314
 ddel property 336
 ddGroup parameter 344
 ddGroup property 329, 336,
 338
 DDProxy class for drag and
 drop 303, 316–319
 DDTTarget class 302–303, 309,
 312, 314, 329
 decimalPrecision property 127
 defaultType attribute 98, 102
 defaultType property 55, 124,
 273, 277, 291
 defer attribute 31
 defer method 28
 deferredRender
 parameter 84–85
 Delete Button 438
 Delete context menu item 202
 Delete Department Button 446
 Delete Employee Button 448
 deleteddepartment event 409
 deleteemployee event 409
 Department field 220
 DepartmentBreakdown
 class 429
 Dashboard screen 427, 431
 for TKE company application
 example 394–395
 DepartmentForm class, for TKE
 company example
 407–415
 departmentId field 438
 departmentId parameter 413
 departmentId property 403
 DepartmentManager class 428,
 443
 departmentName
 property 403, 413
 DepartmentsListView class
 Manage Employees
 screen 432
 for TKE company application
 example 397–398
 DepartmentsListView
 widget 442
 DepartmentsListView
 XType 435
 destroy event 63
 destroy handler 369
 destroy method 174
 and render phase 61
 destroying context
 menu 174
 destroying Windows 77
 for cleanup after logout
 workflow 459
 in final phase of Component's life 62, 362
 specifying whether should be
 called 65
 when changing id for
 elements 307
 destruction phase, lifecycle for
 Component class 62–63
 Diaz, Dustin 39
 DirectProxy class 18, 157
 DirectStore class 18
 dirty field markers 183
 disable method 61, 260
 disabled property 61
 displayInfo property 168
 displayName property 237
 div element 34, 49, 51, 75, 210,
 316
 div:last-child selector 38
 dob data point 41
 doCellCtxMenu method
 192–193
 docReadyEvent event 32
 docs folder 22
 Document Object Model.
 See DOM
 document.body class 40, 57
 document.body element 442
 document.getElementById()
 method 37
 document.readyState
 property 31
 doDelete method 190
 doLayout method 64–65, 86,
 88, 109, 143
 DOM
 changes made by DD
 class 307–308
 event flow in 48, 50
 events based on 50–51
 dom property 37
 DOMContentLoaded event 31
 doMsgBoxAlert method 172
 doRowCtxMenu method 173
 doRowDblClick method 172
 doSomething method 48
 Dow Jones Indexes website 5–6
 downloading Ext JS
 framework 21

drag and drop 299–349
 area of purpose for ExtJS 8–9
 description of process 300–301
 elements must be associated with groups 304–305
 hierarchy of classes for 301–303, 321–322
 implementing with DD class
 DOM changes made by 307–308
 drop invitation for 310–313
 drop targets for 309–310
 invalid drop method 314–315
 making items draggable 306–307
 valid drop method 313–314
 implementing with DDPProxy class 316–319
 overriding methods for 303–304
 overview 10
 with DataView 322–332
 drag gestures for 326, 330
 drop target for 330, 332
 with GridPanel 332, 342
 drag gestures for 335–336
 drop invitation for 337
 drop target for 337–342
 drop target for drag and drop 342
 with TreePanel 342–349
 enabling 343–344
 overriding methods for 345–349
 DragDrop class 301, 321
 dragDropEl element 328
 draggable option 79
 DragProxy class 329
 DragProxy element 317
 dragRecords property 328
 DragSource class 303, 321, 329
 DragZone class 303
 and DropZone 303, 338
 employing drag and drop with DataView 343
 features added by 321, 326
 GridDragZone subclass 333
 StatusProxy used by 326
 drive method 354
 DropTarget class 303, 321

DropZone class 327, 330, 336
 employing drag and drop with DataView 343
 features added by 321
 and GridPanel 333
 multiple-node drops 303
 notifyOver method 338
 purpose of 303
 dropZoneOver CSS class 311
 dummy wait dialog box 82
 duration property 35
 dynamic TreePanel
 overview 254–255
 server interaction of 255–257

E

easing property 35
 Edit Button 295
 edit event 262
 editemployee event 409
 editing mode 182
 editNode property 263
 EditorGridPanel 176–203
 building 178–182
 CRUD requests in
 create method for 189–192
 creating record 192–196
 delete method for 189–192
 deleting record 192–196
 reject method for 184–186
 rejecting changes 187–188
 save method for 184–186
 saving changes 187–188
 navigating 182–183
 overview of 177–178
 using DataWriter in 196–203
 adding to JsonStore 197–200
 autoSave property for 203
 CRUD requests in 200–202
 overview of 196–197
 EditorGridPanel class 12, 366
 el property 58
 el.on method 48
 Element class 33–40
 and child nodes
 creating 35–37
 removing 37–39
 example using 33–35
 overview 33

purged 62
 using Ajax with 39–40
 [element id] attribute 125
 Element.dom property 37
 Element.down method 38
 Element.insertFirst method 36
 elements, association with
 groups for drag and drop 304–305
 else block 260
 empInfo string 232
 empName rule 207
 emplOver rule 207
 EmployeeAssociationWindow
 class 387–388, 404, 406, 413
 EmployeeEditorWindow
 class 446
 EmployeeForm class, for TKE company example 415–425
 EmployeeForm Panel 388
 EmployeeForm widget 442
 EmployeeGridPanel class 385, 387, 402, 412, 428
 EmployeeList class
 Manage Employees screen 432
 for TKE company application example 398–399
 EmployeeList extension 388
 EmployeeListView widget 441–442
 EmployeeListView XType 435
 EmployeeManager class, for TKE company example 433–443
 employeesaved event 447–448
 emplSelected CSS class 323
 emplSelected rule 207
 emplWrap rule 207
 enable method 260
 enable<someTool> properties 135
 enableDragDrop property 336, 341, 344
 enableTabScroll parameter 87
 end value 110
 endDrag method 311, 315, 319
 errors property 188
 event bubbling, preventing 50–51
 event capture model 48
 eventObj argument 313
 eventObj.stopEvent method 50

- EventObject class 260
- EventObject.getXY method 173
- events
 - managing with Observable class
 - custom events 52
 - DOM-based events 47–48
 - event flow in DOM 48–49
 - preventing event
 - bubbling 50
 - registering events 53
 - overview 47
- evtObj.getXY() method 173
- evtObj.stopEvent method 173, 192, 260
- examples folder 22
- exception event listener 199
- expanded property 253, 255
- Ext Core library 9
- Ext JS API Documentation
 - application 5–6
- Ext JS Core. *See* Core for Ext JS framework
- Ext JS framework 25, 29
 - benefits of using
 - API documentation 5–7
 - integration with existing sites 5
 - prebuilt widgets for 7
 - supports AIR 7–8
 - supports other libraries 7–8
 - configuring
 - BLANK_IMAGE_URL property 25
 - SDK contents 22–23
 - setting up for first time 23
 - for use with other libraries 23–24
 - containers in 10–12
 - Core 9
 - data services 9
 - DataView class 13
 - downloading 21
 - drag and drop 10
 - form input fields in 14–16
 - Checkbox class 15
 - ComboBox class 16
 - HtmlEditor class 15
 - RadioGroup class 15
 - Textarea class 15
 - Textfield class 15
 - GridPanel class 12–13
 - layouts in 10–11
- ListView class 13
 - overview 4–5
 - programming
 - prerequisites 8
 - UI components 9
 - utilities 10
 - version 3.0
 - improvements 17–21
 - charts added 21
 - ColumnModel class
 - enhancements 19–20
 - data classes 18
 - layouts added 18–19
 - ListView class added 20–21
 - web remoting with Direct class 18
 - web remoting 9
 - widgets in
 - Menu widget 17
 - MessageBox widget 17
 - Slider widget 17
 - Toolbar widget 16
 - TreePanel widget 13–14
- Ext MessageBox window 32
- Ext namespace 378
- Ext.Ajax.request method 40, 185
- Ext.apply method 141, 311, 329, 335
- Ext.applyIf method 417
- Ext.BLANK_IMAGE_URL property 25–26
- Ext.chart.Chart class 383, 392–394
- Ext.chart.PieChart class 247
- Ext.charts namespace 228
- Ext.Component class 54, 57–58, 61, 329
- Ext.ComponentMgr class 55, 362, 368
- Ext.data class 18, 251
- Ext.data.ArrayStore class 160
- Ext.data.DataWriter class 177, 184, 196
- Ext.data.Field class 160
- Ext.data.field class 179
- Ext.data.Fields class 198
- Ext.data.JsonStore class 180, 394
- Ext.data.JsonWriter class 199
- Ext.data.Node class 251
- Ext.data.Record class 148, 179, 198, 328, 401
- Ext.data.Record() method 160
- Ext.data.Store class 128, 130, 165, 396
- Ext.DD class 311
- Ext.dd.DD class 304, 307, 310, 313, 315
- Ext.dd.DDProxy class 304, 308
- Ext.dd.DDTTarget class 309, 315
- Ext.dd.DragDrop class 307
- Ext.dd.ScrollManager.register method 327
- Ext.decode method 185, 195
- Ext.Direct class 18
- Ext.DomQuery class 133
- Ext.each method 42, 185, 195, 248, 307, 328, 331
- Ext.Element class 30, 33, 45, 48, 58, 338
- Ext.Element.load method 40
- Ext.emptyFn method 258–259
- Ext.encode method 185, 187
- Ext.EventManager.onDocumentReady 32
- Ext.EventObject class 50, 173, 192, 272
- Ext.extend method 351, 354–357, 359
- Ext.form.BasicForm class 407
- Ext.Form.ComboBox class 99, 180
- Ext.form.field subclasses 7
- Ext.form.FormPanel class 385, 407
- Ext.form.NumberField class 180
- Ext.form.TextField class 179, 181
- Ext.form.VTypes class 124
- Ext.fx class 314
- Ext.get method 34, 38–39, 48–49, 58
- Ext.getBody method 39, 284
- Ext.getCmp method 26–27, 190, 223
- Ext.getCmp('myWin').doLayout() method 109
- Ext.grid.Column class 161, 167
- Ext.grid.ColumnModel class 167–168, 400
- Ext.grid.GridPanel class 360, 385, 400
- Ext.grid.RowSelectionModel class 162
- Ext.id method 191
- Ext.isArray method 347
- Ext.list.ListView class 396
- Ext.LoadMask class 168

Ext.menu.Menu class 257, 273, 276, 278, 360, 364
 Ext.menu.MenuItem class 192
 Ext.MessageBox class 73–74, 195
 Ext.MessageBox.confirm method 190, 435
 Ext.MessageBox.OKCANCEL property 81
 Ext.ns method 379–380
 Ext.onReady function 32
 Ext.onReady method 26, 31, 34, 452
 Ext.Panel class 55, 57, 390, 396
 Ext.Panel widget 55
 Ext.preg method 368
 Ext.reg method 363
 Ext.StoreMgr class 165
 Ext.StoreMgr.get method 169, 217
 Ext.TabPanel class 84
 Ext.Toolbar class 73, 75
 Ext.Toolbar.Button class 186, 411
 Ext.Toolbar.Fill class 411
 Ext.Toolbar.Separator class 186
 Ext.util.Format class 10
 Ext.util.JSON class 185
 Ext.util.JSON.decode method 185
 Ext.util.JSON.encode method 185
 Ext.util.MixedCollection class 64
 Ext.util.Observable engine 48, 51
 Ext.Viewport class 431
 Ext.Window class 26, 169, 182, 255, 325–326, 372
 child panels derived from XType configuration objects 56
 DataViews encapsulated in instance of 322, 326
 EditorGridPanel instance of 182
 GridPanel as child of instance of 169
 instance of utilizing HBoxLayout 325, 342
 myWin instance of 64, 95 and TreePanel 255
 Ext.XTemplate class 208
 ext-all.css file 23
 ext-all.js file 23

ext-all-css file 25
 ext-all-debug.js file 23–24, 26
 ext-base-debug.js file 23
 Extcharts class 227
 ext-core.js file 23
 extend method, extensions with 354–357
 extensions for Ext JS components 357, 366
 GridPanel extension 359, 363
 implementing 363, 365
 limitations of 365–366
 purpose of 358
 with extend method 354, 357
 with JavaScript 352, 354
See also plug-ins
 extraStyle property 235, 237–238

F

failure handler 263, 265, 267
 failure method 148, 188
 female element 312
 femaleLockerRoom element 307
 Field element 421
 field element 123
 fieldLabel attribute 123
 fieldLabel property 99
 fields property 128, 160, 164
 FieldSet class 11, 139–140
 fieldset xtype 140
 find method 195
 findBy method 66
 findByType method 66, 457
 findHidden method 67
 findRowIndex method 338
 Firebug DOM inspection tool 37
 fireEvent method 53
 First Name column 171
 firstChild method 38, 268
 firstChild.remove method 38
 firstName parameter 52–53
 FitLayout class 101–102
 Flash checking support for 228
 FlashComponent class 228
 flex parameter 111
 for attribute 42, 44, 98, 209–210
 for loop 89
 for operator 43
 form element 421
 form input fields 14–16
 Checkbox class 15
 ComboBox class 16
 HtmlEditor class 15
 RadioGroup class 15
 Textarea class 15
 Textfield class 15
 form namespace 385
 format property 136
 FormLayout class 98, 100
 FormPanel 11
 binding DataView to 221–224
 Checkbox for 136–138
 ComboBox for 127–134
 components of 132
 customizing 132–133
 local 128–129
 remote 129–132
 TimeField for 134
 creating 219–221
 DateField for 136
 flexibility of 138–144
 HtmlEditor for 134–135
 loading data into 146–149
 NumberField for 126–127
 Radio for 138
 submitting forms 145–149
 standard submit 145
 via Ajax 145–146
 TextArea for 126
 TextField for 122–127
 and file select fields 125–126
 password attribute for 125–126
 FormPanel class 11, 385
 FormPanel.getForm() method 145
 FormPanelBaseCls class 406–407
 FormPanelBaseCls constructor extension 432
 Forward Button 106
 fp.getForm().isValid() method 125
 fpItems variable 124
 frame property 213
 framework. *See* Ext JS framework
 Full Name column 162
 fullName property 130–131
 Function method 28

G

gear method 354
 general utilities 8–9
 genericHandler method 272,
 276, 279, 294
 get method 190
 GET parameter 188
 getAt method 190, 195
 getCompany.php
 controller 256
 getDragData method 327, 329,
 336
 getDropPoint method 347
 getEl method 33, 58
 getElementById method 33
 getEmployeeGridSelections
 method 414
 getForm method 145
 getModifiedRecords
 method 185
 getRepairXY method 327–329
 getSelected method 172, 358,
 401, 436–437
 getSelectedCell method 358
 getSelectedRecord
 method 360, 362, 364,
 368, 370
 getSelections method 414
 getStore method 397
 getValues method 148
 getView method 397
 getXY method 260
 grid namespace 385
 grid.Column class 20
 GridDD group 336
 GridDragZone class 303, 333,
 336, 342, 344
 GridPanel 5, 153–175
 ColumnModel for with
 custom renderers 166–168
 columns 237
 drag and drop with 332–342
 drag gestures for 335–336
 drop invitation for 337
 drop target for 337–342
 event handlers for 171–175
 extending 359–363
 implementing 159, 161–175
 in Container 169, 171
 overview 154–155
 PagingToolbar for 168–169
 setting up ArrayStore
 overview 159, 161
 shortcuts for 163–165
 and Store class 156, 158

supporting classes for
 154–155
See also EditorGridPanel

GridPanel class 12–13, 47, 366,
 369, 385
 gridRowInsertBottomLine CSS
 class 339
 gridRowInsertTopLine CSS
 class 339
 GridView class 154–155
 grouping, of buttons 287–290
 Guard, Damien 274

H

handleNav method 106
 handler property 273
 HBox layout 19
 HBoxLayout class 18–19, 109,
 112, 212
 HEAD tag 26
 height parameter 116
 Hello world example 25–29
 helloWorld.html file 27–28
 helloWorld.js file 26–27
 hidden property 61
 hiddenName property 130
 hide method 61, 77, 260
 hideable flag 171
 hideable property 167
 hideTabStripItem method 88
 highlight effect 27
 highlight method 39
 highlightWindow function 27
 Hot Tub element 309
 HTML button 16
 HTML, use by Ext JS 8
 HtmlEditor 134–135
 HtmlEditor class 15
 htmlFragment.html file 39
 HttpProxy class 156
 Hypertext Markup Language.
See HTML

I

icon property 82, 253
 icon-accept CSS class 273
 iconAlign option 287
 iconCls property 253, 273, 275,
 281, 283–285
 icons for menus
 and browser
 compatibility 274–275
 overview 273–274
 icons.css file 274
 icons.ie6.css file 274

ID column 171
 id parameter 200, 439
 id property 26–27, 75, 131,
 201, 254, 256
 idProperty property 179
 if attribute 44
 if block 260
 if condition 44
 if operator 43
 if statement 313
 increment property 134
 init method 59, 367, 369–370,
 452, 459

initComponent method
 in ChartPanelBaseCls
 391–392
 creating contents for 403
 and EmployeeManager
 construction 433–434
 reducing size of 408
 this.items property 409
 initialization phase, lifecycle for
 Component class 58, 60

innerHTML class 35
 insert method 87, 191
 insertBefore method 268
 insertFirst method 36–37
 instanceof operator 362
 inter-Component events 51
 invalidDrop property 311,
 315, 319
 isCamry method 45
 isTarget property 311
 isValid method 125
 isInvalidDropPoint method
 347–348
 isVisible method 67
 Item handler 273
 Item property 284
 Item.setIconClass method 281
 itemclick event 227, 229, 249,
 390, 392
 itemclick event handler 431
 itemclick event listener 429

itemId property 258
 items array 73, 87, 282, 291
 items parameter 417
 items property 64, 192, 273, 291
 itemSelector property 133, 215
 itemType property 455, 457,
 459

J

James, Mark 274
 JavaScript Serialized Object
 Notation. *See* JSON

JavaScript, extensions
with 352–354
JSON 9
JsonReader class 199
JsonStore class
adding DataWriter to
197–200
configuring 165
creating ArrayStore 164
for DataView 207–208
for extension
implementation 363
GridPanel 334
implementing remote
loading ComboBox 130
mapping fields 230
jsonstore XType 165
JsonWriter class 198

K

keyup event 51
Koch, Peter-Paul 49

L

label element 98
labelWidth attribute 98
Last Name column 171
lastChild.remove method 38
lastName parameter 52–53
layout parameter 113
layout property 26, 106–107,
213
layoutConfig parameter 103,
114
layoutOnTabChange option
85, 90
and incorrectly sized child
items 85–86
layouts 10–11
and containers 10–11
and version 3.0
improvements 18–19
leaf attribute 345
leaf property 253, 256, 268
left attribute 100–101
left property 308
legends for LineChart 238–239
libraries, use of Ext JS with
other libraries
configuring for 23–24
support for 7
limit parameter 170
limit property 168–169
LineChart 21, 230
adding titles to axes 232–234

customizing ToolTip for 232
legends for 238–239
mixing with ColumnChart
241–242
multiple series in 235–239
styling of 234–235
LineSeries class 226–228
listeners option 257
listpanel class 397
listpanel namespace 399
ListPanelBaseCls class 396–397
ListView
binding DataView to
216–218
implementing 214–218
See also DataView
ListView class 13
ListPanelBaseCls 396
TKE namespace 385
version 3.0
improvements 20–21
LiveGrid extension 4
load method 146–147, 169,
171, 401, 414, 424
loadData method 157, 407, 413
loadEmployeeGrid method
414
loadFormAfterRender
method 424
loading data into FormPanel
146–149
loadingText string 130
LoadMask class 169
loadMask property 168
loadRecord method 148, 221
loadStoreByParams method
436
lockerRoom element 306
lockerRoomChildren class 317
Log Out Button 451
Login Button 453
logout Button 455
looping with XTemplate
class 42–43

M

majorGridLines property 237
Manage Departments screen,
for TKE company
example 384–387,
443–450
CRUD workflow in 446–449
employee association work-
flow in 449–450
workflow of 443–446

Manage Employees screen, for
TKE company
example 387–389,
431–443
EmployeeManager class
for 433–443
workflow of 431–432
mapping attribute 130
margins parameter 117
mask method 185
maxHeight parameter 117
maxLength parameter 123
maxValue property 127, 134
maxWidth parameter 117
MemoryProxy class 157
memoryProxy variable 159
menu property 275, 295
Menu widget 17, 271, 273,
361, 369
menu.BaseItem class 277
menu.CheckItem widget 281
menu.Separator class 276,
278, 281
MenuItem handler 371
menuItems array 273, 275,
279–281
MenuLayout class 18–19
menus
attaching to buttons
284–285
building 272–273
CheckItem for
overview 280–281
selecting only one of
group 281–283
ColorMenu for 278–280
DateMenu for 278–280
icons for
and browser compatibility
274–275
overview 273–274
overview of 271–272
Separator for 276–277
submenus for 275–276
TextItem for 277–278
MessageBox alert dialog
box 276
MessageBox alert method 80
MessageBox class
animated wait dialog box
with 82, 84
options for 81–82
replacing alert and
prompt 79–80
MessageBox widget 17

MessageBox.alert method 80
 MessageBox.confirm
 method 195, 264–265, 438
 MessageBox.prompt
 method 80, 264
 MessageBox.show method 80
 minChars property 130
 minHeight parameter 79, 117
 minLength parameter 123
 minValue property 127, 134
 minWidth parameter 79, 117
 MixedCollection utility 64
 modal dialogs
 animated wait dialog box,
 with MessageBox class
 82, 84
 creating rigid modal
 Window 78–79
 modal option 78
 mode attribute 128
 modified records list 185
 mousedown event 304
 mouseover event 232
 mouseover gesture 227, 229
 msg property 146, 188
 msgTarget property 125
 multiple series in
 LineChart 235–239
 multiSelect property 212
 MyApp namespace 379–380
 MyApp.grid namespace 380
 myBottomToolbar array 74–75
 myBtnHandler method 75
 myCallback method 80
 myDiv class 34
 myDiv element 49
 myDiv1 variable 34, 36
 myDiv1.createChild()
 method 36
 myDiv1.dom.childNodes 37
 myFormPanel.getForm().getValues() method 148
 myFormPanel.getForm().setValues(dataObj) method 148
 myHref tag 50
 myObservable.addListener
 method 53
 myObservable.on method 53
 myObservable.removeListener
 method 53
 myPanel class 55
 myPanel.getBottomToolbar()
 method 74
 myPanel.getTopToolbar()
 method 74

myPanel.render method 57
 myPanel.show method 59
 myTpl variable 40
 myTpl.append method 40
 myValidFn method 123

N

name attribute 130, 220
 name data point 41
 nameRecord variable 159
 namespaces 378–379
 segmentation of
 for large applications 381
 for small
 applications 379–380
 for TKE company application
 example 429
 New Employee Button 385,
 446
 newDepartment handler 272
 newHires attribute 230
 newHires column 245
 newRecordId property 191,
 194–195
 node parameter 256
 notifyOut method 339
 notifyOver method 338
 NumberColumn class 20
 NumberField 15, 126–127
 NumericAxis class 232, 234,
 241, 244

O

Observable class, managing
 events with
 custom events 51–52
 DOM-based events 47–48
 event flow in DOM 48, 50
 preventing event
 bubbling 50–51
 registering event 52–53
 octaneRequired property 354
 on method 53
 onAdd handler 268
 onAddNode method 268
 onAddToDepartment
 method 404–405
 onAfterAjaxReq method 452,
 455, 458
 onAfterDeleteEmployee
 method 438, 440
 onAfterLogout method 457

onAssociateEmployees
 method 413, 450
 onBeforeDrag method 345,
 348
 onCellContextMenu
 method 359, 364, 368, 370
 onclick attribute 47
 onClose method 404–405
 onComplete method 264
 onCompleteAdd method 268
 onCompleteEdit handler 262
 onCompleteEdit listener 263
 onConfirmDelete method 265,
 438
 onConfirmDeleteEmployee
 method 436, 439
 onContainerDrop
 method 331–332, 339
 onContainerOver method 331,
 337–338, 340
 onCtxMenu handler 257–258
 onDelete method 190, 195,
 200, 265
 onDeleteDepartment
 method 414
 onDeleteEmployee
 method 435, 438
 onDeleteEmployees
 method 414
 onDepartmentListClick
 method 405, 435–436, 444
 onDepartmentStoreLoad
 method 405
 onDeptFormSave method 444
 onDeptFormSaveFailure
 method 444
 onDeptFormSaveSuccess
 method 444
 onDestroy method 62, 360,
 362, 367, 370
 onDestroyMethod method 367
 onDrag method 304
 onDragDrop method 304, 311,
 313–314, 317, 319
 onDragEnter method 304,
 311–312, 317
 onDragOut method 304,
 311–313, 317
 onDragOver method 304
 onEdit method 261, 263
 onEditEmployee method 413
 onEmpFormSaveFailure
 method 442
 onEmpFormSaveSuccess
 method 441

onEmployeeListClick handler 435
 onEmployeeListClick method 437
 onEmployeeLoadFailure method 437
 onEmployeeWindowSave-Success method 448
 onGridRowDblClick method 412
 onInsertRecord method 193
 onInvalidDrop method 304, 311, 313–315, 319
 onLayout method 108
 onLoad attribute 31
 onLogin method 456
 onLoginFailure method 456
 onLoginSuccess method 456
 onLogout method 457
 onMenuItemClick method 365
 onMouseMove event 304
 onNewDepartment method 444
 onNewEmployee method 412, 435, 438, 441–442
 onReady initializing JavaScript with 31–33
 onRejectChanges method 184, 186
 onRender method 61
 onReset method 412
 onSave method 184, 187, 193, 200, 412
 onSaveEmployee method 435
 onSuccessOrFail method 146
 onSwitchPanel method 455, 457
 options.succCallback method 459
 originalXY property 315, 317
 overClass CSS class 212
 overCls property 215
 overflow-x attribute 94
 overflow-y attribute 94
 overriding methods, for drag and drop 303–304

P

pack parameter 110
 padding property 239
 pageSize property 127, 131, 168, 182
 PagingToolbar 168–169
 PagingToolbar class 12, 16

Panel class
 parent-child relationship 10–11
 Toolbar widget 16
 toolbars in 72, 76
 TreePanel 251
 params property 169, 185
 parentNode property 263
 password attribute for TextField 125–126
 personName field 160
 phoneNumbers property 209–210
 PieChart 245, 248–249
 PieChart class 226, 228–229
 PieSeries class 227
 Plain Old JavaScript Object. *See* POJSO
 plain parameter 79
 plug-ins
 creating 368–370
 implementing 370–374
 overview of 366–368
 PNG 274
 POJSO 128
 Pool element 309
 Portable Network Graphics. *See* PNG
 position attribute 100–101
 position property 308
 POST parameter 188
 PremiumCar class 352, 354, 357
 PremiumCar.prototype.drive method 353
 prepareFormForNew method 438, 442
 pressed option 455
 prevHired attribute 230
 prevHired column 245
 progress option 83
 ProgressBar class 17, 82
 ProgressBar PagingToolbar plug-in 373
 ProgressBarPager.js file 373
 prompt method 80
 PropertyGridPanel class 366
 Prototype library 23–24
 Proxy class 159, 197
 proxy property 130

Q

qtip attribute 125
 QuickTip class 11
 QuickTip widget 11

R

Radio class 138
 RadioGroup class 15, 280
 Record field 161
 record parameter 185
 Record template 191
 Record.create method 159
 record.get method 172
 records parameter 188, 194, 200–202
 recordsToInsertUpdate property 185
 recordsToSend array 185
 recordType property 191
 regex method 14
 Region class 115
 region property 117
 registering events 53
 Reject Changes Button 184, 186, 188
 reject method 188
 rejectChanges method 186, 188, 200, 203
 reload method 188
 Remote Procedure Calls. *See* RPCs
 remoteJsonStore class 182
 remoteJsonStore.load method 182
 remoting methods 157
 remove method 37, 66, 87, 265
 removeAll method 401
 removeFromGroup method 305
 render event 61
 render method 57–58, 60, 106
 render phase, lifecycle for Component class 60, 62
 rendering, of Component class 57–58
 renderTo attribute 57–58, 60–61
 renderTo parameter 59
 repairXY property 328
 request inspection tool 200–201
 request parameter 188
 reset Button 432
 reset method 224, 407, 412
 resizable option 78
 resizeTabs parameters 90
 resources folder 22
 response.responseText property 195

return method 190
 reusability of code.
See namespaces, for TKE
 company application example
 root property 165
 RootTreeNodeUI class 251
 rootVisible property 253
 rowclick event 224
 rowcontextmenu event 47,
 163, 360
 rowContextMenu property 173, 192
 rowdblclick event 171, 401, 412
 rowdblclick method 163
 rowIndex parameter 173
 RowSelectionModel class
 162–163, 174
 RowSelectionModel selection
 model 12, 358, 364
 rowspan parameter 113
 rowspan property 290
 rowToDelete parameter 190,
 195
 RPCs 157

S

s.gif file 24–25
 sameClass class 38
 Save Button 218, 222–223
 Save Changes Button 184,
 186–187, 193, 200, 202
 save method 200
 saveemp event 441
 sayGoodbye event 52–53
 sayGoodbyeFn method 53
 sayHello event 52
 sayHi.html file 27
 scale property 287, 290
 script tag 27, 39
 Scriptaculous library 24
 ScriptTagProxy 180, 198, 201,
 208, 324, 334
 in EditorGridPanel
 construction 179
 in ListView construction 215
 overview 157
 recreating to work with
 instance of
 Ext.data.JsonWriter 199
 scroll property 327
 segmentation of namespaces
 for large applications 381
 for small applications
 379–380
 select method 192, 259, 307

selectCell method 358
 selectedClass CSS class 212
 selectedCls property 215
 selectedNodes list 328
 selectedRecord property 223
 SelectionModel class 154–155,
 163
 SelectionModel.getSelectCell
 method 190
 selectRow method 173, 358
 Separator for menus 276–277
 series array 242
 series property 238, 247
 series.data array 248
 series.xField property 244
 series.yField property 244
 set method 195
 setActiveItem method 104, 458
 setActiveTab method 87
 setFlagColor handler 282,
 285–286
 setHeight method 34
 setIconCls method 282
 setId method 268
 setSize method 35
 setTimeout method 28, 83
 setValues method 85, 146
 setWidth method 34
 shiftTo method 353
 show event 61
 show method 80, 82, 260
 showAt method 173, 273
 side attribute 125
 singleSelect: true property 163
 Slider widget 17
 someContainer.items
 property 64
 sort method 162, 401
 source DataView property 328
 sourceEl element 327
 spacing property 239
 split parameter 116–117
 SplitButton
 layout of 287
 overview 286
 StackedBarChart 243–244
 StackedBarChart class 228,
 242, 244
 StackedColumnChart
 class 240, 242–243
 stacking columns, in
 ColumnChart 240–241
 stackingEnabled property 241,
 244
 standardSubmit property 145
 start parameter 170
 start property 169
 start value, pack parameter 110
 startDrag method 304,
 316–317
 startEdit method 263
 startEditing method 191
 State column 162
 state field 141, 160
 StateManager class 59
 static TreePanel 252–253
 StatusProxy class 326, 329–330,
 332, 336, 348
 stopEvent method 50
 Store class
 DataView class 205
 and GridPanel 156–158
 overview 156–158
 Store ID string 169
 store property 128
 STP. *See* ScriptTagProxy
 stretch properties, FieldSet 142
 stretch value, align
 parameter 110
 stretchmax value, align
 parameter 110
 String class 434
 string value 54
 String.format method 166,
 379, 433–434, 443
 stripCharsRe property 123
 style attribute 308
 style parameter 61
 style tag 309
 style.position attribute 313, 315
 stylizeAddress method 166–167
 subclasses. *See* extensions
 submenus 275–276
 submit method 145
 submitHandler method 146
 submitting forms 145–149
 standard submit 145
 via Ajax 145–146
 succCallback method 439, 459
 success handler 263, 265
 success method 188
 success property 146–147, 185,
 263, 459
 successFalse.js file 178
 successProperty property
 199, 201
 successTrue.js file 178, 185,
 190, 193, 198
 superclass method 353–354,
 356
 superclass.afterRender
 method 61

superclass.beforeDestroy
 method 62
superclass.loadData method
 414
superclass.onRender method
 61
SWFObject class 228
switchToCard method 458

T

TableLayout class 112
TabPanel class 84, 91
 construct complex form 139
 creating simple
 TabPanel 86–87
 deferredRender parameter,
 and setValues method
 84–85
 displaying documentation 7
 layoutOnTabChange parameter,
 and incorrectly sized
 child items 85–86
 tab management methods
 for 87–88
 tab widths in 88
TabPanel container 10–11
TabPanel widget 5–6, 11
TabScrollerMenu plug-in 372
TabScrollerMenu.js file 372
targetElId argument 313
tbar parameter 417
tbar property 74, 291–292, 295
Template class 40–45
 example using 40–42
 extension of by
 XTemplates 42
 See also XTemplates
Template constructor 41
TemplateColumn class 20
text attribute 252
text property 253, 256, 258,
 273, 282, 284, 290
TextArea 15, 80, 126
TextField 6, 14, 122–127
 and file select fields 125–126
 password attribute for
 125–126
Textfield class 15
TextItem for menus 277–278
this.buildEmployeeGrid
 method 409
this.buildGeneralInfoForm
 method 409
this.buildSeries method 393
this.buildStore method 393

this.buildViewport method 456
this.clearMask method 437
this.close method 405
this.departmentId
 parameter 404
this.destroy method 457
this.doLogout method 457
this.gear property 352
this.isCamry method 44–45
this.items class 55
this.loadFormAfterRender
 method 417
this.octaneRequired property
 352
this.onCellContextMenu
 method 361
this.onConfirmDelete-
 Employee method 438
this.onDepartmentListClick
 method 404
this.onDepartmentStoreLoad
 method 404
this.onLogin method 453
this.onLoginFailure
 method 456
this.point property 339
this.setDeptIdOnForm
 method 436
this.shiftTo method 352
this.switchToCard method 458
TimeAxis class 232
TimeField class 15
TimeField for ComboBox 134
tipRenderer method 232, 237,
 244, 247, 249, 392–393
tipRenderer property 238
title attribute 125
title rule 207
titleRotation property 235, 237
titles adding for axes 232–234
TKE company application
 example
ChartPanel components in
 389–395
 ChartPanelBaseCls class
 389–392
 CompanySnapshot class
 392–394
 DepartmentBreakdown
 class 394–395
Dashboard screen for 382–
 384, 429–431
EmployeeAssociationWin-
 dow class for 402–406
EmployeeGridPanel class
 for 399–402
form namespace for
 406–425
 DepartmentForm
 class 407–415
 EmployeeForm class
 415–425
 FormPanelBaseCls
 class 406–407
ListPanel components
 in 396–399
 DepartmentsListView
 class 397–398
 ListPanelBaseCls
 class 396–397
ListView components in
 EmployeeList class
 398–399
Manage Departments screen
 for 384–387, 443–450
 CRUD workflow in
 446–449
 employee association work-
 flow in 449–450
 workflow of 443–446
Manage Employees screen
 for 387–389, 431–443
 EmployeeManager class
 for 433–443
 workflow of 431–432
namespace design for 429
and reusability in 382
workspace class for 451–459
workspace class for, workflow
 of 451–452
TKE.window.UserLogin-
 Window class 453
ToastWindow extension 4
Toolbar Button 74
Toolbar Buttons widget 6
Toolbar class 7
Toolbar.Fill widget 292–293
Toolbar.Separator class 291
Toolbar.TextItem widget 292
ToolbarLayout class 18
Toolbars 6, 16
 implementing 290
 in Panel class 72, 76
 using Action class with
 293–296
tools array 75
ToolTip class 17
ToolTips customizing
 for LineChart 232
 for PieChart 248–249
top attribute 100–101
top parameter 110
top property 308

TotalCompany class 392
 totalCount property 165, 168
 TotalEmployees class 384
 totalProperty property 165
 tpl element 43
 tpl flag 44
 tpl modifier 44–45
 tpl tags 43, 209–211
 trackResetOnLoad
 method 407
 trackResetOnLoad option 432
 trackResetOnLoad
 property 412
 treeTreeNode class 251, 253
 TreeDragZone class 303, 344
 TreeDropZone class 303, 344
 TreeDropZone.proto
 type.isValidDropPoint
 method 346–347
 TreeEditor class 263, 266,
 268–269
 TreeLoader class 14, 251, 254
 TreeNode class 344
 TreeNodeUI class 251
 TreePanel 6, 104, 250–269
 CRUD requests in 257–269
 adding context menus
 for 257–260
 create methods for
 266–269
 delete methods for
 264–266
 edit methods for 261–264
 drag and drop with 342–349
 enabling 343–344
 overriding methods
 for 345–349
 dynamic 254–255
 server interaction of
 255–257
 overview of 251
 static 252–253
 widget 13
 try/catch block 459
 type attribute 125, 245
 type property 242

U

UI Component class 76
 UI components 9
 un method 53
 under attribute 125
 unhideTabStripItem
 method 88
 update event 162
 updateFn function 83

url property 27, 130, 164, 197,
 254
 urlOnlyText property 124
 UserLoginWindow class 382
 utilities for Ext JS
 framework 10

V

validateValue method 135
 validation, lack of in
 HtmlEditor 135
 validDropPoints array 347–348
 values property 44
 VBoxLayout class 18–19, 110,
 112
 Viewport class
 DataView in 211–214
 exploring scrollable tabs 89
 flexing BorderLayout 115
 subclass of Container
 class 67–68
 Viewport widget 6
 vtype property 124

W

web remoting 9, 18
 widgets, benefits of 7
 width property 167, 216
 win.show method 26
 winBody class 27
 Window class 76, 84, 292, 325
 and Container model
 methods 63
 creating helloWorld.html 25
 creating rigid modal
 Window 78–79
 MessageBox class 79–80
 animated wait dialog box
 with 82, 84
 options for 81, 84
 out-of-the-box form
 elements 14
 parent-child relationships
 10–11
 placing DataViews inside 325
 Toolbar 292
 winBody 27
 Window widget 5
 WishlistGrid.js file 380
 workspace class, for TKE com-
 pany example 451–459
 writeAllFields parameter 201
 writeAllFields property 198
 Writer class 196–198, 200–202

X

xaction parameter 170–171
 xAxis property 234, 244
 xcount array 44
 x-dd-drop-ok CSS class 331
 xField property 231, 243, 247
 x-form-item class 98
 XHR inspection tool 148, 188,
 193, 269
 xindex index 44
 XMLHttpRequest 148
 x-panel-fbar class 75
 XTemplate constructor 31, 45
 XTemplates 132–133
 advanced concepts with
 43–45
 for DataView 208–211
 looping with 42–43
 See Template class
 XType 94, 96, 98, 102
 and Component class 54, 57
 definition 122
 xtype option 455
 xtype property 231, 277, 458
 in ColumnChart
 construction 239
 of EditorGridPanel 182
 in onSwitchPanel 455
 in PieChart configuration
 247
 specifying combo as simple
 POJSO 128
 in StackedBarChart
 configuration 244
 in XType configuration
 object creation 364

Y

Yahoo! User Interface. *See* YUI
 yAxis property 234, 244
 yearInfo string 232
 Yes Button 81, 265
 yField property 231, 236, 238,
 243, 247
 YouTubePlayer extension 4
 YUI 3

Z

ZIP Code cell 183
 ZIP Code column 181
 ZIP Code field 141

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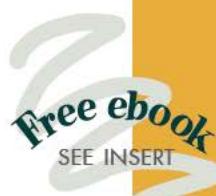
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