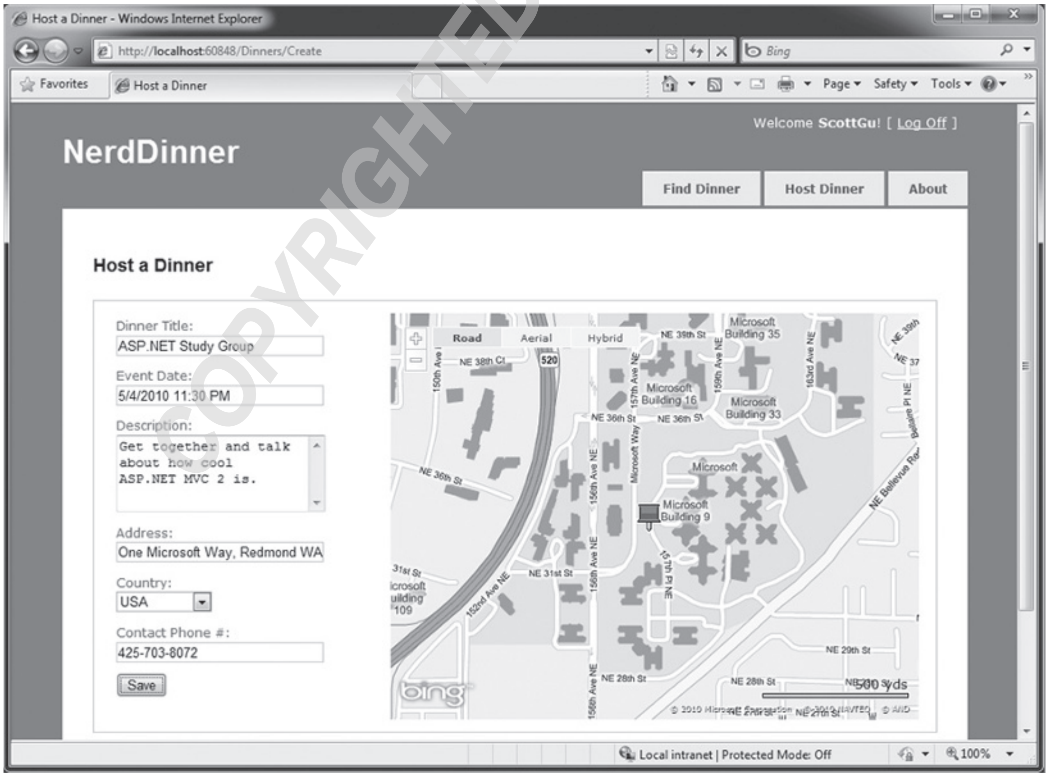
1

NerdDinner

The best way to learn a new framework is to build an application with it. This first chapter walks you through how to build a small, but complete, application using ASP.NET MVC 2 and introduces some of the core concepts behind it.

The application we are going to build is called *NerdDinner*. NerdDinner provides an easy way for people to find and organize dinners online (Figure 1-1).


Host a Dinner - Windows Internet Explorer
http://localhost:60848/Dinners/Create
Bing
Favorites
Host a Dinner
Page ▾ Safety ▾ Tools ▾
Welcome ScottGu! [Log Off]
NerdDinner
Find Dinner
Host Dinner
About
Road
Aerial
Hybrid
500 yds
Save
Local intranet | Protected Mode: Off
100%

Host a Dinner

Dinner Title: ASP.NET Study Group

Event Date: 5/4/2010 11:30 PM

Description: Get together and talk about how cool ASP.NET MVC 2 is.

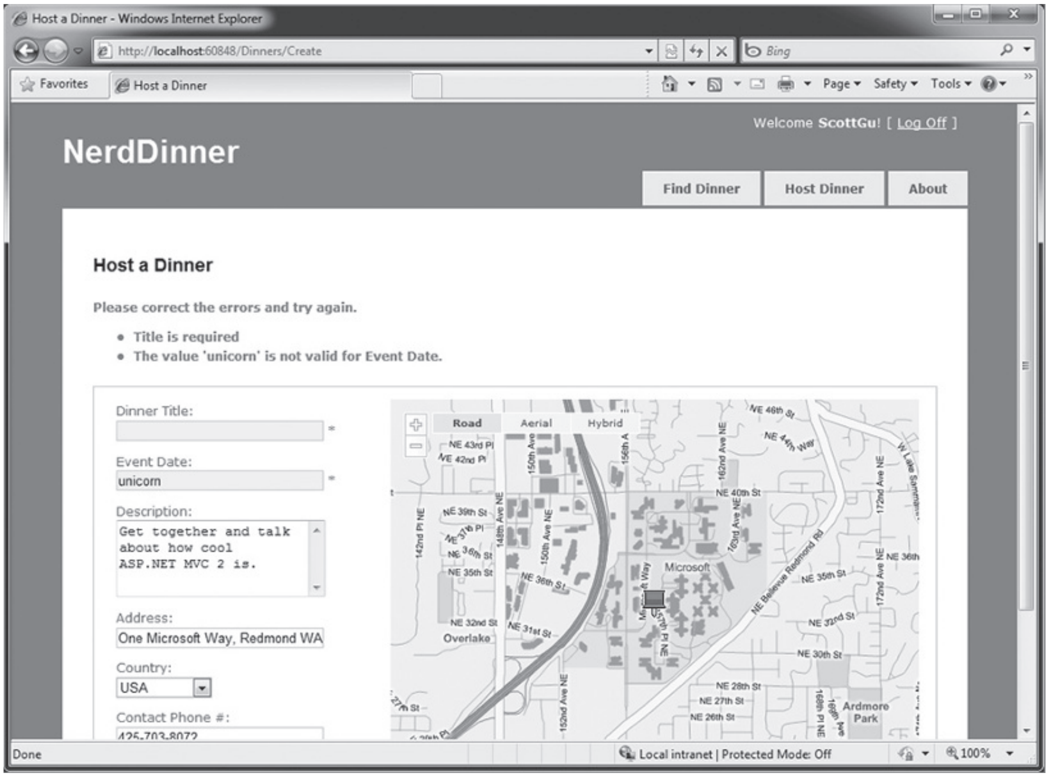
Address: One Microsoft Way, Redmond WA

Country: USA

Contact Phone #: 425-703-8072

FIGURE 1-1

NerdDinner enables registered users to create, edit, and delete dinners. It enforces a consistent set of validation and business rules across the application (Figure 1-2).


Host a Dinner - Windows Internet Explorer
http://localhost:60848/Dinners/Create
Bing
Favorites
Host a Dinner
Page
Safety
Tools
Welcome ScottGu! [Log Off]
NerdDinner
Find Dinner
Host Dinner
About
Road
Aerial
Hybrid
Microsoft
Overlake
Ardmore Park
Done
Local intranet | Protected Mode: Off
100%

Host a Dinner

Please correct the errors and try again.

- Title is required
- The value 'unicorn' is not valid for Event Date.

Dinner Title: *

Event Date: unicorn *

Description:
```
Get together and talk
about how cool
ASP.NET MVC 2 is.
```

Address: One Microsoft Way, Redmond WA

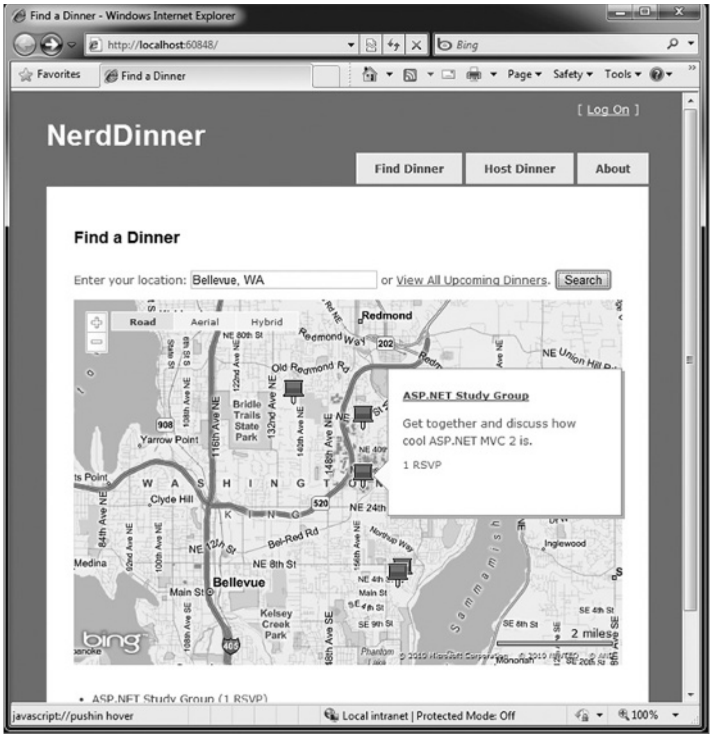
Country: USA

Contact Phone #: 425-703-8072

FIGURE 1-2

Visitors to the site can search to find upcoming dinners being held near them (Figure 1-3).

Clicking a dinner will take them to a details page, where they can learn more about it (Figure 1-4).



Find a Dinner

Enter your location: Bellevue, WA or View All Upcoming Dinners. Search

ASP.NET Study Group

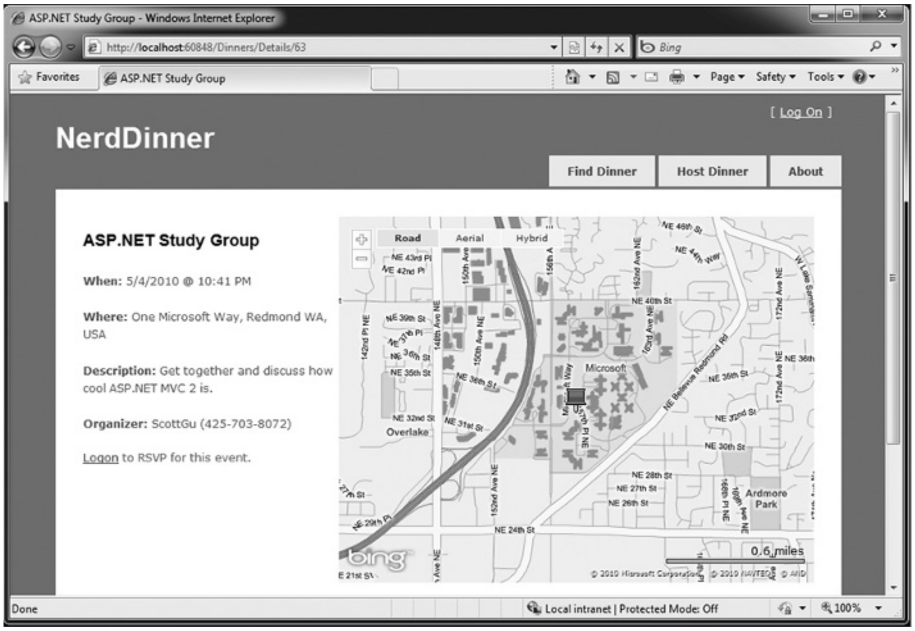
Get together and discuss how cool ASP.NET MVC 2 is.

1 RSVP

- ASP.NET Study Group (1 RSVP)

javascript://pushin hover

FIGURE 1-3



ASP.NET Study Group

When: 5/4/2010 @ 10:41 PM

Where: One Microsoft Way, Redmond WA, USA

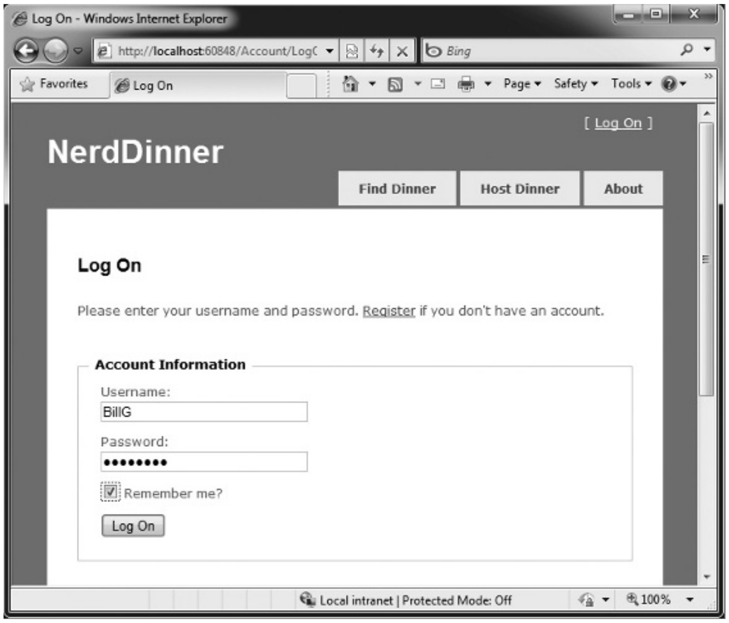
Description: Get together and discuss how cool ASP.NET MVC 2 is.

Organizer: ScottGu (425-703-8072)

Logon to RSVP for this event.

FIGURE 1-4

If they are interested in attending the dinner, they can log in or register on the site (Figure 1-5). They can then easily RSVP to attend the event (Figures 1-6 and 1-7).


Log On - Windows Internet Explorer
http://localhost:60848/Account/LogO
Bing
Favorites
Log On
Page
Safety
Tools
[Log On]
NerdDinner
Find Dinner
Host Dinner
About
Local intranet | Protected Mode: Off
100%

Log On

Please enter your username and password. Register if you don't have an account.

Account Information

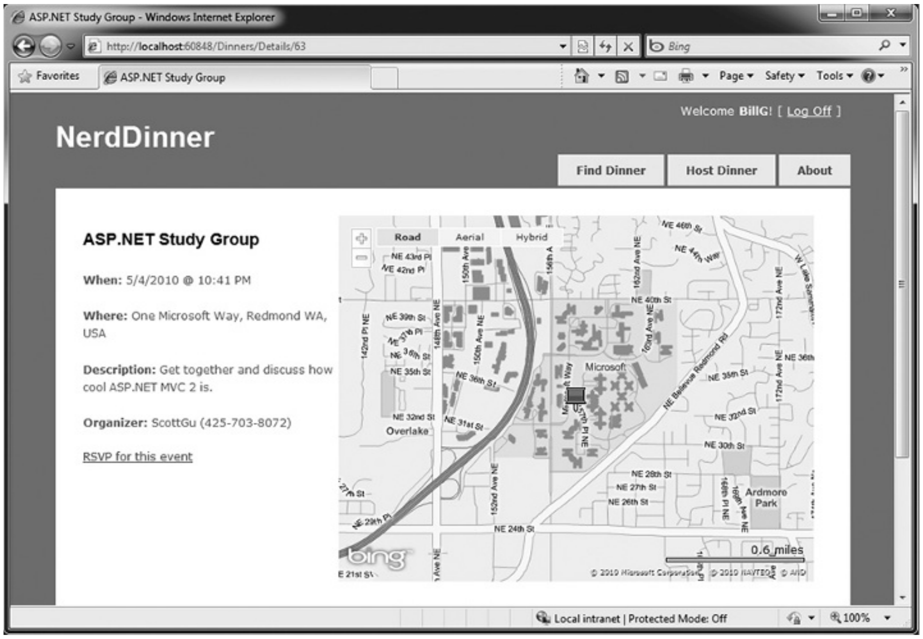
Username: BillG

Password: ●●●●●●●●●

[✓] Remember me?

Log On

FIGURE 1-5


ASP.NET Study Group - Windows Internet Explorer
http://localhost:60848/Dinners/Details/63
Bing
Favorites
ASP.NET Study Group
Page
Safety
Tools
Welcome BillG! [Log Off]
NerdDinner
Find Dinner
Host Dinner
About
Road
Aerial
Hybrid
Microsoft
Overlake
Ardmore Park
0.6 miles
bing
Local intranet | Protected Mode: Off
100%

ASP.NET Study Group

When: 5/4/2010 @ 10:41 PM

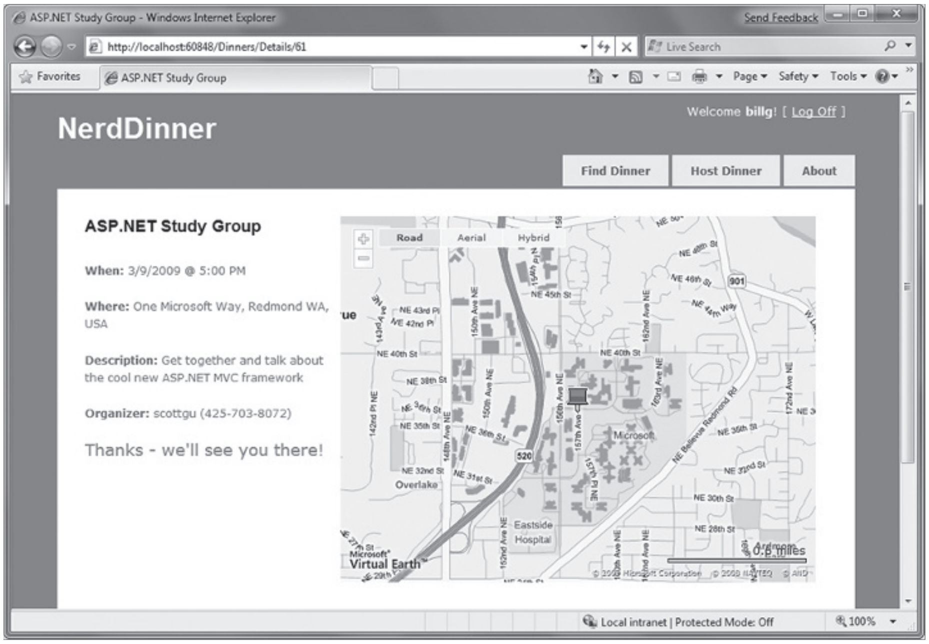
Where: One Microsoft Way, Redmond WA, USA

Description: Get together and discuss how cool ASP.NET MVC 2 is.

Organizer: ScottGu (425-703-8072)

RSVP for this event

FIGURE 1-6


ASP.NET Study Group - Windows Internet Explorer
http://localhost:60848/Dinners/Details/61
Favorites
ASP.NET Study Group
Welcome billg! [Log Off]
NerdDinner
Find Dinner
Host Dinner
About
Road
Aerial
Hybrid
Microsoft Virtual Earth
Local intranet | Protected Mode: Off
100%

ASP.NET Study Group

When: 3/9/2009 @ 5:00 PM

Where: One Microsoft Way, Redmond WA, USA

Description: Get together and talk about the cool new ASP.NET MVC framework

Organizer: scottgu (425-703-8072)

Thanks - we'll see you there!

FIGURE 1-7

To implement the NerdDinner application, we'll start by using the File ➪ New Project command within Visual Studio to create a brand new ASP.NET MVC 2 project. We'll then incrementally add functionality and features. Along the way, we'll cover how to create a database, build a model with business rule validations, implement the data listing/details user interface (UI), provide CRUD (Create, Read, Update, Delete) form entry support, implement efficient data paging, create reusable and shared the UI using master pages and partials, secure the application using authentication and authorization, use AJAX to deliver dynamic updates and interactive map support, and implement automated unit testing.

You can build your own copy of NerdDinner from scratch by completing each step we walk through in this chapter. Alternatively, you can download a completed version of the source code here: `http://tinyurl.com/aspnetmvc`.

You can use either Visual Studio 2010 or the free Visual Web Developer 2010 Express to build the application. ASP.NET MVC 2 is included as part of these development environments. You can use either SQL Server or the free SQL Server Express to host the database.

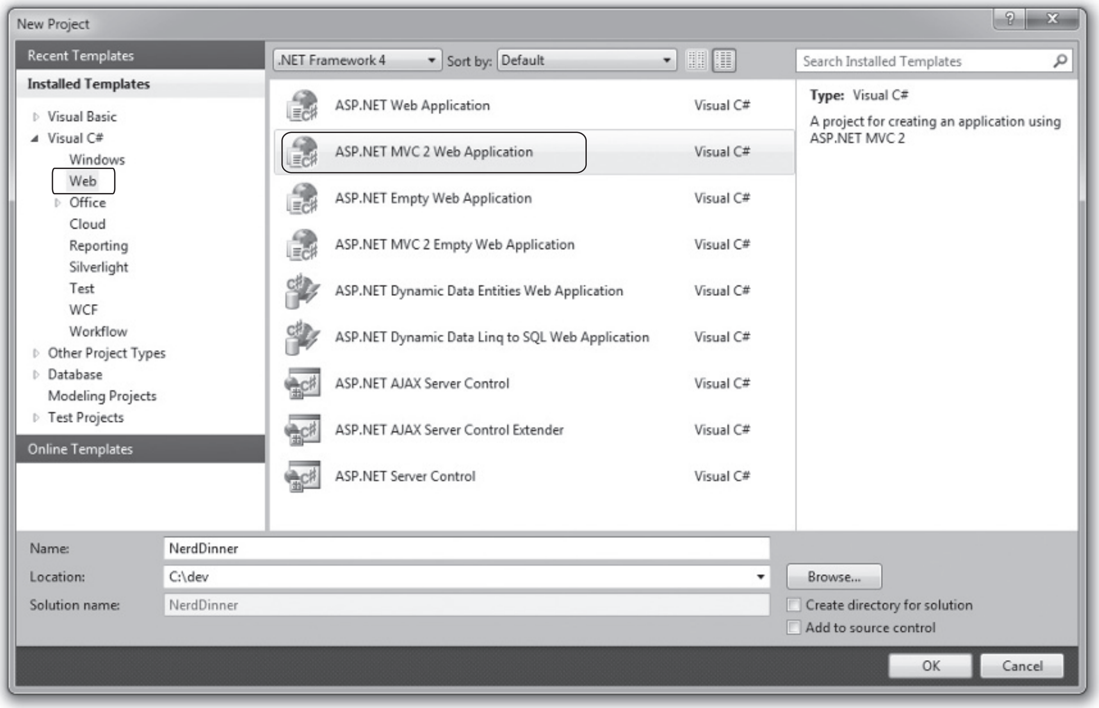
You can install ASP.NET MVC 2, Visual Web Developer 2010, and SQL Server Express using the Microsoft Web Platform Installer available at `www.microsoft.com/web/downloads`.

While this book focuses on using ASP.NET MVC 2 with Visual Studio 2010, most of what is shown in this book can also be done with Visual Studio 2008 by installing ASP.NET MVC 2 for Visual Studio 2008 via the Microsoft Web Platform Installer.

FILE ➪ NEW PROJECT

We'll begin our NerdDinner application by selecting the File ➪ New Project menu item within Visual Studio 2010 or the free Visual Web Developer 2010 Express.

This brings up the "New Project" dialog. To create a new ASP.NET MVC 2 application, expand the Visual C# node, then select the Web node on the left side of the dialog and choose the "ASP.NET MVC 2 Web Application" project template on the right (Figure 1-8).


New Project
Recent Templates
Installed Templates
Visual Basic
Visual C#
Windows
Web
Office
Cloud
Reporting
Silverlight
Test
WCF
Workflow
Other Project Types
Database
Modeling Projects
Test Projects
Online Templates
.NET Framework 4
Sort by: Default
Search Installed Templates
ASP.NET Web Application Visual C#
ASP.NET MVC 2 Web Application Visual C#
ASP.NET Empty Web Application Visual C#
ASP.NET MVC 2 Empty Web Application Visual C#
ASP.NET Dynamic Data Entities Web Application Visual C#
ASP.NET Dynamic Data Linq to SQL Web Application Visual C#
ASP.NET AJAX Server Control Visual C#
ASP.NET AJAX Server Control Extender Visual C#
ASP.NET Server Control Visual C#
Browse...
Create directory for solution
Add to source control
OK
Cancel

Type: Visual C#

A project for creating an application using ASP.NET MVC 2

Name: NerdDinner
Location: C:\dev
Solution name: NerdDinner

FIGURE 1-8

Name the new project **NerdDinner** and then click the OK button to create it.

Clicking OK causes Visual Studio to bring up an additional dialog that prompts us to optionally create a unit test project for the new application as well (Figure 1-9). This unit test project enables us to create automated tests that verify the functionality and behavior of our application (something we'll cover later in this tutorial).

The Test framework dropdown in Figure 1-9 is populated with all available ASP.NET MVC 2 unit test project templates installed on the machine. Versions can be downloaded for NUnit, MbUnit, and XUnit. The built-in Visual Studio Unit Test Framework is also supported.

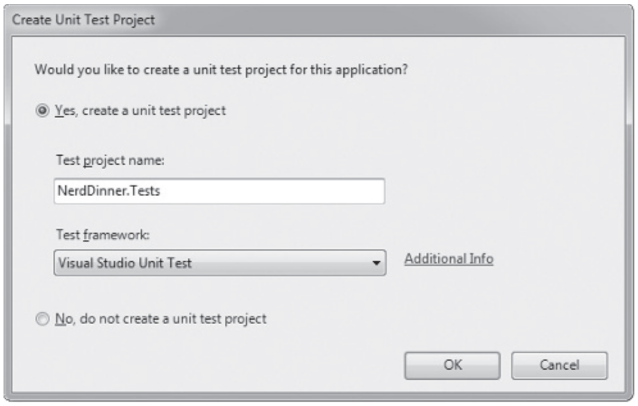

Create Unit Test Project
Would you like to create a unit test project for this application?
Yes, create a unit test project
Test project name:
NerdDinner.Tests
Test framework:
Visual Studio Unit Test
Additional Info
No, do not create a unit test project
OK
Cancel

FIGURE 1-9

The Visual Studio Unit Test Framework is only available with Visual Studio 2010 Professional and higher versions. If you are using VS 2010 Standard Edition or Visual Web Developer 2010 Express, you will need to download and install the NUnit, MbUnit, or XUnit extensions for ASP.NET MVC in order for this dialog to be shown. The dialog will not display if there aren't any test frameworks installed.

We'll use the default *NerdDinner.Tests* name for the test project we create, and use the "Visual Studio Unit Test Framework" option. When we click the OK button, Visual Studio will create a solution for us with two projects in it — one for our web application and one for our unit tests (Figure 1-10).

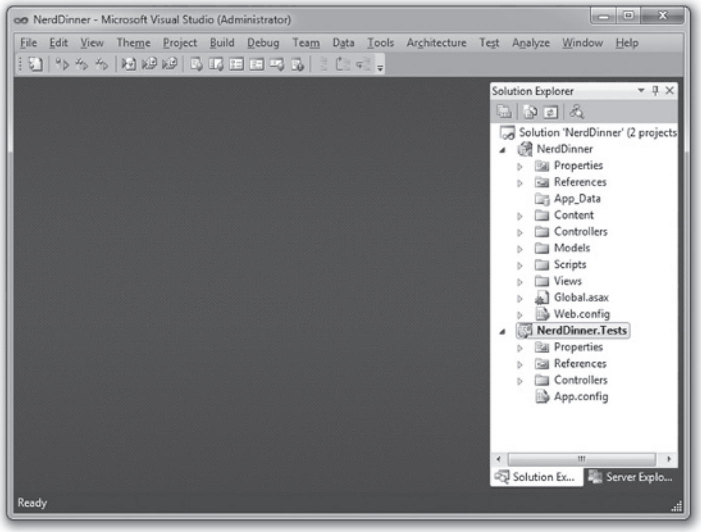


FIGURE 1-10

Examining the NerdDinner Directory Structure

When you create a new ASP.NET MVC application with Visual Studio, it automatically adds several files and directories to the project, as shown in Figure 1-11.

ASP.NET MVC projects by default have six top-level directories, shown in Table 1-1.

TABLE 1-1: Default Top-Level Directories

DIRECTORY	PURPOSE
`/Controllers`	Where you put Controller classes that handle URL requests
`/Models`	Where you put classes that represent and manipulate data and business objects
`/Views`	Where you put UI template files that are responsible for rendering output, such as HTML
`/Scripts`	Where you put JavaScript library files and scripts (.js)
`/Content`	Where you put CSS and image files, and other non-dynamic/non-JavaScript content
`/App_Data`	Where you store data files you want to read/write

ASP.NET MVC does not require this structure. In fact, developers working on large applications will typically partition the application up across multiple projects to make it more manageable (e.g., data model classes often go in a separate class library project from the web application). The default project structure, however, does provide a nice default directory convention that we can use to keep our application concerns clean.

When we expand the /Controllers directory, we'll find that Visual Studio added two `Controller` classes (Figure 1-12) — `HomeController` and `AccountController` — by default to the project:

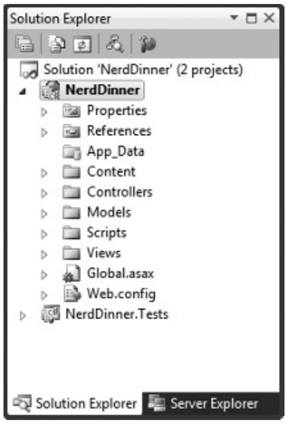


FIGURE 1-11

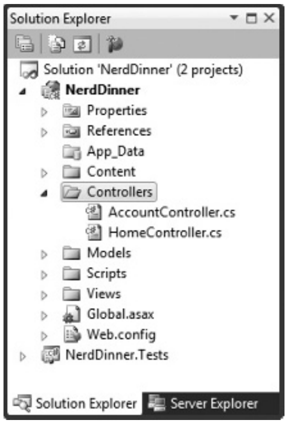
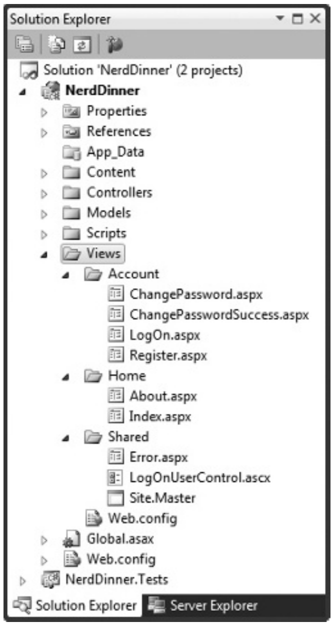


FIGURE 1-12

When we expand the /Views directory, we'll find that three subdirectories — /Home, /Account, and /Shared — as well as several template files within them, were also added to the project by default (Figure 1-13).

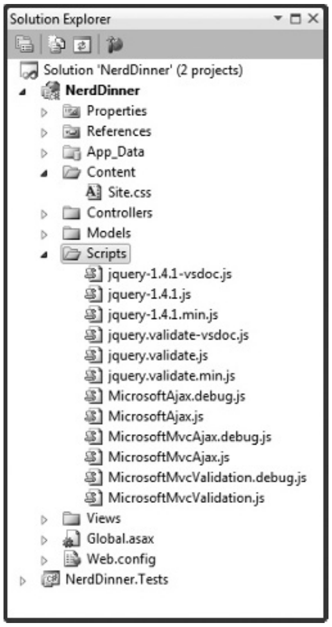
When we expand the /Content and /Scripts directories, we'll find a Site.css file that is used to style all HTML on the site, as well as JavaScript libraries that can enable ASP.NET AJAX and jQuery support within the application (Figure 1-14).

When we expand the NerdDinner.Tests project, we'll find two classes that contain unit tests for our `Controller` classes (see Figure 1-15).



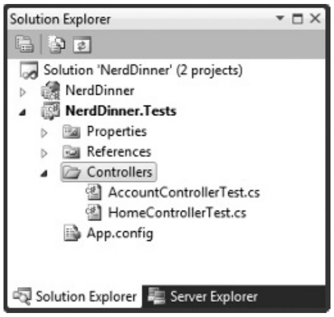
```
Solution Explorer
Solution 'NerdDinner' (2 projects)
  NerdDinner
    Properties
    References
    App_Data
    Content
    Controllers
    Models
    Scripts
    Views
      Account
        ChangePassword.aspx
        ChangePasswordSuccess.aspx
        LogOn.aspx
        Register.aspx
      Home
        About.aspx
        Index.aspx
      Shared
        Error.aspx
        LogOnUserControl.ascx
        Site.Master
      Web.config
    Global.asax
    Web.config
  NerdDinner.Tests
Solution Explorer | Server Explorer
```

FIGURE 1-13



```
Solution Explorer
Solution 'NerdDinner' (2 projects)
  NerdDinner
    Properties
    References
    App_Data
    Content
      Site.css
    Controllers
    Models
    Scripts
      jquery-1.4.1-vsdoc.js
      jquery-1.4.1.js
      jquery-1.4.1.min.js
      jquery.validate-vsdoc.js
      jquery.validate.js
      jquery.validate.min.js
      MicrosoftAjax.debug.js
      MicrosoftAjax.js
      MicrosoftMvcAjax.debug.js
      MicrosoftMvcAjax.js
      MicrosoftMvcValidation.debug.js
      MicrosoftMvcValidation.js
    Views
    Global.asax
    Web.config
  NerdDinner.Tests
```

FIGURE 1-14



```
Solution Explorer
Solution 'NerdDinner' (2 projects)
  NerdDinner
  NerdDinner.Tests
    Properties
    References
    Controllers
      AccountControllerTest.cs
      HomeControllerTest.cs
    App.config
Solution Explorer | Server Explorer
```

FIGURE 1-15

These default files, added by Visual Studio, provide us with a basic structure for a working application — complete with home page, about page, account login/logout/registration pages, and an unhandled error page (all wired-up and working out-of-the-box).

Running the NerdDinner Application

We can run the project by choosing either the Debug ➪ Start Debugging or Debug ➪ Start Without Debugging menu items (see Figure 1-16).

This will launch the built-in ASP.NET web server that comes with Visual Studio, and run our application (Figure 1-17).

FIgure 1-18 is the home page for our new project (URL: `/`) when it runs.

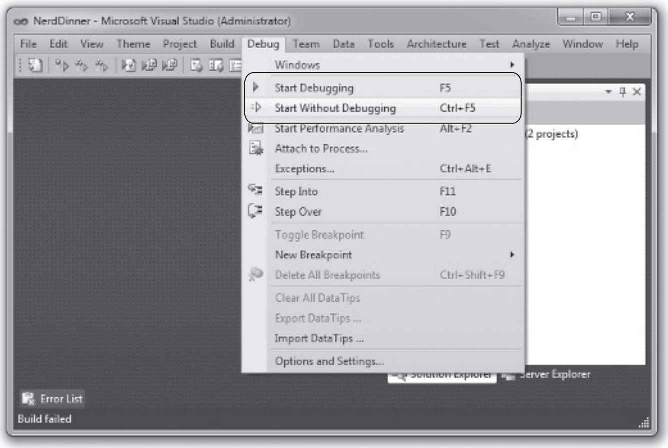


FIGURE 1-16

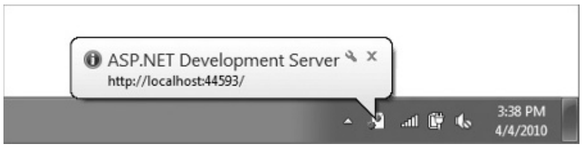
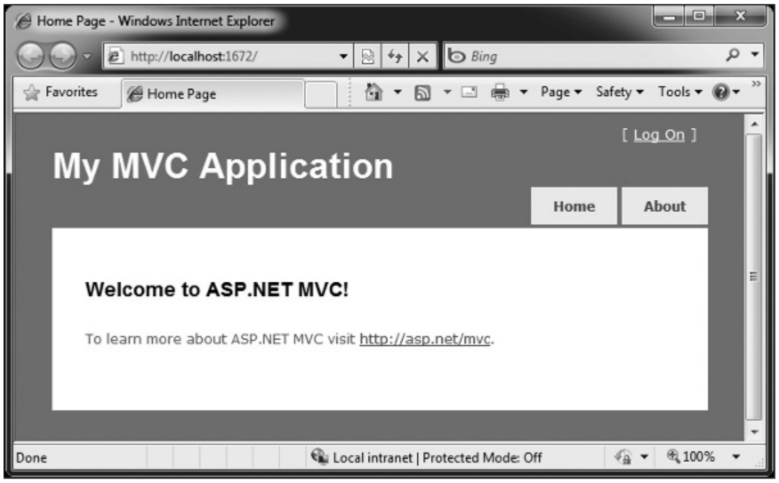


FIGURE 1-17



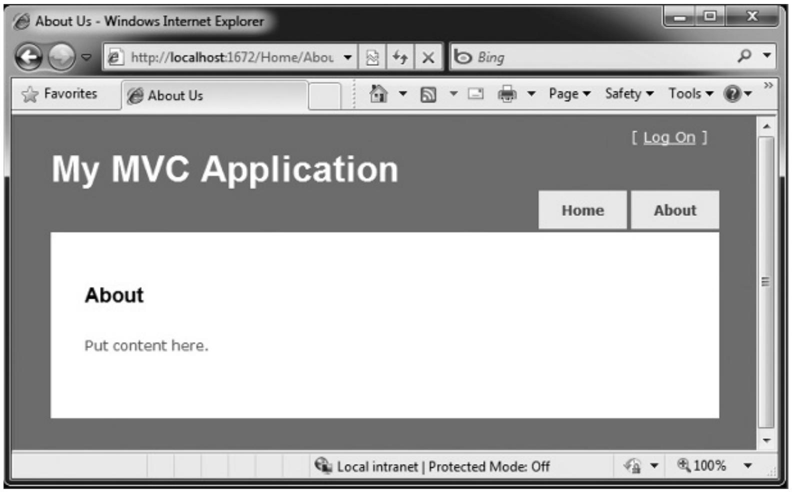
Welcome to ASP.NET MVC!

To learn more about ASP.NET MVC visit http://asp.net/mvc.

FIGURE 1-18

Clicking the About tab displays an About page (URL: `/Home/About`, as shown in Figure 1-19).

Clicking the Log On link on the top right takes us to a Login page, as shown in Figure 1-20 (URL: `/Account/LogOn`).

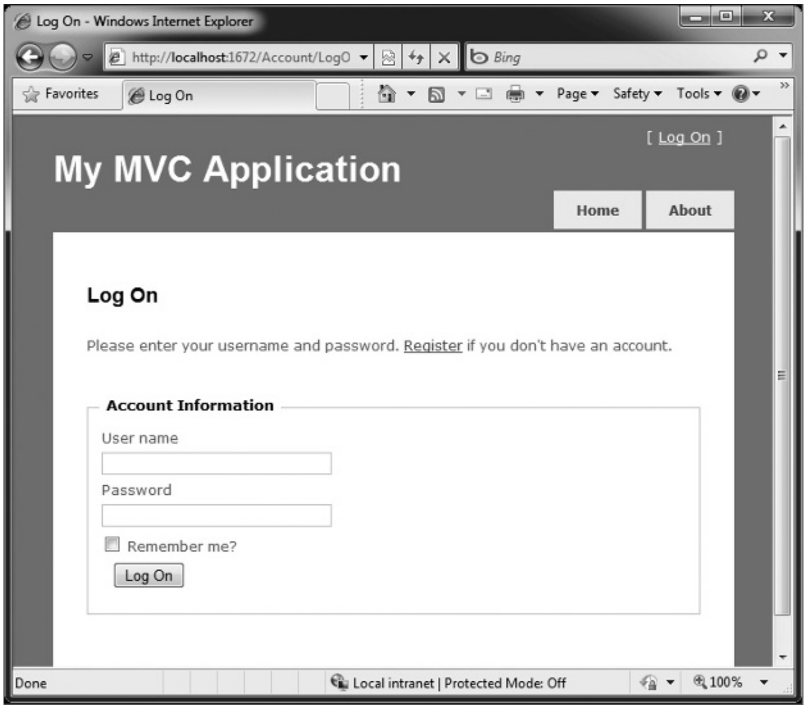

About Us - Windows Internet Explorer
http://localhost:1672/Home/Abou
Bing
Favorites
About Us
Page
Safety
Tools
[Log On]
Home
About
Local intranet | Protected Mode: Off
100%

My MVC Application

About

Put content here.

FIGURE 1-19


Log On - Windows Internet Explorer
http://localhost:1672/Account/LogO
Bing
Favorites
Log On
Page
Safety
Tools
[Log On]
Home
About
Log On
Done
Local intranet | Protected Mode: Off
100%

My MVC Application

Log On

Please enter your username and password. Register if you don't have an account.

Account Information

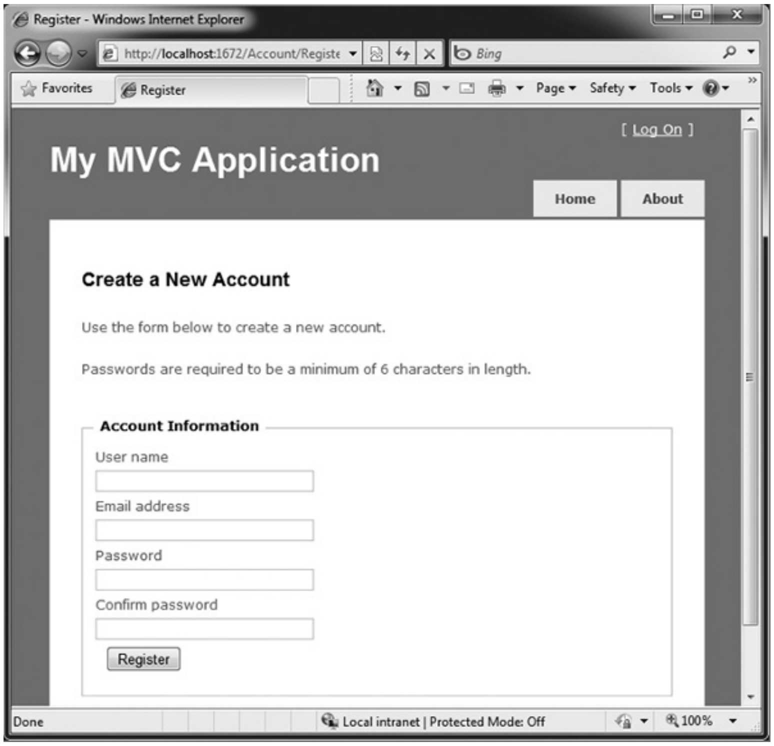
User name

Password

Remember me?

FIGURE 1-20

If we don't have a login account, we can click the Register link (URL: `/Account/Register`) to create one (see Figure 1-21).


Register - Windows Internet Explorer
http://localhost:1672/Account/Registe
Bing
Favorites
Register
Page
Safety
Tools
[Log On]
My MVC Application
Home
About

Create a New Account

Use the form below to create a new account.

Passwords are required to be a minimum of 6 characters in length.

Account Information

User name

Email address

Password

Confirm password

Register

Done
Local intranet | Protected Mode: Off
100%

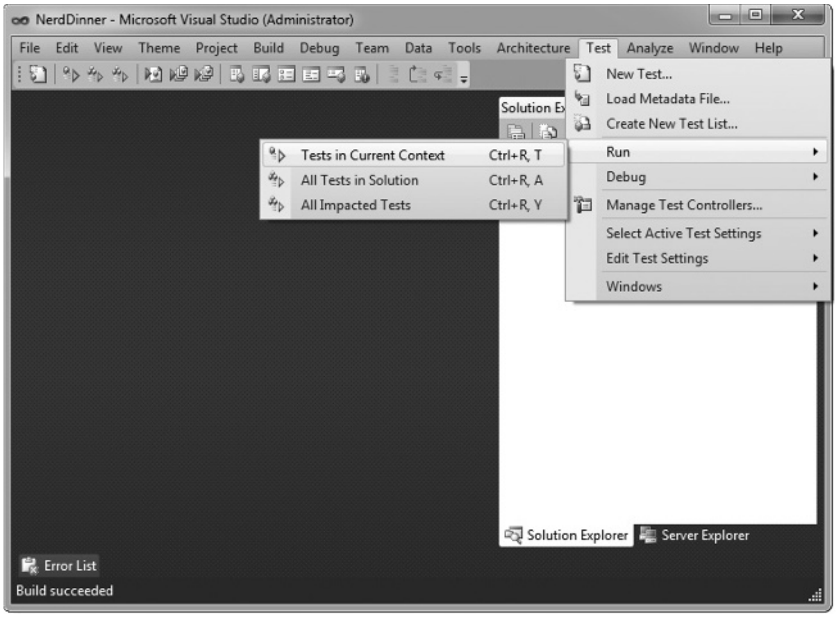
FIGURE 1-21

The code to implement the above home, about, and login/register functionality was added by default when we created our new project. We'll use it as the starting point of our application.

Testing the NerdDinner Application

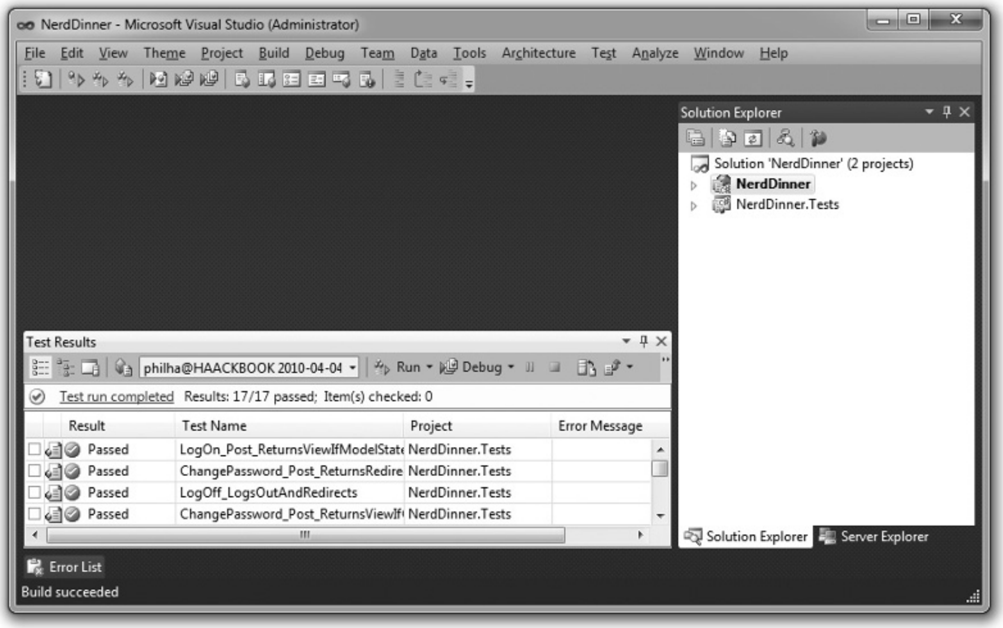
If we are using the Professional Edition or higher version of Visual Studio 2008, we can use the built-in unit-testing IDE support within Visual Studio to test the project.

To run our unit tests, select the Test ➪ Run menu and choose one of the three options as shown in Figure 1-22. This will open the Test Results pane within the IDE (Figure 1-23) and provide us with pass/fail status on the 17 unit tests included in our new project that cover the built-in functionality.


NerdDinner - Microsoft Visual Studio (Administrator)
File Edit View Theme Project Build Debug Team Data Tools Architecture Test Analyze Window Help
New Test...
Load Metadata File...
Create New Test List...
Run
Debug
Manage Test Controllers...
Select Active Test Settings
Edit Test Settings
Windows
Tests in Current Context Ctrl+R, T
All Tests in Solution Ctrl+R, A
All Impacted Tests Ctrl+R, Y
Solution Explorer
Server Explorer
Error List

Build succeeded

FIGURE 1-22


NerdDinner - Microsoft Visual Studio (Administrator)
File Edit View Theme Project Build Debug Team Data Tools Architecture Test Analyze Window Help
Test Results
philha@HAACKBOOK 2010-04-04
Run
Debug
Solution Explorer
Server Explorer
Error List

Solution 'NerdDinner' (2 projects)
NerdDinner
NerdDinner.Tests

Test run completed Results: 17/17 passed; Item(s) checked: 0

Result	Test Name	Project	Error Message
Passed	LogOn_Post_ReturnsViewIfModelStat	NerdDinner.Tests	
Passed	ChangePassword_Post_ReturnsRedire	NerdDinner.Tests	
Passed	LogOff_LogsOutAndRedirects	NerdDinner.Tests	
Passed	ChangePassword_Post_ReturnsViewIf	NerdDinner.Tests	

Build succeeded

FIGURE 1-23

CREATING THE DATABASE

We'll be using a database to store all of the Dinner and RSVP data for our NerdDinner application.

The steps below show creating the database using the free SQL Server Express Edition. All of the code we'll write works with both SQL Server Express and the full SQL Server.

Creating a New SQL Server Express Database

We'll begin by right-clicking on our web project, and then selecting the Add ➪ New Item menu command (Figure 1-24).

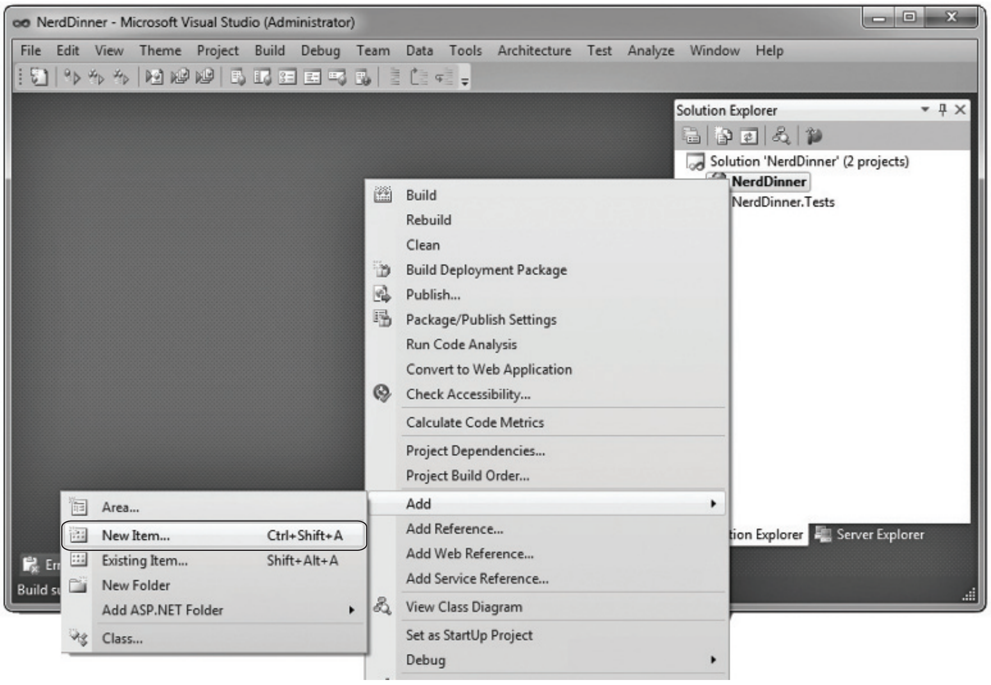
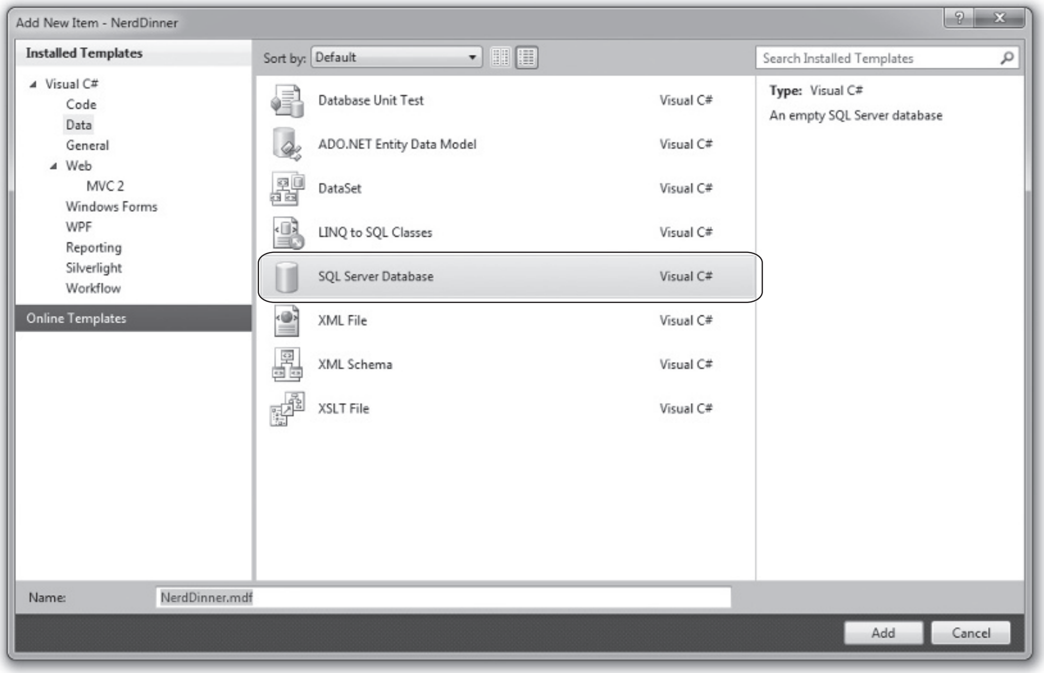


FIGURE 1-24

This will bring up the Add New Item dialog (Figure 1-25). We'll filter by the Data category and select the SQL Server Database item template.

We'll name the SQL Server Express database we want to create **NerdDinner.mdf** and hit OK. Visual Studio will then ask us if we want to add this file to our \App_Data directory (Figure 1-26), which is a directory already set up with both read and write security permissions.

We'll click Yes, and our new database will be created and added to our Solution Explorer (Figure 1-27).


Add New Item - NerdDinner

Installed Templates

- Visual C#
  - Code
  - Data
  - General
  - Web
    - MVC 2
  - Windows Forms
  - WPF
  - Reporting
  - Silverlight
  - Workflow

Online Templates

Sort by: Default

Database Unit Test	Visual C#
ADO.NET Entity Data Model	Visual C#
DataSet	Visual C#
LINQ to SQL Classes	Visual C#
SQL Server Database	Visual C#
XML File	Visual C#
XML Schema	Visual C#
XSLT File	Visual C#

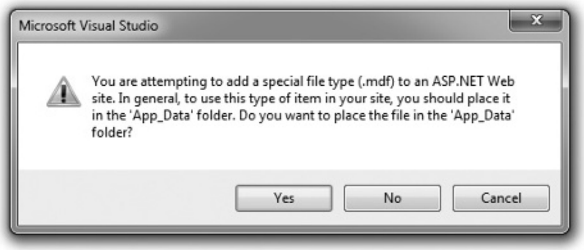
Search Installed Templates

Type: Visual C#

An empty SQL Server database

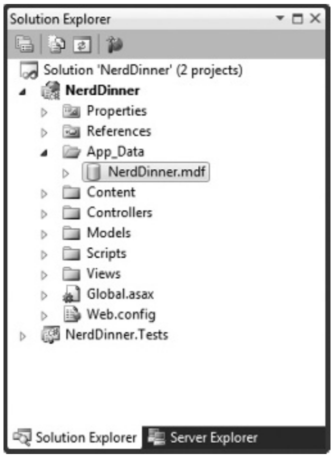
Name: NerdDinner.mdf

FIGURE 1-25


Microsoft Visual Studio

You are attempting to add a special file type (.mdf) to an ASP.NET Web site. In general, to use this type of item in your site, you should place it in the 'App_Data' folder. Do you want to place the file in the 'App_Data' folder?

FIGURE 1-26


Solution Explorer

- Solution 'NerdDinner' (2 projects)
  - NerdDinner
    - Properties
    - References
    - App_Data
      - NerdDinner.mdf
    - Content
    - Controllers
    - Models
    - Scripts
    - Views
    - Global.asax
    - Web.config
  - NerdDinner.Tests

FIGURE 1-27

Creating Tables within Our Database

We now have a new empty database. Let's add some tables to it.

To do this, we'll navigate to the Server Explorer tab window within Visual Studio, which enables us to manage databases and servers. SQL Server Express databases stored in the \App_Data folder of our application will automatically show up within the Server Explorer. We can optionally use the

Connect to Database icon on the top of the Server Explorer window to add additional SQL Server databases (both local and remote) to the list as well (Figure 1-28).

We will add two tables to our NerdDinner database — one to store our Dinners and the other to track RSVP acceptances to them. We can create new tables by right-clicking on the Tables folder within our database and choosing the Add New Table menu command (Figure 1-29).

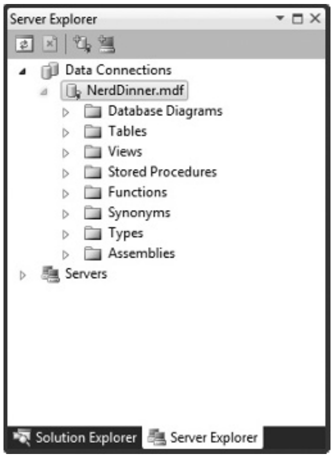


FIGURE 1-28

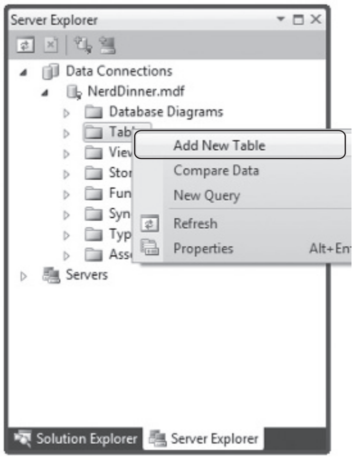
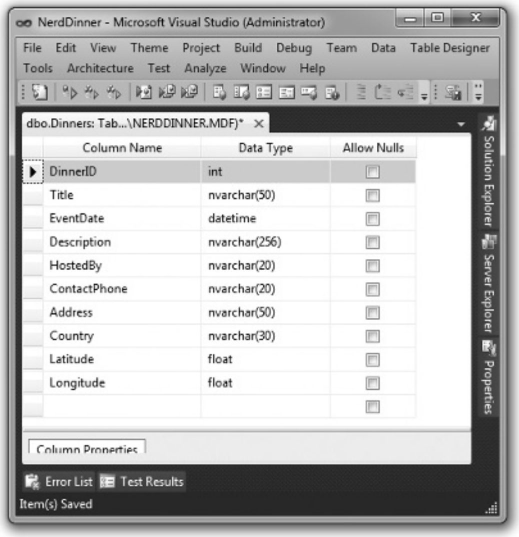


FIGURE 1-29

This will open up a Table Designer that allows us to configure the schema of our table. For our Dinners table, we will add 10 columns of data (Figure 1-30).

We want the `DinnerID` column to be a unique primary key for the table. We can configure this by right-clicking on the `DinnerID` column and choosing the Set Primary Key menu item (Figure 1-31).


NerdDinner - Microsoft Visual Studio (Administrator)
File Edit View Theme Project Build Debug Team Data Table Designer
Tools Architecture Test Analyze Window Help
dbo.Dinners: Tab...\NERDDINNER.MDF)*
Column Properties
Error List
Test Results
Item(s) Saved
Solution Explorer
Server Explorer
Properties

Column Name	Data Type	Allow Nulls
DinnerID	int	☐
Title	nvarchar(50)	☐
EventDate	datetime	☐
Description	nvarchar(256)	☐
HostedBy	nvarchar(20)	☐
ContactPhone	nvarchar(20)	☐
Address	nvarchar(50)	☐
Country	nvarchar(30)	☐
Latitude	float	☐
Longitude	float	☐
		☐

FIGURE 1-30

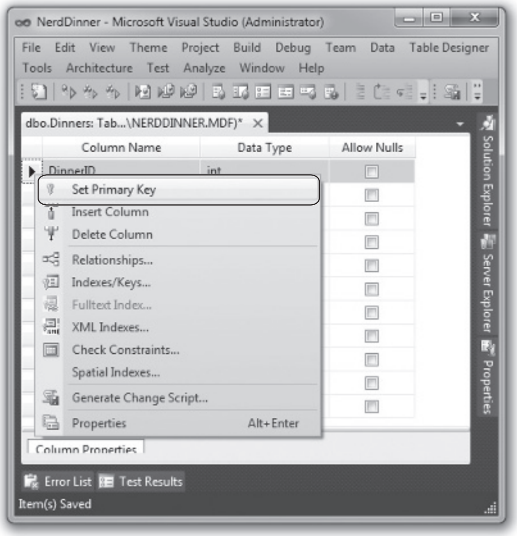
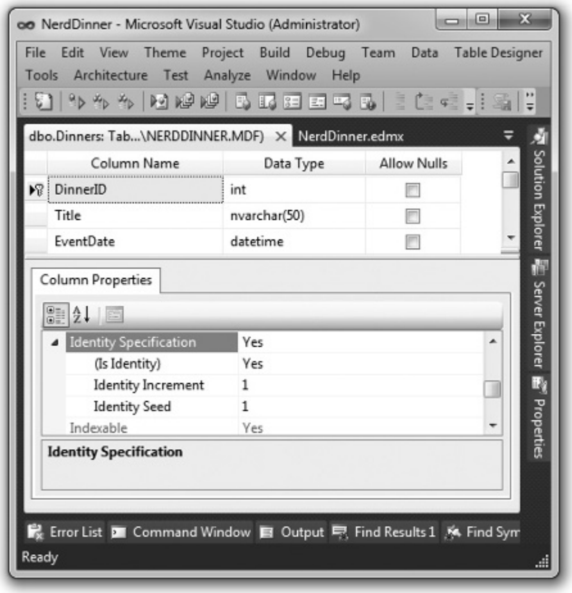


FIGURE 1-31

In addition to making `DinnerID` a primary key, we also want to configure it as an *identity* column whose value is automatically incremented as new rows of data are added to the table (meaning the first inserted Dinner row will have an automatic `DinnerID` of 1, the second inserted row will have a `DinnerID` of 2, etc.).

We can do this by selecting the `DinnerID` column and then using the Column Properties editor to set the `"(Is Identity)"` property on the column to Yes (Figure 1-32). We will use the standard identity defaults (start at 1 and increment 1 on each new Dinner row).


NerdDinner - Microsoft Visual Studio (Administrator)
File Edit View Theme Project Build Debug Team Data Table Designer
Tools Architecture Test Analyze Window Help
dbo.Dinners: Tab...\NERDDINNER.MDF)
NerdDinner.edmx
Solution Explorer
Server Explorer
Properties
Column Properties
Error List
Command Window
Output
Find Results 1
Find Sym
Ready

Column Name	Data Type	Allow Nulls
DinnerID	int	☐
Title	nvarchar(50)	☐
EventDate	datetime	☐

Identity Specification	Yes
(Is Identity)	Yes
Identity Increment	1
Identity Seed	1
Indexable	Yes

Identity Specification

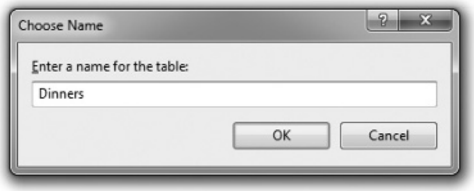
FIGURE 1-32

We'll then save our table by pressing Ctrl+S or by clicking the File ➪ Save menu command. This will prompt us to name the table. We'll name it **Dinners** (Figure 1-33).

Our new `Dinners` table will then show up in our database in the Server Explorer.

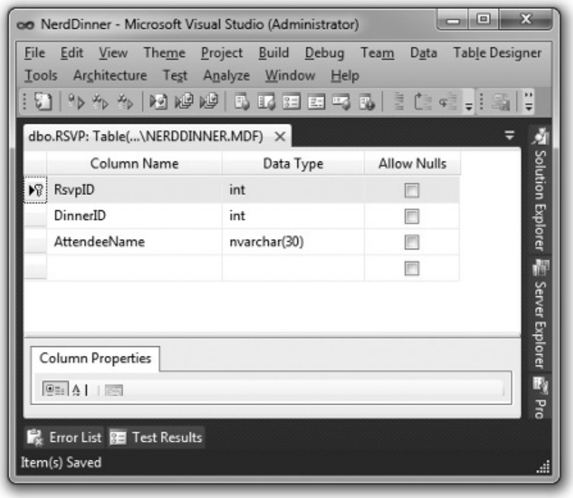
Next, we'll repeat the above steps and create an RSVP table. This table will have three columns. We will set up the `RsvpID` column as the primary key, and also make it an identity column (Figure 1-34).

We'll save it and give it the name **RSVP**.



Enter a name for the table:
Dinners

FIGURE 1-33


NerdDinner - Microsoft Visual Studio (Administrator)
File Edit View Theme Project Build Debug Team Data Table Designer
Tools Architecture Test Analyze Window Help
dbo.RSVP: Table(...\NERDDINNER.MDF)
Solution Explorer
Server Explorer
Pro
Column Properties
Error List
Test Results
Item(s) Saved

Column Name	Data Type	Allow Nulls
RsvpID	int	☐
DinnerID	int	☐
AttendeeName	nvarchar(30)	☐
		☐

FIGURE 1-34

Setting Up a Foreign Key Relationship between Tables

We now have two tables within our database. Our last schema design step will be to set up a "one-to-many" relationship between these two tables — so that we can associate each Dinner row with zero or more RSVP rows that apply to it. We will do this by configuring the `RSVP` table's `DinnerID` column to have a foreign-key relationship to the `DinnerID` column in the `Dinners` table.

To do this, we'll open up the `RSVP` table within the table designer by double-clicking it in the Server Explorer. We'll then select the `DinnerID` column within it, right-click, and choose the Relationships context menu command (see Figure 1-35).

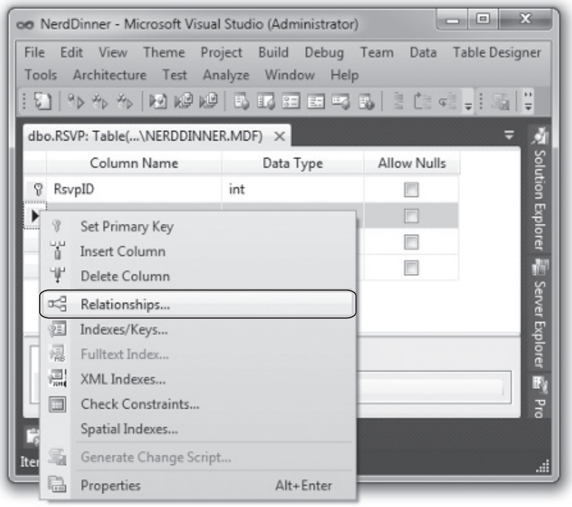
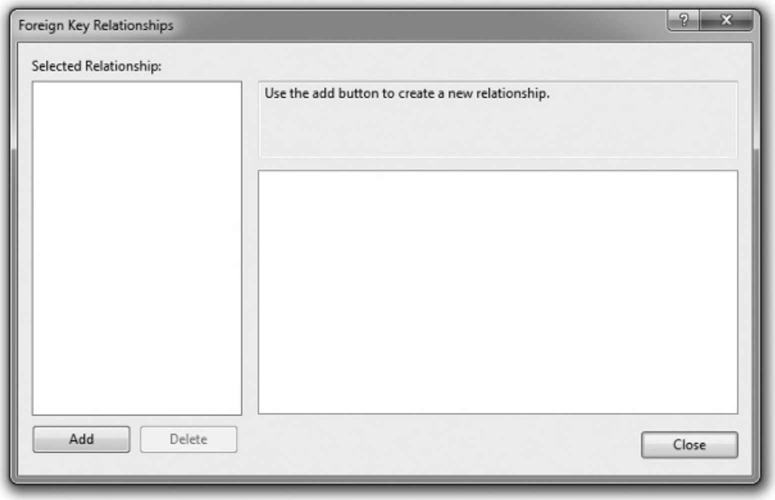


FIGURE 1-35

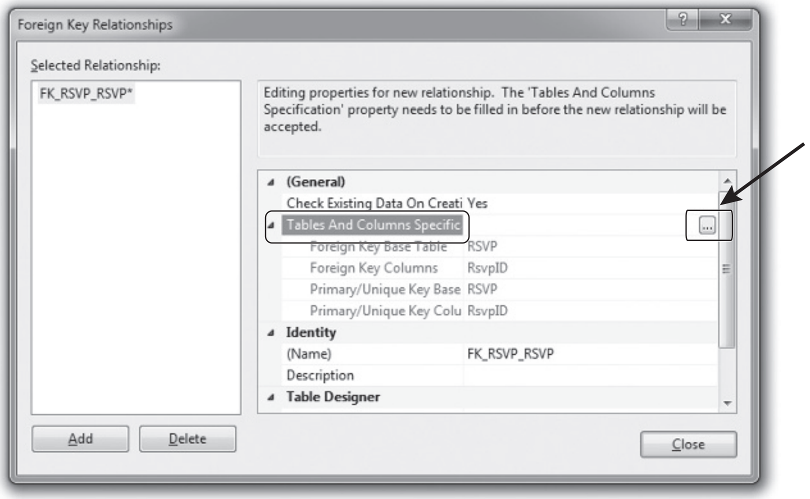
This will bring up a dialog that we can use to set up relationships between tables (Figure 1-36).



Use the add button to create a new relationship.

FIGURE 1-36

We'll click the Add button to add a new relationship to the dialog. Once a relationship has been added, we'll expand the Tables and Column Specification tree-view node within the property grid to the right of the dialog, and then click the "…" button to the right of it (Figure 1-37).



Foreign Key Relationships

Selected Relationship:

FK_RSVP_RSVP*

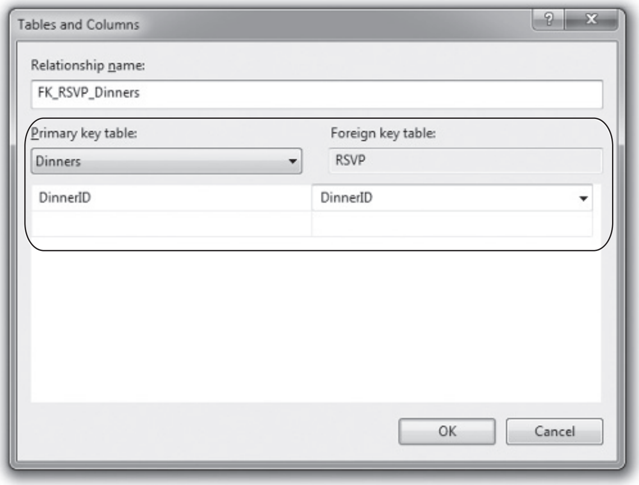
Editing properties for new relationship. The 'Tables And Columns Specification' property needs to be filled in before the new relationship will be accepted.

(General)	
Check Existing Data On Creati	Yes
Tables And Columns Specific	
Foreign Key Base Table	RSVP
Foreign Key Columns	RsvpID
Primary/Unique Key Base	RSVP
Primary/Unique Key Colu	RsvpID
Identity	
(Name)	FK_RSVP_RSVP
Description	
Table Designer	

FIGURE 1-37

Clicking the "…" button will bring up another dialog that allows us to specify which tables and columns are involved in the relationship, as well as allow us to name the relationship.

We will change the Primary Key Table to be `Dinners`, and select the `DinnerID` column within the `Dinners` table as the primary key. Our `RSVP` table will be the foreign-key table, and the `RSVP.DinnerID` column will be associated as the foreign key (Figure 1-38).



Tables and Columns

Relationship name: FK_RSVP_Dinners

Primary key table:	Foreign key table:
Dinners	RSVP
DinnerID	DinnerID

FIGURE 1-38

Now each row in the `RSVP` table will be associated with a row in the `Dinner` table. SQL Server will maintain referential integrity for us — and prevent us from adding a new RSVP row if it does not point to a valid Dinner row. It will also prevent us from deleting a Dinner row if there are still RSVP rows referring to it.

Adding Data to Our Tables

Let's finish by adding some sample data to our `Dinners` table. We can add data to a table by right-clicking it in the Server Explorer and choosing the Show Table Data command (see Figure 1-39).

Let's add a few rows of Dinner data that we can use later as we start implementing the application (Figure 1-40).

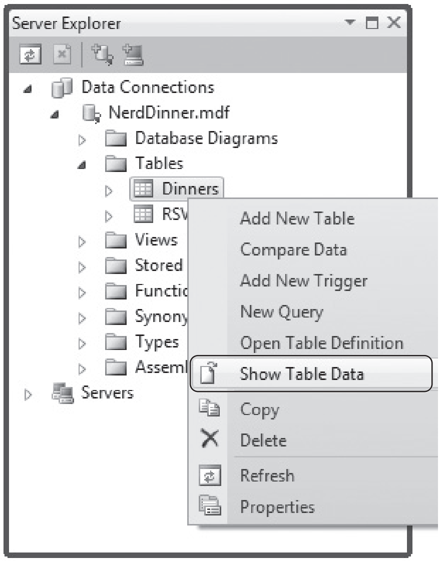
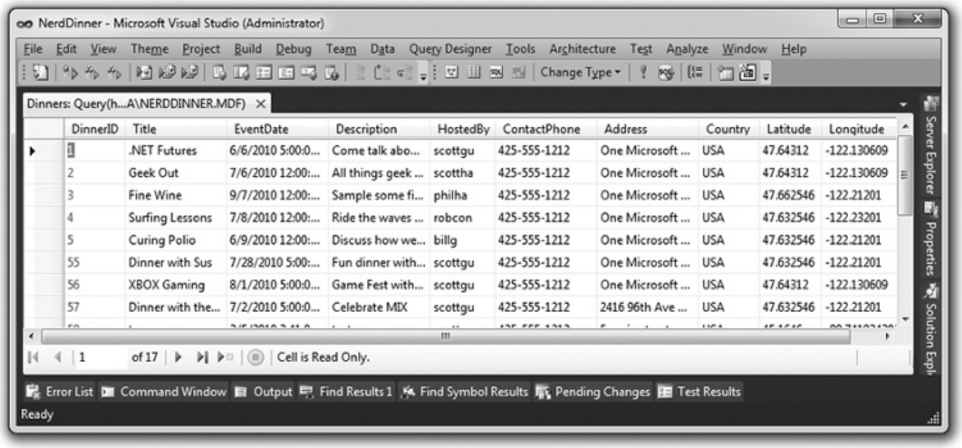


FIGURE 1-39


NerdDinner - Microsoft Visual Studio (Administrator)
File Edit View Theme Project Build Debug Team Data Query Designer Tools Architecture Test Analyze Window Help
Change Type
Dinners: Query(h...A\NERDDINNER.MDF)
Server Explorer
Properties
Solution Expl
Error List
Command Window
Output
Find Results 1
Find Symbol Results
Pending Changes
Test Results
Ready

DinnerID	Title	EventDate	Description	HostedBy	ContactPhone	Address	Country	Latitude	Longitude
1	.NET Futures	6/6/2010 5:00:0...	Come talk abo...	scottgu	425-555-1212	One Microsoft ...	USA	47.64312	-122.130609
2	Geek Out	7/6/2010 12:00:...	All things geek ...	scottha	425-555-1212	One Microsoft ...	USA	47.64312	-122.130609
3	Fine Wine	9/7/2010 12:00:...	Sample some fi...	philha	425-555-1212	One Microsoft ...	USA	47.662546	-122.21201
4	Surfing Lessons	7/8/2010 12:00:...	Ride the waves ...	robcon	425-555-1212	One Microsoft ...	USA	47.632546	-122.23201
5	Curing Polio	6/9/2010 12:00:...	Discuss how we...	billg	425-555-1212	One Microsoft ...	USA	47.632546	-122.21201
55	Dinner with Sus	7/28/2010 5:00:...	Fun dinner with...	scottgu	425-555-1212	One Microsoft ...	USA	47.632546	-122.21201
56	XBOX Gaming	8/1/2010 5:00:0...	Game Fest with...	scottgu	425-555-1212	One Microsoft ...	USA	47.64312	-122.130609
57	Dinner with the...	7/2/2010 5:00:0...	Celebrate MIX	scottgu	425-555-1212	2416 96th Ave ...	USA	47.632546	-122.21201

1 of 17 Cell is Read Only.

FIGURE 1-40

BUILDING THE MODEL

In a Model-View-Controller framework, the term *Model* refers to the objects that represent the data of the application, as well as the corresponding domain logic that integrates validation and business rules with it. The Model is in many ways the *heart* of an MVC-based application, and as we'll see later, it fundamentally drives the behavior of the application.

The ASP.NET MVC Framework supports using any data access technology. Developers can choose from a variety of rich .NET data options to implement their models, including: Entity Framework, LINQ to SQL, NHibernate, LLBLGen Pro, SubSonic, WilsonORM, or just raw ADO.NET DataReaders or DataSets.

For our NerdDinner application, we are going to use Entity Framework to create a simple domain model that corresponds fairly closely to our database design, and add some custom validation logic and business rules. We will then implement a repository class that helps abstract away the data persistence implementation from the rest of the application, and enables us to easily unit test it.

Entity Framework

Entity Framework is an ORM (object relational mapper) that ships as part of .NET 4.

Entity Framework provides an easy way to map database tables to .NET classes we can code against. For our NerdDinner application, we'll use it to map the `Dinners` and `RSVP` tables within our database to `Dinner` and `RSVP` model classes. The columns of the `Dinners` and `RSVP` tables will correspond to properties on the `Dinner` and `RSVP` classes. Each `Dinner` and `RSVP` object will represent a separate row within the `Dinners` or `RSVP` tables in the database.

Entity Framework allows us to avoid having to manually construct SQL statements to retrieve and update `Dinner` and `RSVP` objects with database data. Instead, we'll define the `Dinner` and `RSVP` classes, how they map to/from the database, and the relationships between them. Entity Framework will then take care of generating the appropriate SQL execution logic to use at run time when we interact and use them.

We can use the LINQ language support within VB and C# to write expressive queries that retrieve `Dinner` and `RSVP` objects. This minimizes the amount of data code we need to write and allows us to build really clean applications.

Adding Entity Framework Classes to Our Project

We'll begin by right-clicking the Models folder in our project and selecting the Add ➪ New Item menu command (Figure 1-41).

This will bring up the "Add New Item" dialog (Figure 1-42). We'll filter by the Data category and select the ADO.NET Entity Data Model template within it.

We'll name the item **NerdDinner.edmx** and click the Add button. This takes us to the Entity Data Model Wizard (see Figure 1-43), which allows us to choose between two options. We can generate the model from the database, or we can choose an empty model.

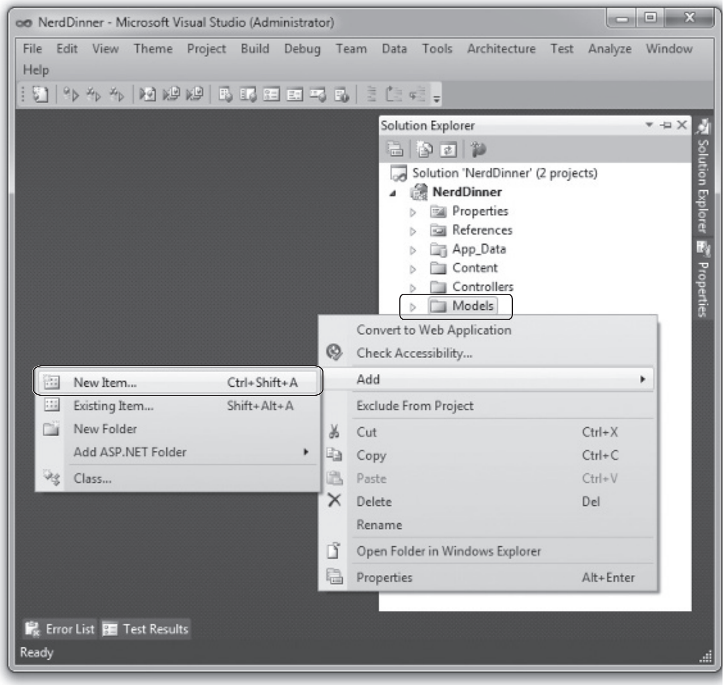
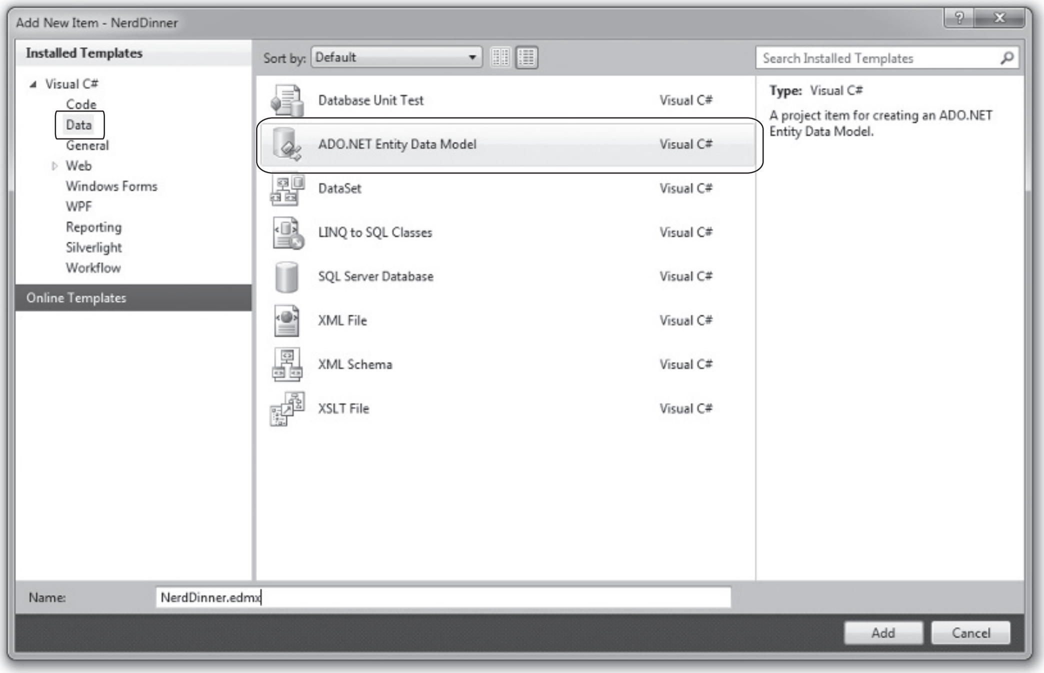


FIGURE 1-41



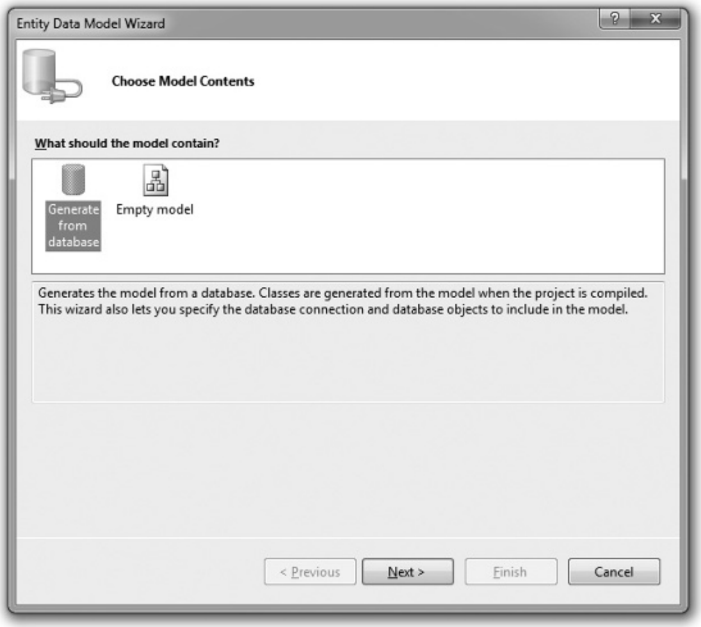
Type: Visual C#

A project item for creating an ADO.NET Entity Data Model.

Name: NerdDinner.edmx

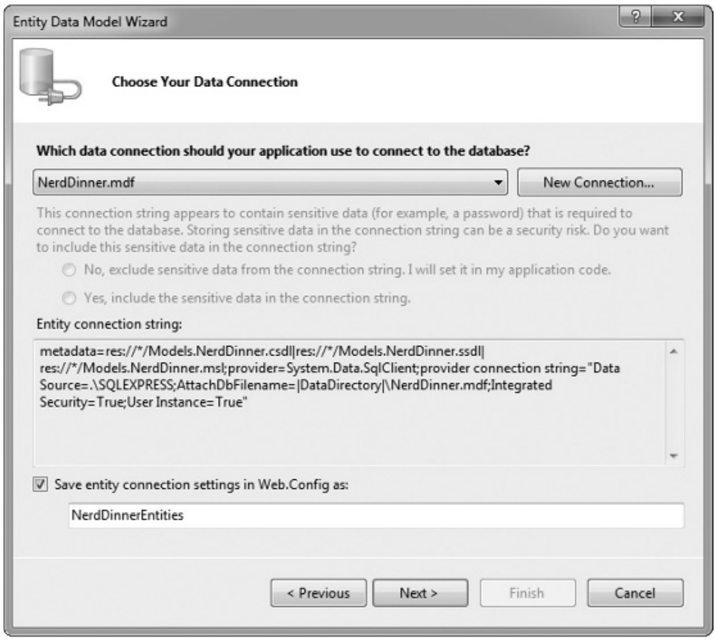
FIGURE 1-42

Because we already have a database prepared, we'll choose "Generate from database" to generate our model classes based on our database tables. Clicking Next takes us to a screen that prompts us to choose connection information for connecting to our database (see Figure 1-44).



Generates the model from a database. Classes are generated from the model when the project is compiled. This wizard also lets you specify the database connection and database objects to include in the model.

FIGURE 1-43



Which data connection should your application use to connect to the database?

NerdDinner.mdf

This connection string appears to contain sensitive data (for example, a password) that is required to connect to the database. Storing sensitive data in the connection string can be a security risk. Do you want to include this sensitive data in the connection string?

- No, exclude sensitive data from the connection string. I will set it in my application code.
- Yes, include the sensitive data in the connection string.

Entity connection string:

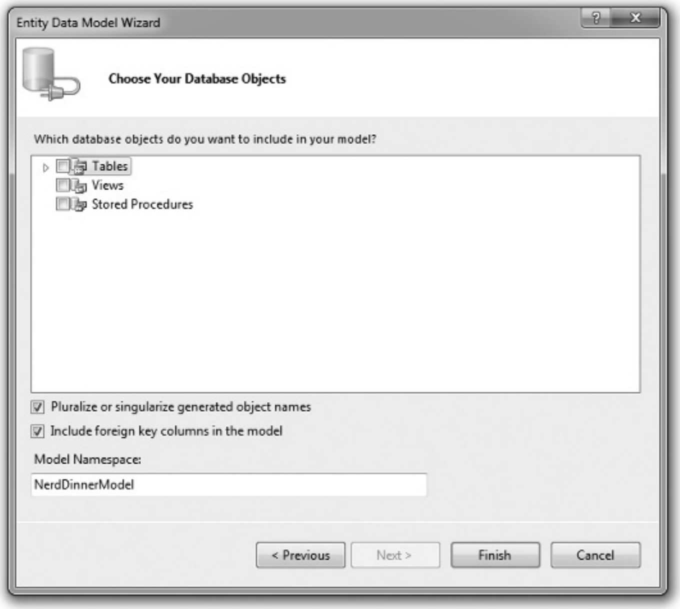
```
metadata=res://*/Models.NerdDinner.csdl|res://*/Models.NerdDinner.ssdl|
res://*/Models.NerdDinner.msl;provider=System.Data.SqlClient;provider connection string="Data
Source=.\SQLEXPRESS;AttachDbFilename=|DataDirectory|\NerdDinner.mdf;Integrated
Security=True;User Instance=True"
```

[✓] Save entity connection settings in Web.Config as: NerdDinnerEntities

FIGURE 1-44

We can click Next here to choose the default, which takes us to a screen allowing us to choose which tables, views, and stored procedures we want to include in our model (see Figure 1-45).

Make sure to check Tables, Views, and Stored Procedures. Also, make sure that the options to "Pluralize or singularize generated object names" and "Include foreign key columns in the model" are also both checked (see Figure 1-46). We'll talk about what these do in the next section.


Entity Data Model Wizard

Choose Your Database Objects

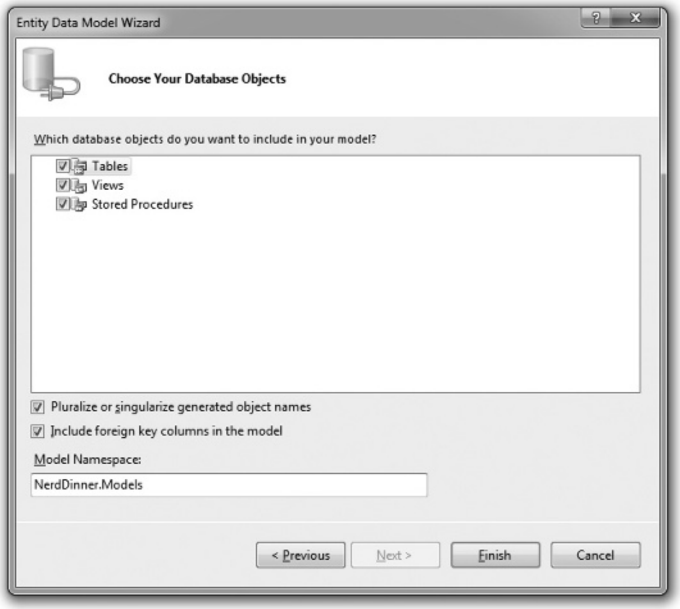
Which database objects do you want to include in your model?

- [ ] Tables
- [ ] Views
- [ ] Stored Procedures

- [x] Pluralize or singularize generated object names
- [x] Include foreign key columns in the model

Model Namespace: NerdDinnerModel

FIGURE 1-45


Entity Data Model Wizard

Choose Your Database Objects

Which database objects do you want to include in your model?

- [x] Tables
- [x] Views
- [x] Stored Procedures

- [x] Pluralize or singularize generated object names
- [x] Include foreign key columns in the model

Model Namespace: NerdDinner.Models

FIGURE 1-46

At that point, Visual Studio will add a NerdDinner.edmx file under our \Models directory and then open the Entity Framework Object Relational Designer (Figure 1-47).

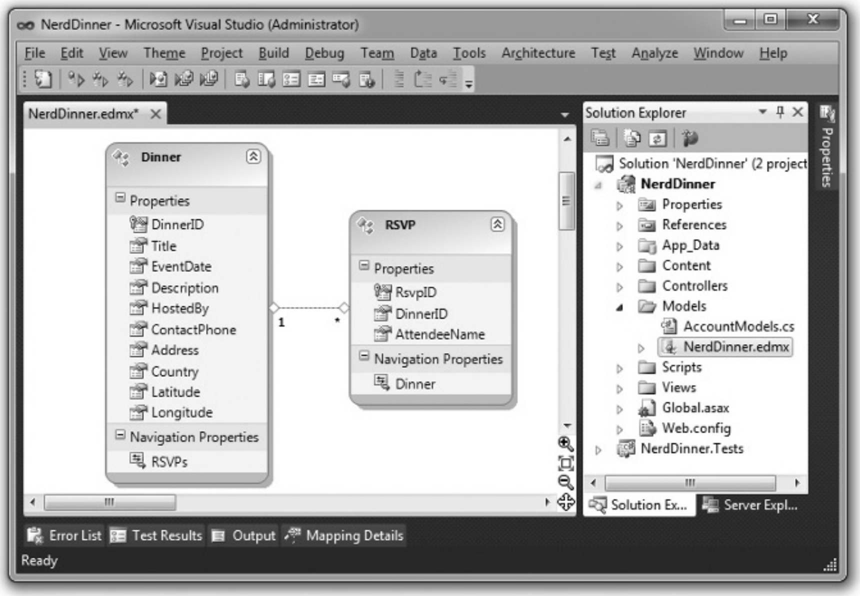


FIGURE 1-47

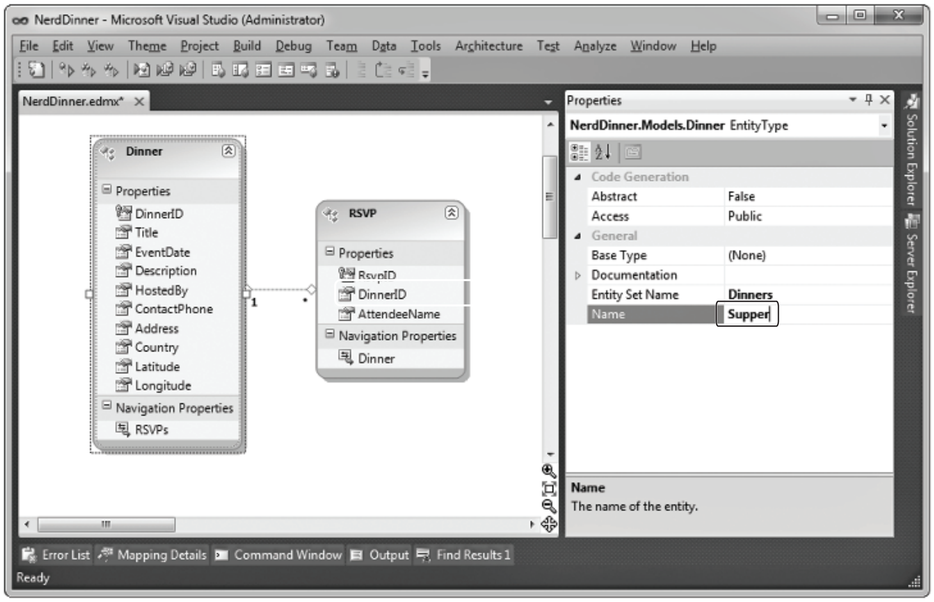
Creating Data Model Classes with Entity Framework

The Entity Data Model Wizard we just walked through enables us to quickly create data model classes from an existing database schema.

In the previous section, we checked the option to “Pluralize or singularize generated object names.” By checking this, Entity Framework *pluralizes* table and column names when it creates classes based on a database schema. For example: the `Dinners` table in our example above resulted in a `Dinner` class. This class naming helps make our models consistent with .NET naming conventions, and having the Designer fix this up is convenient (especially when adding lots of tables).

If you don’t like the name of a class or property that the Designer generates, though, you can always override it and change it to any name you want. You can do this either by editing the entity/property name inline within the Designer or by modifying it via the property grid. Figure 1-48 shows an example of changing the entity name from `Dinner` to `Supper`.

We also checked the option “Include foreign key columns in the model.” This causes the Entity Framework Wizard to inspect the primary key/foreign key relationships of the tables, and based on them automatically creates default *relationship associations* between the different model classes it creates. For example, when we selected the `Dinners` and `RSVP` tables in the Wizard by choosing all tables, a one-to-many relationship association between the two was inferred based on the fact that the `RSVP` table had a foreign key to the `Dinners` table (this is indicated by the circled area in the Designer in Figure 1-49).



NerdDinner.Models.Dinner EntityType

Code Generation	
Abstract	False
Access	Public
General	
Base Type	(None)
Documentation	
Entity Set Name	Dinners
Name	Supper

Name
The name of the entity.

FIGURE 1-48

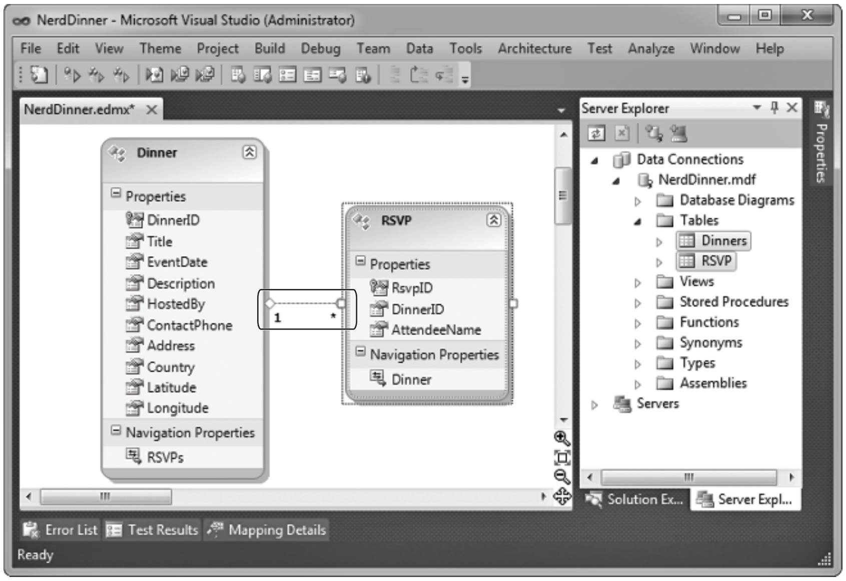
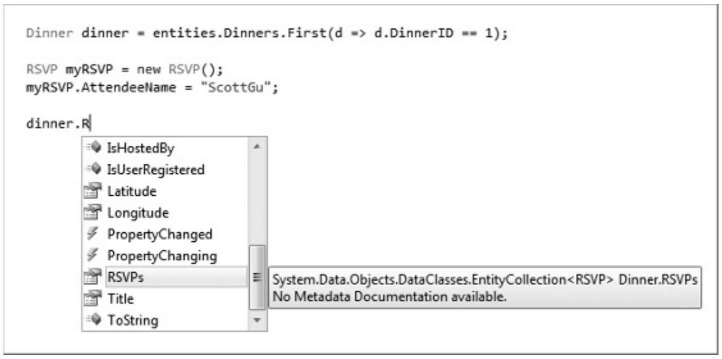


FIGURE 1-49

The association in Figure 1-49 will cause Entity Framework to add a strongly typed `Dinner` property to the `RSVP` class that developers can use to access the `Dinner` entity associated with a given `RSVP`. It will also cause the `Dinner` class to have a strongly typed `RSVPs` collection property that enables developers to retrieve and update `RSVP` objects associated with that Dinner.

In Figure 1-50, you can see an example of IntelliSense within Visual Studio when we create a new `RSVP` object and add it to a Dinner's RSVPs collection.

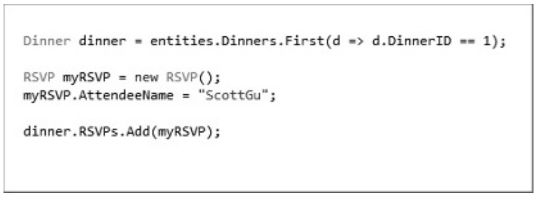


```
Dinner dinner = entities.Dinners.First(d => d.DinnerID == 1);

RSVP myRSVP = new RSVP();
myRSVP.AttendeeName = "ScottGu";

dinner.R
```

System.Data.Objects.DataClasses.EntityCollection<RSVP> Dinner.RSVPs
No Metadata Documentation available.

FIGURE 1-50

Notice how Entity Framework created an "RSVPs" collection on the `Dinner` object. We can use this to associate a foreign-key relationship between a Dinner and an RSVP row in our database (see Figure 1-51).



```
Dinner dinner = entities.Dinners.First(d => d.DinnerID == 1);

RSVP myRSVP = new RSVP();
myRSVP.AttendeeName = "ScottGu";

dinner.RSVPs.Add(myRSVP);
```

FIGURE 1-51

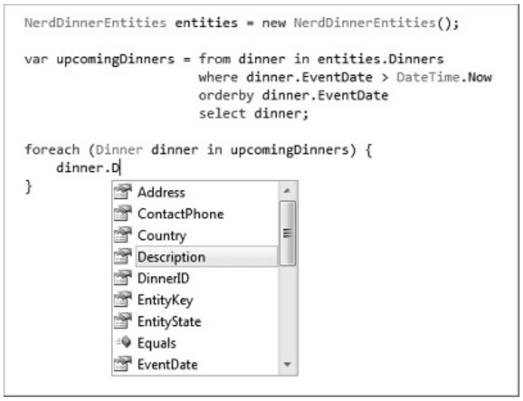
If you don't like how the Designer has modeled or named a table association, you can override it. Just click on the association arrow within the designer and access its properties via the property grid to rename, delete, or modify it. For our NerdDinner application, though, the default association rules work well for the data model classes we are building, and we can just use the default behavior.

NerdDinnerEntities Class

Visual Studio automatically generates .NET classes that represent the models and database relationships defined using the Entity Framework Designer. An `ObjectContext` class is also generated for each Entity Framework Designer file added to the solution. Because we named our Entity Framework class item *NerdDinner*, the `ObjectContext` class created will be called `NerdDinnerEntities`. This `NerdDinnerEntities` class is the primary way we will interact with the database.

Our `NerdDinnerEntities` class exposes two properties — `Dinners` and `RSVP` — that represent the two tables we modeled within the database. We can use C# to write LINQ queries against those properties to query and retrieve `Dinner` and `RSVP` objects from the database.

The following code (see Figure 1-52) demonstrates how to instantiate a `NerdDinnerDataContext` object and perform a LINQ query against it to obtain a sequence of Dinners that occur in the future.



```
NerdDinnerEntities entities = new NerdDinnerEntities();

var upcomingDinners = from dinner in entities.Dinners
                      where dinner.EventDate > DateTime.Now
                      orderby dinner.EventDate
                      select dinner;

foreach (Dinner dinner in upcomingDinners) {
    dinner.D
}
```

FIGURE 1-52

A `NerdDinnerEntities` object tracks any changes made to `Dinner` and `RSVP` objects retrieved using it and enables us to easily save the changes back to the database. The code that follows demonstrates how we can use a LINQ query to retrieve a single `Dinner` object from the database, update two of its properties, and then save the changes back to the database:

Available for download on Wrox.com

```
NerdDinnerEntities entities = new NerdDinnerEntities();

// Retrieve Dinner object that reprents a row with DinnerID of 1
Dinner dinner = entities.Dinners.Single(d => d.DinnerID == 1);

// Update two properties on Dinner
dinner.Title = "Changed Title";
dinner.Description = "This dinner will be fun";

// Persist changes to database
db.SaveChanges();
```

Code snippet 1-1.txt

The `NerdDinnerEntities` object in the code automatically tracked the property changes made to the `Dinner` object we retrieved from it. When we called the `SaveChanges` method, it executed an appropriate SQL "UPDATE" statement to the database to persist the updated values back.

Creating a DinnerRepository Class

For small applications, it is sometimes fine to have Controllers work directly against an Entity Framework `ObjectContext` class and embed LINQ queries within the Controllers. As applications get larger, though, this approach becomes cumbersome to maintain and test. It can also lead to us duplicating the same LINQ queries in multiple places.

One approach that can make applications easier to maintain and test is to use a *repository* pattern. A `repository` class helps encapsulate data querying and persistence logic and abstracts away the implementation details of the data persistence from the application. In addition to making application code cleaner, using a repository pattern can make it easier to change data storage implementations in the future, and it can help facilitate unit testing an application without requiring a real database.

For our NerdDinner application, we'll define a `DinnerRepository` class with the following signature:

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```
public class DinnerRepository {

    // Query Methods
```

```
        public IQueryable<Dinner> FindAllDinners();
        public IQueryable<Dinner> FindUpcomingDinners();
        public Dinner             GetDinner(int id);

        // Insert/Delete
        public void Add(Dinner dinner);
        public void Delete(Dinner dinner);

        // Persistence
        public void Save();
    }
```

Code snippet 1-2.txt

Later in this chapter, we'll extract an `IDinnerRepository` *interface from this class and enable dependency injection with it on our Controllers. To begin with, though, we are going to start simple and just work directly with the* `DinnerRepository` *class.*

To implement this class, we'll right-click our Models folder and choose the Add ➪ New Item menu command (Figure 1-53). Within the Add New Item dialog, we'll select the Class template and name the file *DinnerRepository.cs*.

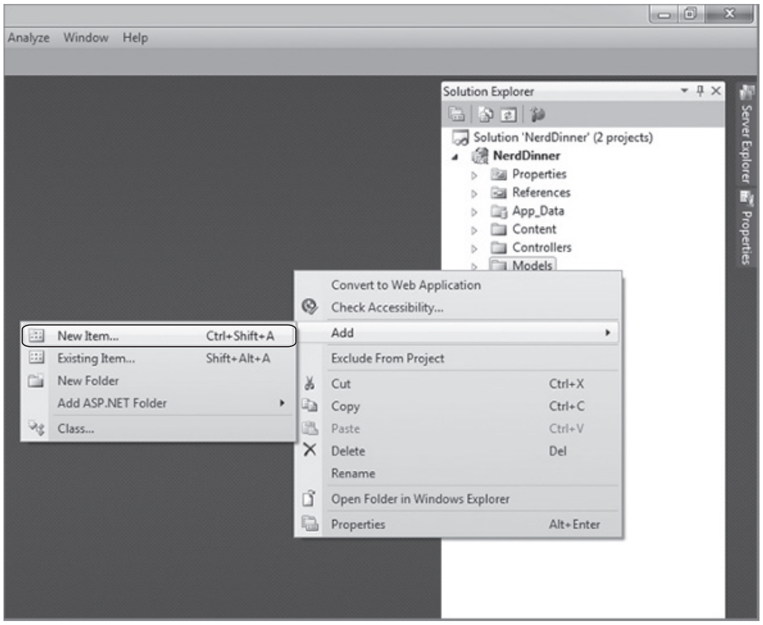

FIGURE 1-53

We can then implement our `DinnerRespository` class using the code that follows:

```
public class DinnerRepository {

    private NerdDinnerEntities entities = new NerdDinnerEntities();

    //
    // Query Methods

    public IQueryable<Dinner> FindAllDinners() {
        return entities.Dinners;
    }

    public IQueryable<Dinner> FindUpcomingDinners() {
        return from dinner in entities.Dinners
               where dinner.EventDate > DateTime.Now
               orderby dinner.EventDate
               select dinner;
    }



    public Dinner GetDinner(int id) {
        return entities.Dinners.FirstOrDefault(d => d.DinnerID == id);
    }

    //
    // Insert/Delete Methods

    public void Add(Dinner dinner) {
        entities.Dinners.AddObject(dinner);
    }

    public void Delete(Dinner dinner) {
        foreach(var rsvp in dinner.RSVPs) {
            entities.RSVPs.DeleteObject(dinner.RSVPs);
        }
        entities.Dinners.DeleteObject(dinner);
    }

    //
    // Persistence

    public void Save() {
        entities.SaveChanges();
    }
}
```

Code snippet 1-3.txt

Retrieving, Updating, Inserting, and Deleting Using the DinnerRepository Class

Now that we've created our `DinnerRepository` class, let's look at a few code examples that demonstrate common tasks we can do with it.

Querying Examples

The code that follows retrieves a single Dinner using the `DinnerID` value:

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```
DinnerRepository dinnerRepository = new DinnerRepository();

// Retrieve specific dinner by its DinnerID
Dinner dinner = dinnerRepository.GetDinner(5);
```

Code snippet 1-4.txt

The code that follows retrieves all upcoming dinners and loops over them:

```
DinnerRepository dinnerRepository = new DinnerRepository();

// Retrieve all upcoming Dinners
var upcomingDinners = dinnerRepository.FindUpcomingDinners();

// Loop over each upcoming Dinner
foreach (Dinner dinner in upcomingDinners) {

}
```

Code snippet 1-5.txt

Insert and Update Examples

The code that follows demonstrates adding two new Dinners. Additions/modifications to the repository aren't committed to the database until the `Save` method is called upon it. Entity Framework automatically wraps all changes in a database transaction — so either all changes happen or none of them does when our repository saves:

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```
DinnerRepository dinnerRepository = new DinnerRepository();

// Create First Dinner
Dinner newDinner1 = new Dinner();
newDinner1.Title = "Dinner with Scott";
newDinner1.HostedBy = "ScottGu";
newDinner1.ContactPhone = "425-703-8072";

// Create Second Dinner
Dinner newDinner2 = new Dinner();
```

```
newDinner2.Title = "Dinner with Bill";
newDinner2.HostedBy = "BillG";
newDinner2.ContactPhone = "425-555-5151";

// Add Dinners to Repository
dinnerRepository.Add(newDinner1);
dinnerRepository.Add(newDinner2);

// Persist Changes
dinnerRepository.Save();
```

Code snippet 1-6.txt

The code that follows retrieves an existing `Dinner` object and modifies two properties on it. The changes are committed back to the database when the `Save` method is called on our repository:

```
DinnerRepository dinnerRepository = new DinnerRepository();

// Retrieve specific dinner by its DinnerID
Dinner dinner = dinnerRepository.GetDinner(5);

// Update Dinner properties
dinner.Title = "Update Title";
dinner.HostedBy = "New Owner";

// Persist changes
dinnerRepository.Save();
```

Code snippet 1-7.txt

The code that follows retrieves a Dinner and then adds an RSVP to it. It does this using the RSVPs collection on the `Dinner` object that Entity Framework created for us (because there is a primary-key/foreign-key relationship between the two in the database). This change is persisted back to the database as a new `RSVP` table row when the `Save` method is called on the repository:

```
DinnerRepository dinnerRepository = new DinnerRepository();

// Retrieve specific dinner by its DinnerID
Dinner dinner = dinnerRepository.GetDinner(5);

// Create a new RSVP object
RSVP myRSVP = new RSVP();
myRSVP.AttendeeName = "ScottGu";

// Add RSVP to Dinner's RSVP Collection
dinner.RSVPs.Add(myRSVP);

// Persist changes
dinnerRepository.Save();
```

Code snippet 1-8.txt

Delete Example

The code that follows retrieves an existing `Dinner` object and then marks it to be deleted. When the `Save` method is called on the repository, it will commit the delete back to the database:

```
DinnerRepository dinnerRepository = new DinnerRepository();

// Retrieve specific dinner by its DinnerID
Dinner dinner = dinnerRepository.GetDinner(5);

// Mark dinner to be deleted
dinnerRepository.Delete(dinner);

// Persist changes
dinnerRepository.Save();
```

Code snippet 1-9.txt

Integrating Validation and Business Rule Logic with Model Classes

Integrating validation and business rule logic is a key part of any application that works with data.

Schema Validation

When Model classes are defined using the Entity Framework Designer, the data types of the properties in the data Model classes will correspond to the data types of the database table. For example: If the `EventDate` column in the `Dinners` table is a date/time, the data Model class created by Entity Framework will be of type `DateTime` (which is a built-in .NET data type). This means you will get compile errors if you attempt to assign an integer or Boolean to it from code, and it will raise an error automatically if you attempt to implicitly convert a non-valid string type to it at run time.

Entity Framework will also automatically handle escaping SQL values for you when you use strings — so you don't need to worry about SQL injection attacks when using it.

Validation and Business Rule Logic

Data-type validation is useful as a first step but is rarely sufficient. Most real-world scenarios require the ability to specify richer validation logic that can span multiple properties, execute code, and often have awareness of a Model's state (e.g., is it being created/updated/deleted, or within a domain-specific state like *archived*).

ASP.NET MVC 2 introduces support for Data Annotations validation attributes. These are a set of attributes that live in the `System.ComponentModel.DataAnnotations` namespace and were introduced as part of the Dynamic Data feature of ASP.NET 3.5 Service Pack 1. To use these attributes, make sure to reference the `System.ComponentModel.DataAnnotations.dll` assembly from the .NET tab of the Add Reference dialog. Note that this assembly is referenced by default when creating new ASP.NET MVC 2 projects in Visual Studio.

The .NET Framework includes the four validation attributes presented in Table 1-2.

TABLE 1-2: DataAnnotations Validation Attributes

ATTRIBUTE	DESCRIPTION
`RangeAttribute`	Specifies the numeric range constraints for the value of a property.
`RegularExpressionAttribute`	Specifies that the property value must match the specified regular expression.
`StringLengthAttribute`	Specifies the maximum length of characters that are allowed in the property.
`RequiredAttribute`	Specifies that a value for the property is required.

We can apply these attributes directly to properties of our model for validation. For example, to indicate that the title of a dinner is required, we could apply the `RequiredAttribute` like so:

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```
public class Dinner {
   [Required(ErrorMessage = "Title is required")]
    public string Title {
        get;
        set;
    }
}
```

Code snippet 1-10.txt

However, taking this approach can mean that you run into problems with classes maintained by a Visual Studio Designer (like the `Dinner` class generated by the Entity Framework Designer). When changes are made to the Designer, the Designer will use code generation to re-create the class that will overwrite the changes we've made. Fortunately, we can apply these attributes by specifying a *buddy class* that will hold the validation attributes instead of the main class.

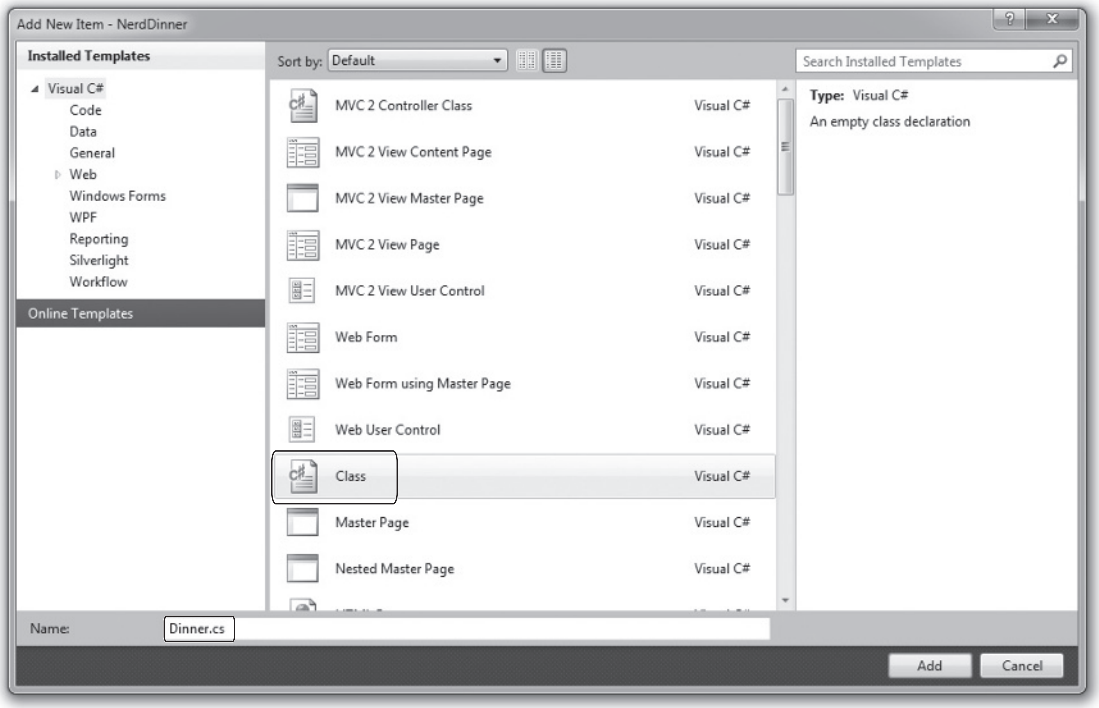
To add this buddy class, we'll need to add a *partial class* to our project. *Partial classes* can be used to add methods/properties/events to classes maintained by a VS Designer (like the `Dinner` class generated by the Entity Framework Designer) to avoid having the tool mess with our code.

We can add a new partial class to our project by right-clicking the \Models folder, and then selecting the "Add New Item" menu command. We can then choose the Class template within the "Add New Item" dialog (Figure 1-54) and name it *Dinner.cs*.

Clicking the Add button will add a Dinner.cs file to our project and open it within the IDE. We then apply the `partial` keyword to the class. Now we can add the `MetadataTypeAttribute` to the `Dinner` class by applying it to the partial class. This attribute is used to specify the buddy class, in this case `Dinner_Validation`:

```
 [MetadataType(typeof(Dinner_Validation))]
public partial class Dinner {
  //…
}
public class Dinner_Validation
{
    [Required(ErrorMessage = "Title is required")]
    [StringLength(50, ErrorMessage = "Title may not be longer than 50 characters")]
    public string Title { get; set; }

    [Required(ErrorMessage = "Description is required")]
    [StringLength(265, ErrorMessage =
      "Description must be 256 characters or less")]
    public string Description { get; set; }

    [Required(ErrorMessage = "Address is required")]
    public string Address { get; set; }

    [Required(ErrorMessage = "Country is required")]
    public string Country { get; set; }

    [Required(ErrorMessage = "Phone# is required")]
    public string ContactPhone { get; set; }
}
```

Code snippet 1-11.txt


Add New Item - NerdDinner
Installed Templates
Visual C#
Code
Data
General
Web
Windows Forms
WPF
Reporting
Silverlight
Workflow
Online Templates
Sort by: Default
Search Installed Templates
MVC 2 Controller Class — Visual C#
MVC 2 View Content Page — Visual C#
MVC 2 View Master Page — Visual C#
MVC 2 View Page — Visual C#
MVC 2 View User Control — Visual C#
Web Form — Visual C#
Web Form using Master Page — Visual C#
Web User Control — Visual C#
Class — Visual C#
Master Page — Visual C#
Nested Master Page — Visual C#
Add
Cancel

Type: Visual C#
An empty class declaration

Name: Dinner.cs

FIGURE 1-54

A couple of notes about this code:

- The `Dinner` class is prefaced with a `partial` keyword — which means the code contained within it will be combined with the class generated/maintained by the Entity Framework Designer and compiled into a single class.
- The property names of the `Dinner_Validate` class match the property names of the `Dinner` class. Thus, when we validate a property of a `Dinner`, we'll look at the attributes applied to the corresponding property of `Dinner_Validation`.

With these validation attributes in place, our model is validated any time we post it to an action method or call `UpdateModel` against it. Within an action method, we can check the `ModelState.IsValid` property to see if our model is valid as seen in the following `Create` method:

```
public class DinnerController : Controller {

    [HttpPost]
    public ActionResult Create(Dinner dinner) {
        if(ModelState.IsValid) {
            // Dinner is valid, save it.
        }
        else {
            return View();
        }
    }
```

Code snippet 1-12.txt

Notice that when the Model state is not valid, we simply show the create form again. When posting the Dinner to the action method, each of the validation attributes is run for each property. If an attribute fails, for example, if the `Title` field was left blank, an error is added to the ModelState dictionary with the key `Title`. This enables the helper methods used to build up the form to automatically display error messages and highlight fields that are in error.

Because our validation and business rules are implemented within our domain Model layer, and not within the UI layer, they will be applied and used across all scenarios within our application. We can later change or add business rules and have all code that works with our `Dinner` objects honor them. Having the flexibility to change business rules in one place, without having these changes ripple throughout the application and UI logic, is a sign of a well-written application, and a benefit that an MVC Framework helps encourage.

In Chapter 13, we'll cover validation and data annotations in more depth.

CONTROLLERS AND VIEWS

With traditional web frameworks (classic ASP, PHP, ASP.NET Web Forms, etc.), incoming URLs are typically mapped to files on disk. For example: a request for a URL like `/Products.aspx` or `/Products.php` might be processed by a Products.aspx or Products.php file.

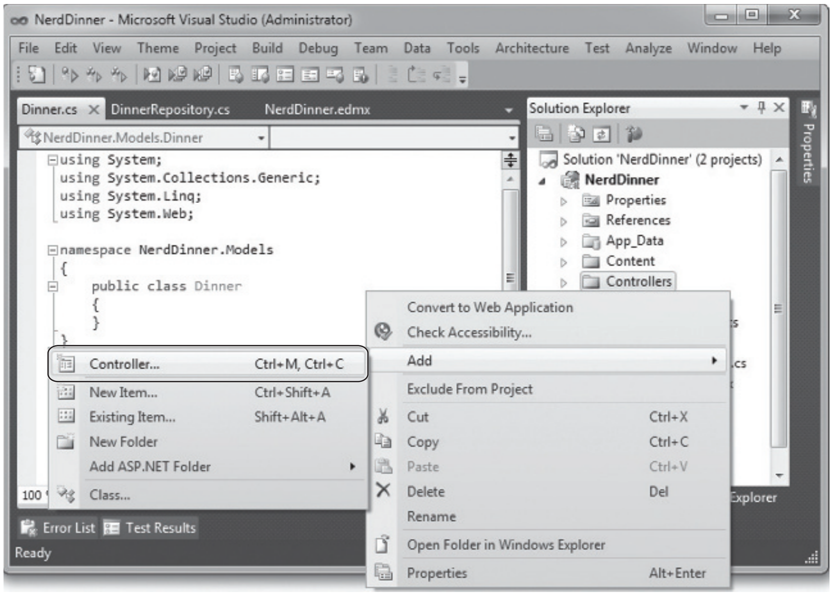
Web-based MVC Frameworks map URLs to server code in a slightly different way. Instead of mapping incoming URLs to files, they instead map URLs to methods on classes. These classes are called *Controllers*, and they are responsible for processing incoming HTTP requests, handling user input, retrieving and saving data, and determining the response to send back to the client (display HTML, download a file, redirect to a different URL, etc.).

Now that we have built up a basic model for our NerdDinner application, our next step will be to add a Controller to the application that takes advantage of it to provide users with a data listing/details navigation experience for Dinners on our site.

Adding a DinnersController Controller

We'll begin by right-clicking the Controllers folder within our Web Project and then selecting the Add ➪ Controller menu command (see Figure 1-55).

You can also execute this command by typing Ctrl+M, Ctrl+C.



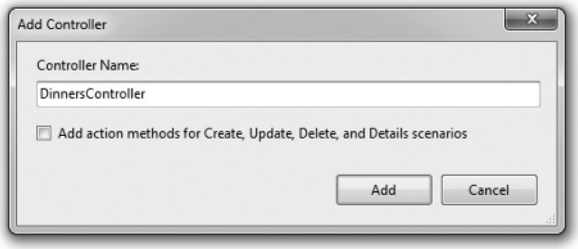
```
using System;
using System.Collections.Generic;
using System.Linq;
using System.Web;

namespace NerdDinner.Models
{
    public class Dinner
    {
    }
}
```

FIGURE 1-55

This will bring up the Add Controller dialog (Figure 1-56).

We'll name the new Controller *DinnersController* and click the Add button. Visual Studio will then add a DinnersController.cs file under our \Controllers directory (Figure 1-57).

It will also open up the new `DinnersController` class within the code-editor.


Add Controller

Controller Name: DinnersController

☐ Add action methods for Create, Update, Delete, and Details scenarios

FIGURE 1-56

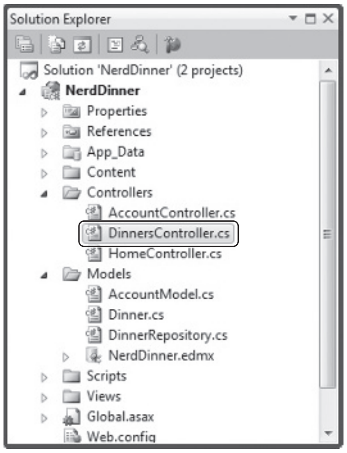


FIGURE 1-57

Adding Index and Details Action Methods to the DinnersController Class

We want to enable visitors using our application to browse the list of upcoming Dinners and enable them to click on any Dinner in the list to see specific details about it. We'll do this by publishing the URLs, presented in Table 1-3, from our application.

TABLE 1-3: Application URLs to Publish

URL	PURPOSE
`/Dinners/`	Display an HTML list of upcoming Dinners.
`/Dinners/Details/[id]`	Display details about a specific Dinner indicated by an `id` parameter embedded within the URL — which will match the `DinnerID` of the Dinner in the database. For example: `/Dinners/Details/2` would display an HTML page with details about the Dinner whose `DinnerID` value is 2.

We can publish initial implementations of these URLs by adding two public "action methods" to our `DinnersController` class:

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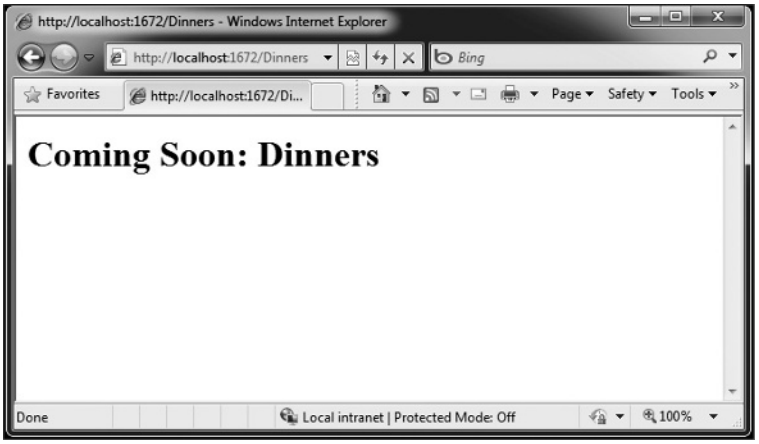
```
public class DinnersController : Controller {

    //
    // GET: /Dinners/

    public void Index() {
            Response.Write("<h1>Coming Soon: Dinners</h1>");
        }

        //
        // GET: /Dinners/Details/2

        public void Details(int id) {
            Response.Write("<h1>Details DinnerID: " + id + "</h1>");
        }
    }
```

Code snippet 1-13.txt

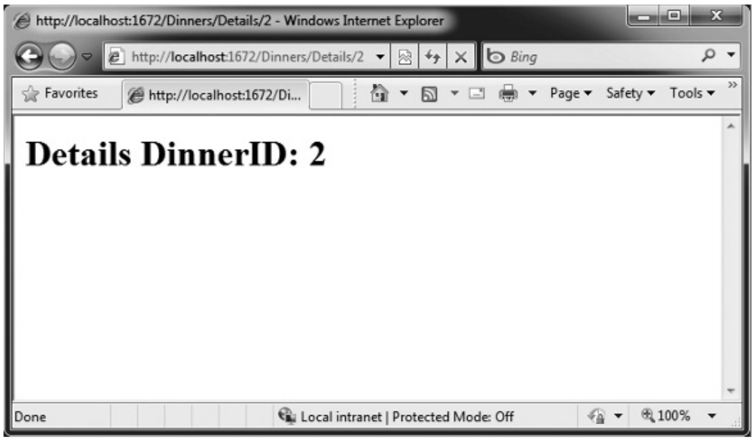
We can then run the application and use our browser to invoke the action methods. Typing in the **/Dinners/** URL will cause our `Index` method to run, and it will send back the response shown in Figure 1-58.

Typing in the **/Dinners/Details/2** URL will cause our `Details` method to run, and send back the response shown in Figure 1-59.


http://localhost:1672/Dinners - Windows Internet Explorer
http://localhost:1672/Dinners
Bing
Favorites
http://localhost:1672/Di...
Page
Safety
Tools
Done
Local intranet | Protected Mode: Off
100%

Coming Soon: Dinners

FIGURE 1-58


http://localhost:1672/Dinners/Details/2 - Windows Internet Explorer
http://localhost:1672/Dinners/Details/2
Bing
Favorites
http://localhost:1672/Di...
Page
Safety
Tools
Done
Local intranet | Protected Mode: Off
100%

Details DinnerID: 2

FIGURE 1-59

You might be wondering — how did ASP.NET MVC know to create our `DinnersController` class and invoke those methods? To understand that, let's take a quick look at how routing works.

Understanding ASP.NET MVC Routing

ASP.NET MVC includes a powerful URL routing engine that provides a lot of flexibility in controlling how URLs are mapped to `Controller` classes. It allows us to completely customize how ASP.NET MVC chooses which `Controller` class to create and which method to invoke on it, as well as configure different ways that variables can be automatically parsed from the URL/query string and passed to the method as parameter arguments. It delivers the flexibility to totally optimize a site for SEO (Search Engine Optimization) as well as publish any URL structure we want from an application.

By default, new ASP.NET MVC projects come with a preconfigured set of URL routing rules already registered. This enables us to easily get started on an application without having to explicitly configure anything. The default routing rule registrations can be found within the `Application` class of our projects — which we can open by double-clicking the Global.asax file in the root of our project (Figure 1-60).

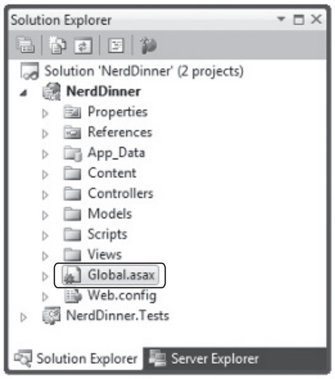


FIGURE 1-60

The default ASP.NET MVC routing rules are registered within the `RegisterRoutes` method of this class:

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```
public void RegisterRoutes(RouteCollection routes)
{
    routes.IgnoreRoute("{resource}.axd/{*pathInfo}");

    routes.MapRoute(
        "Default",                                          // Route name
        "{controller}/{action}/{id}",                       // URL w/ params
        new { controller="Home", action="Index",
              id=UrlParameter.Optional }  // Param defaults
    );
}
```

Code snippet 1-14.txt

The `routes.MapRoute` method call in the previous code registers a default routing rule that maps incoming URLs to `Controller` classes using the URL format: `/{`*`controller`*`}/{`*`action`*`}/{`*`id`*`}`, where *`controller`* is the name of the `Controller` class to instantiate, *`action`* is the name of a public method to invoke on it, and *`id`* is an optional parameter embedded within the URL that can be passed as an argument to the method. The third parameter passed to the `MapRoute` method call is a set of default values to use for the *`controller`*/*`action`*/*`id`* values in the event that they are not present in the URL (`controller = "Home", action="Index", id=UrlParameter.Optional`).

Table 1-4 demonstrates how a variety of URLs are mapped using the default `/{controllers}/{action}/{id}` route rule.

TABLE 1-4: Example URLs Mapped to the Default Route

URL	CONTROLLER CLASS	ACTION METHOD	PARAMETERS PASSED
`/Dinners/Details/2`	`DinnersController`	`Details(id)`	`id=2`
`/Dinners/Edit/5`	`DinnersController`	`Edit(id)`	`id=5`
`/Dinners/Create`	`DinnersController`	`Create()`	N/A
`/Dinners`	`DinnersController`	`Index()`	N/A
`/Home`	`HomeController`	`Index()`	N/A
`/`	`HomeController`	`Index()`	N/A

The last three rows show the default values (`Controller = Home, Action = Index, IdUrlParameter.Optional ""`) being used. Because the `Index` method is registered as the default action name if one isn't specified, the `/Dinners` and `/Home` URLs cause the `Index` action method to be invoked on their `Controller` classes. Because the `Home` controller is registered as the default controller if one isn't specified, the `/` URL causes the `HomeController` to be created, and the `Index` action method on it to be invoked.

If you don't like these default URL routing rules, the good news is that they are easy to change — just edit them within the `RegisterRoutes` method in the previous code. For our NerdDinner application, though, we aren't going to change any of the default URL routing rules — instead, we'll just use them as is.

Using the DinnerRepository from Our DinnersController

Let's now replace the current implementation of our `Index` and `Details` action methods with implementations that use our Model.

We'll use the `DinnerRepository` class we built earlier to implement the behavior. We'll begin by adding a `using` statement that references the `NerdDinner.Models` namespace, and then declare an instance of our `DinnerRepository` as a field on our `DinnerController` class.

Later in this chapter, we'll introduce the concept of *Dependency Injection* and show another way for our Controllers to obtain a reference to a `DinnerRepository` that enables better unit testing — but for right now, we'll just create an instance of our `DinnerRepository` inline like the code that follows:

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```
using System;
using System.Collections.Generic;
using System.Linq;
using System.Web;
using System.Web.Mvc;
using NerdDinner.Models;

namespace NerdDinner.Controllers {

    public class DinnersController : Controller {

        DinnerRepository dinnerRepository = new DinnerRepository();

        //
        // GET: /Dinners/

        public void Index() {
            var dinners = dinnerRepository.FindUpcomingDinners().ToList();
        }

        //
        // GET: /Dinners/Details/2

        public void Details(int id) {
            Dinner dinner = dinnerRepository.GetDinner(id);
        }
    }
}
```

Code snippet 1-15.txt

Now we are ready to generate an HTML response back using our retrieved data Model objects.

Using Views with Our Controller

Although it is possible to write code within our action methods to assemble HTML and then use the `Response.Write` helper method to send it back to the client, that approach becomes fairly unwieldy quickly. A much better approach is for us to only perform application and data logic inside our `DinnersController` action methods, and to then pass the data needed to render an HTML response to a separate View template that is responsible for outputting the HTML representation of it. As we'll see in a moment, a *View template* is a text file that typically contains a combination of HTML markup and embedded rendering code.

Separating our Controller logic from our View rendering brings several big benefits. In particular, it helps enforce a clear *separation of concerns* between the application code and UI formatting/rendering code. This makes it much easier to unit test application logic in isolation from UI rendering logic. It makes it easier to later modify the UI rendering templates without having to make application code changes. And it can make it easier for developers and designers to collaborate together on projects.

We can update our `DinnersController` class to indicate that we want to use a View template to send back an HTML UI response by changing the method signatures of our two action methods from having a return type of `void` to instead have a return type of `ActionResult`. We can then call the `View` helper method on the `Controller` base class to return back a `ViewResult` object:

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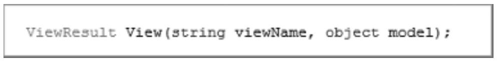
```
public class DinnersController : Controller {

    DinnerRepository dinnerRepository = new DinnerRepository();

    //
```

```
        // GET: /Dinners/

        public ActionResult Index() {

            var dinners = dinnerRepository.FindUpcomingDinners().ToList();

            return View("Index", dinners);
        }

        //
        // GET: /Dinners/Details/2

        public ActionResult Details(int id) {

            Dinner dinner = dinnerRepository.GetDinner(id);

            if (dinner == null)
                return View("NotFound");
            else
                return View("Details", dinner);
        }
    }
```

Code snippet 1-16.txt

The signature of the `View` helper method we are using in the previous code looks like Figure 1-61.



```
ViewResult View(string viewName, object model);
```

FIGURE 1-61

The first parameter to the `View` helper method is the name of the View template file we want to use to render the HTML response. The second parameter is a Model object that contains the data that the View template needs in order to render the HTML response.

Within our `Index` action method, we are calling the `View` helper method and indicating that we want to render an HTML listing of dinners using an `"Index"` View template. We are passing the View template a sequence of `Dinner` objects to generate the list from:

```
        //
        // GET: /Dinners/

        public ActionResult Index() {

            var dinners = dinnerRepository.FindUpcomingDinners().ToList();

            return View("Index", dinners);
        }
```

Code snippet 1-17.txt

Within our `Details` action method, we attempt to retrieve a `Dinner` object using the `id` provided within the URL. If a valid `Dinner` is found, we call the `View` helper method, indicating that we want to use a `"Details"` View template to render the retrieved `Dinner` object. If an invalid Dinner is requested, we render a helpful error message that indicates that the Dinner doesn't exist, using a `"NotFound"` View template (and an overloaded version of the `View` helper method that just takes the template name):

```
//
// GET: /Dinners/Details/2

public ActionResult Details(int id) {

    Dinner dinner = dinnerRepository.FindDinner(id);

    if (dinner == null)
        return View("NotFound");
    else
        return View("Details", dinner);
}
```

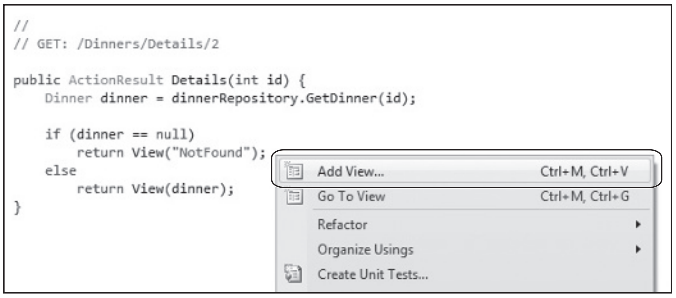
Code snippet 1-18.txt

Let's now implement the `"NotFound"`, `"Details"`, and `"Index"` View templates.

Implementing the "NotFound" View Template

We'll begin by implementing the `"NotFound"` View template — which displays a friendly error message indicating that the requested Dinner can't be found.

We'll create a new View template by positioning our text cursor within a `Controller` action method, and then by right-clicking and choosing the Add View menu command (see Figure 1-62; we can also execute this command by pressing Ctrl+M, Ctrl+V).



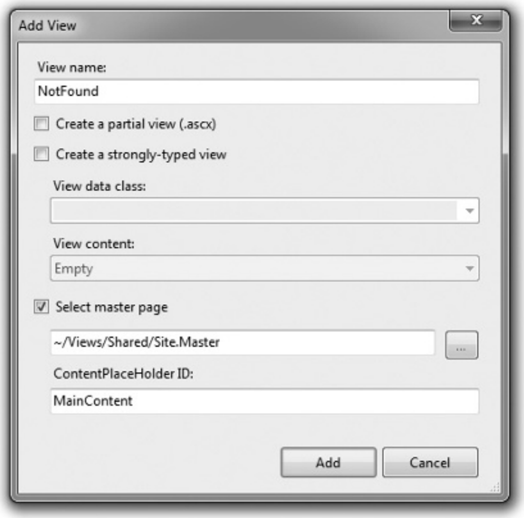
```
//
// GET: /Dinners/Details/2

public ActionResult Details(int id) {
    Dinner dinner = dinnerRepository.GetDinner(id);

    if (dinner == null)
        return View("NotFound");
    else
        return View(dinner);
}
```

FIGURE 1-62

This will bring up the "Add View" dialog shown in Figure 1-63. By default, the dialog will pre-populate the name of the View to create to match the name of the action method the cursor was in when the dialog was launched (in this case, *Details*). Because we want to first implement the `"NotFound"` template, we'll override this View name and set it instead to be **NotFound**.

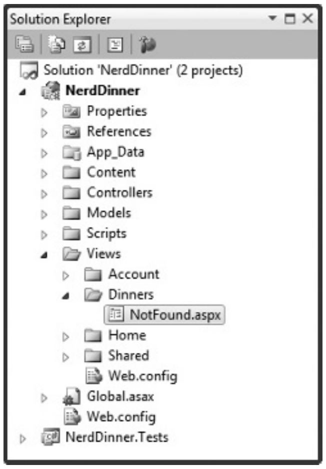
When we click the Add button, Visual Studio will create a new *NotFound.aspx* (see Figure 1-64) View template for us within the \Views\Dinners directory (which it will also create if the directory doesn't already exist).

It will also open up our new NotFound.aspx View template within the code-editor (see Figure 1-65).



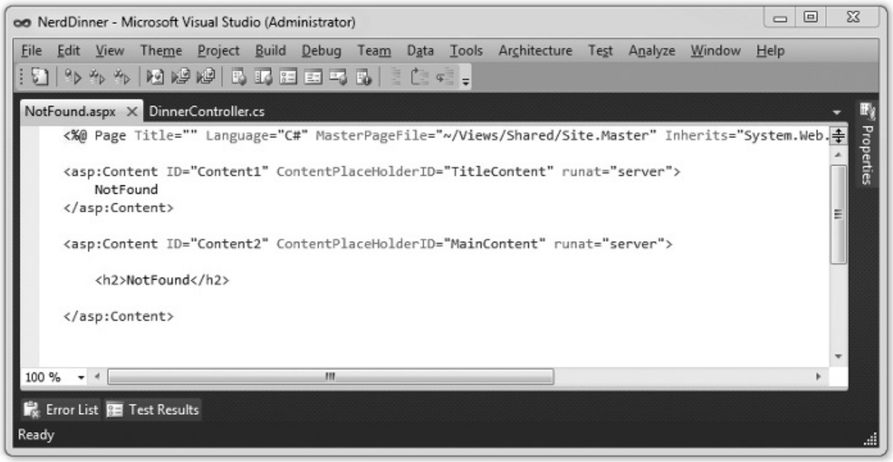
View name:	NotFound
Create a partial view (.ascx)	☐
Create a strongly-typed view	☐
View content:	Empty
Select master page	☑ ~/Views/Shared/Site.Master
ContentPlaceHolder ID:	MainContent

FIGURE 1-63



```
Solution Explorer
Solution 'NerdDinner' (2 projects)
  NerdDinner
    Properties
    References
    App_Data
    Content
    Controllers
    Models
    Scripts
    Views
      Account
      Dinners
        NotFound.aspx
      Home
      Shared
      Web.config
    Global.asax
    Web.config
  NerdDinner.Tests
```

FIGURE 1-64


NerdDinner - Microsoft Visual Studio (Administrator)
File Edit View Theme Project Build Debug Team Data Tools Architecture Test Analyze Window Help
NotFound.aspx
DinnerController.cs
Properties
100 %
Error List
Test Results
Ready

```
<%@ Page Title="" Language="C#" MasterPageFile="~/Views/Shared/Site.Master" Inherits="System.Web.

<asp:Content ID="Content1" ContentPlaceHolderID="TitleContent" runat="server">
    NotFound
</asp:Content>

<asp:Content ID="Content2" ContentPlaceHolderID="MainContent" runat="server">

    <h2>NotFound</h2>

</asp:Content>
```

FIGURE 1-65

View templates by default have two *content regions* where we can add content and code. The first allows us to customize the *title* of the HTML page sent back. The second allows us to customize the *main content* of the HTML page sent back.

To implement our "NotFound" View template, we'll add some basic content:

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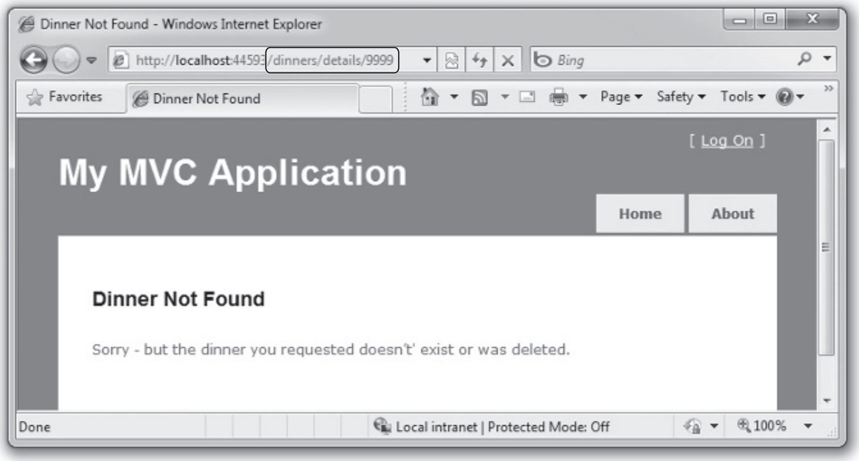
```
<asp:Content ID="Title" ContentPlaceHolderID="TitleContent" runat="server">
    Dinner Not Found
</asp:Content>

<asp:Content ID="Main" ContentPlaceHolderID="MainContent" runat="server">

    <h2>Dinner Not Found</h2>

    <p>Sorry - but the dinner you requested doesn't exist or was deleted.</p>

</asp:Content>
```

Code snippet 1-19.txt

We can then try it out within the browser. To do this, let's request the /Dinners/Details/9999 URL. This will refer to a Dinner that doesn't currently exist in the database and will cause our DinnersController.Details action method to render our "NotFound" View template (see Figure 1-66).


Dinner Not Found - Windows Internet Explorer
http://localhost:44593/dinners/details/9999
Bing
Favorites
Dinner Not Found
Page
Safety
Tools
[Log On]
My MVC Application
Home
About

Dinner Not Found

Sorry - but the dinner you requested doesn't' exist or was deleted.

Done
Local intranet | Protected Mode: Off
100%

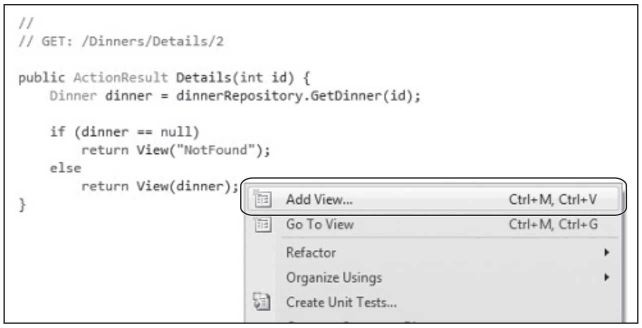
FIGURE 1-66

One thing you'll notice in Figure 1-66 is that our basic View template has inherited a bunch of HTML that surrounds the main content on the screen. This is because our View template is using a *Master Page* template that enables us to apply a consistent layout across all views on the site. We'll discuss how Master Pages work more in a later part of this chapter.

Implementing the "Details" View Template

Let's now implement the "Details" View template — which will generate HTML for a single Dinner model.

We'll do this by positioning our text cursor within the Details action method, and then right-clicking and choosing the Add View menu command (Figure 1-67) or pressing Ctrl+M, Ctrl+V.



```
//
// GET: /Dinners/Details/2

public ActionResult Details(int id) {
    Dinner dinner = dinnerRepository.GetDinner(id);

    if (dinner == null)
        return View("NotFound");
    else
        return View(dinner);
}
```

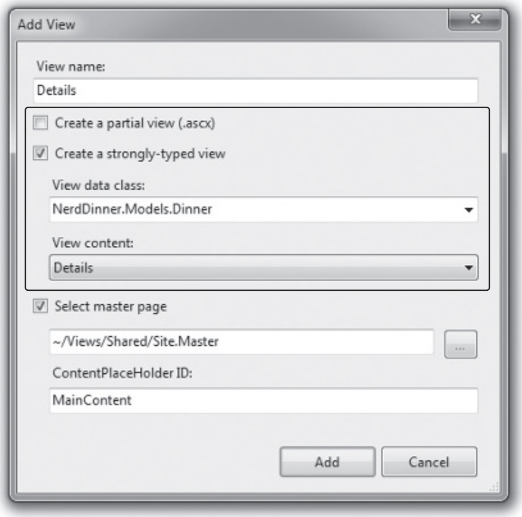
FIGURE 1-67

This will bring up the “Add View” dialog. We’ll keep the default View name (*Details*). We’ll also select the “Create a strongly-typed view” checkbox in the dialog and select (using the combobox dropdown) the name of the model type we are passing from the Controller to the View. For this View, we are passing a `Dinner` object (the fully qualified name for this type is: `NerdDinner.Models.Dinner`) as shown in Figure 1-68.

Unlike the previous template, where we chose to create an “Empty View,” this time we will choose to automatically *scaffold* the view using a `"Details"` template. We can indicate this by changing the View content dropdown in the dialog above.

Scaffolding will generate an initial implementation of our Details View template based on the Dinner model we are passing to it. This provides an easy way for us to quickly get started on our View template implementation.

When we click the Add button, Visual Studio will create a new Details.aspx View template file for us within our \Views\Dinners directory (see Figure 1-69).



Add View

View name: Details

Create a partial view (.ascx) [ ]

Create a strongly-typed view [✓]

View data class: NerdDinner.Models.Dinner

View content: Details

Select master page [✓]

~/Views/Shared/Site.Master

ContentPlaceHolder ID: MainContent

FIGURE 1-68

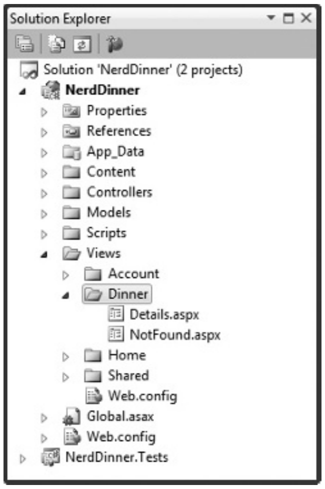


FIGURE 1-69

It will also open up our new Details.aspx View template within the code-editor. It will contain an initial scaffold implementation of a Details View based on a Dinner model. The scaffolding engine uses .NET reflection to look at the public properties exposed on the class passed to it and will add appropriate content based on each type it finds:

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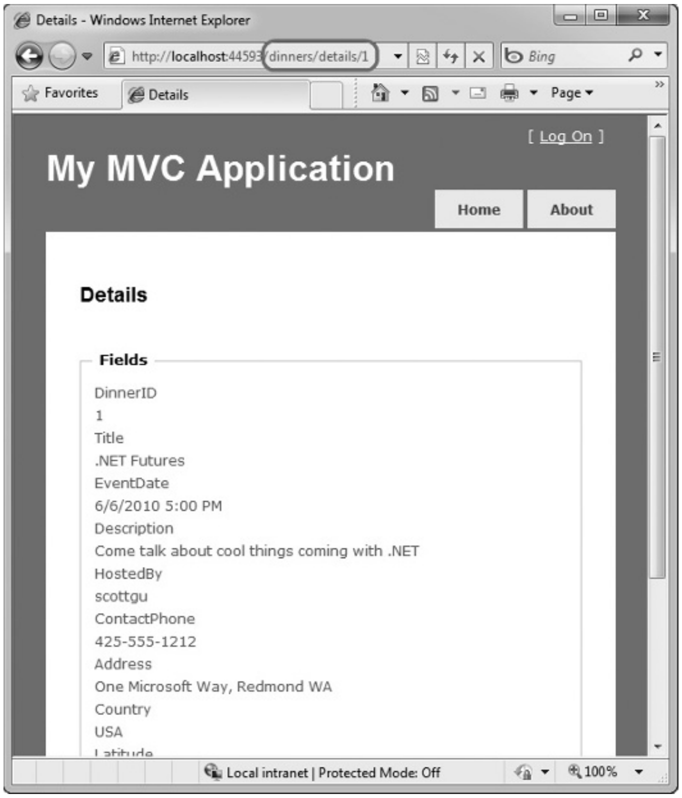
```
<asp:Content ID="Title" ContentPlaceHolderID="TitleContent" runat="server">
    Details
</asp:Content>

<asp:Content ID="Main" ContentPlaceHolderID="MainContent" runat="server">

    <h2>Details</h2>

    <fieldset>
        <legend>Fields</legend>

        <div class="display-label">DinnerID</div>
        <div class="display-field"><%: Model.DinnerID %></div>

        <div class="display-label">Title</div>
        <div class="display-field"><%: Model.Title %></div>

        <div class="display-label">EventDate</div>
        <div class="display-field">
            <%: String.Format("{0:g}", Model.EventDate) %>
        </div>

        <div class="display-label">Description</div>
        <div class="display-field"><%: Model.Description %></div>

        <div class="display-label">HostedBy</div>
        <div class="display-field"><%: Model.HostedBy %></div>

        <div class="display-label">ContactPhone</div>
        <div class="display-field"><%: Model.ContactPhone %></div>

        <div class="display-label">Address</div>
        <div class="display-field"><%: Model.Address %></div>

        <div class="display-label">Country</div>
        <div class="display-field"><%: Model.Country %></div>

        <div class="display-label">Latitude</div>
        <div class="display-field">
            <%: String.Format("{0:F}", Model.Latitude) %>
        </div>

        <div class="display-label">Longitude</div>
        <div class="display-field">
            <%: String.Format("{0:F}", Model.Longitude) %>
        </div>


    </fieldset>
```

```
        <p>

            <%: Html.ActionLink("Edit", "Edit", new { id=Model.DinnerID }) %> |
            <%: Html.ActionLink("Back to List", "Index") %>
        </p>

    </asp:Content>
```

Code snippet 1-20.txt

We can request the `/Dinners/Details/1` URL to see what this "details" scaffold implementation looks like in the browser. Using this URL will display one of the Dinners we manually added to our database when we first created it (see Figure 1-70).


Details - Windows Internet Explorer
http://localhost:44593/dinners/details/1
Bing
Favorites
Details
Page
[Log On]
My MVC Application
Home
About
Local intranet | Protected Mode: Off
100%

Details

Fields

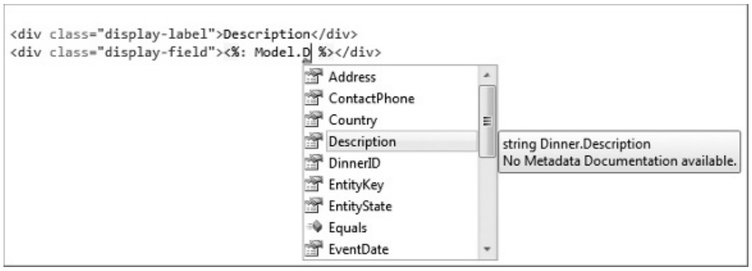
DinnerID
1
Title
.NET Futures
EventDate
6/6/2010 5:00 PM
Description
Come talk about cool things coming with .NET
HostedBy
scottgu
ContactPhone
425-555-1212
Address
One Microsoft Way, Redmond WA
Country
USA
Latitude

FIGURE 1-70

This gets us up and running quickly and provides us with an initial implementation of our Details .aspx View. We can then tweak it to customize the UI to our satisfaction.

When we look at the Details.aspx template more closely, we'll find that it contains static HTML as well as embedded rendering code. `<% %>` code nuggets execute code when the View template renders, and `<%: %>` code nuggets execute the code contained within them and then render the result to the output stream of the template.

We can write code within our View that accesses the `Dinner` Model object that was passed from our Controller using a strongly typed `Model` property. Visual Studio provides us with full code-IntelliSense when accessing this `Model` property within the Editor (Figure 1-71).



```
<div class="display-label">Description</div>
<div class="display-field"><%: Model.D %></div>
```

string Dinner.Description
No Metadata Documentation available.

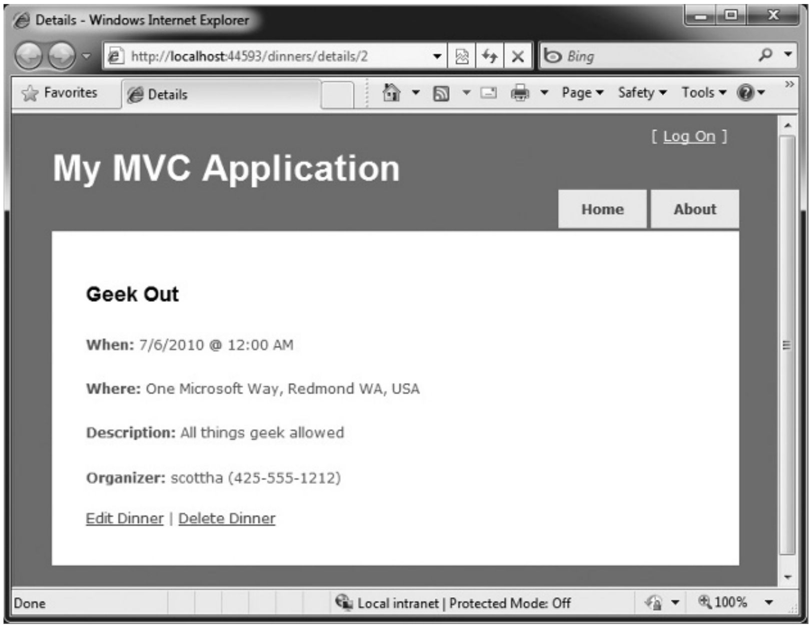
FIGURE 1-71

Let's make some tweaks so that the source for our final Details View template looks like that below:

```
<asp:Content ID="Title" ContentPlaceHolderID="TitleContent" runat="server">
    Dinner: <%: Model.Title %>
</asp:Content>

<asp:Content ID="Main" ContentPlaceHolderID="MainContent" runat="server">

    <h2><%: Model.Title %></h2>
    <p>
        <strong>When:</strong>
        <%: Model.EventDate.ToShortDateString() %>

        <strong>@</strong>
        <%: Model.EventDate.ToShortTimeString() %>
    </p>
    <p>
        <strong>Where:</strong>
        <%: Model.Address %>,
        <%: Model.Country %>
    </p>
     <p>
        <strong>Description:</strong>
        <%: Model.Description %>
    </p>
    <p>
        <strong>Organizer:</strong>
        <%: Model.HostedBy %>
        (<%: Model.ContactPhone %>)
    </p>

    <%: Html.ActionLink("Edit Dinner", "Edit", new { id=Model.DinnerID })%> |
    <%: Html.ActionLink("Delete Dinner","Delete", new { id=Model.DinnerID})%>

</asp:Content>
```

Code snippet 1-21.txt

When we access the `/Dinners/Details/1` URL again, it will render as shown in Figure 1-72.


Details - Windows Internet Explorer
http://localhost:44593/dinners/details/2
Bing
Favorites
Details
Page
Safety
Tools
[Log On]
My MVC Application
Home
About
Done
Local intranet | Protected Mode: Off
100%

Geek Out

When: 7/6/2010 @ 12:00 AM

Where: One Microsoft Way, Redmond WA, USA

Description: All things geek allowed

Organizer: scottha (425-555-1212)

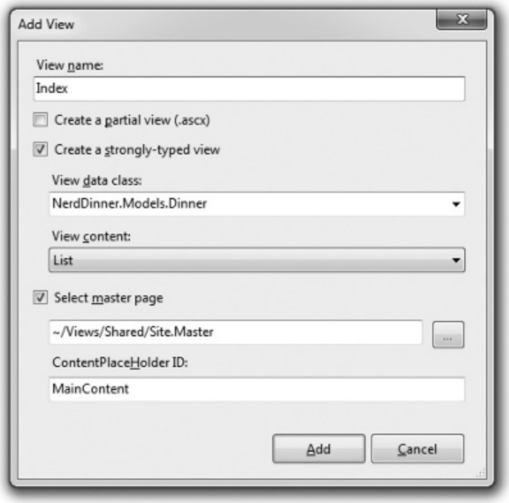
Edit Dinner | Delete Dinner

FIGURE 1-72

Implementing the "Index" View Template

Let's now implement the `"Index"` View template — which will generate a listing of upcoming Dinners. To do this, we'll position our text cursor within the `Index` action method and then right-click and choose the "Add View" menu command (or press Ctrl+M, Ctrl+V).

Within the "Add View" dialog (Figure 1-73), we'll keep the View template named *Index* and select the "Create a strongly-typed view" checkbox. This time we will choose to automatically generate a List View template and select `NerdDinner.Models.Dinner` as the Model type passed to the View (which, because we have indicated that we are creating a List scaffold, will cause the "Add View" dialog to assume that we are passing a sequence of `Dinner` objects from our Controller to the View).


Add View

View name: Index

Create a partial view (.ascx) [ ]

Create a strongly-typed view [✓]

View data class: NerdDinner.Models.Dinner

View content: List

Select master page [✓]

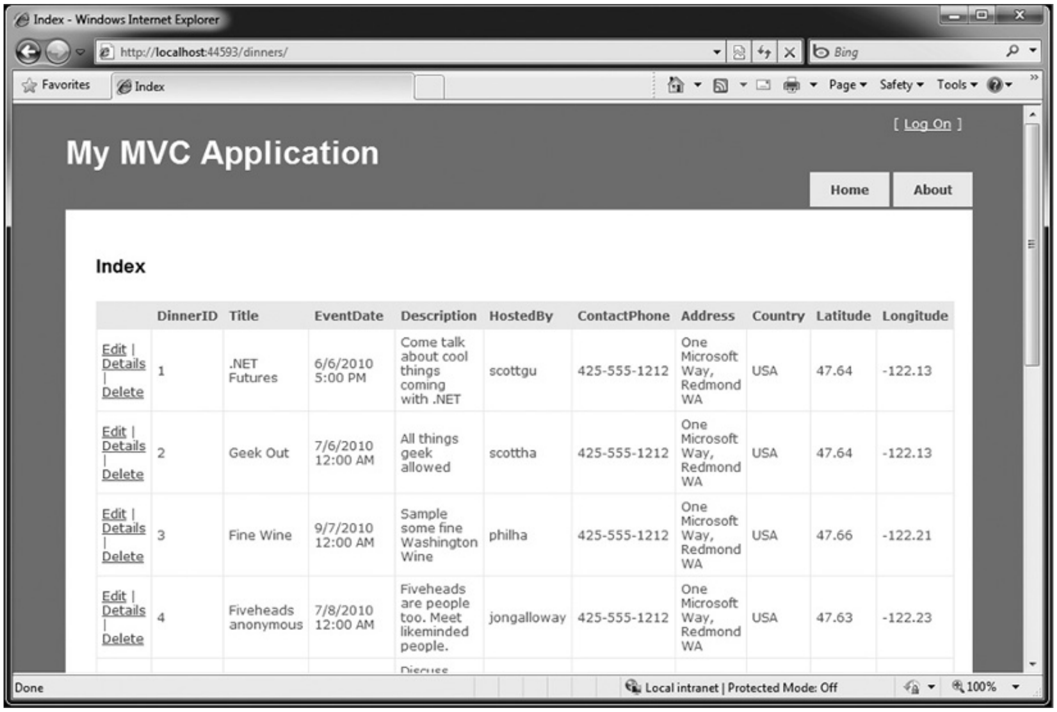
~/Views/Shared/Site.Master

ContentPlaceHolder ID: MainContent

FIGURE 1-73

When we click the Add button, Visual Studio will create a new Index.aspx View template file for us within our \Views\Dinners directory. It will *scaffold* an initial implementation within it that provides an HTML table listing of the Dinners we pass to the View.

When we run the application and access the `/Dinners/` URL, it will render our list of Dinners as shown in Figure 1-74.


Index - Windows Internet Explorer
http://localhost:44593/dinners/
Bing
Favorites
Index
Page
Safety
Tools

[Log On]

My MVC Application

Home About

Index

	DinnerID	Title	EventDate	Description	HostedBy	ContactPhone	Address	Country	Latitude	Longitude
Edit | Details | Delete	1	.NET Futures	6/6/2010 5:00 PM	Come talk about cool things coming with .NET	scottgu	425-555-1212	One Microsoft Way, Redmond WA	USA	47.64	-122.13
Edit | Details | Delete	2	Geek Out	7/6/2010 12:00 AM	All things geek allowed	scottha	425-555-1212	One Microsoft Way, Redmond WA	USA	47.64	-122.13
Edit | Details | Delete	3	Fine Wine	9/7/2010 12:00 AM	Sample some fine Washington Wine	philha	425-555-1212	One Microsoft Way, Redmond WA	USA	47.66	-122.21
Edit | Details | Delete	4	Fiveheads anonymous	7/8/2010 12:00 AM	Fiveheads are people too. Meet likeminded people.	jongalloway	425-555-1212	One Microsoft Way, Redmond WA	USA	47.63	-122.23

Done

Local intranet | Protected Mode: Off

100%

FIGURE 1-74

The table solution in Figure 1-74 gives us a grid-like layout of our Dinner data — which isn't quite what we want for our consumer-facing Dinner listing. We can update the Index.aspx View template and modify it to list fewer columns of data, and use a `<ul>` element to render them instead of a table using the code that follows:

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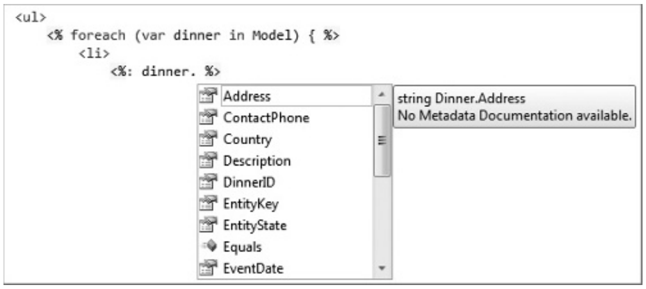
```
<asp:Content ID="Main" ContentPlaceHolderID="MainContent" runat="server">

    <h2>Upcoming Dinners</h2>

    <ul>
        <% foreach (var dinner in Model) { %>

            <li>
                <%: dinner.Title %>
                on
                <%: dinner.EventDate.ToShortDateString()%>
                @
                <%: dinner.EventDate.ToShortTimeString()%>
                </li>

            <% } %>
        </ul>

    </asp:Content>
```

Code snippet 1-22.txt

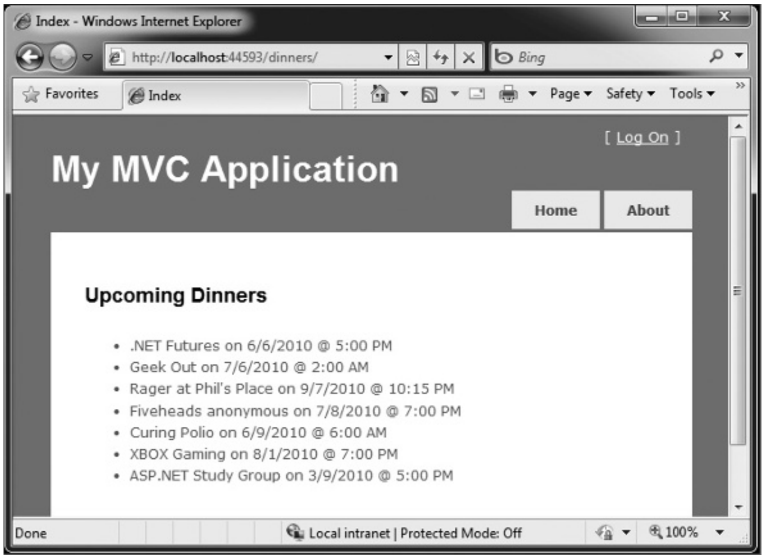
We are using the `var` keyword within the `foreach` statement as we loop over each Dinner in our Model. Those unfamiliar with C# 3.0 might think that using `var` means that the `Dinner` object is late-bound. It, instead, means that the compiler is using type-inference against the strongly typed `Model` property (which is of type `IEnumerable<Dinner>`) and compiling the local *`dinner`* variable as a Dinner type — which means that we get full IntelliSense and compile-time checking for it within code blocks (Figure 1-75).

When we press the Refresh button on the `/Dinners` URL in our browser, our updated View now looks like Figure 1-76.



```
<ul>
    <% foreach (var dinner in Model) { %>
        <li>
            <%: dinner. %>
```

FIGURE 1-75



Index - Windows Internet Explorer
http://localhost:44593/dinners/
Bing
Favorites
Index
Page
Safety
Tools
[Log On]
My MVC Application
Home
About
Done
Local intranet | Protected Mode: Off
100%

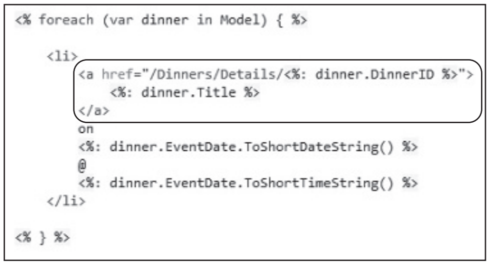
Upcoming Dinners

- .NET Futures on 6/6/2010 @ 5:00 PM
- Geek Out on 7/6/2010 @ 2:00 AM
- Rager at Phil's Place on 9/7/2010 @ 10:15 PM
- Fiveheads anonymous on 7/8/2010 @ 7:00 PM
- Curing Polio on 6/9/2010 @ 6:00 AM
- XBOX Gaming on 8/1/2010 @ 7:00 PM
- ASP.NET Study Group on 3/9/2010 @ 5:00 PM

FIGURE 1-76

This is looking better — but isn't entirely there yet. Our last step is to enable end users to click individual Dinners in the list and see details about them. We'll implement this by rendering HTML hyperlink elements that link to the `Details` action method on our `DinnersController`.

We can generate these hyperlinks within our Index view in one of two ways. The first is to manually create HTML `<a>` elements as shown in Figure 1-77, where we embed `<% %>` blocks within the `<a>` HTML element.



```
<% foreach (var dinner in Model) { %>

    <li>
        <a href="/Dinners/Details/<%: dinner.DinnerID %>">
            <%: dinner.Title %>
        </a>
        on
        <%: dinner.EventDate.ToShortDateString() %>
        @
        <%: dinner.EventDate.ToShortTimeString() %>
    </li>

<% } %>
```

FIGURE 1-77

An alternative approach we can use is to take advantage of the built-in `Html.ActionLink` helper method within ASP.NET MVC that supports programmatically creating an HTML `<a>` element that links to another action method on a Controller:

```
<%: Html.ActionLink(dinner.Title, "Details", new { id=dinner.DinnerID }) %>
```

The first parameter to the `Html.ActionLink` helper method is the link-text to display (in this case, the title of the Dinner); the second parameter is the Controller action name we want to generate the link to (in this case, the `"Details"` method); and the third parameter is a set of parameters to send to the action (implemented as an anonymous type with property name/values). In this case, we are specifying the `id` parameter of the Dinner we want to link to, and because the default URL routing rule in ASP.NET MVC is `{`*`Controller`*`}/{`*`Action`*`}/{`*`id`*`}`, the `Html.ActionLink` helper method will generate the following output:

```
<a href="/Dinners/Details/1">.NET Futures</a>
```

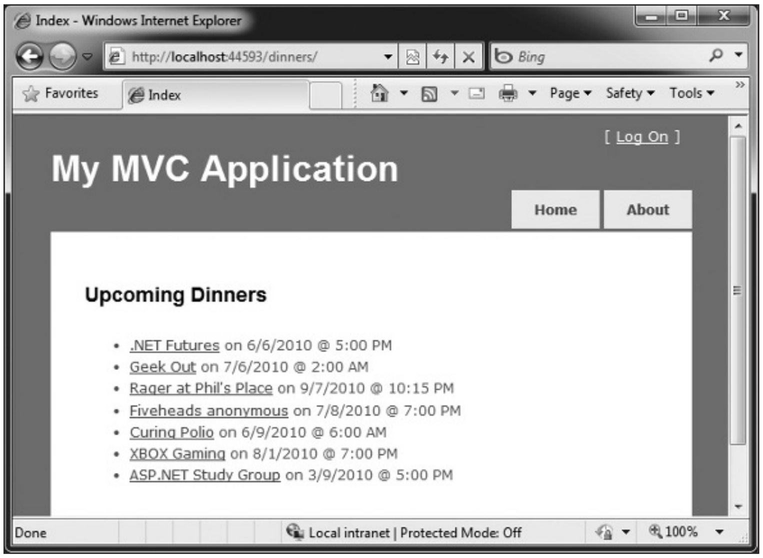
For our Index.aspx View, we'll use the `Html.ActionLink` helper method approach and have each dinner in the list link to the appropriate details URL:

```
<asp:Content ID="Title" ContentPlaceHolderID="TitleContent" runat="server">
    Upcoming Dinners
</asp:Content>

<asp:Content ID="Main" ContentPlaceHolderID="MainContent" runat="server">

    <h2>Upcoming Dinners</h2>

    <ul>
        <% foreach (var dinner in Model) { %>
            <li>
                <%: Html.ActionLink(dinner.Title, "Details",
                                    new { id=dinner.DinnerID }) %>
                on
                <%: dinner.EventDate.ToShortDateString()%>
                @
                <%: dinner.EventDate.ToShortTimeString()%>
            </li>
        <% } %>
    </ul>

</asp:Content>
```

Code snippet 1-23.txt

And now when we hit the `/Dinners` URL, our Dinner List looks like Figure 1-78.

When we click any of the Dinners in the list, we'll navigate to see details about it (Figure 1-79).

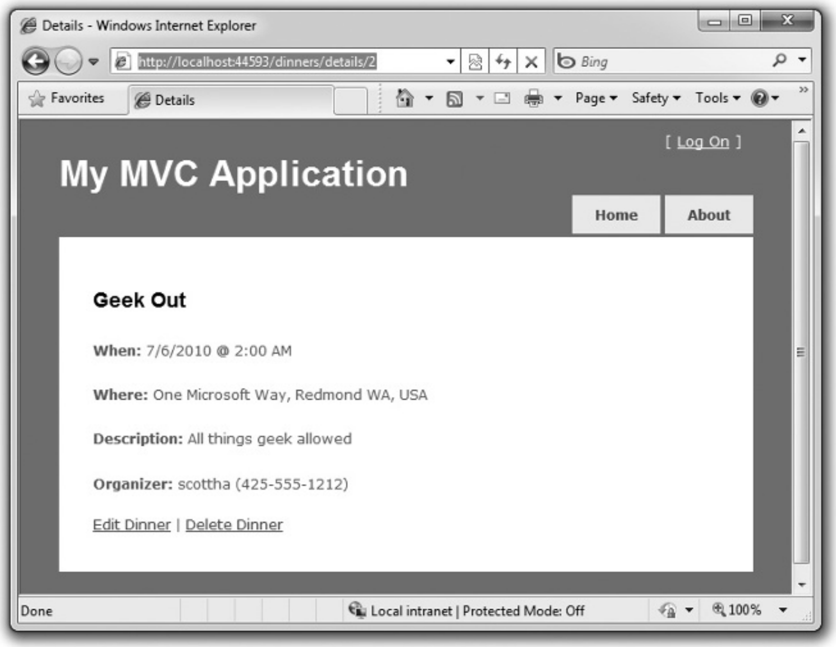

Index - Windows Internet Explorer
http://localhost:44593/dinners/
Bing
Favorites
Index
Page
Safety
Tools
[Log On]
Home
About
Done
Local intranet | Protected Mode: Off
100%

My MVC Application

Upcoming Dinners

- .NET Futures on 6/6/2010 @ 5:00 PM
- Geek Out on 7/6/2010 @ 2:00 AM
- Rager at Phil's Place on 9/7/2010 @ 10:15 PM
- Fiveheads anonymous on 7/8/2010 @ 7:00 PM
- Curing Polio on 6/9/2010 @ 6:00 AM
- XBOX Gaming on 8/1/2010 @ 7:00 PM
- ASP.NET Study Group on 3/9/2010 @ 5:00 PM

FIGURE 1-78


Details - Windows Internet Explorer
http://localhost:44593/dinners/details/2
Bing
Favorites
Details
Page
Safety
Tools
[Log On]
Home
About
Done
Local intranet | Protected Mode: Off
100%

My MVC Application

Geek Out

When: 7/6/2010 @ 2:00 AM

Where: One Microsoft Way, Redmond WA, USA

Description: All things geek allowed

Organizer: scottha (425-555-1212)

Edit Dinner | Delete Dinner

FIGURE 1-79

Convention-Based Naming and the \Views Directory Structure

ASP.NET MVC applications, by default, use a convention-based directory-naming structure when resolving View templates. This allows developers to avoid having to fully qualify a location path when referencing Views from within a Controller class. By default, ASP.NET MVC will look for the View template file within the \Views\[ControllerName]\ directory underneath the application.

For example, we've been working on the `DinnersController` class — which explicitly references three View templates: `"Index"`, `"Details"`, and `"NotFound"`. ASP.NET MVC will, by default, look for these Views within the \Views\Dinners directory underneath our application root directory (see Figure 1-80).

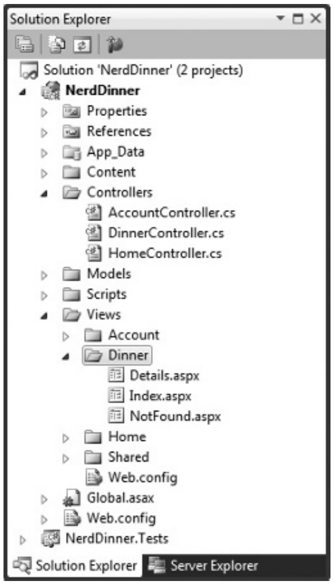


FIGURE 1-80

Notice in Figure 1-80 how there are currently three Controller classes within the project (`DinnersController`, `HomeController`, and `AccountController` — the last two were added by default when we created the project), and there are three subdirectories (one for each Controller) within the \Views directory.

Views referenced from the `Home` and `Accounts` Controllers will automatically resolve their View templates from the respective \Views\Home and \Views\Account directories. The \Views\Shared subdirectory provides a way to store View templates that are reused across multiple Controllers within the application. When ASP.NET MVC attempts to resolve a View template, it will first check within the \Views\[Controller]-specific directory, and if it can't find the View template there, it will look within the \Views \Shared directory.

When it comes to naming individual View templates, the recommended guidance is to have the View template share the same name as the action method that caused it to render. For example, our `Index` action method above is using the `"Index"` View to render the View result, and the `Details` action method is using the `"Details"` View to render its results. This makes it easy to quickly see which template is associated with each action.

Developers do not need to explicitly specify the View template name when the View template has the same name as the action method being invoked on the Controller. We can, instead, just pass the Model object to the `View` helper method (without specifying the View name), and ASP.NET MVC will automatically infer that we want to use the \Views\[ControllerName]\[ActionName] View template on disk to render it.

This allows us to clean up our Controller code a little, and avoid duplicating the name twice in our code:

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```
public class DinnersController : Controller {
    DinnerRepository dinnerRepository = new DinnerRepository();

    //
    // GET: /Dinners/
```

```
        public ActionResult Index() {

            var dinners = dinnerRepository.FindUpcomingDinners().ToList();

            return View(dinners);
        }

        //
        // GET: /Dinners/Details/2

        public ActionResult Details(int id) {

            Dinner dinner = dinnerRepository.GetDinner(id);

            if (dinner == null)
                return View("NotFound");
            else
                return View(dinner);
        }
    }
```

Code snippet 1-24.txt

The previous code is all that is needed to implement a nice Dinner listing/details experience for the site.

CREATE, UPDATE, DELETE FORM SCENARIOS

We've introduced Controllers and Views, and covered how to use them to implement a listing/details experience for dinners on the site. Our next step will be to take our `DinnersController` class further and enable support for editing, creating, and deleting Dinners with it as well.

URLs Handled by DinnersController

We previously added action methods to `DinnersController` that implemented support for two URLs (shown in Table 1-5): `/Dinners` and `/Dinners/Details/[id]`.

TABLE 1-5: URLs Handled by DinnersController

URL	VERB	PURPOSE
`/Dinners/`	GET	Displays an HTML list of upcoming Dinners.
`/Dinners/Details/[id]`	GET	Displays details about a specific Dinner.

We will now add action methods to implement three additional URLs: `/Dinners/Edit/[id]`, `/Dinners/Create` and `/Dinners/Delete/[id]`. These URLs will enable support for editing existing Dinners, creating new Dinners, and deleting Dinners.

We will support both HTTP-GET and HTTP-POST verb interactions with these new URLs. HTTP GET requests to these URLs will display the initial HTML View of the data (a form populated with the Dinner data in the case of "edit," a blank form in the case of "create," and a delete confirmation screen in the case of "delete"). HTTP-POST requests to these URLs will save/update/delete the Dinner data in our DinnerRepository (and from there to the database), as shown in Table 1-6.

TABLE 1-6: URLs Combined with HTTP Verbs

URL	VERB	PURPOSE
`/Dinners/Edit/[id]`	GET	Displays an editable HTML form populated with Dinner data.
	POST	Saves the form changes for a particular Dinner to the database.
`/Dinners/Create`	GET	Displays an empty HTML form that allows users to define new Dinners.
	POST	Creates a new Dinner and saves it in the database.
`/Dinners/Delete/[id]`	GET	Displays a confirmation screen that asks the user whether they want to delete the specified Dinner.
	POST	Deletes the specified Dinner from the database.

Let's begin by implementing the "edit" scenario.

Implementing the HTTP-GET Edit Action Method

We'll start by implementing the HTTP GET behavior of our `Edit` action method. This method will be invoked when the `/Dinners/Edit/[id]` URL is requested. Our implementation will look like this:

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```
//
// GET: /Dinners/Edit/2

public ActionResult Edit(int id) {

    Dinner dinner = dinnerRepository.GetDinner(id);

    return View(dinner);
}
```

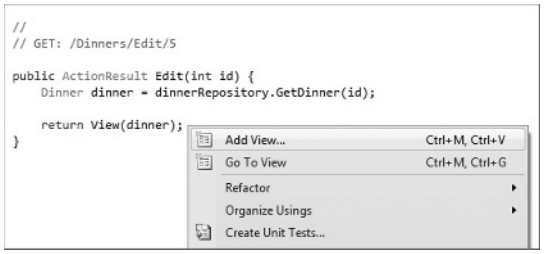
Code snippet 1-25.txt

The code above uses the `DinnerRepository` to retrieve a `Dinner` object. It then renders a View template using the `Dinner` object. Because we haven't explicitly passed a template name to the `View` helper method, it will use the convention-based default path to resolve the View template: /Views/Dinners/Edit.aspx.

Let's now create this View template. We will do this by right-clicking within the `Edit` method and selecting the Add View context menu command (see Figure 1-81).

Within the Add View dialog, we'll indicate that we are passing a `Dinner` object to our View template as its model, and choose to auto-scaffold an Edit template (see Figure 1-82).

When we click the Add button, Visual Studio will add a new Edit.aspx View template file for us within the \Views\Dinners directory. It will also open up the new Edit.aspx View template within the code-editor — populated with an initial "Edit" scaffold implementation like that shown in Figure 1-83.

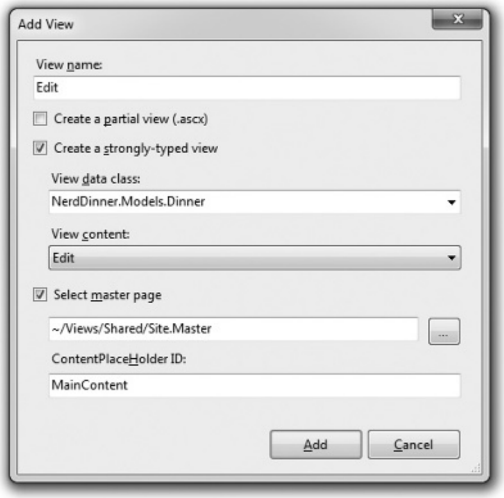


```
//
// GET: /Dinners/Edit/5

public ActionResult Edit(int id) {
    Dinner dinner = dinnerRepository.GetDinner(id);

    return View(dinner);
}
```

FIGURE 1-81



Add View

View name: Edit

[ ] Create a partial view (.ascx)

[✓] Create a strongly-typed view

View data class: NerdDinner.Models.Dinner

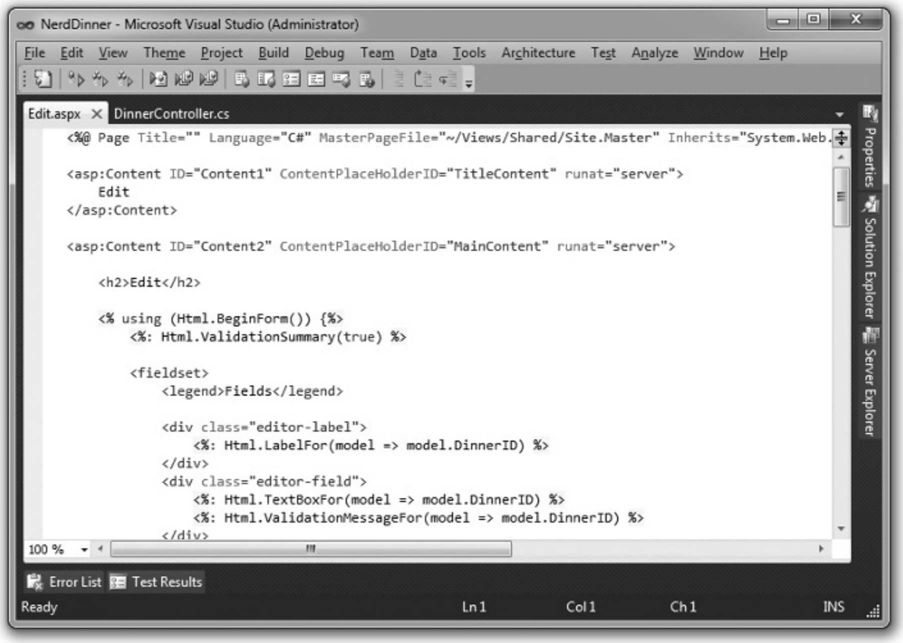
View content: Edit

[✓] Select master page

~/Views/Shared/Site.Master

ContentPlaceHolder ID: MainContent

FIGURE 1-82



NerdDinner - Microsoft Visual Studio (Administrator)
File Edit View Theme Project Build Debug Team Data Tools Architecture Test Analyze Window Help
Edit.aspx
DinnerController.cs
Properties
Solution Explorer
Server Explorer
100 %
Error List
Test Results
Ready
Ln 1
Col 1
Ch 1
INS

```
<%@ Page Title="" Language="C#" MasterPageFile="~/Views/Shared/Site.Master" Inherits="System.Web.

<asp:Content ID="Content1" ContentPlaceHolderID="TitleContent" runat="server">
    Edit
</asp:Content>

<asp:Content ID="Content2" ContentPlaceHolderID="MainContent" runat="server">

    <h2>Edit</h2>

    <% using (Html.BeginForm()) {%>
        <%: Html.ValidationSummary(true) %>

        <fieldset>
            <legend>Fields</legend>

            <div class="editor-label">
                <%: Html.LabelFor(model => model.DinnerID) %>
            </div>
            <div class="editor-field">
                <%: Html.TextBoxFor(model => model.DinnerID) %>
                <%: Html.ValidationMessageFor(model => model.DinnerID) %>
            </div>
```

FIGURE 1-83

Let's make a few changes to the default "Edit" scaffold generated, and update the Edit View template to have the content below (which removes a few of the properties we don't want to expose):

```
<asp:Content ID="Title" ContentPlaceHolderID="TitleContent" runat="server">
    Edit: <%: Model.Title %>
</asp:Content>

<asp:Content ID="Main" ContentPlaceHolderID="MainContent" runat="server">

    <h2>Edit Dinner</h2>
    <% using (Html.BeginForm()) { %>
        <%: Html.ValidationSummary("Please correct the errors and try again.") %>
        <fieldset>
           <legend>Fields</legend>
            <div class="editor-label">
                <%: Html.LabelFor(m => m.Title) %>
            </div>
            <div class="editor-field">
                <%: Html.TextBoxFor(m => m.Title) %>
                <%: Html.ValidationMessageFor(m => m.Title, "*") %>
            </div>
            <div class="editor-label">
                <%: Html.LabelFor(m => m.EventDate) %>
            </div>
            <div class="editor-field">
                <%: Html.TextBoxFor(m => m.EventDate) %>
                <%: Html.ValidationMessageFor(m => m.EventDate, "*") %>
            </div>
            <div class="editor-label">
                <%: Html.LabelFor(m => m.Description) %>
            </div>
            <div class="editor-field">
                <%: Html.TextAreaFor(m => m.Description) %>
                <%: Html.ValidationMessageFor(m => m.Description, "*") %>
            </div>
            <div class="editor-label">
                <%: Html.LabelFor(m => m.Address) %>
            </div>
            <div class="editor-field">
                <%: Html.TextBoxFor(m => m.Address) %>
                <%: Html.ValidationMessageFor(m => m.Address, "*") %>
            </div>
            <div class="editor-label">
                <%: Html.LabelFor(m => m.Country) %>
            </div>
            <div class="editor-field">
                <%: Html.TextBoxFor(m => m.Country) %>
                <%: Html.ValidationMessageFor(m => m.Country, "*") %>
            </div>
            <div class="editor-label">
                <%: Html.LabelFor(m => m.ContactPhone) %>
            </div>
            <div class="editor-field">
                <%: Html.TextBoxFor(m => m.ContactPhone) %>
                <%: Html.ValidationMessageFor(m => m.ContactPhone, "*") %>
            </div>
            <div class="editor-label">
```

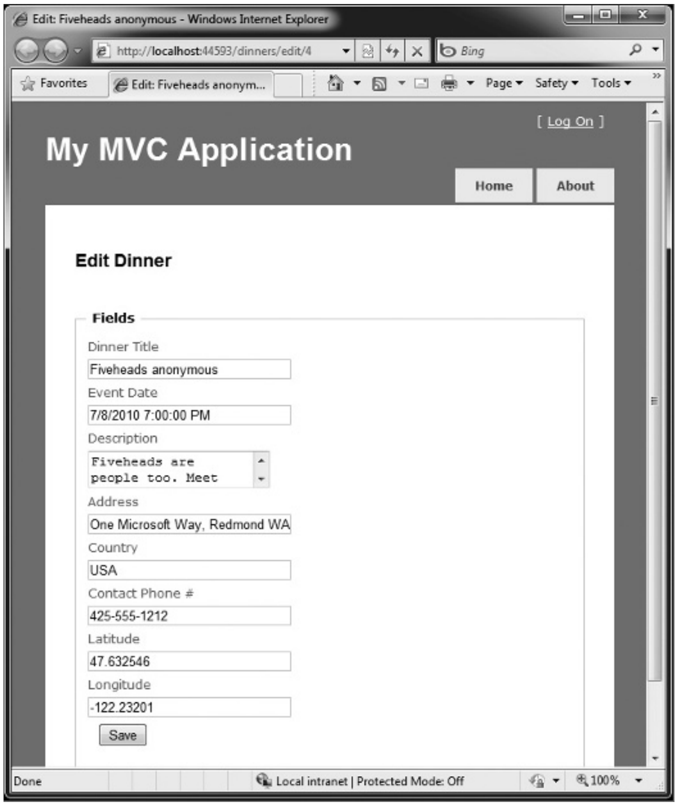
```
                <%: Html.LabelFor(m => m.Latitude) %>
            </div>
            <div class="editor-field">
                <%: Html.TextBoxFor(m => m.Latitude) %>
                <%: Html.ValidationMessageFor(m => m.Latitude, "*") %>
            </div>
            <div class="editor-label">
                <%: Html.LabelFor(m => m.Longitude) %>
            </div>
            <div class="editor-field">
                <%: Html.TextBoxFor(m => m.Longitude) %>
                <%: Html.ValidationMessageFor(m => m.Longitude, "*") %>
            </div>
            <p>
                <input type="submit" value="Save" />
            </p>
        </fieldset>

    <% } %>

</asp:Content>
```

Code snippet 1-26.txt

When we run the application and request the `/Dinners/Edit/1` URL, we will see the page shown in Figure 1-84.


Edit: Fiveheads anonymous - Windows Internet Explorer
http://localhost:44593/dinners/edit/4
Bing
Favorites
Edit: Fiveheads anonym...
Page
Safety
Tools
[Log On]
Home
About
Save
Done
Local intranet | Protected Mode: Off
100%

My MVC Application

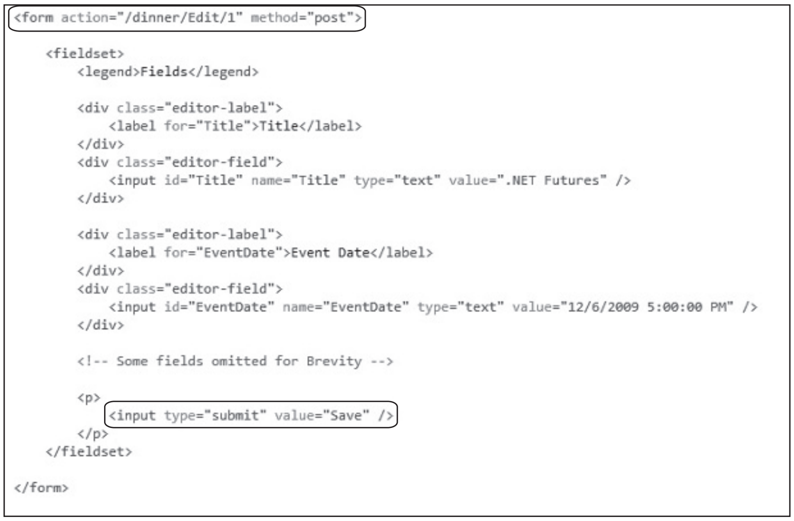
Edit Dinner

Fields

Dinner Title
Fiveheads anonymous
Event Date
7/8/2010 7:00:00 PM
Description
Fiveheads are people too. Meet
Address
One Microsoft Way, Redmond WA
Country
USA
Contact Phone #
425-555-1212
Latitude
47.632546
Longitude
-122.23201

FIGURE 1-84

The HTML markup generated by our View looks like that below. It is standard HTML — with a `<form>` element that performs an HTTP POST to the `/Dinners/Edit/1` URL when the Save `<input type="submit"/>` button is pushed. An HTML `<input type="text"/>` element has been output for each editable property (see Figure 1-85). One property is rendered as a `<textarea />` element.



```
<form action="/dinner/Edit/1" method="post">

    <fieldset>
        <legend>Fields</legend>

        <div class="editor-label">
            <label for="Title">Title</label>
        </div>
        <div class="editor-field">
            <input id="Title" name="Title" type="text" value=".NET Futures" />
        </div>

        <div class="editor-label">
            <label for="EventDate">Event Date</label>
        </div>
        <div class="editor-field">
            <input id="EventDate" name="EventDate" type="text" value="12/6/2009 5:00:00 PM" />
        </div>

        <!-- Some fields omitted for Brevity -->

        <p>
            <input type="submit" value="Save" />
        </p>
    </fieldset>

</form>
```

FIGURE 1-85

Html.BeginForm and Html.TextBoxFor Html Helper Methods

Our Edit.aspx View template is using several *HTML Helper* methods: `Html.ValidationSummary`, `Html.BeginForm`, `Html.TextBoxFor`, `Html.TextAreaFor`, and `Html.ValidationMessageFor`. In addition to generating HTML markup for us, these helper methods provide built-in support for displaying validation errors.

Html.BeginForm Helper Method

The `Html.BeginForm` helper method is what output the HTML `<form>` element in our markup. In our Edit.aspx View template, you'll notice that we are applying a C# `using` statement when using this method. The open curly brace indicates the beginning of the `<form>` content, and the closing curly brace is what indicates the end of the `</form>` element:

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```
<% using (Html.BeginForm()) { %>

    <fieldset>

        <! —  Fields Omitted for Brevity  — >

        <p>
            <input type="submit" value="Save" />
        </p>
    </fieldset>

<% } %>
```

Code snippet 1-27.txt

Alternatively, if you find the `using` statement approach unnatural for a scenario like this, you can use a `Html.BeginForm` and `Html.EndForm` combination (which does the same thing):

```
<% Html.BeginForm();  %>

    <fieldset>
        <! —  Fields Omitted for Brevity  — >

        <p>
            <input type="submit" value="Save" />
        </p>
    </fieldset>

<% Html.EndForm(); %>
```

Code snippet 1-28.txt

Calling `Html.BeginForm` without any parameters will cause it to output a form element that does an HTTP-POST to the current request's URL. That is why our Edit View generates a `<form action="/Dinners/Edit/1" method="post">` element. We could have alternatively passed explicit parameters to `Html.BeginForm` if we wanted to post to a different URL.

Html.TextBoxFor Helper Method

Our Edit.aspx View uses the `Html.TextBoxFor` helper method to output `<input type="text"/>` elements:

```
<%: Html.TextBoxFor(model => model.Title) %>
```

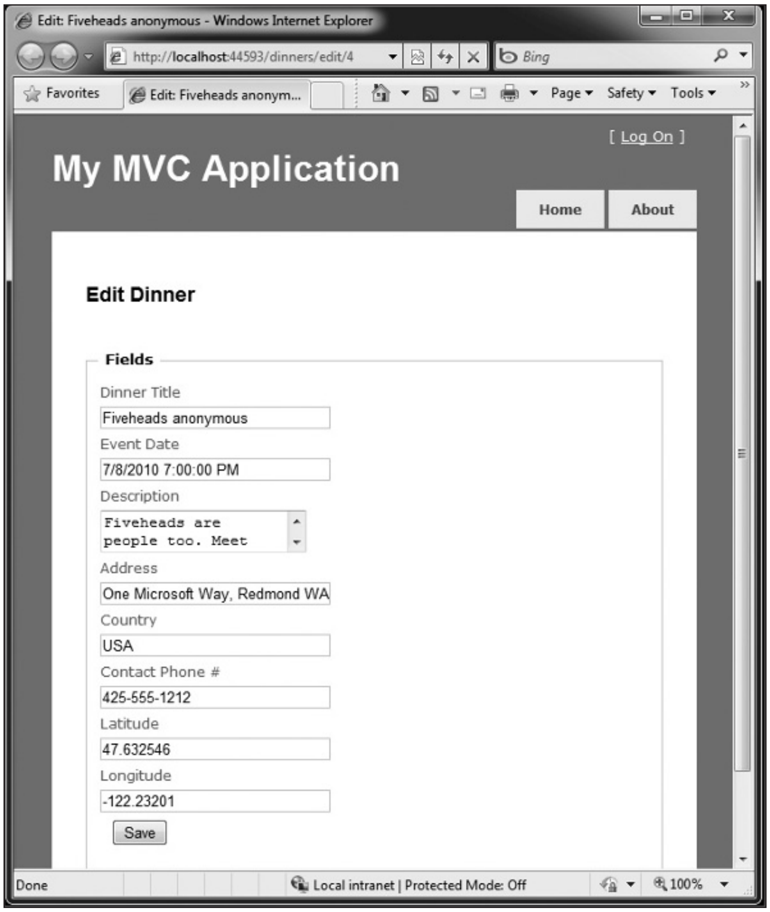
The `Html.TextBoxFor` method takes a single parameter — which is being used to specify both the ID/name attributes of the `<input type="text"/>` element to output, as well as the Model property to populate the textbox value from. For example, the `Dinner` object we passed to the Edit View had a `"Title"` property value of `.NET Futures`, and so our `Html.TextBoxFor(model => model.Title)` method call output is `<input id="Title" name="Title" type="text" value=".NET Futures" />`.

A second parameter to `Html.TextBoxFor` can optionally be used to output additional HTML attributes. The code snippet below demonstrates how to render an additional `size="30"` attribute and a `class="myclass"` attribute on the `<input type="text"/>` element. Note how we are escaping the name of the class attribute using a `@` character because `class` is a reserved keyword in C#:

```
<%: Html.TextBoxFor(model => model.Title, new {size=30, @class="myclass"} )%>
```

Implementing the HTTP-POST Edit Action Method

We now have the HTTP-GET version of our `Edit` action method implemented. When a user requests the `/Dinners/Edit/1` URL, they receive an HTML page like the one shown in Figure 1-86.


Edit: Fiveheads anonymous - Windows Internet Explorer
http://localhost:44593/dinners/edit/4
Bing
Favorites
Edit: Fiveheads anonym...
Page
Safety
Tools
[Log On]
My MVC Application
Home
About
Save
Done
Local intranet | Protected Mode: Off
100%

Edit Dinner

Fields

Dinner Title: Fiveheads anonymous

Event Date: 7/8/2010 7:00:00 PM

Description: Fiveheads are people too. Meet

Address: One Microsoft Way, Redmond WA

Country: USA

Contact Phone #: 425-555-1212

Latitude: 47.632546

Longitude: -122.23201

FIGURE 1-86

Pressing the Save button causes a form post to the `/Dinners/Edit/1` URL, and submits the HTML `<input>` form values using the HTTP-POST verb. Let's now implement the HTTP-POST behavior of our `Edit` action method — which will handle saving the Dinner.

We'll begin by adding an overloaded `Edit` action method to our `DinnersController` that has an `HttpPost` attribute on it that indicates it handles HTTP-POST scenarios:

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```
//
// POST: /Dinners/Edit/2

[HttpPost]
```

```
public ActionResult Edit(int id, FormCollection formValues) {
   ...
}
```

Code snippet 1-29.txt

When the `[HttpPost]` attribute is applied to overloaded action methods, ASP.NET MVC automatically handles dispatching requests to the appropriate action method depending on the incoming HTTP verb. HTTP-POST requests to `/Dinners/Edit/[id]` URLs will go to the above `Edit` method, while all other HTTP verb requests to `/Dinners/Edit/[id]` URLs will go to the first `Edit` method we implemented (which did not have an `[HttpPost]` attribute).

WHY DIFFERENTIATE VIA HTTP VERBS?

You might ask — why are we using a single URL and differentiating its behavior via the HTTP verb? Why not just have two separate URLs to handle loading and saving edit changes? For example: `/Dinners/Edit/[id]` to display the initial form and `/Dinners/Save/[id]` to handle the form post to save it?

The downside with publishing two separate URLs is that in cases in which we post to `/Dinners/Save/2` and then need to redisplay the HTML form because of an input error, end users will end up having the `/Dinners/Save/2` URL in their browser's address bar (since that was the URL the form posted to). If the end users bookmark this redisplayed page to their browser favorites list or copy/paste the URL and e-mail it to friends, they will end up saving a URL that won't work in the future (since that URL depends on post values).

By exposing a single URL (like `/Dinners/Edit/[id]`) and differentiating the processing of it by HTTP verb, it is safe for end users to bookmark the edit page and/or send the URL to others.

Retrieving Form Post Values

There are a variety of ways we can access posted form parameters within our HTTP-POST `Edit` method. One simple approach is to just use the `Request` property on the `Controller` base class to access the form collection and retrieve the posted values directly:

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```
//
// POST: /Dinners/Edit/2

[HttpPost]
public ActionResult Edit(int id, FormCollection formValues) {

    // Retrieve existing dinner
    Dinner dinner = dinnerRepository.GetDinner(id);

    // Update dinner with form posted values
```

```
        dinner.Title = Request.Form["Title"];
        dinner.Description = Request.Form["Description"];
        dinner.EventDate = DateTime.Parse(Request.Form["EventDate"]);
        dinner.Address = Request.Form["Address"];
        dinner.Country = Request.Form["Country"];
        dinner.ContactPhone = Request.Form["ContactPhone"];

        // Persist changes back to database
        dinnerRepository.Save();

        // Perform HTTP redirect to details page for the saved Dinner
        return RedirectToAction("Details", new { id = dinner.DinnerID });
    }
```

Code snippet 1-30.txt

The approach in the previous code is a little verbose, though, especially once we add error handling logic.

A better approach for this scenario is to leverage the built-in `UpdateModel` helper method on the `Controller` base class. It supports updating the properties of an object we pass it using the incoming form parameters. It uses reflection to determine the property names on the object and then automatically converts and assigns values to them based on the input values submitted by the client.

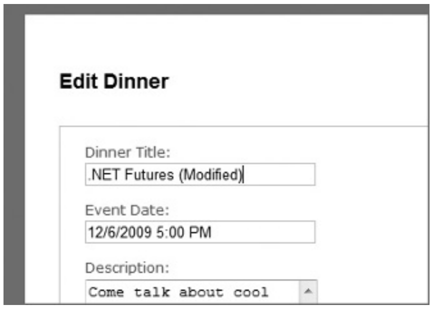
We could use the `UpdateModel` method to implement our HTTP-POST `Edit` action using this code:

```
    //
    // POST: /Dinners/Edit/2

    [HttpPost]
    public ActionResult Edit(int id, FormCollection formValues) {

        Dinner dinner = dinnerRepository.GetDinner(id);

        UpdateModel(dinner);

        dinnerRepository.Save();

        return RedirectToAction("Details", new { id = dinner.DinnerID });
    }
```

Code snippet 1-31.txt

We can now visit the `/Dinners/Edit/1` URL and change the title of our Dinner (see Figure 1-87).

When we click the Save button, we'll perform a form post to our `Edit` action, and the updated values will be persisted in the database. We will then be redirected to the Details URL for the Dinner (which will display the newly saved values like those in Figure 1-88).



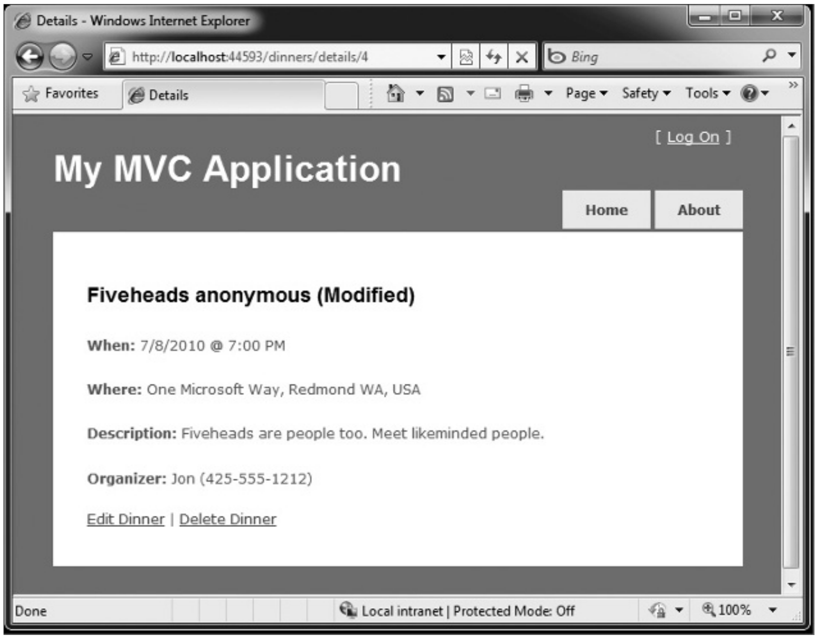
Edit Dinner

Dinner Title: .NET Futures (Modified)

Event Date: 12/6/2009 5:00 PM

Description: Come talk about cool

FIGURE 1-87


Details - Windows Internet Explorer
http://localhost:44593/dinners/details/4
Bing
Favorites
Details
Page
Safety
Tools
[Log On]
Home
About
Done
Local intranet | Protected Mode: Off
100%

My MVC Application

Fiveheads anonymous (Modified)

When: 7/8/2010 @ 7:00 PM

Where: One Microsoft Way, Redmond WA, USA

Description: Fiveheads are people too. Meet likeminded people.

Organizer: Jon (425-555-1212)

Edit Dinner | Delete Dinner

FIGURE 1-88

Handling Edit Errors

Our current HTTP-POST implementation works fine — except when there are errors.

When a user makes a mistake editing a form, we need to make sure that the form is redisplayed with an informative error message that guides them to fix it. This includes cases in which an end user posts incorrect input (e.g., a malformed date string), as well as cases in which the input format is valid, but there is a business rule violation. When errors occur, the form should preserve the input data the user originally entered so that they don't have to refill their changes manually. This process should repeat as many times as necessary until the form successfully completes.

ASP.NET MVC includes some nice built-in features that make error handling and form redisplay easy. To see these features in action, let's update our `Edit` action method with the following code:

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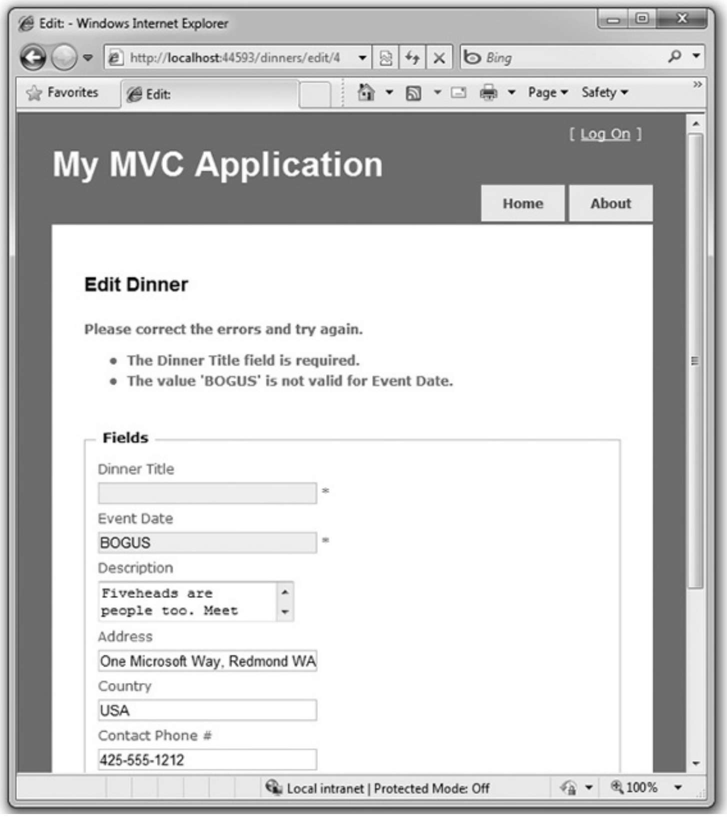
```
//
// POST: /Dinners/Edit/2

[HttpPost]
public ActionResult Edit(int id, FormCollection formValues) {
    Dinner dinner = dinnerRepository.GetDinner(id);
    if(TryUpdateModel(dinner)) {
        dinnerRepository.Save();
        return RedirectToAction("Details", new { id=dinner.DinnerID });
    }
    return View(dinner);
}
```

Code snippet 1-32.txt

To see this working, let's re-run the application, edit a Dinner, and change it to have an empty Title and an Event Date of *BOGUS*. When we press the Save button, our HTTP-POST `Edit` method will not be able to save the Dinner (because there are errors) and will redisplay the form shown in Figure 1-89.


Edit: - Windows Internet Explorer
http://localhost:44593/dinners/edit/4
Bing
Favorites
Edit:
Page
Safety
[Log On]
Home
About
Local intranet | Protected Mode: Off
100%

My MVC Application

Edit Dinner

Please correct the errors and try again.

- The Dinner Title field is required.
- The value 'BOGUS' is not valid for Event Date.

Fields

Dinner Title: *

Event Date: BOGUS *

Description: Fiveheads are people too. Meet

Address: One Microsoft Way, Redmond WA

Country: USA

Contact Phone #: 425-555-1212

FIGURE 1-89

Our application has a decent error experience. The text elements with the invalid input are highlighted in red, and validation error messages are displayed to the end user about them. The form is also preserving the input data the user originally entered — so that they don't have to refill anything.

How, you might ask, did this occur? How did the Title and Event Date textboxes highlight themselves in red and know to output the originally entered user values? And how did error messages get displayed in the list at the top? The good news is that this didn't occur by magic — rather, it was because we used some of the built-in ASP.NET MVC features that make input validation and error handling scenarios easy.

Understanding ModelState and the Validation HTML Helper Methods

Controller classes have a `ModelState` property collection that provides a way to indicate that errors exist with a Model object being passed to a View. Error entries within the ModelState collection identify the name of the Model property with the issue (e.g., *Title*, *EventDate*, or *ContactPhone*), and allow a human-friendly error message to be specified (e.g., "Title is required").

The `TryUpdateModel` helper method automatically populates the ModelState collection when it encounters errors while trying to assign form values to properties on the `Model` object. For example, our `Dinner` object's `EventDate` property is of type `DateTime`. When the `UpdateModel` method was unable to assign the string value `BOGUS` to it in the previous scenario, the `UpdateModel` method added an entry to the ModelState collection indicating that an assignment error had occurred with that property.

HTML Helper Integration with ModelState

HTML helper methods (like `Html.TextBoxFor`) check the ModelState collection when rendering output. If an error for the item exists, they render the user-entered value and a CSS error class.

For example, in our `"Edit"` View, we are using the `Html.TextBoxFor` helper method to render the `EventDate` of our `Dinner` object:

```
<%: Html.TextBoxFor(model => model.EventDate) %>
```

When the View was rendered in the error scenario, the `Html.TextBoxFor` method `checked` the ModelState collection to see if there were any errors associated with the `"EventDate"` property of our `Dinner` object. When it determined that there was an error, it rendered the submitted user input (`"BOGUS"`) as the value and added a CSS error class to the `<input type="textbox"/>` markup it generated:

```
<input class="input-validation-error" id="EventDate"
name="EventDate" type="text" value="BOGUS" />
```

You can customize the appearance of the CSS error class to look however you want. The default CSS error class — `input-validation-error` — is defined in the \content\site.css style sheet and looks like the code below:

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```
.input-validation-error
{
    border: 1px solid #ff0000;
    background-color: #ffeeee;
}
```

Code snippet 1-33.txt

This CSS rule is what caused our invalid input elements to be highlighted, as in Figure 1-90.

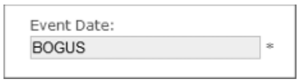


FIGURE 1-90

Html .ValidationMessageFor Helper Method

The `Html.ValidationMessageFor` helper method can be used to output the `ModelState` error message associated with a particular model property:

```
<%: Html.ValidationMessageFor(model => model.EventDate) %>
```

The previous code outputs:

```
<span class="field-validation-error"> The value 'BOGUS' is invalid</span>
```

The `Html.ValidationMessageFor` helper method also supports a second parameter that allows developers to override the error text message that is displayed:

```
<%: Html.ValidationMessageFor(model => model.EventDate, "*") %>
```

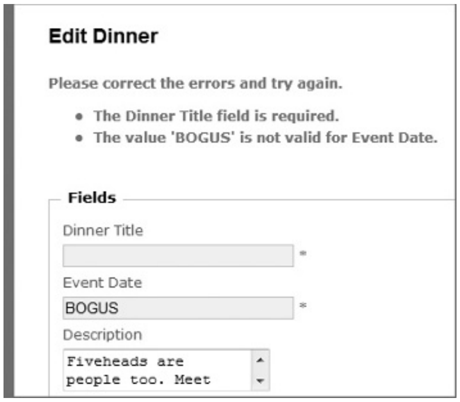
The previous code outputs:

```
<span class="field-validation-error">*</span>
```

instead of the default error text when an error is present for the `EventDate` property.

Html.ValidationSummary Helper Method

The `Html.ValidationSummary` helper method can be used to render a summary error message, accompanied by a `<ul><li/></ul>` list of all detailed error messages in the ModelState collection as shown in Figure 1-91.



Edit Dinner

Please correct the errors and try again.

- The Dinner Title field is required.
- The value 'BOGUS' is not valid for Event Date.

Fields

Dinner Title

*

Event Date

BOGUS *

Description

Fiveheads are
people too. Meet

FIGURE 1-91

The `Html.ValidationSummary` helper method takes an optional string parameter — which defines a summary error message to display above the list of detailed errors:

```
<%: Html.ValidationSummary("Please correct the errors and try again.") %>
```

You can optionally use CSS to override what the error list looks like.

Complete Edit Action Method Implementations

The following code implements all of the Controller logic necessary for our Edit scenario:

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```
//
// GET: /Dinners/Edit/2

public ActionResult Edit(int id) {

    Dinner dinner = dinnerRepository.GetDinner(id);
    return View(dinner);
}
//
// POST: /Dinners/Edit/2

[HttpPost]
public ActionResult Edit(int id, FormCollection formValues) {
    Dinner dinner = dinnerRepository.GetDinner(id);
    if(TryUpdateModel(dinner)) {
        dinnerRepository.Save();

        return RedirectToAction("Details", new { id=dinner.DinnerID });
    }
    return View(dinner);
}
```

Code snippet 1-34.txt

The nice thing about our Edit implementation is that neither our Controller class nor our View template has to know anything about the specific validation rules being enforced by our Dinner model. We can add additional rules to our model in the future and *do not have to make any code changes* to our Controller or View in order for them to be supported. This provides us with the flexibility to easily evolve our application requirements in the future with a minimum of code changes.

Implementing the HTTP-GET Create Action Method

We've finished implementing the `Edit` behavior of our `DinnersController` class. Let's now move on to implement the `Create` support on it — which will enable users to add new Dinners.

We'll begin by implementing the HTTP-GET behavior of our `Create` action method. This method will be called when someone visits the `/Dinners/Create` URL. Our implementation looks like this:

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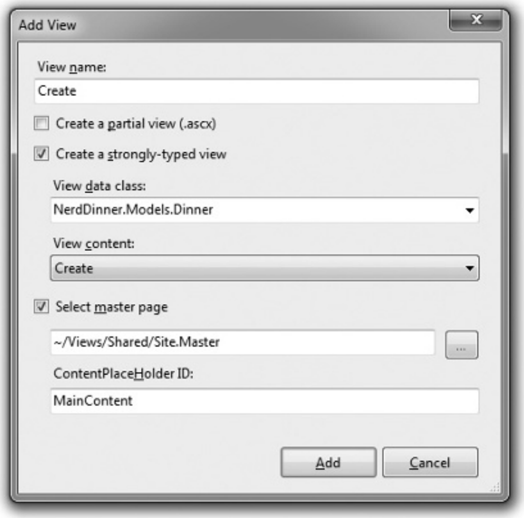
```
//
// GET: /Dinners/Create

public ActionResult Create() {

    Dinner dinner = new Dinner() {
        EventDate = DateTime.Now.AddDays(7)
        };

        return View(dinner);
    }
```

Code snippet 1-35.txt

The previous code creates a new `Dinner` object and assigns its `EventDate` property to be one week in the future. It then renders a View that is based on the new `Dinner` object. Because we haven't explicitly passed a name to the `View` helper method, it will use the convention-based default path to resolve the View template: /Views/Dinners/Create.aspx.

Let's now create this View template. We can do this by right-clicking within the `Create` action method and selecting the "Add View" context menu command. Within the "Add View" dialog we'll indicate that we are passing a `Dinner` object to the View template and choose to auto-scaffold a Create template (see Figure 1-92).



View name: Create

[ ] Create a partial view (.ascx)

[✓] Create a strongly-typed view

View data class: NerdDinner.Models.Dinner

View content: Create

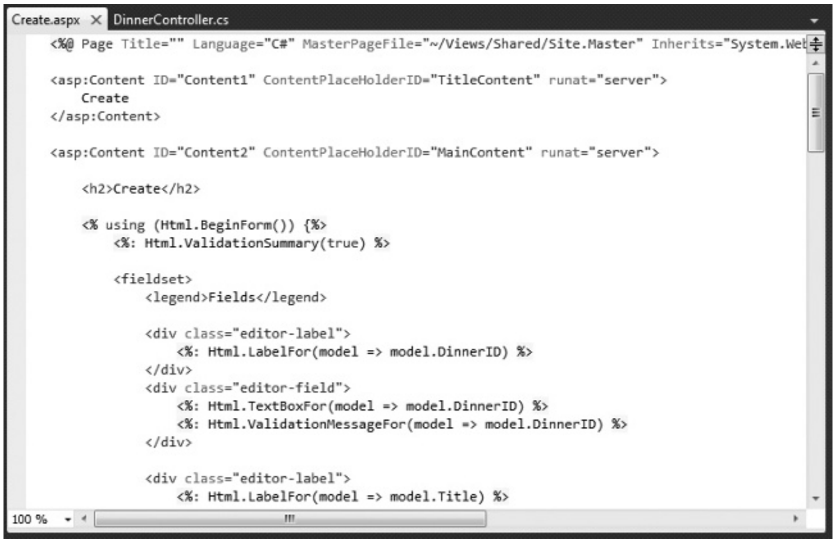
[✓] Select master page

~/Views/Shared/Site.Master

ContentPlaceHolder ID: MainContent

FIGURE 1-92

When we click the Add button, Visual Studio will save a new scaffold-based Create.aspx View to the \Views\Dinners directory and open it up within the integrated development environment (IDE) (see Figure 1-93).



```
<%@ Page Title="" Language="C#" MasterPageFile="~/Views/Shared/Site.Master" Inherits="System.We

<asp:Content ID="Content1" ContentPlaceHolderID="TitleContent" runat="server">
    Create
</asp:Content>

<asp:Content ID="Content2" ContentPlaceHolderID="MainContent" runat="server">

    <h2>Create</h2>

    <% using (Html.BeginForm()) {%>
        <%: Html.ValidationSummary(true) %>

        <fieldset>
            <legend>Fields</legend>

            <div class="editor-label">
                <%: Html.LabelFor(model => model.DinnerID) %>
            </div>
            <div class="editor-field">
                <%: Html.TextBoxFor(model => model.DinnerID) %>
                <%: Html.ValidationMessageFor(model => model.DinnerID) %>
            </div>

            <div class="editor-label">
                <%: Html.LabelFor(model => model.Title) %>
```

FIGURE 1-93

Let's make a few changes to the default "create" scaffold file that was generated for us, and modify it up to look like the code below:

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```
<asp:Content ID="Title" ContentPlaceHolderID="TitleContent" runat="server">
    Host a Dinner
</asp:Content>

<asp:Content ID="Main" ContentPlaceHolderID="MainContent" runat="server">

    <h2>Host a Dinner</h2>

    <%: Html.ValidationSummary("Please correct the errors and try again.") %>

    <% using (Html.BeginForm()) {%>

        <fieldset>
            <p>
                <%: Html.LabelFor(m => m.Title) %>
                <%: Html.TextBoxFor(m => m.Title) %>
                <%: Html.ValidationMessageFor(m => m.Title, "*") %>
            </p>
            <p>
                <%: Html.LabelFor(m => m.EventDate) %>
                <%: Html.TextBoxFor(m => m.EventDate) %>
                <%: Html.ValidationMessageFor(m => m.EventDate, "*") %>
            </p>
            <p>
                <%: Html.LabelFor(m => m.Description) %>
                <%: Html.TextAreaFor(m => m.Description) %>
                <%: Html.ValidationMessageFor(m => m.Description, "*") %>
            </p>
            <p>
                <%: Html.LabelFor(m => m.Address) %>
                <%: Html.TextBoxFor(m => m.Address) %>
                <%: Html.ValidationMessageFor(m => m.Address, "*") %>
            </p>
            <p>
                <%: Html.LabelFor(m => m.Country) %>
                <%: Html.TextBoxFor(m => m.Country) %>
                <%: Html.ValidationMessageFor(m => m.Country, "*") %>
            </p>
            <p>
                <%: Html.LabelFor(m => m.ContactPhone) %>
                <%: Html.TextBoxFor(m => m.ContactPhone) %>
                <%: Html.ValidationMessageFor(m => m.ContactPhone, "*") %>
            </p>
            <p>
                <%: Html.LabelFor(m => m.Latitude) %>
                <%: Html.TextBoxFor(m => m.Latitude) %>
                <%: Html.ValidationMessageFor(m => m.Latitude, "*") %>
            </p>
            <p>
                <%: Html.LabelFor(m => m.Longitude) %>
                <%: Html.TextBoxFor(m => m.Longitude) %>
                <%: Html.ValidationMessageFor(m => m.Longitude, "*") %>
            </p>
            <p>
                <input type="submit" value="Save" />
            </p>
        </fieldset>

    <% } %>

</asp:Content>
```

Code snippet 1-36.txt

And now when we run our application and access the `/Dinners/Create` URL within the browser, it will render the UI as in Figure 1-94 from our `Create` action implementation.

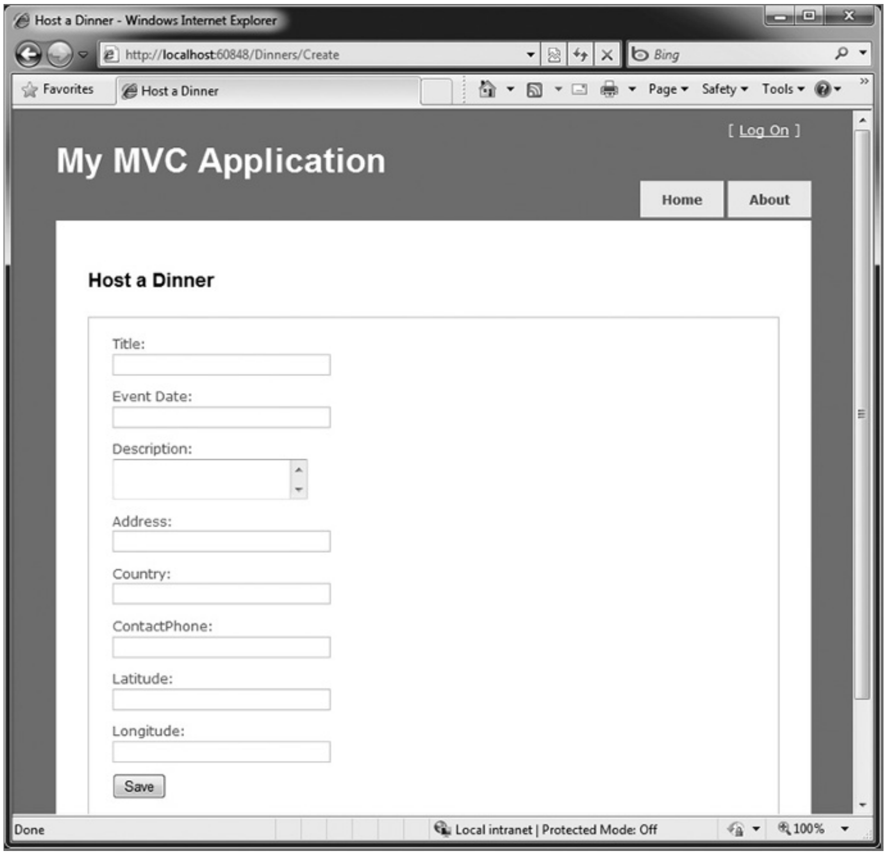

FIGURE 1-94

Implementing the HTTP-POST Create Action Method

We have the HTTP-GET version of our `Create` action method implemented. When a user clicks the Save button, it performs a form post to the `/Dinners/Create` URL and submits the HTML `<input>` form values using the HTTP-POST verb.

Let's now implement the HTTP-POST behavior of our `Create` action method. We'll begin by adding an overloaded `Create` action method to our `DinnersController` that has an `HttpPost` attribute on it that indicates it handles HTTP-POST scenarios:

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```
//
// POST: /Dinners/Create

[HttpPost]
public ActionResult Create(FormCollection formValues) {
    ...
}
```

Code snippet 1-37.txt

There are a variety of ways in which we can access the posted form parameters within our HTTP-POST-enabled `Create` method.

One approach is to create a new `Dinner` object and then use the `UpdateModel` helper method (as we did with the `Edit` action) to populate it with the posted form values. We can then add it to our `DinnerRepository`, persist it to the database, and redirect the user to our `Details` action to show the newly created Dinner, using the following code:

```
//
// POST: /Dinners/Create

[HttpPost]
public ActionResult Create(FormCollection formValues) {
    Dinner dinner = new Dinner();

    if(TryUpdateModel(dinner)) {
        dinnerRepository.Add(dinner);
        dinnerRepository.Save();

        return RedirectToAction("Details", new {id=dinner.DinnerID});
    }
    return View(dinner);
}
```

Code snippet 1-38.txt

Alternatively, we can use an approach in which we have our `Create` action method take a `Dinner` object as a method parameter. ASP.NET MVC will then automatically instantiate a new `Dinner` object for us, populate its properties using the form inputs, and pass it to our action method:

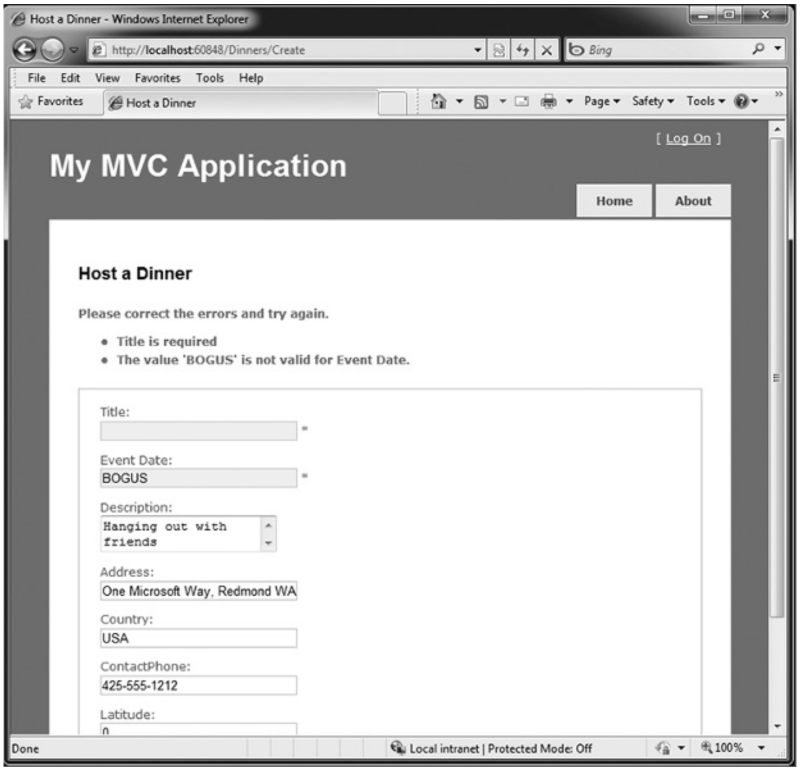
```
//
// POST: /Dinners/Create

[HttpPost]
public ActionResult Create(Dinner dinner) {
    if (ModelState.IsValid) {
        dinner.HostedBy = "SomeUser";

        dinnerRepository.Add(dinner);
        dinnerRepository.Save();

        return RedirectToAction("Details", new {id = dinner.DinnerID });
        }
        return View(dinner);
    }
```

Code snippet 1-39.txt

Our action method in the previous code verifies that the `Dinner` object has been successfully populated with the form post values by checking the `ModelState.IsValid` property. This will return `false` if there are input conversion issues (e.g., a string of `"BOGUS"` for the `EventDate` property), and if there are any issues, our action method redisplays the form.

If the input values are valid, then the action method attempts to add and save the new Dinner to the `DinnerRepository`.

To see this error handling behavior in action, we can request the `/Dinners/Create` URL and fill out details about a new Dinner. Incorrect input or values will cause the Create form to be redisplayed with the errors highlighted as in Figure 1-95.


Host a Dinner - Windows Internet Explorer
http://localhost:60848/Dinners/Create
File Edit View Favorites Tools Help
Favorites
Host a Dinner
[Log On]
My MVC Application
Home
About
Local intranet | Protected Mode: Off
100%
Done

Host a Dinner

Please correct the errors and try again.

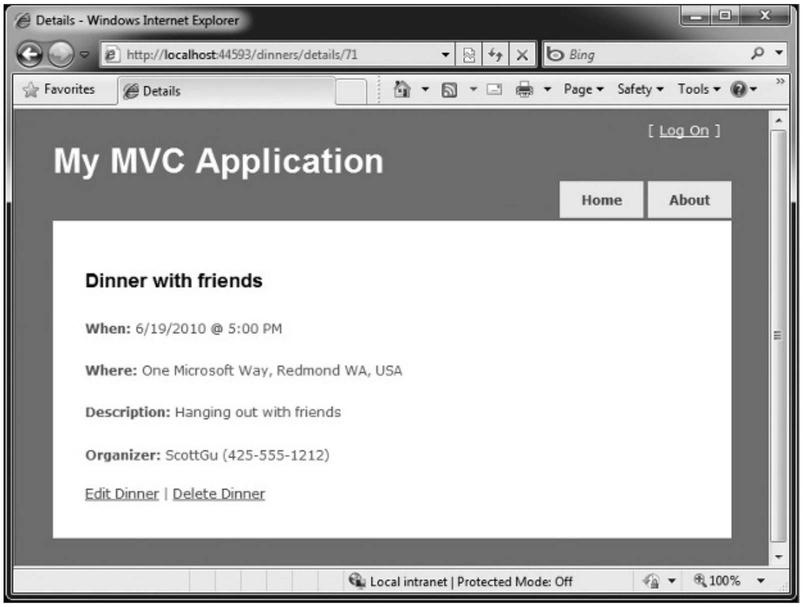
- Title is required
- The value 'BOGUS' is not valid for Event Date.

Title:
Event Date: BOGUS
Description: Hanging out with friends
Address: One Microsoft Way, Redmond WA
Country: USA
ContactPhone: 425-555-1212
Latitude: 0

FIGURE 1-95

Notice how our Create form is honoring the exact same validation and business rules as our Edit form. This is because our validation and business rules were defined in the model and were not embedded within the UI or Controller of the application. This means we can later change/evolve our validation or business rules in a single place and have them apply throughout our application. We will not have to change any code within either our `Edit` or `Create` action method to automatically honor any new rules or modifications to existing ones.

When we fix the input values and click the Save button again, our addition to the `DinnerRepository` will succeed, and a new Dinner will be added to the database. We will then be redirected to the `/Dinners/Details/[id]` URL — where we will be presented with details about the newly created Dinner (see Figure 1-96).


Details - Windows Internet Explorer
http://localhost:44593/dinners/details/71
Bing
Favorites
Details
Page
Safety
Tools
[Log On]
My MVC Application
Home
About

Dinner with friends

When: 6/19/2010 @ 5:00 PM

Where: One Microsoft Way, Redmond WA, USA

Description: Hanging out with friends

Organizer: ScottGu (425-555-1212)

Edit Dinner | Delete Dinner

Local intranet | Protected Mode: Off
100%

FIGURE 1-96

Implementing the HTTP-GET Delete Action Method

Let's now add "Delete" support to our `DinnersController`.

We'll begin by implementing the HTTP-GET behavior of our `Delete` action method. This method will get called when someone visits the `/Dinners/Delete/[id]` URL. Below is the implementation:

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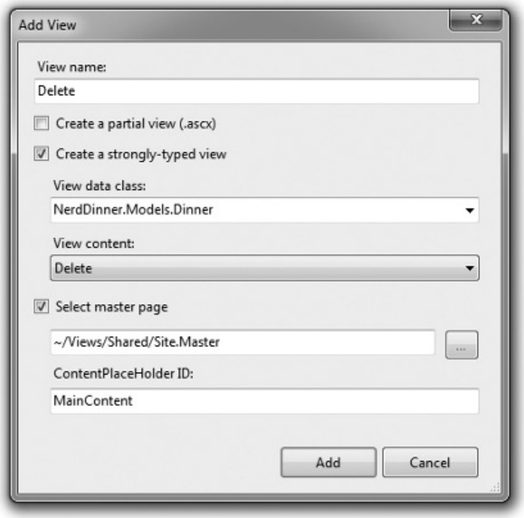
```
//
// HTTP GET: /Dinners/Delete/1

public ActionResult Delete(int id) {

    Dinner dinner = dinnerRepository.GetDinner(id);

    if (dinner == null)
        return View("NotFound");
    else
        return View(dinner);
}
```

Code snippet 1-40.txt

The action method attempts to retrieve the Dinner to be deleted. If the dinner exists, it renders a View based on the `Dinner` object. If the object doesn't exist (or has already been deleted), it returns a View that renders the `"NotFound"` View template we created earlier for our `Details` action method.

We can create the `"Delete"` View template by right-clicking within the `Delete` action method and selecting the "Add View" context menu command. Within the "Add View" dialog, we'll indicate that we are passing a `Dinner` object to our View template as its Model, and choose to create a delete template as shown in Figure 1-97.



View name: Delete
Create a partial view (.ascx): [ ]
Create a strongly-typed view: [✓]
View data class: NerdDinner.Models.Dinner
View content: Delete
Select master page: [✓]
~/Views/Shared/Site.Master
ContentPlaceHolder ID: MainContent

FIGURE 1-97

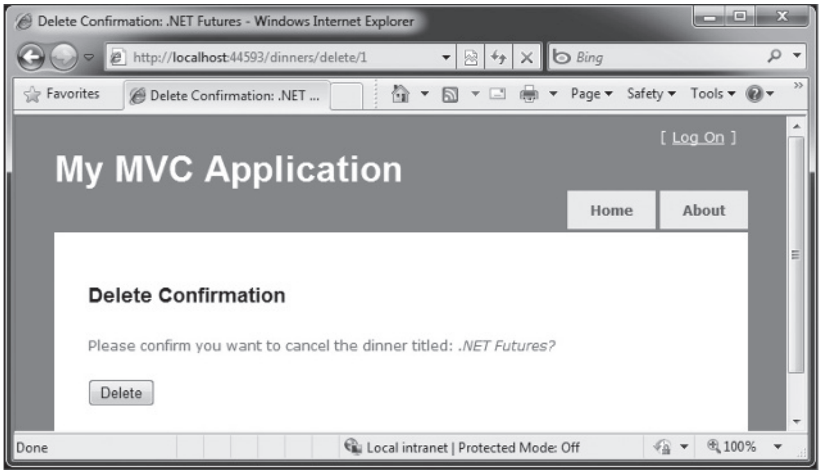
When we click the Add button, Visual Studio will add a new Delete.aspx View template file for us within our \Views\Dinners directory. We'll add some HTML and code to the template to implement a Delete Confirmation screen, as shown below:

```
<asp:Content ID="Title" ContentPlaceHolderID="TitleContent" runat="server">
    Delete Confirmation: <%: Model.Title %>
</asp:Content>

<asp:Content ID="Main" ContentPlaceHolderID="MainContent" runat="server">

    <h2>
        Delete Confirmation
    </h2>

    <div>
        <p>Please confirm you want to cancel the dinner titled:
        <i> <%: Model.Title %>? </i> </p>
    </div>

    <% using (Html.BeginForm()) { %>

        <input name="confirmButton" type="submit" value="Delete" />

    <% } %>

</asp:Content>
```

Code snippet 1-41.txt

The code above displays the title of the Dinner to be deleted and outputs a `<form>` element that does a POST to the `/Dinners/Delete/[id]` URL if the end user clicks the Delete button within it.

When we run our application and access the `/Dinners/Delete/[id]` URL for a valid `Dinner` object, it renders the UI as shown in Figure 1-98.



Delete Confirmation: .NET Futures - Windows Internet Explorer
http://localhost:44593/dinners/delete/1
Bing
Favorites
Delete Confirmation: .NET ...
Page
Safety
Tools
[Log On]
My MVC Application
Home
About
Delete
Done
Local intranet | Protected Mode: Off
100%

Delete Confirmation

Please confirm you want to cancel the dinner titled: *.NET Futures?*

FIGURE 1-98

PRODUCT TEAM ASIDE

Why Are We Doing a POST?

You might ask — why did we go through the effort of creating a `<form>` within our Delete Confirmation screen? Why not just use a standard hyperlink to link to an action method that does the actual delete operation?

The reason is because we want to be careful to guard against Web-crawlers and search engines discovering our URLs and inadvertently causing data to be deleted when they follow the links. HTTP-GET-based URLs are considered *safe* for them to access/crawl, and they are supposed to not follow HTTP-POST ones.

A good rule is to make sure that you always put destructive or data-modifying operations behind HTTP-POST requests.

Implementing the HTTP-POST Delete Action Method

We now have the HTTP-GET version of our `Delete` action method implemented that displays a Delete Confirmation screen. When an end user clicks the Delete button, it will perform a form post to the `/Dinners/Dinner/[id]` URL.

Let's now implement the HTTP-POST behavior of the `Delete` action method using the code that follows:

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```
//
// HTTP POST: /Dinners/Delete/1

[HttpPost]
public ActionResult Delete(int id, string confirmButton) {

    Dinner dinner = dinnerRepository.GetDinner(id);

    if (dinner == null)
        return View("NotFound");

    dinnerRepository.Delete(dinner);
    dinnerRepository.Save();

    return View("Deleted");
}
```

Code snippet 1-42.txt

The HTTP-POST version of our `Delete` action method attempts to retrieve the `Dinner` object to delete. If it can't find it (because it has already been deleted), it renders our `"NotFound"` template. If it finds the Dinner, it deletes it from the `DinnerRepository`. It then renders a `"Deleted"` template.

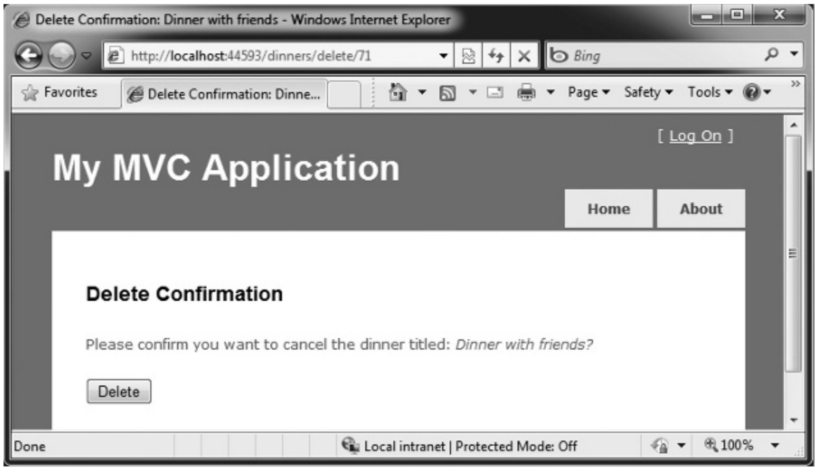
To implement the `"Deleted"` template, we'll right-click in the action method and choose the "Add View" context menu. We'll name our view **Deleted** and have it be an empty template (and not take a strongly typed `Model` object). We'll then add some HTML content to it:

```
<asp:Content ID="Title" ContentPlaceHolderID="TitleContent" runat="server">
      Dinner Deleted
</asp:Content>

<asp:Content ID="Main" ContentPlaceHolderID="MainContent" runat="server">
    <h2>Dinner Deleted</h2>

    <div>
        <p>Your dinner was successfully deleted.</p>
    </div>
    <div>
        <p><a href="/dinners">Click for Upcoming Dinners</a></p>
    </div>
</asp:Content>
```

Code snippet 1-43.txt

And now when we run our application and access the `/Dinners/Delete/[id]` URL for a valid `Dinner` object, it will render our Dinner Delete Confirmation screen as shown in Figure 1-99.

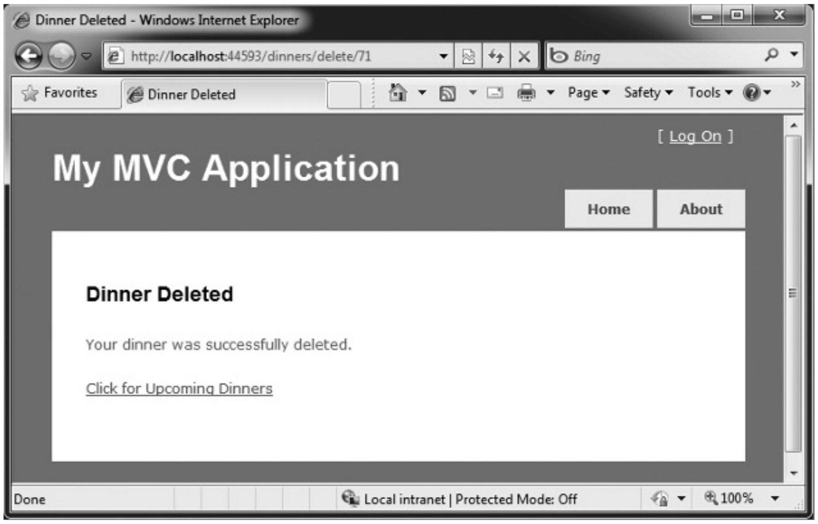
When we click the Delete button, it will perform an HTTP POST to the `/Dinners/Delete/[id]` URL, which will delete the Dinner from our database, and display our `"Deleted"` View template (see Figure 1-100).


Delete Confirmation: Dinner with friends - Windows Internet Explorer
http://localhost:44593/dinners/delete/71
Bing
Favorites
Delete Confirmation: Dinne...
Page
Safety
Tools
[Log On]
My MVC Application
Home
About
Delete
Done
Local intranet | Protected Mode: Off
100%

Delete Confirmation

Please confirm you want to cancel the dinner titled: *Dinner with friends?*

FIGURE 1-99


Dinner Deleted - Windows Internet Explorer
http://localhost:44593/dinners/delete/71
Bing
Favorites
Dinner Deleted
Page
Safety
Tools
[Log On]
My MVC Application
Home
About
Click for Upcoming Dinners
Done
Local intranet | Protected Mode: Off
100%

Dinner Deleted

Your dinner was successfully deleted.

FIGURE 1-100

Model Binding Security

We've discussed two different ways to use the built-in model-binding features of ASP.NET MVC. The first using the `UpdateModel` method to update properties on an existing `Model` object, and the second using ASP.NET MVC's support for passing `Model` objects in as action method parameters. Both of these techniques are very powerful and extremely useful.

This power also brings with it responsibility. It is important to always be paranoid about security when accepting any user input, and this is also true when binding objects to form input. You should be careful to always HTML-encode any user-entered values to avoid HTML and JavaScript injection attacks, and be careful of SQL injection attacks.

We are using Entity Framework for our application, which automatically encodes parameters to prevent SQL Injection attacks.

You should never rely on client-side validation alone, and always use server-side validation to guard against hackers attempting to send you bogus values.

One additional security item to make sure you think about when using the binding features of ASP.NET MVC is the scope of the objects you are binding. Specifically, you want to make sure you understand the security implications of the properties you are allowing to be bound, and make sure you only allow those properties that really should be updatable by an end user to be updated.

By default, the `UpdateModel` method will attempt to update all properties on the `Model` object that match incoming form parameter values. Likewise, objects passed as action method parameters also, by default, can have all of their properties set via form parameters.

Locking Down Binding on a Per-Usage Basis

You can lock down the binding policy on a per-usage basis by providing an explicit *include list* of properties that can be updated. This can be done by passing an extra string array parameter to the `UpdateModel` method like the following code:

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```
string[] allowedProperties = new[]{"Title", "Description",
                                              "ContactPhone", "Address",
                                              "EventDate", "Latitude",
                                     "Longitude"};

UpdateModel(dinner, allowedProperties);
```

Code snippet 1-44.txt

Objects passed as action method parameters also support a `[Bind]` attribute that enables an include list of allowed properties to be specified like the code that follows:

```
//
// POST: /Dinners/Create

[HttpPost]
public ActionResult Create( [Bind(Include="Title,Address")] Dinner dinner ) {
    ...
}
```

Code snippet 1-45.txt

Locking Down Binding on a Type Basis

You can also lock down the binding rules on a per-type basis. This allows you to specify the binding rules once and then have them apply in all scenarios (including both `UpdateModel` and action method parameter scenarios) across all Controllers and action methods.

You can customize the per-type binding rules by adding a `[Bind]` attribute onto a type. You can then use the `Bind` attribute's `Include` and `Exclude` properties to control which properties are bindable for the particular class or interface.

We'll use this technique for the `Dinner` class in our NerdDinner application and add a `[Bind]` attribute to it that restricts the list of bindable properties to the following:

```
[Bind(Include="Title,Description,EventDate,Address,Country,ContactPhone,Latitude,
               Longitude")]
public partial class Dinner {
}
```

Code snippet 1-46.txt

Notice we are not allowing the RSVPs collection to be manipulated via binding, nor are we allowing the `DinnerID` or `HostedBy` properties to be set via binding. For security reasons, we'll instead only manipulate these particular properties using explicit code within our action methods.

CRUD Wrap-Up

ASP.NET MVC includes several built-in features that help with implementing form posting scenarios. We used a variety of these features to provide CRUD (Create Read Update Delete) UI support on top of our `DinnerRepository`.

We are using a Model-focused approach to implement our application. This means that all our validation and business rule logic is defined within our Model layer — and not within our Controllers or Views. Neither our Controller class nor our View templates know anything about the specific business rules being enforced by our Dinner Model class.

This will keep our application architecture clean and make it easier to test. We can add additional business rules to our Model layer in the future and *not have to make any code changes* to our Controller or View in order for them to be supported. This is going to provide us with a great deal of agility to evolve and change our application in the future.

Our `DinnersController` now enables Dinner listings/details, as well as create, edit, and delete support. The complete code for the class can be found below:

Available for download on Wrox.com

```
public class DinnersController : Controller {

    DinnerRepository dinnerRepository = new DinnerRepository();

    //
    // GET: /Dinners/

    public ActionResult Index() {
        var dinners = dinnerRepository.FindUpcomingDinners().ToList();
        return View(dinners);
    }

    //
    // GET: /Dinners/Details/2

    public ActionResult Details(int id) {
        Dinner dinner = dinnerRepository.GetDinner(id);

        if (dinner == null)
            return View("NotFound");
        else
            return View(dinner);
    }

    //
    // GET: /Dinners/Edit/2

    public ActionResult Edit(int id) {
        Dinner dinner = dinnerRepository.GetDinner(id);
        return View(dinner);
    }

    //
    // POST: /Dinners/Edit/2

    [HttpPost]
    public ActionResult Edit(int id, FormCollection formValues) {
        Dinner dinner = dinnerRepository.GetDinner(id);

        if (TryUpdateModel(dinner)){

            dinnerRepository.Save();

            return RedirectToAction("Details", new { id = dinner.DinnerID });
        }
        return View(dinner);
    }


    //
    // GET: /Dinners/Create

    public ActionResult Create() {
        Dinner dinner = new Dinner() {
            EventDate = DateTime.Now.AddDays(7)
        };
        return View(dinner);
    }

    //
    // POST: /Dinners/Create

    [HttpPost]
    public ActionResult Create(Dinner dinner) {
        if (ModelState.IsValid) {
            dinner.HostedBy = "SomeUser";
            dinnerRepository.Add(dinner);
            dinnerRepository.Save();

            return RedirectToAction("Details", new{id=dinner.DinnerID});
        }
```

```
            return View(dinner);
        }

        //
        // HTTP GET: /Dinners/Delete/1

        public ActionResult Delete(int id) {
            Dinner dinner = dinnerRepository.GetDinner(id);

            if (dinner == null)
                return View("NotFound");
            else
                return View(dinner);
        }
        //
        // HTTP POST: /Dinners/Delete/1

        [HttpPost]
        public ActionResult Delete(int id, string confirmButton) {

            Dinner dinner = dinnerRepository.GetDinner(id);

            if (dinner == null)
                return View("NotFound");

            dinnerRepository.Delete(dinner);
            dinnerRepository.Save();

            return View("Deleted");
        }
    }
```

Code snippet 1-47.txt

VIEWDATA AND VIEWMODEL

We've covered several form post scenarios and discussed how to implement create, read, update, and delete (CRUD) support. We'll now take our `DinnersController` implementation further and enable support for richer form editing scenarios. While doing this, we'll discuss two approaches that can be used to pass data from Controllers to Views: `ViewData` and `ViewModel`.

Passing Data from Controllers to View Templates

One of the defining characteristics of the MVC pattern is the strict *separation of concerns* it helps enforce between the different components of an application. Models, Controllers, and Views each have well-defined roles and responsibilities, and they communicate with each other in well-defined ways. This helps promote testability and code reuse.

When a Controller class decides to render an HTML response back to a client, it is responsible for explicitly passing to the View template all of the data needed to render the response. View templates *should never* perform any data retrieval or application logic — and should instead limit themselves to only having rendering code that is driven off of the Model data passed to it by the Controller.

Right now the Model data being passed by our `DinnersController` class to our View templates is simple and straightforward — a list of `Dinner` objects in the case of `Index`, and a single `Dinner` object in the case of `Details`, `Edit`, `Create`, and `Delete`. As we add more UI capabilities to our application, we are often going to need to pass more than just this data to render HTML responses within our View templates. For example, we might want to change the `Country` field within our Edit and Create views from being an HTML textbox to being a dropdown list. Rather than hard-code the dropdown list of country names in the View template, we might want to generate it from a list of supported countries that we populate dynamically. We will need a way to pass both the `Dinner` object *and* the list of supported countries from our Controller to our View templates.

Let's look at two ways we can accomplish this.

Using the ViewData Dictionary

The Controller base class exposes a `ViewDataDictionary` property that can be used to pass additional data items from Controllers to Views.

For example, to support the scenario in which we want to change the Country textbox within our Edit view from being an HTML textbox to a dropdown list, we can update our `Edit` action method to pass (in addition to a `Dinner` object) a `SelectList` object that can be used as the Model of a Countries dropdown list:

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```
//
// GET: /Dinners/Edit/5

[Authorize]
public ActionResult Edit(int id) {

    Dinner dinner = dinnerRepository.GetDinner(id);
    var countries = new[] {
        "USA",
        "Afghanistan",
        "Akrotiri",
        "Albania",
        //… omitted for brevity
        "Zimbabwe"
    };


    ViewData["Countries"] = new SelectList(countries, dinner.Country);

    return View(dinner);
}
```

Code snippet 1-48.txt

For now, we define the list of countries within this controller action. That's something we'll need to fix later as we'll need to reuse that list in other places.

The constructor of the `SelectList` from the previous code is accepting a list of countries to populate the dropdown list with, as well as the currently selected value.

We can then update our Edit.aspx View template to use the `Html.DropDownListFor` helper method instead of the `Html.TextBoxFor` helper method we used previously:

```
<%: Html.DropDownListFor(model => model.Country,
ViewData["Countries"] as SelectList) %>
```

The `Html.DropDownListFor` helper method in the previous line of code takes two parameters. The first is an expression that specifies the name of the HTML form element to output. The second is the `SelectList` model we passed via the `ViewDataDictionary`. We are using the C# `as` keyword to cast the type within the dictionary as a `SelectList`.

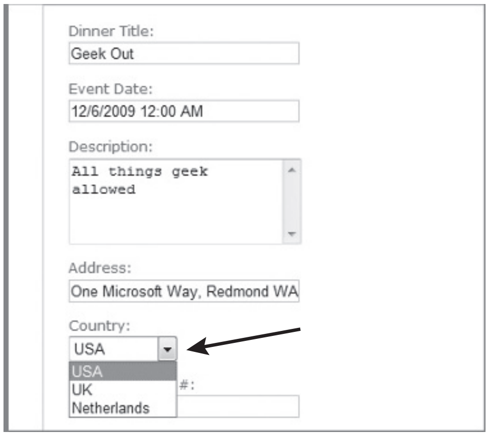
Dinner Title:
Geek Out
Event Date:
12/6/2009 12:00 AM
Description:
All things geek allowed
Address:
One Microsoft Way, Redmond WA
Country:
USA

FIGURE 1-101

And now when we run our application and access the `/Dinners/Edit/1` URL within our browser, we'll see that our Edit UI has been updated to display a dropdown list of countries instead of a textbox (Figure 1-101).

Because we also render the Edit View template from the HTTP-POST `Edit` method (in scenarios when errors occur), we'll want to make sure that we also update this method to add the `SelectList` to `ViewData` when the View template is rendered in error scenarios:

```
//
// POST: /Dinners/Edit/5

[HttpPost]
public ActionResult Edit(int id, FormCollection collection) {
    Dinner dinner = dinnerRepository.GetDinner(id);

    if(TryUpdateModel(dinner)) {
        dinnerRepository.Save();

        return RedirectToAction("Details", new { id=dinner.DinnerID });
    }

    var countries = new[] {
        "USA",
        "Afghanistan",
        "Akrotiri",
        "Albania",
        //… omitted for brevity
        "Zimbabwe"
    };

    ViewData["countries"] = new SelectList(countries, dinner.Country);
    return View(dinner)
}
```

Code snippet 1-49.txt

And now our DinnersController Edit scenario supports a dropdown list.

Using a ViewModel Pattern

The ViewDataDictionary approach has the benefit of being fairly fast and easy to implement. Some developers don't like using string-based dictionaries, though, since typos can lead to errors that will not be caught at compile-time. The untyped ViewDataDictionary also requires using the as operator or casting when using a strongly typed language like C# in a View template.

An alternative approach that we could use is one often referred to as the *ViewModel pattern*. When using this pattern, we create strongly typed classes that are optimized for our specific View scenarios and that expose properties for the dynamic values/content needed by our View templates. Our Controller classes can then populate and pass these View-optimized classes to our View template to use. This enables type safety, compile-time checking, and editor IntelliSense within View templates.

For example, to enable Dinner form editing scenarios, we can create a DinnerFormViewModel class like the following code that exposes two strongly typed properties: a Dinner object and the SelectList model needed to populate the Countries dropdown list:

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```
public class DinnerFormViewModel {

    private static string[] _countries = new[] {
        "USA",
        "Afghanistan",
        "Akrotiri",
        "Albania",
        //… omitted for brevity
        "Zimbabwe"
    };


    // Properties
    public Dinner     Dinner    { get; private set; }
    public SelectList Countries { get; private set; }

    // Constructor
    public DinnerFormViewModel(Dinner dinner) {
        Dinner = dinner;

        Countries = new SelectList(_countries, dinner.Country);
    }
}
```

Code snippet 1-50.txt

We can then update our Edit action method to create the DinnerFormViewModel using the Dinner object we retrieve from our repository, and then pass it to our View template:

```
//
// GET: /Dinners/Edit/5

[Authorize]
```

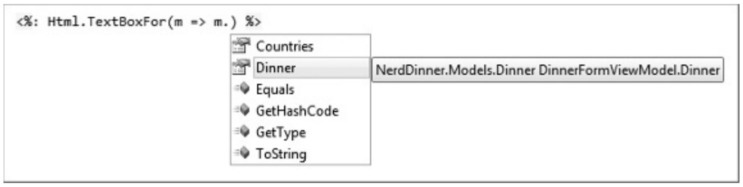
```
public ActionResult Edit(int id) {

    Dinner dinner = dinnerRepository.GetDinner(id);

    return View(new DinnerFormViewModel(dinner));
}
```

Code snippet 1-51.txt

We'll then update our View template so that it expects a `DinnerFormViewModel` instead of a `Dinner` object by changing the `Inherits` attribute at the top of the edit.aspx page like so:

```
Inherits="System.Web.Mvc.ViewPage<NerdDinner.Controllers.DinnerFormViewModel>
```

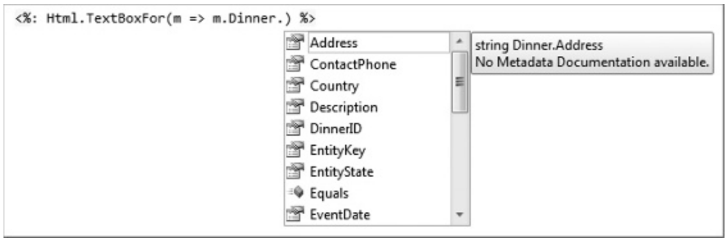
Once we do this, the IntelliSense of the `Model` property within our View template will be updated to reflect the object model of the `DinnerFormViewModel` type we are passing it (see Figure 1-102 and Figure 1-103).



```
<%: Html.TextBoxFor(m => m.) %>
```

NerdDinner.Models.Dinner DinnerFormViewModel.Dinner

FIGURE 1-102



```
<%: Html.TextBoxFor(m => m.Dinner.) %>
```

string Dinner.Address
No Metadata Documentation available.

FIGURE 1-103

We can then update our View code to work off of it. Notice in the following code how we are not changing the names of the input elements we are creating (the form elements will still be named `"Title"`, `"Country"`) — but we are updating the HTML Helper methods to retrieve the values using the `DinnerFormViewModel` class:

```
<p>
    <%: Html.LabelFor(m => m.Title) %>
    <%: Html.TextBoxFor(m => m.Title) %>
    <%: Html.ValidationMessageFor(m => m.Title, "*") %>
</p>
<p>
    <%: Html.LabelFor(m => m.Country) %>
```

```
        <%: Html.DropDownListFor(m => m.Country, Model.Countries) %>
        <%: Html.ValidationMessageFor(m => m.Country, "*") %>
    </p>
```

Code snippet 1-52.txt

We'll also update our `Edit` post method to use the `DinnerFormViewModel` class when rendering errors:

```
    //
    // POST: /Dinners/Edit/5

    [HttpPost]
    public ActionResult Edit(int id, FormCollection collection) {
        Dinner dinner = dinnerRepository.GetDinner(id);

        if(TryUpdateModel(dinner)) {
            dinnerRepository.Save();

            return RedirectToAction("Details", new { id=dinner.DinnerID });
        }

        return View(new DinnerFormViewModel(dinner));
    }
```

Code snippet 1-53.txt

We can also update our `Create` action methods to reuse the exact same `DinnerFormViewModel` class to enable the Countries dropdown list within those as well. The following code is the HTTP-GET implementation:

```
    //
    // GET: /Dinners/Create

    public ActionResult Create() {

        Dinner dinner = new Dinner() {
            EventDate = DateTime.Now.AddDays(7)
        };

        return View(new DinnerFormViewModel(dinner));
    }
```

Code snippet 1-54.txt

The following code is the implementation of the HTTP-POST `Create` method:

```
    //
    // POST: /Dinners/Create

    [HttpPost]
    public ActionResult Create(Dinner dinner) {

        if (ModelState.IsValid) {
                dinner.HostedBy = "SomeUser";

                dinnerRepository.Add(dinner);
                dinnerRepository.Save();

                return RedirectToAction("Details", new { id=dinner.DinnerID });
            }

            return View(new DinnerFormViewModel(dinnerToCreate));
        }
```

Code snippet 1-55.txt

And now both our Edit and Create screens support dropdown lists for picking the country.

Custom-Shaped ViewModel Classes

In the scenario above, our `DinnerFormViewModel` class directly exposes the `Dinner` model object as a property, along with a supporting `SelectList` model property. This approach works fine for scenarios in which the HTML UI we want to create within our View template corresponds relatively closely to our domain model objects.

For scenarios where this isn't the case, one option that you can use is to create a custom-shaped `ViewModel` class whose object model is more optimized for consumption by the View — and that might look completely different from the underlying domain model object. For example, it could potentially expose different property names and/or aggregate properties collected from multiple model objects.

Custom-shaped `ViewModel` classes can be used both to pass data from Controllers to Views to render and to help handle form data posted back to a `Controller`'s action method. For this later scenario, you might have the action method update a `ViewModel` object with the form-posted data, and then use the `ViewModel` instance to map or retrieve an actual domain model object.

Custom-shaped `ViewModel` classes can provide a great deal of flexibility and are something to investigate any time you find the rendering code within your View templates or the form-posting code inside your action methods starting to get too complicated. This is often a sign that your domain models don't cleanly correspond to the UI you are generating and that an intermediate custom-shaped `ViewModel` class can help.

PARTIALS AND MASTER PAGES

One of the design philosophies that ASP.NET MVC embraces is the *Don't Repeat Yourself* principle (commonly referred to as *DRY*). A DRY design helps eliminate the duplication of code and logic, which ultimately makes applications faster to build and easier to maintain.

We've already seen the DRY principle applied in several of our NerdDinner scenarios. A few examples: Our validation logic is implemented within our Model layer, which enables it to be enforced across both Edit and Create scenarios in our Controller; we are reusing the `"NotFound"` View template across the `Edit`, `Details`, and `Delete` action methods; we are using a convention-naming pattern with our View templates, which eliminates the need to explicitly specify the name when we call the `View` helper method; and we are reusing the `DinnerFormViewModel` class for both Edit and Create action scenarios.

Let's now look at ways we can apply the DRY principle within our View templates to eliminate code duplication there as well.

Revisiting Our Edit and Create View Templates

Currently we are using two different View templates — Edit.aspx and Create.aspx — to display our Dinner form UI. A quick visual comparison of them highlights how similar they are. Figure 1-104 shows what the Create form looks like.

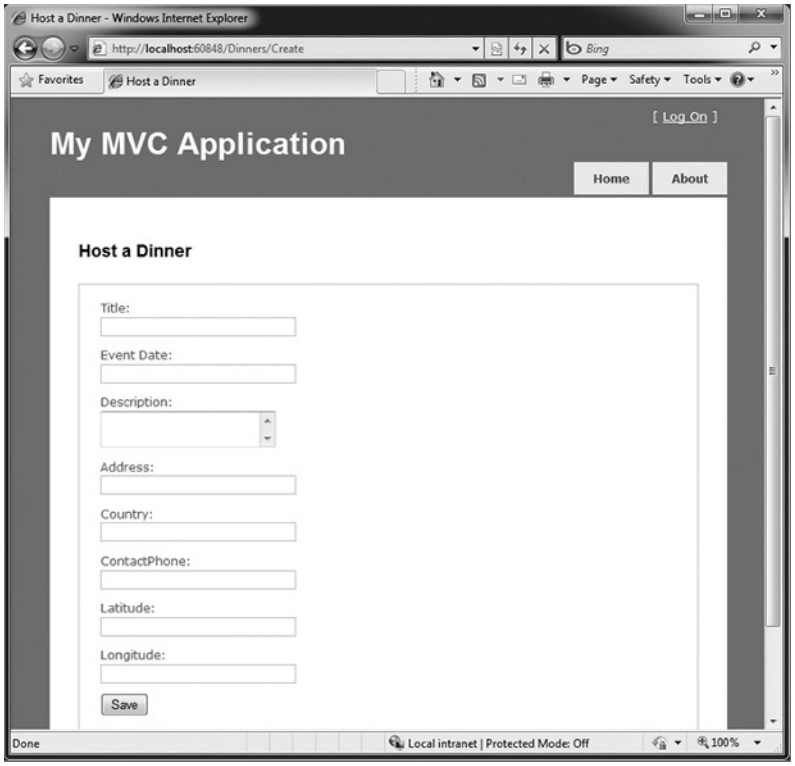
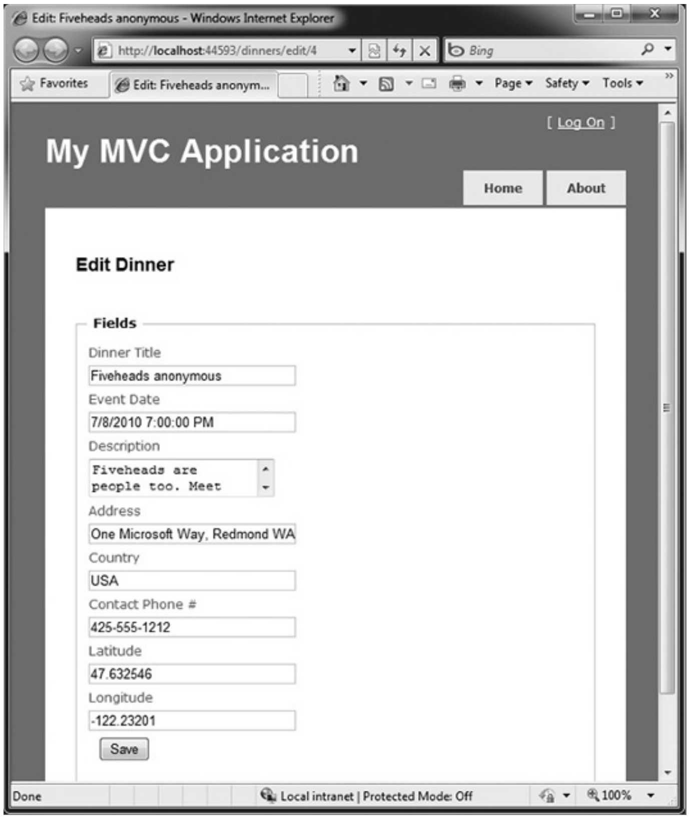


FIGURE 1-104

And Figure 1-105 is what our "Edit" form looks like.

Not much of a difference, is there? Other than the title and header text, the form layout and input controls are identical.


Edit: Fiveheads anonymous - Windows Internet Explorer
http://localhost:44593/dinners/edit/4
Bing
Favorites
Edit: Fiveheads anonym...
Page
Safety
Tools
[Log On]
Home
About
Save
Done
Local intranet | Protected Mode: Off
100%

My MVC Application

Edit Dinner

Fields

Dinner Title
Fiveheads anonymous

Event Date
7/8/2010 7:00:00 PM

Description
Fiveheads are
people too. Meet

Address
One Microsoft Way, Redmond WA

Country
USA

Contact Phone #
425-555-1212

Latitude
47.632546

Longitude
-122.23201

FIGURE 1-105

If we open up the Edit.aspx and Create.aspx View templates, we'll find that they contain identical form layout and input control code. This duplication means that we end up having to make changes twice whenever we introduce or change a new `Dinner` property — which is not good.

Using Partial View Templates

ASP.NET MVC supports the ability to define *Partial View* templates that can be used to encapsulate View rendering logic for a subportion of a page. Partials provide a useful way to define View rendering logic once and then reuse it in multiple places across an application.

To help "DRY-up" our Edit.aspx and Create.aspx View template duplication, we can create a Partial View template named DinnerForm.ascx that encapsulates the form layout and input elements common to both. We'll do this by right-clicking our \Views\Dinners directory and choosing the Add ➪ View menu command shown in Figure 1-106.

This will display the “Add View” dialog. We’ll name the new View we want to create **DinnerForm**, select the “Create a partial view” checkbox on the dialog, and indicate that we will pass it a `DinnerFormViewModel` class (see Figure 1-107).

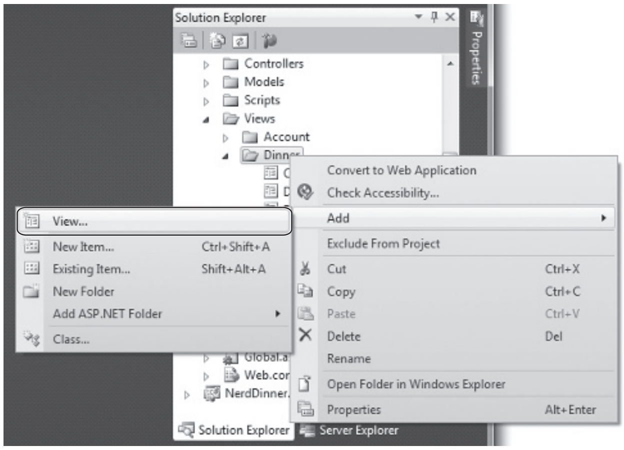
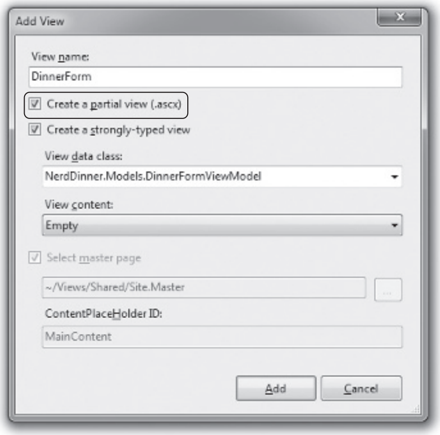


FIGURE 1-106



Add View

View name: DinnerForm

[✓] Create a partial view (.ascx)

[✓] Create a strongly-typed view

View data class: NerdDinner.Models.DinnerFormViewModel

View content: Empty

[✓] Select master page

~/Views/Shared/Site.Master

ContentPlaceHolder ID: MainContent

FIGURE 1-107

When we click the Add button, Visual Studio will create a new DinnerForm.ascx View template for us within the \Views\Dinners directory.

We can then copy/paste the duplicate form layout/input control code from our Edit.aspx/ Create.aspx View templates into our new DinnerForm.ascx Partial View template:

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```
<%: Html.ValidationSummary("Please correct the errors and try again.") %>

<% using (Html.BeginForm()) { %>

  <fieldset>

    <p>
      <%: Html.LabelFor(m => m.Title) %>
      <%: Html.TextBoxFor(m => m.Title) %>
      <%: Html.ValidationMessageFor(m => m.Title, "*") %>
    </p>
    <p>
      <%: Html.LabelFor(m => m.EventDate) %>
      <%: Html.TextBoxFor(m => m.EventDate) %>
      <%: Html.ValidationMessageFor(m => m.EventDate, "*") %>
    </p>
    <p>
      <%: Html.LabelFor(m => m.Description) %>
      <%: Html.TextAreaFor(m => m.Description) %>
      <%: Html.ValidationMessageFor(m => m.Description, "*")%>
    </p>
    <p>
      <%: Html.LabelFor(m => m.Address) %>
      <%: Html.TextBoxFor(m => m.Address) %>
```

```
                <%: Html.ValidationMessageFor(model => model.Address, "*") %>
            </p>
            <p>
                <%: Html.LabelFor(m => m.Country) %>
                <%: Html.DropDownListFor(m => m.Country, Model.Countries) %>
                <%: Html.ValidationMessageFor(m => m.Country, "*") %>
            </p>
            <p>
                <%: Html.LabelFor(m => m.ContactPhone) %>
                <%: Html.TextBoxFor(m => m.ContactPhone) %>
                <%: Html.ValidationMessageFor(m => m.ContactPhone, "*") %>
            </p>

            <p>
                <input type="submit" value="Save" />
            </p>
        </fieldset>

    <% } %>
```

Code snippet 1-56.txt

We can then update our Edit and Create View templates to call the DinnerForm Partial template and eliminate the form duplication. We can do this by calling `Html.RenderPartial("DinnerForm")` within our View templates:

CREATE.ASPX

```
<asp:Content ID="Title" ContentPlaceHolderID="TitleContent" runat="server">
    Host a Dinner
</asp:Content>

<asp:Content ID="Create" ContentPlaceHolderID="MainContent" runat="server">

    <h2>Host a Dinner</h2>

    <% Html.RenderPartial("DinnerForm"); %>

</asp:Content>
```

EDIT.ASPX

```
<asp:Content ID="Title" ContentPlaceHolderID="TitleContent" runat="server">
    Edit: <%: Model.Dinner.Title %>
</asp:Content>

<asp:Content ID="Edit" ContentPlaceHolderID="MainContent" runat="server">

    <h2>Edit Dinner</h2>

    <% Html.RenderPartial("DinnerForm"); %>

</asp:Content>
```

Code snippet 1-57.txt

You can explicitly qualify the path of the Partial template you want when calling `Html.RenderPartial` (e.g., ~/Views/Dinners/DinnerForm.ascx). In our previous code, though, we were taking advantage of the convention-based naming pattern within ASP.NET MVC and just specifying *DinnerForm* as the name of the Partial to render. When we do this, ASP.NET MVC will look first in the convention-based views directory (for `DinnersController` this would be /Views/Dinners). If it doesn't find the Partial template there, it will then look for it in the /Views/Shared directory.

When `Html.RenderPartial` is called with just the name of the Partial View, ASP.NET MVC will pass to the Partial View the same `Model` and `ViewData` dictionary objects used by the calling View template. Alternatively, there are overloaded versions of `Html.RenderPartial` that enable you to pass an alternate `Model` object and/or ViewData dictionary for the partial view to use. This is useful for scenarios in which you only want to pass a subset of the full Model/ViewModel.

PRODUCT TEAM ASIDE

Why <% %> instead of <%: %>?

One of the subtle things you might have noticed with the previous code is that we are using a `<% %>` block instead of a `<%: %>` block when calling `Html.RenderPartial`.

`<%: %>` blocks in ASP.NET indicate that a developer wants to render a specified value (e.g., `<%: "Hello" %>` would render "Hello"). `<% %>` blocks instead indicate that the developer wants to execute code and that any rendered output within them must be done explicitly (e.g., `<% Response.Write("Hello"); %>`).

The reason we are using a `<% %>` block with our previous `Html.RenderPartial` code is because the `Html.RenderPartial` method doesn't return a string and instead outputs the content directly to the calling View template's output stream. It does this for performance efficiency reasons, and by doing so, it avoids the need to create a (potentially very large) temporary string object. This reduces memory usage and improves overall application throughput.

One common mistake when using `Html.RenderPartial` is to forget to add a semicolon at the end of the call when it is within a `<% %>` block. For example, this code will cause a compiler error:

```
<% Html.RenderPartial("DinnerForm") %>
```

You instead need to write:

```
<% Html.RenderPartial("DinnerForm"); %>
```

This is because `<% %>` blocks are self-contained code statements and, when using C# code statements, need to be terminated with a semicolon.

Using Partial View Templates to Clarify Code

We created the DinnerForm Partial View template to avoid duplicating View rendering logic in multiple places. This is the most common reason to create Partial View templates.

Sometimes it still makes sense to create Partial Views even when they are only being called in a single place. Very complicated View templates can often become much easier to read when their View rendering logic is extracted and partitioned into one or more well-named Partial templates.

For example, consider the following code snippet from the e file in our project (which we will be looking at shortly). The code is relatively straightforward to read — partly because the logic to display a login/logout link at the top right of the screen is encapsulated within the LogOnUserControl Partial:

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```
<div id="header">
    <div id="title">
        <h1>My MVC Application</h1>
    </div>

    <div id="logindisplay">
        <% Html.RenderPartial("LogOnUserControl"); %>
    </div>

    <div id="menucontainer">

        <ul id="menu">
            <li><%: Html.ActionLink("Home", "Index", "Home")%></li>
            <li><%: Html.ActionLink("About", "About", "Home")%></li>
        </ul>

    </div>
</div>
```

Code snippet 1-58.txt

Whenever you find yourself getting confused trying to understand the HTML/code markup within a View template, consider whether it wouldn't be clearer if some of it was extracted and refactored into well-named Partial Views.

Master Pages

In addition to supporting Partial Views, ASP.NET MVC also supports the ability to create Master Page templates that can be used to define the common layout and top-level HTML of a site. Content placeholder controls can then be added to the Master Page to identify replaceable regions that can be overridden or *filled in* by Views. This provides a very effective (and DRY) way to apply a common layout across an application.

By default, new ASP.NET MVC projects have a Master Page template automatically added to them. This Master Page is named Site.master and lives within the \Views\Shared\ folder, as shown in Figure 1-108.

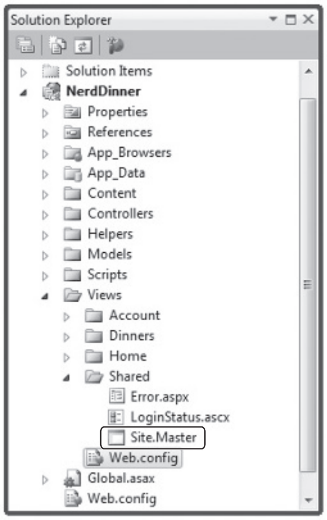


FIGURE 1-108

The default Site.master file looks like the following code. It defines the outer HTML of the site, along with a menu for navigation at the top. It contains two replaceable content placeholder controls — one for the title and the other for where the primary content of a Page should be replaced:

Available for download on Wrox.com

```
<%@ Master Language="C#" Inherits="System.Web.Mvc.ViewMasterPage" %>

<!DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.0 Strict//EN"
"http://www.w3.org/TR/xhtml1/DTD/xhtml1-strict.dtd">
<html xmlns="http://www.w3.org/1999/xhtml">

<head runat="server">
   <title><asp:ContentPlaceHolder ID="TitleContent" runat="server" /></title>
   <link href="../../Content/Site.css" rel="stylesheet" type="text/css" />
</head>

<body>
    <div class="page">

        <div id="header">
            <div id="title">
                <h1>My MVC Application</h1>
            </div>

            <div id="logindisplay">
                <% Html.RenderPartial("LogOnUserControl"); %>
            </div>

            <div id="menucontainer">

                <ul id="menu">
                    <li><%: Html.ActionLink("Home", "Index", "Home")%></li>
                    <li><%: Html.ActionLink("About", "About", "Home")%></li>
                </ul>

            </div>
        </div>

        <div id="main">
            <asp:ContentPlaceHolder ID="MainContent" runat="server" />
        </div>
    </div>
</body>
</html>
```

Code snippet 1-59.txt

All of the View templates we've created for our NerdDinner application (`"List"`, `"Details"`, `"Edit"`, `"Create"`, `"NotFound"`, etc.) have been based on this Site.master template. This is indicated via the `MasterPageFile` attribute that was added by default to the top `<% @ Page %>` directive when we created our Views using the "Add View" dialog:

```
<%@ Page Language="C#"
Inherits="System.Web.Mvc.ViewPage<NerdDinner.Controllers
.DinnerViewModel>" MasterPageFile="~/Views/Shared/Site.Master" %>
```

Code snippet 1-60.txt

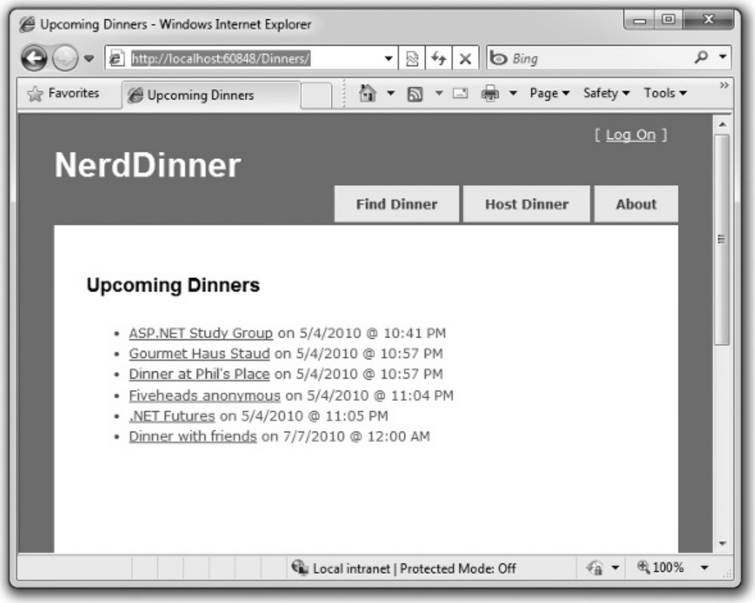
What this means is that we can change the Site.master content and have the changes automatically be applied and used when we render any of our View templates.

Let's update our Site.master's header section so that the header of our application is "NerdDinner" instead of "My MVC Application." Let's also update our navigation menu so that the first tab is "Find a Dinner" (handled by the `HomeController`'s `Index` action method), and let's add a new tab called "Host a Dinner" (handled by the `DinnersController`'s `Create` action method):

```
<div id="header">
    <div id="title">
        <h1>NerdDinner</h1>
    </div>

    <div id="logindisplay">
        <% Html.RenderPartial("LoginStatus"); %>
    </div>

    <div id="menucontainer">
        <ul id="menu">
           <li><%: Html.ActionLink("Find Dinner", "Index", "Home")%></li>
           <li><%: Html.ActionLink("Host Dinner", "Create", "Dinners")%></li>
           <li><%: Html.ActionLink("About", "About", "Home")%></li>
        </ul>
    </div>
</div>
```

Code snippet 1-61.txt

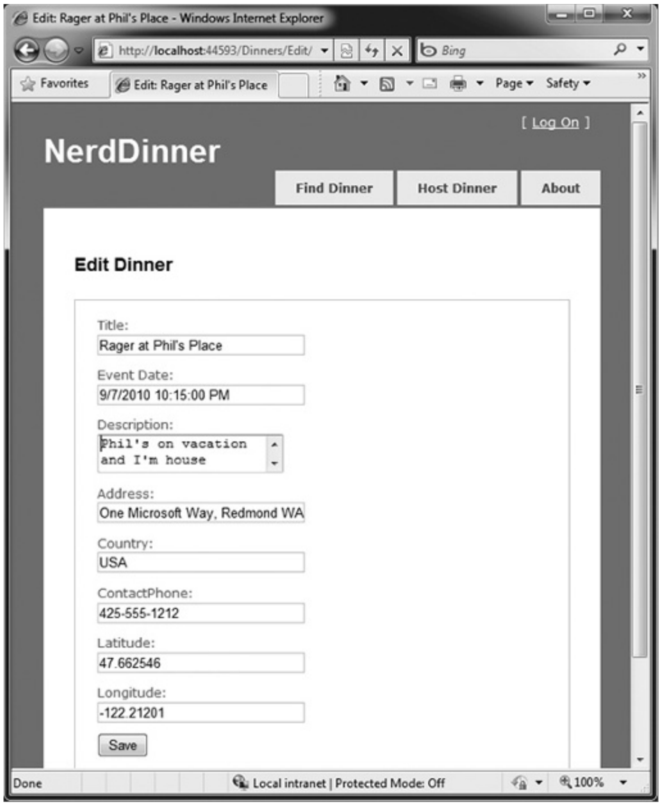
When we save the Site.master file and refresh our browser, we'll see our header changes show up across all Views within our application (e.g., see Figure 1-109) and with the `/Dinners/Edit/[id]` URL (see Figure 1-110).


Upcoming Dinners - Windows Internet Explorer
http://localhost:60848/Dinners/
Bing
Favorites
Upcoming Dinners
Page
Safety
Tools
[Log On]
NerdDinner
Find Dinner
Host Dinner
About
Local intranet | Protected Mode: Off
100%

Upcoming Dinners

- ASP.NET Study Group on 5/4/2010 @ 10:41 PM
- Gourmet Haus Staud on 5/4/2010 @ 10:57 PM
- Dinner at Phil's Place on 5/4/2010 @ 10:57 PM
- Fiveheads anonymous on 5/4/2010 @ 11:04 PM
- .NET Futures on 5/4/2010 @ 11:05 PM
- Dinner with friends on 7/7/2010 @ 12:00 AM

FIGURE 1-109


Edit: Rager at Phil's Place - Windows Internet Explorer
http://localhost:44593/Dinners/Edit/
Bing
Favorites
Edit: Rager at Phil's Place
Page
Safety
[Log On]
NerdDinner
Find Dinner
Host Dinner
About
Save
Done
Local intranet | Protected Mode: Off
100%

Edit Dinner

Title:
Rager at Phil's Place

Event Date:
9/7/2010 10:15:00 PM

Description:
Phil's on vacation and I'm house

Address:
One Microsoft Way, Redmond WA

Country:
USA

ContactPhone:
425-555-1212

Latitude:
47.662546

Longitude:
-122.21201

FIGURE 1-110

Partials and Master Pages provide very flexible options that enable you to cleanly organize views. You'll find that they help you avoid duplicating View content/code, and make your View templates easier to read and maintain.

PAGING SUPPORT

If our site is successful, it will have thousands of upcoming Dinners. We need to make sure that our UI scales to handle all of these Dinners and allows users to browse them. To enable this, we'll add paging support to our `/Dinners` URL so that instead of displaying thousands of Dinners at once, we'll only display 10 upcoming Dinners at a time — and allow end users to page back and forward through the entire list in an SEO-friendly way.

Index Action Method Recap

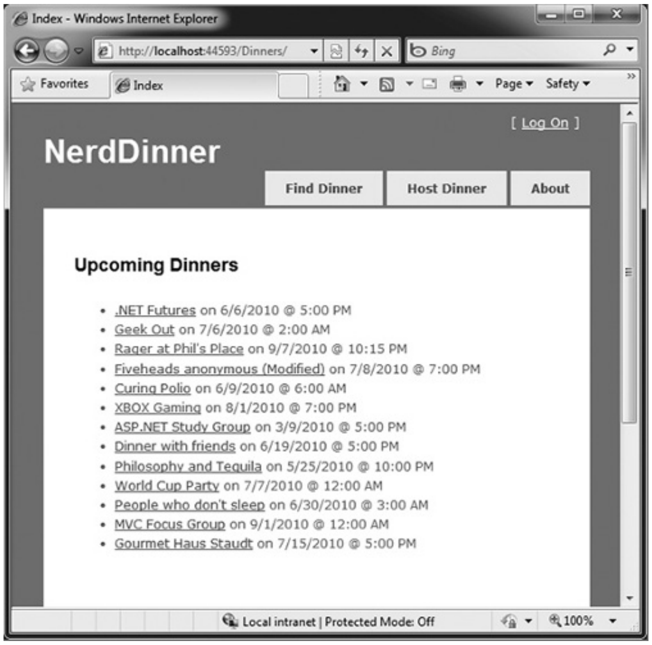
The `Index` action method within our `DinnersController` class currently looks like the following code:

Available for download on Wrox.com

```
//
// GET: /Dinners/

public ActionResult Index() {

    var dinners = dinnerRepository.FindUpcomingDinners().ToList();

    return View(dinners);
}
```

Code snippet 1-62.txt

When a request is made to the `/Dinners` URL, it retrieves a list of all upcoming Dinners and then renders a listing of all of them (see Figure 1-111).


Index - Windows Internet Explorer
http://localhost:44593/Dinners/
Bing
Favorites
Index
Page
Safety
[Log On]
NerdDinner
Find Dinner
Host Dinner
About
Local intranet | Protected Mode: Off
100%

Upcoming Dinners

- .NET Futures on 6/6/2010 @ 5:00 PM
- Geek Out on 7/6/2010 @ 2:00 AM
- Rager at Phil's Place on 9/7/2010 @ 10:15 PM
- Fiveheads anonymous (Modified) on 7/8/2010 @ 7:00 PM
- Curing Polio on 6/9/2010 @ 6:00 AM
- XBOX Gaming on 8/1/2010 @ 7:00 PM
- ASP.NET Study Group on 3/9/2010 @ 5:00 PM
- Dinner with friends on 6/19/2010 @ 5:00 PM
- Philosophy and Tequila on 5/25/2010 @ 10:00 PM
- World Cup Party on 7/7/2010 @ 12:00 AM
- People who don't sleep on 6/30/2010 @ 3:00 AM
- MVC Focus Group on 9/1/2010 @ 12:00 AM
- Gourmet Haus Staudt on 7/15/2010 @ 5:00 PM

FIGURE 1-111

Understanding IQueryable<T>

`IQueryable<T>` is an interface that was introduced with LINQ in .NET 3.5. It enables powerful *deferred execution* scenarios that we can take advantage of to implement paging support.

In our DinnerRepository in the following code we are returning an IQueryable<Dinner> sequence from our FindUpcomingDinners method:

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```
public class DinnerRepository {

    private NerdDinnerDataContext db = new NerdDinnerDataContext();

    //
    // Query Methods

    public IQueryable<Dinner> FindUpcomingDinners() {
        return from dinner in db.Dinners
               where dinner.EventDate > DateTime.Now
               orderby dinner.EventDate
               select dinner;
    }
```

Code snippet 1-63.txt

The IQueryable<Dinner> object returned by our FindUpcomingDinners method encapsulates a query to retrieve Dinner objects from our database using Entity Framework. Importantly, it won't execute the query against the database until we attempt to access/iterate over the data in the query, or until we call the ToList method on it. The code calling our FindUpcomingDinners method can optionally choose to add additional *chained* operations/filters to the IQueryable<Dinner> object before executing the query. Entity Framework is then smart enough to execute the combined query against the database when the data is requested.

To implement paging logic, we can update our Index action method so that it applies additional Skip and Take operators to the returned IQueryable<Dinner> sequence before calling ToList on it:

```
//
// GET: /Dinners/

public ActionResult Index() {

    var upcomingDinners = dinnerRepository.FindUpcomingDinners();
    var paginatedDinners = upcomingDinners.OrderBy(d => d.EventDate)
                                          .Skip(10)
                                          .Take(20).ToList();

    return View(paginatedDinners);
}
```

Code snippet 1-64.txt

The preceding code skips over the first 10 upcoming Dinners in the database and then returns 20 Dinners. Entity Framework is smart enough to construct an optimized SQL query that performs this skipping logic in the SQL database — and not in the web server. This means that even if we have millions of upcoming Dinners in the database, only the 10 we want will be retrieved as part of this request (making it efficient and scalable).

Also note that the code makes a call to OrderBy before calling Skip. The Skip method is only supported for sorted input.

Adding a *page* Value to the URL

Instead of hard-coding a specific page range, we'll want our URLs to include a *page* parameter that indicates which Dinner range a user is requesting.

Using a Querystring Value

The code that follows demonstrates how we can update our `Index` action method to support a query-string parameter and enable URLs like `/Dinners?page=2`:

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```
//
// GET: /Dinners/
//      /Dinners?page=2

public ActionResult Index(int page = 0) {

    const int pageSize = 10;

    var upcomingDinners = dinnerRepository.FindUpcomingDinners();
    var paginatedDinners = upcomingDinners.OrderBy(d => d.EventDate)
                                          .Skip(page * pageSize)
                                          .Take(pageSize)
                                          .ToList();

    return View(paginatedDinners);
}
```

Code snippet 1-65.txt

The `Index` action method in the previous code has a parameter named `page`. The parameter is declared as an integer, but with a default value of 0. This means that the `/Dinners?page=2` URL will cause a value of `2` to be passed as the parameter value. The `/Dinners` URL (without a query-string value) will cause the default value of 0 to be passed.

We are multiplying the page value by the page size (in this case, 10 rows) to determine how many Dinners to skip over.

Using Embedded URL Values

An alternative to using a query-string value would be to embed the `page` parameter within the actual URL itself. For example: `/Dinners/Page/2` or `/Dinners/2`. ASP.NET MVC includes a powerful URL routing engine that makes it easy to support scenarios like this.

We can register custom routing rules that map any incoming URL or URL format to any `Controller` class or action method we want. All we need to do is to open the Global.asax file within our project (see Figure 1-112)

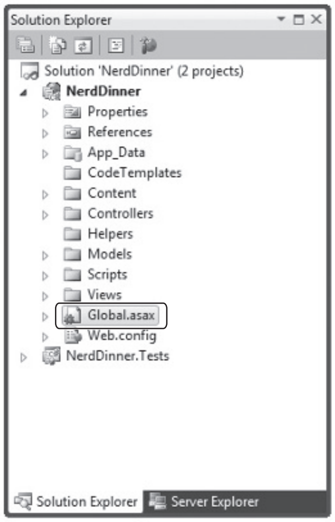

FIGURE 1-112

and then register a new mapping rule using the MapRoute helper method as in the first call to routes.MapRoute that follows:

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```
public void RegisterRoutes(RouteCollection routes) {

    routes.IgnoreRoute("{resource}.axd/{*pathInfo}");

    routes.MapRoute(
        "UpcomingDinners",
        "Dinners/Page/{page}",
        new { controller = "Dinners", action = "Index" }
    );

    routes.MapRoute(
        "Default",                                      // Route name
        "{controller}/{action}/{id}",                   // URL with params
        new { controller="Home", action="Index",
             id=UrlParameter.Optional }  // Param defaults
    );
}

void Application_Start() {
    RegisterRoutes(RouteTable.Routes);
}
```

Code snippet 1-66.txt

In the previous code, we were registering a new routing rule named UpcomingDinners. We indicate that it has the URL format Dinners/Page/{page} — where {page} is a parameter value embedded within the URL. The third parameter to the MapRoute method indicates that we should map URLs that match this format to the Index action method on the DinnersController class.

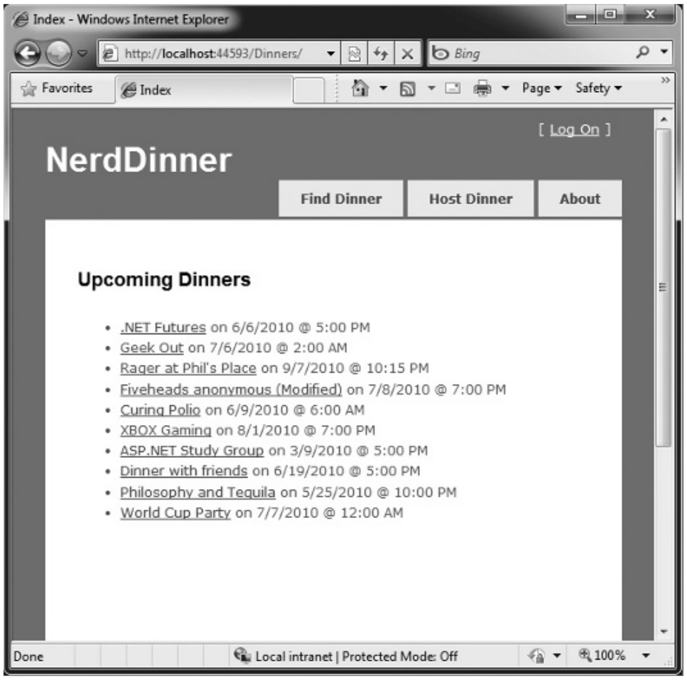
We can use the exact same Index code we had before with our Query-string scenario — except now our page parameter will come from the URL and not the query string:

```
//
// GET: /Dinners/
//      /Dinners/Page/2

public ActionResult Index(int page = 0) {

    const int pageSize = 10;

    var upcomingDinners = dinnerRepository.FindUpcomingDinners();
    var paginatedDinners = upcomingDinners.OrderBy(d => d.EventDate)
                                          .Skip(page * pageSize)
                                          .Take(pageSize)
                                          .ToList();

    return View(paginatedDinners);
}
```

Code snippet 1-67.txt

And now when we run the application and type in **/Dinners**, we'll see the first 10 upcoming Dinners, as shown in Figure 1-113.

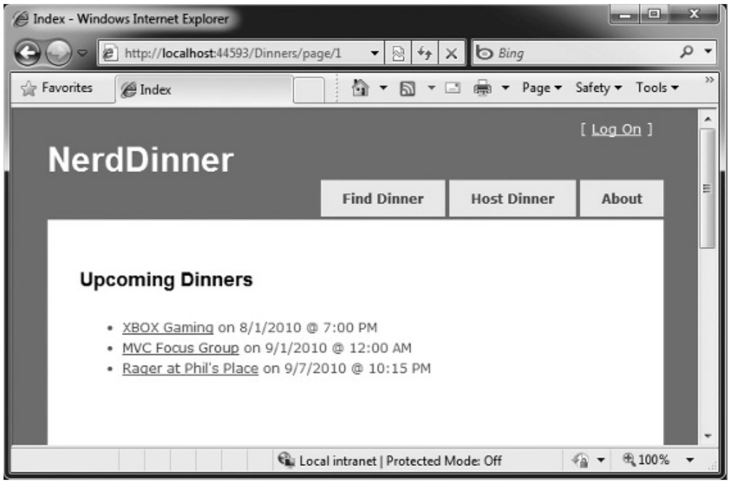
And when we type in **/Dinners/Page/1**, we'll see the next page of Dinners (see Figure 1-114).


Index - Windows Internet Explorer
http://localhost:44593/Dinners/
Bing
Favorites
Index
Page
Safety
[Log On]
NerdDinner
Find Dinner
Host Dinner
About
Done
Local intranet | Protected Mode: Off
100%

Upcoming Dinners

- .NET Futures on 6/6/2010 @ 5:00 PM
- Geek Out on 7/6/2010 @ 2:00 AM
- Rager at Phil's Place on 9/7/2010 @ 10:15 PM
- Fiveheads anonymous (Modified) on 7/8/2010 @ 7:00 PM
- Curing Polio on 6/9/2010 @ 6:00 AM
- XBOX Gaming on 8/1/2010 @ 7:00 PM
- ASP.NET Study Group on 3/9/2010 @ 5:00 PM
- Dinner with friends on 6/19/2010 @ 5:00 PM
- Philosophy and Tequila on 5/25/2010 @ 10:00 PM
- World Cup Party on 7/7/2010 @ 12:00 AM

FIGURE 1-113


Index - Windows Internet Explorer
http://localhost:44593/Dinners/page/1
Bing
Favorites
Index
Page
Safety
Tools
[Log On]
NerdDinner
Find Dinner
Host Dinner
About
Local intranet | Protected Mode: Off
100%

Upcoming Dinners

- XBOX Gaming on 8/1/2010 @ 7:00 PM
- MVC Focus Group on 9/1/2010 @ 12:00 AM
- Rager at Phil's Place on 9/7/2010 @ 10:15 PM

FIGURE 1-114

Adding Page Navigation UI

The last step to complete our paging scenario will be to implement the "Next" and "Previous" navigation UIs within our View template to enable users to easily skip over the Dinner data.

To implement this correctly, we'll need to know the total number of Dinners in the database, as well as how many pages of data this translates to. We'll then need to calculate whether the currently requested `page` value is at the beginning or end of the data, and show or hide the Previous and Next UIs accordingly. We could implement this logic within our `Index` action method. Alternatively, we can add a helper class to our project that encapsulates this logic in a more reusable way.

The following code is a simple `PaginatedList` helper class that derives from the `List<T>` collection class built into the .NET Framework. It implements a reusable collection class that can be used to paginate any sequence of IQueryable data. In our NerdDinner application we'll have it work over the `IQueryable<Dinner>` results, but it could just as easily be used against the `IQueryable<Product>` or `IQueryable<Customer>` results in other application scenarios:

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```
public class PaginatedList<T> : List<T> {

    public int PageIndex  { get; private set; }
    public int PageSize   { get; private set; }
    public int TotalCount { get; private set; }
    public int TotalPages { get; private set; }

    public PaginatedList(IQueryable<T> source, int pageIndex, int pageSize) {
        PageIndex = pageIndex;
        PageSize = pageSize;
        TotalCount = source.Count();
        TotalPages = (int) Math.Ceiling(TotalCount / (double)PageSize);

        this.AddRange(source.Skip(PageIndex * PageSize).Take(PageSize));
    }

    public bool HasPreviousPage {
        get {
            return (PageIndex > 0);
        }
    }

    public bool HasNextPage {
        get {
            return (PageIndex+1 < TotalPages);
        }
    }
}
```

Code snippet 1-68.txt

Notice in the previous code how it calculates and then exposes properties like `PageIndex`, `PageSize`, `TotalCount`, and `TotalPages`. It also then exposes two helper properties — `HasPreviousPage` and `HasNextPage` — that indicate whether the page of data in the collection is at the beginning or end of the original sequence. The above code will cause two SQL queries to be run — the first to retrieve the count of the total number of `Dinner` objects (this doesn't return the objects; rather, it performs a `SELECT COUNT` statement that returns an integer), and the second to retrieve just the rows of data we need from our database for the current page of data.

We can then update our `DinnersController.Index` helper method to create a `PaginatedList<Dinner>` from our `DinnerRepository.FindUpcomingDinners` result and pass it to our View template:

```
//
// GET: /Dinners/
//      /Dinners/Page/2

public ActionResult Index(int page = 0) {

    const int pageSize = 10;

    var upcomingDinners = dinnerRepository.FindUpcomingDinners();
    var paginatedDinners = new PaginatedList<Dinner>(upcomingDinners,
                                                     page,
                                                     pageSize);

    return View(paginatedDinners);
}
```

Code snippet 1-69.txt

We can then update the \Views\Dinners\Index.aspx View template to inherit from `ViewPage<NerdDinner.Helpers.PaginatedList<Dinner>>` instead of `ViewPage<IEnumerable<Dinner>>`, and then add the following code to the bottom of our View template to show or hide the Next and Previous navigation UIs:

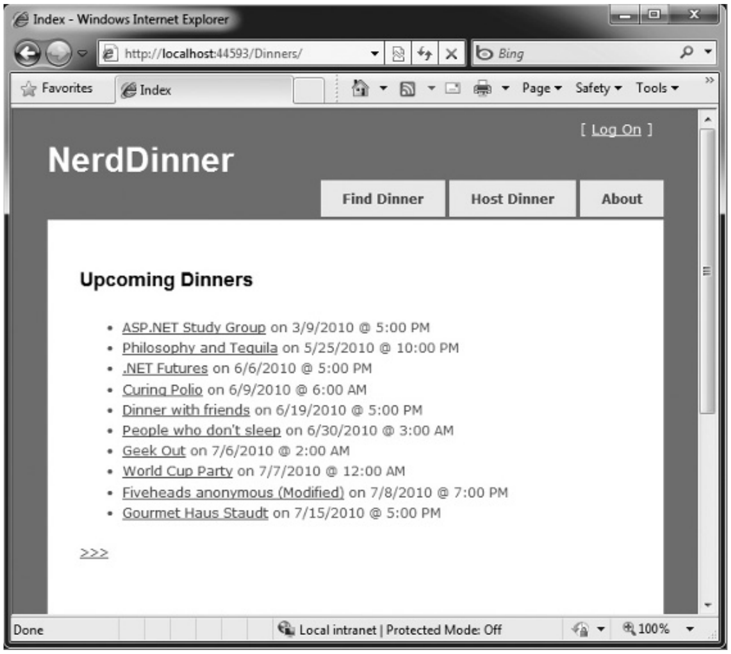
```
<% if (Model.HasPreviousPage) { %>

    <%: Html.RouteLink("<<<",
                       "UpcomingDinners",
                       new { page=(Model.PageIndex-1) }) %>

<% } %>

<% if (Model.HasNextPage) { %>

    <%: Html.RouteLink(">>>",
                       "UpcomingDinners",
                       new { page = (Model.PageIndex + 1) })%>

<% } %>
```

Code snippet 1-70.txt

Notice, in the previous code, how we are using the `Html.RouteLink` helper method to generate our hyperlinks. This method is similar to the `Html.ActionLink` helper method we've used previously. The difference is that we are generating the URL using the `"UpcomingDinners"` routing rule we set up within our Global.asax file. This ensures that we'll generate URLs to our `Index` action method that have the format: `/Dinners/Page/{page}`, where the `{page}` value is a variable we are providing above based on the current `PageIndex`.

And now when we run our application again, we'll see 10 Dinners at a time in our browser, as shown in Figure 1-115.

We also have <<< and >>> navigation UIs at the bottom of the page that allow us to skip forward and backward over our data using search-engine-accessible URLs (see Figure 1-116).

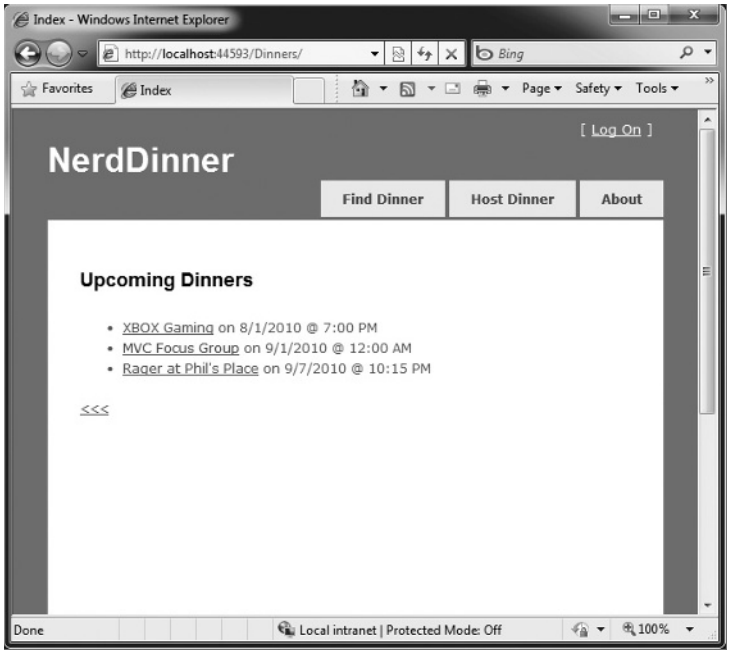

Index - Windows Internet Explorer
http://localhost:44593/Dinners/
Bing
Favorites
Index
Page
Safety
Tools
[Log On]
NerdDinner
Find Dinner
Host Dinner
About
Done
Local intranet | Protected Mode: Off
100%

Upcoming Dinners

- ASP.NET Study Group on 3/9/2010 @ 5:00 PM
- Philosophy and Tequila on 5/25/2010 @ 10:00 PM
- .NET Futures on 6/6/2010 @ 5:00 PM
- Curing Polio on 6/9/2010 @ 6:00 AM
- Dinner with friends on 6/19/2010 @ 5:00 PM
- People who don't sleep on 6/30/2010 @ 3:00 AM
- Geek Out on 7/6/2010 @ 2:00 AM
- World Cup Party on 7/7/2010 @ 12:00 AM
- Fiveheads anonymous (Modified) on 7/8/2010 @ 7:00 PM
- Gourmet Haus Staudt on 7/15/2010 @ 5:00 PM

>>>

FIGURE 1-115


Index - Windows Internet Explorer
http://localhost:44593/Dinners/
Bing
Favorites
Index
Page
Safety
Tools
[Log On]
NerdDinner
Find Dinner
Host Dinner
About
Done
Local intranet | Protected Mode: Off
100%

Upcoming Dinners

- XBOX Gaming on 8/1/2010 @ 7:00 PM
- MVC Focus Group on 9/1/2010 @ 12:00 AM
- Rager at Phil's Place on 9/7/2010 @ 10:15 PM

<<<

FIGURE 1-116

PRODUCT TEAM ASIDE

Understanding the Implications of IQueryable<T>

`IQueryable<T>` is a very powerful feature that enables a variety of interesting deferred execution scenarios (like paging and composition-based queries). As with all powerful features, you want to be careful with how you use it and make sure it is not abused.

It is important to recognize that returning an `IQueryable<T>` result from your repository enables calling code to append on chained operator methods to it and thus participate in the ultimate query execution. If you do not want to provide this ability to calling code, then you should return back `IList<T>`, `List<T>`, or `IEnumerable<T>` results — which contain the results of a query that has already executed.

For pagination scenarios, this would require you to push the actual data pagination logic into the repository method being called. In this scenario, we might update our `FindUpcomingDinners` finder method to have a signature that either returned a `PaginatedList`:

```
PaginatedList< Dinner> FindUpcomingDinners(int pageIndex,
  int pageSize){ }
```

or returned an `IList<Dinner>`, and use a `totalCount out` param to return the total count of Dinners:

```
IList<Dinner> FindUpcomingDinners(int pageIndex, int pageSize,
     out int totalCount) { }
```

AUTHENTICATION AND AUTHORIZATION

Right now our NerdDinner application grants anyone visiting the site the ability to create and edit the details of any Dinner. Let's change this so that users need to register and log in to the site to create new Dinners, and add a restriction so that only the user who is hosting a Dinner can edit it later.

To enable this, we'll use authentication and authorization to secure our application.

Understanding Authentication and Authorization

Authentication is the process of identifying and validating the identity of a client accessing an application. Put more simply, it is about identifying *who* the end user is when he or she visits a website.

ASP.NET supports multiple ways to authenticate browser users. For Internet web applications, the most common authentication approach used is called *Forms Authentication*. *Forms Authentication* enables a developer to author an HTML login form within his application and then validate the username/password an end user submits against a database or other password credential store. If the username/password combination is correct, the developer can then ask ASP.NET to issue an encrypted HTTP cookie to identify the user across future requests. We'll be using Forms Authentication with our NerdDinner application.

Authorization is the process of determining whether an authenticated user has permission to access a particular URL/resource or to perform some action. For example, within our NerdDinner application, we'll want to authorize only users who are logged in to access the `/Dinners/Create` URL and create new Dinners. We'll also want to add authorization logic so that only the user who is hosting a dinner can edit it — and deny edit access to all other users.

Forms Authentication and the AccountController

The default Visual Studio project template for ASP.NET MVC automatically enables Forms Authentication when new ASP.NET MVC applications are created. It also automatically adds a prebuilt account login implementation to the project — which makes it really easy to integrate security within a site.

The default Site.master Master Page displays a `[Log On]` link (shown in Figure 1-117) at the top right of the site when the user accessing it is not authenticated.

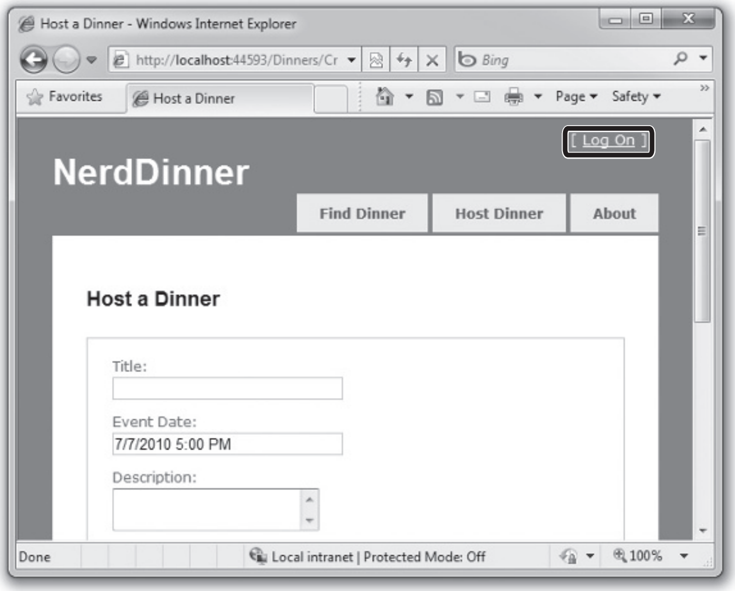
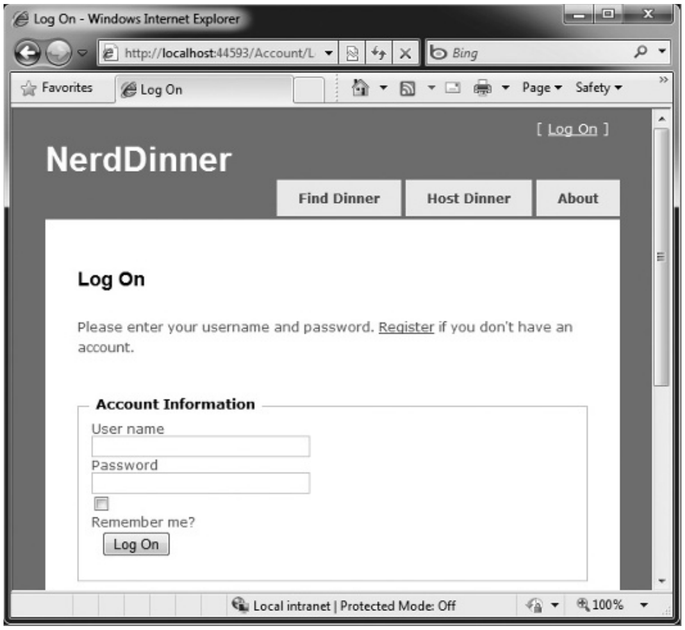


FIGURE 1-117

Clicking the `[Log On]` link takes a user to the `/Account/LogOn` URL (Figure 1-118).

Visitors who haven't registered can do so by clicking the Register link, which will take them to the `/Account/Register` URL and allow them to enter account details (see Figure 1-119).



Log On

Please enter your username and password. Register if you don't have an account.

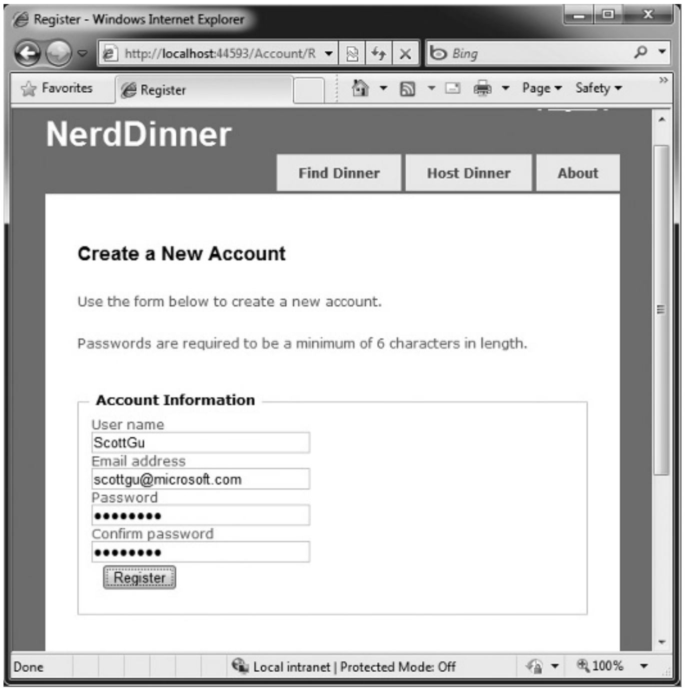
Account Information

User name

Password

Remember me?

FIGURE 1-118


Register - Windows Internet Explorer
http://localhost:44593/Account/R
Bing
Favorites
Register
Page
Safety
NerdDinner
Find Dinner
Host Dinner
About
Register
Done
Local intranet | Protected Mode: Off
100%

Create a New Account

Use the form below to create a new account.

Passwords are required to be a minimum of 6 characters in length.

Account Information

User name
ScottGu

Email address
scottgu@microsoft.com

Password
••••••••

Confirm password
••••••••

FIGURE 1-119

Clicking the Register button will create a new user within the ASP.NET Membership System and authenticate the user onto the site using Forms Authentication.

When a user is logged in, the Site.master changes the top right of the page to output a "Welcome [*username*]!" message and renders a `[Log Off]` link instead of a `[Log On]` one. Clicking the `[Log Off]` link logs out the user (see Figure 1-120).

The above login, logout, and registration functionality is implemented within the `AccountController` class that was added to our project by VS when it created it. The UI for the `AccountController` is implemented using View templates within the \Views\Account directory (shown in Figure 1-121).

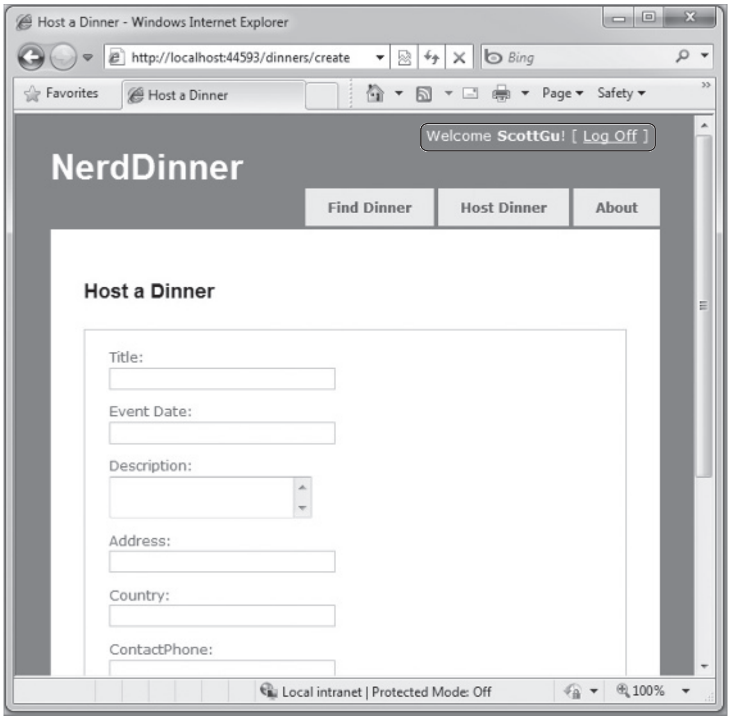


FIGURE 1-120

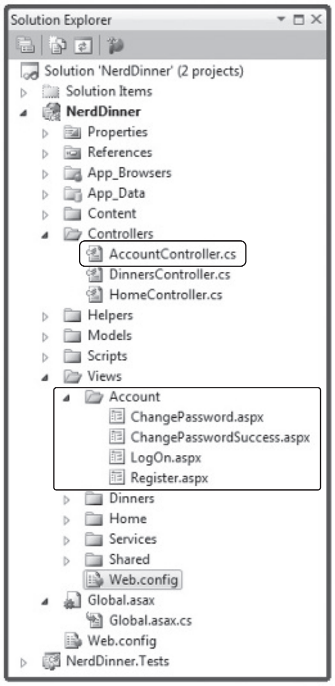


FIGURE 1-121

The `AccountController` class uses the ASP.NET Forms Authentication system to issue encrypted authentication cookies and the ASP.NET Membership API to store and validate usernames/passwords. The ASP.NET Membership API is extensible and enables any password credential store to be used. ASP.NET ships with built-in membership provider implementations that store usernames/passwords within a SQL database or within the Active Directory.

We can configure which membership provider our NerdDinner application should use by opening the web.config file at the root of the project and looking for the `<membership>` section within it. The default web.config, added when the project was created, registers the SQL membership provider and configures it to use a connection-string named `ApplicationServices` to specify the database location.

The default ApplicationServices connection string (which is specified within the <connectionStrings> section of the web.config file) is configured to use SQL Express. It points to a SQL Express database named ASPNETDB.MDF under the application's App_Data directory. If this database doesn't exist the first time the Membership API is used within the application, ASP.NET will automatically create the database and provision the appropriate membership database schema within it (Figure 1-122).

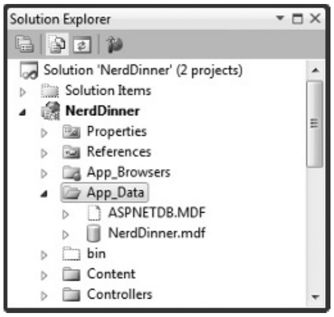


FIGURE 1-122

If, instead of using SQL Express, we wanted to use a full SQL Server instance (or connect to a remote database), all we'd need to do is to update the ApplicationServices connection string within the web.config file and make sure that the appropriate membership schema has been added to the database it points at. You can run the aspnet_regsql.exe utility within the \Windows\Microsoft.NET\Framework\v4.0.30319\ directory to add the appropriate schema for membership and the other ASP.NET application services to a database.

Authorizing the /Dinners/Create URL Using the [Authorize] Filter

We didn't have to write any code to enable a secure authentication and account management implementation for the NerdDinner application. Users can register new accounts with our application and log in/log out of the site. And now we can add authorization logic to the application, and use the authentication status and username of visitors to control what they can and can't do within the site.

Let's begin by adding authorization logic to the Create action methods of our DinnersController class. Specifically, we will require that users accessing the /Dinners/Create URL must be logged in. If they aren't logged in, we'll redirect them to the login page so that they can sign in.

Implementing this logic is pretty easy. All we need to do is to add an [Authorize] filter attribute to our Create action methods like so:

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```
//
// GET: /Dinners/Create
[Authorize]
public ActionResult Create() {
   ...
}

//
// POST: /Dinners/Create

[HttpPost, Authorize]
public ActionResult Create(Dinner dinnerToCreate) {
   ...
}
```

Code snippet 1-71.txt

ASP.NET MVC supports the ability to create *action filters* that can be used to implement reusable logic that can be declaratively applied to action methods. The [Authorize] filter is one of the built-in action filters provided by ASP.NET MVC, and it enables a developer to declaratively apply authorization rules to action methods and `Controller` classes.

When applied without any parameters (as in the previous code), the `[Authorize]` filter enforces that the user making the action method request must be logged in — and it will automatically redirect the browser to the login URL if they aren't. When doing this redirect, the originally requested URL is passed as a query-string argument (e.g., `/Account/LogOn?ReturnUrl=%2fDinners%2fCreate`). The `AccountController` will then redirect the user back to the originally requested URL once they log in.

The `[Authorize]` filter optionally supports the ability to specify a `Users` or `Roles` property that can be used to require that the user is both logged in and within a list of allowed users or a member of an allowed security role. For example, the following code only allows two specific users, `scottgu` and `billg`, to access the `/Dinners/Create` URL:

```
[Authorize(Users="scottgu,billg")]
public ActionResult Create() {
    ...
}
```

Code snippet 1-72.txt

Embedding specific usernames within code tends to be pretty unmaintainable, however. A better approach is to define higher-level *roles* that the code checks against, and then to map users into the role using either a database or active directory system (enabling the actual User Mapping List to be stored externally from the code). ASP.NET includes a built-in Role Management API as well as a built-in set of role providers (including ones for SQL and Active Directory) that can help perform this user/role mapping. We could then update the code to only allow users within a specific `"admin"` role to access the `/Dinners/Create` URL:

```
[Authorize(Roles="admin")]
public ActionResult Create() {
   ...
}
```

Code snippet 1-73.txt

Using the User.Identity.Name Property When Creating Dinners

We can retrieve the username of the currently logged-in user of a request using the `User.Identity.Name` property exposed on the `Controller` base class.

Earlier, when we implemented the HTTP-POST version of our `Create` action method, we had hard-coded the `HostedBy` property of the dinner to a static string. We can now update this code to instead use the `User.Identity.Name` property, as well as automatically add an RSVP for the host creating the Dinner:

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```
//
// POST: /Dinners/Create

[HttpPost, Authorize]
public ActionResult Create(Dinner dinner) {
    if (ModelState.IsValid) {
            dinner.HostedBy = User.Identity.Name;

            RSVP rsvp = new RSVP();
            rsvp.AttendeeName = User.Identity.Name;
            dinner.RSVPs.Add(rsvp);

            dinnerRepository.Add(dinner);
            dinnerRepository.Save();

            return RedirectToAction("Details", new { id=dinner.DinnerID });
        }

        return View(new DinnerFormViewModel(dinner));
    }
```

Code snippet 1-74.txt

Because we have added an `[Authorize]` attribute to the `Create` method, ASP.NET MVC ensures that the action method only executes if the user visiting the `/Dinners/Create` URL is logged in on the site. As such, the `User.Identity.Name` property value will always contain a valid username.

Using the User.Identity.Name Property When Editing Dinners

Let's now add some authorization logic that restricts users so that they can only edit the properties of Dinners they themselves are hosting.

To help with this, we'll first add an `IsHostedBy(username)` helper method to our `Dinner` object (within the `Dinner.cs` Partial class we built earlier). This helper method returns `true` or `false`, depending on whether a supplied username matches the Dinner `HostedBy` property, and encapsulates the logic necessary to perform a case-insensitive string comparison of them:

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```
    public partial class Dinner {

        public bool IsHostedBy(string userName) {

            return HostedBy.Equals(userName,
                StringComparison.OrdinalIgnoreCase);
        }
    }
```

Code snippet 1-75.txt

We'll then add an `[Authorize]` attribute to the `Edit` action methods within our `DinnersController` class. This will ensure that users must be logged in to request a `/Dinners/Edit/[id]` URL.

We can then add code to our `Edit` methods that uses the `Dinner.IsHostedBy(username)` helper method to verify that the logged-in user matches the Dinner host. If the user is not the host, we'll display an `"InvalidOwner"` view and terminate the request. The code to do this looks like the following:

```
    //
    // GET: /Dinners/Edit/5

    [Authorize]
```

```
public ActionResult Edit(int id) {

    Dinner dinner = dinnerRepository.GetDinner(id);

    if (!dinner.IsHostedBy(User.Identity.Name))
        return View("InvalidOwner");

    return View(new DinnerFormViewModel(dinner));
}

//
// POST: /Dinners/Edit/5

[HttpPost, Authorize]
public ActionResult Edit(int id, FormCollection collection) {

    Dinner dinner = dinnerRepository.GetDinner(id);

    if (!dinner.IsHostedBy(User.Identity.Name))
        return View("InvalidOwner");

    if(TryUpdateModel(dinner)) {
        dinnerRepository.Save();

        return RedirectToAction("Details", new {id = dinner.DinnerID});
    }
    return View(new DinnerFormViewModel(dinner));
}
```

Code snippet 1-76.txt

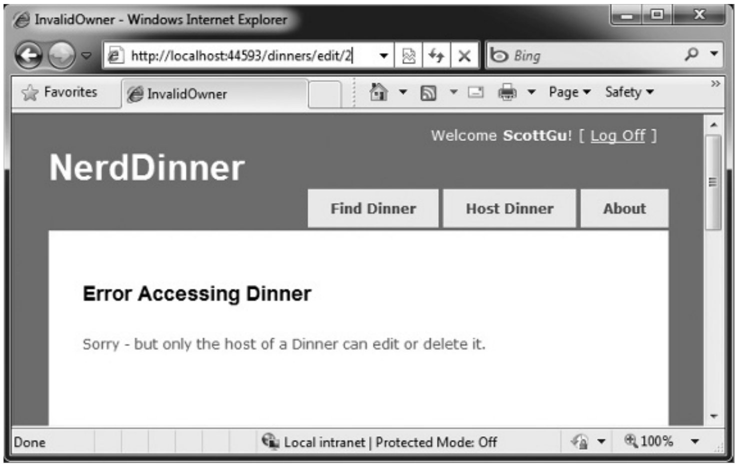
We can then right-click the \Views\Dinners directory and choose the Add ➪ View menu command to create a new `"InvalidOwner"` view. We'll populate it with the following error message:

```
<asp:Content ID="Title" ContentPlaceHolderID="TitleContent" runat="server">
      You Don't Own This Dinner
</asp:Content>

<asp:Content ID="Main" ContentPlaceHolderID="MainContent" runat="server">
    <h2>Error Accessing Dinner</h2>

    <p>Sorry - but only the host of a Dinner can edit or delete it.</p>
</asp:Content>
```

Code snippet 1-77.txt

And now when a user attempts to edit a Dinner she doesn't own, she'll get the error message shown in Figure 1-123.

We can repeat the same steps for the `Delete` action methods within our Controller to lock down permission to delete Dinners as well, and ensure that only the host of a Dinner can delete it.



InvalidOwner - Windows Internet Explorer

http://localhost:44593/dinners/edit/2

Welcome **ScottGu**! [Log Off]

NerdDinner

Find Dinner | Host Dinner | About

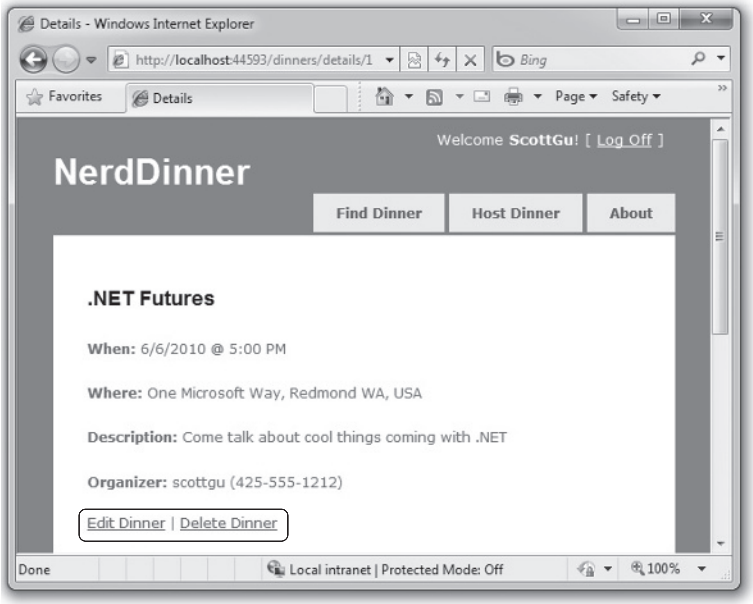
Error Accessing Dinner

Sorry - but only the host of a Dinner can edit or delete it.

FIGURE 1-123

Showing/Hiding Edit and Delete Links

We are linking to the `Edit` and `Delete` action methods of our `DinnersController` class from our `/Details` URL (see Figure 1-124).



Details - Windows Internet Explorer

http://localhost:44593/dinners/details/1

Welcome **ScottGu**! [Log Off]

NerdDinner

Find Dinner | Host Dinner | About

.NET Futures

When: 6/6/2010 @ 5:00 PM

Where: One Microsoft Way, Redmond WA, USA

Description: Come talk about cool things coming with .NET

Organizer: scottgu (425-555-1212)

Edit Dinner | Delete Dinner

FIGURE 1-124

Currently we are showing the Edit and Delete action links regardless of whether the visitor to the Details URL is the host of the Dinner. Let's change this so that the links are only displayed if the visiting user is the owner of the Dinner.

The `Details` action method within our `DinnersController` retrieves a `Dinner` object and then passes it as the `Model` object to our View template:

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```
//
// GET: /Dinners/Details/5

public ActionResult Details(int id) {

    Dinner dinner = dinnerRepository.GetDinner(id);

    if (dinner == null)
        return View("NotFound");

    return View(dinner);
}
```

Code snippet 1-78.txt

We can update our View template to conditionally show/hide the Edit and Delete links by using the `Dinner.IsHostedBy` helper method as in the code that follows:

```
<% if (Model.IsHostedBy(Context.User.Identity.Name)) { %>

   <%: Html.ActionLink("Edit Dinner", "Edit", new { id=Model.DinnerID })%> |
   <%: Html.ActionLink("Delete Dinner", "Delete", new {id=Model.DinnerID})%>

<% } %>
```

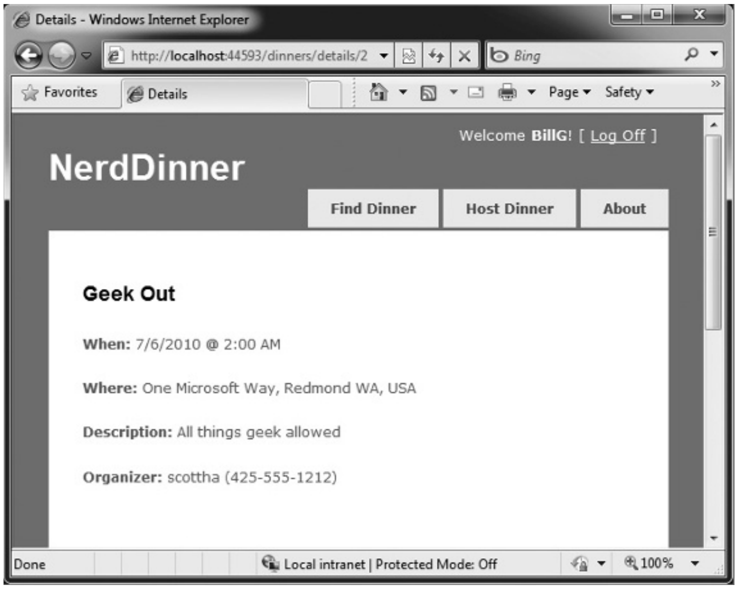
Code snippet 1-79.txt

AJAX ENABLING RSVPS ACCEPTS

Let's now add support for logged-in users to RSVP their interest in attending a Dinner. We'll implement this using an AJAX-based approach integrated within the Dinner Details page.

Indicating Whether the User Is RSVP'ed

Users can visit the `/Dinners/Details/[id]` URL to see details about a particular Dinner (see Figure 1-125).


Details - Windows Internet Explorer
http://localhost:44593/dinners/details/2
Bing
Favorites
Details
Page
Safety
Welcome BillG! [Log Off]
NerdDinner
Find Dinner
Host Dinner
About
Done
Local intranet | Protected Mode: Off
100%

Geek Out

When: 7/6/2010 @ 2:00 AM

Where: One Microsoft Way, Redmond WA, USA

Description: All things geek allowed

Organizer: scottha (425-555-1212)

FIGURE 1-125

The `Details` action method is implemented like so:

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```
//
// GET: /Dinners/Details/2

public ActionResult Details(int id) {

    Dinner dinner = dinnerRepository.GetDinner(id);

    if (dinner == null)
        return View("NotFound");
    else
        return View(dinner);
}
```

Code snippet 1-80.txt

Our first step to implement RSVP support will be to add an `IsUserRegistered(`*`username`*`)` helper method to our `Dinner` object (within the `Dinner.cs` Partial class we built earlier). This helper method returns `true` or `false`, depending on whether the user is currently RSVP'ed for the dinner:

```
public partial class Dinner {

    public bool IsUserRegistered(string userName) {

        return RSVPs.Any(r => r.AttendeeName.Equals(userName,
                                        StringComparison.OrdinalIgnoreCase));
        }
    }
```

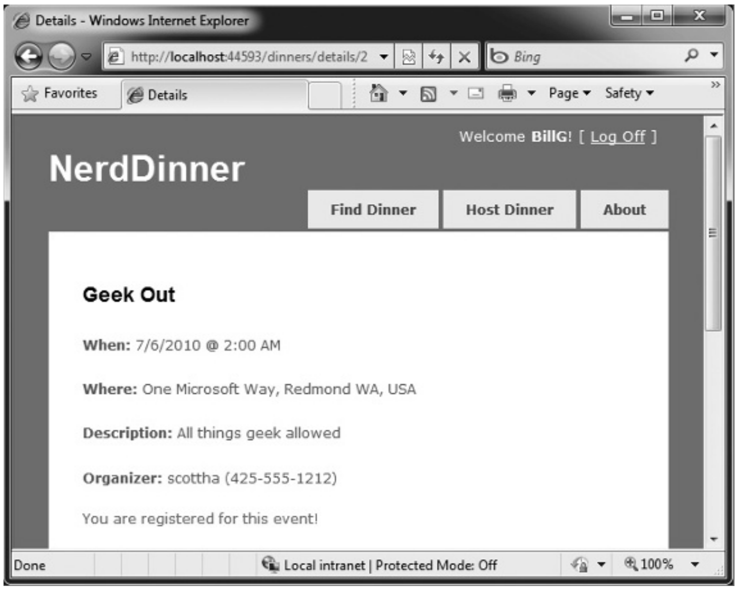
Code snippet 1-81.txt

We can then add the following code to our Details.aspx View template to display an appropriate message indicating whether the user is registered or not for the event:

```
<% if (Request.IsAuthenticated) { %>

    <% if (Model.IsUserRegistered(Context.User.Identity.Name)) { %>

        <p>You are registered for this event!</p>

    <% } else { %>

        <p>You are not registered for this event</p>

    <% } %>

<% } else { %>

    <a href="/Account/Logon">Logon</a> to RSVP for this event.

<% } %>
```

Code snippet 1-82.txt

And now when users visit a Dinner they are registered for, they'll see the message shown in Figure 1-126.


Details - Windows Internet Explorer
http://localhost:44593/dinners/details/2
Bing
Favorites
Details
Page
Safety
Welcome BillG! [Log Off]
NerdDinner
Find Dinner
Host Dinner
About
Done
Local intranet | Protected Mode: Off
100%

Geek Out

When: 7/6/2010 @ 2:00 AM

Where: One Microsoft Way, Redmond WA, USA

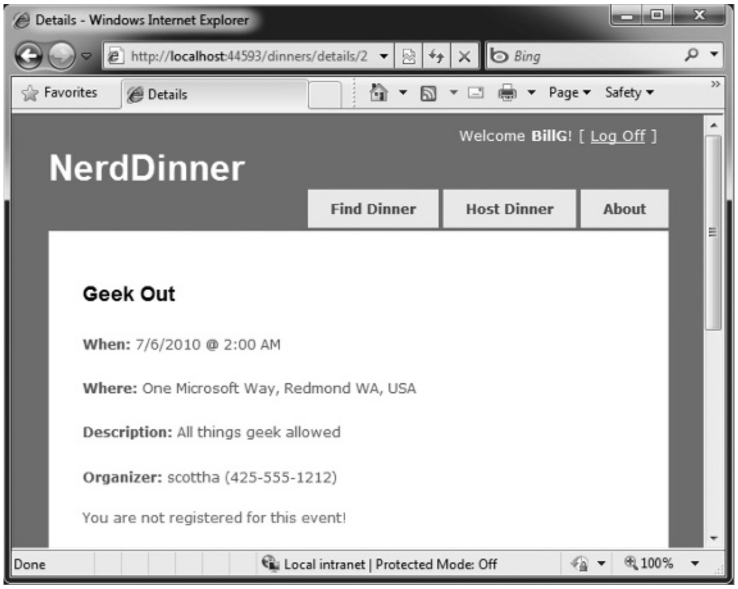
Description: All things geek allowed

Organizer: scottha (425-555-1212)

You are registered for this event!

FIGURE 1-126

And when they visit a Dinner they are not registered for, they'll see the message shown in Figure 1-127.


Details - Windows Internet Explorer
http://localhost:44593/dinners/details/2
Bing
Favorites
Details
Page
Safety
Welcome BillG! [Log Off]
NerdDinner
Find Dinner
Host Dinner
About
Done
Local intranet | Protected Mode: Off
100%

Geek Out

When: 7/6/2010 @ 2:00 AM

Where: One Microsoft Way, Redmond WA, USA

Description: All things geek allowed

Organizer: scottha (425-555-1212)

You are not registered for this event!

FIGURE 1-127

Implementing the Register Action Method

Now let's add the functionality necessary to enable users to RSVP for a Dinner from the Details page.

To implement this, we'll create a new `RSVPController` class by right-clicking on the \Controllers directory and choosing the Add ➪ Controller menu command.

We'll implement a `Register` action method within the new `RSVPController` class that takes an ID for a Dinner as an argument, retrieves the appropriate `Dinner` object, checks to see if the logged-in user is currently in the list of users who have registered for it, and if not adds an `RSVP` object for them:

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```
public class RSVPController : Controller {

    DinnerRepository dinnerRepository = new DinnerRepository();

    //
    // AJAX: /Dinners/Register/1

    [Authorize, HttpPost]
    public ActionResult Register(int id) {

        Dinner dinner = dinnerRepository.GetDinner(id);

        if (!dinner.IsUserRegistered(User.Identity.Name)) {
            RSVP rsvp = new RSVP();
```

```
                rsvp.AttendeeName = User.Identity.Name;

                dinner.RSVPs.Add(rsvp);
                dinnerRepository.Save();
            }

            return Content("Thanks - we'll see you there!");
        }
    }
```

Code snippet 1-83.txt

Notice, in the previous code, how we are returning a simple string as the output of the action method. We could have embedded this message within a View template — but since it is so small, we'll just use the `Content` helper method on the `Controller` base class and return a string message like the previous one.

Calling the Register Action Method Using AJAX

We'll use AJAX to invoke the `Register` action method from our Details View. Implementing this is pretty easy. First, we'll add two script library references:

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```
<script src="/Scripts/MicrosoftAjax.js" type="text/javascript"></script>
<script src="/Scripts/MicrosoftMvcAjax.js" type="text/javascript"></script>
```

Code snippet 1-84.txt

The first library references the core ASP.NET AJAX client-side script library. This file is approximately 24k in size (compressed) and contains core client-side AJAX functionality. The second library contains utility functions that integrate with ASP.NET MVC's built-in AJAX helper methods (which we'll use shortly).

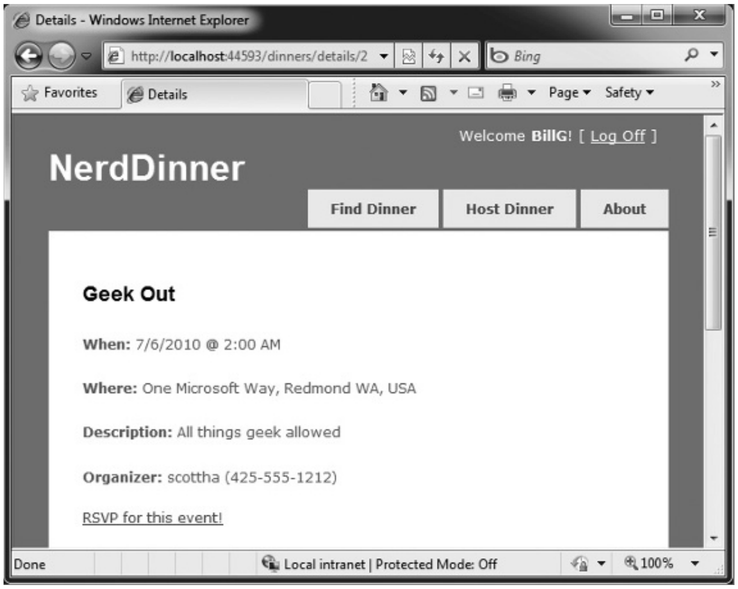
We can then update the View template code we added earlier so that, instead of outputting a "You are not registered for this event" message, we render a link that when pushed performs an AJAX call that invokes our `Register` action method on our `RSVP` Controller and RSVPs the user:

```
<div id="rsvpmsg">

<% if (Request.IsAuthenticated) { %>

    <% if (Model.IsUserRegistered(Context.User.Identity.Name)) { %>

        <p>You are registered for this event!</p>

    <% } else { %>

        <%: Ajax.ActionLink( "RSVP for this event",
                             "Register", "RSVP",
                             new { id=Model.DinnerID },
                             new AjaxOptions { UpdateTargetId="rsvpmsg" }) %>
        <% } %>

    <% } else { %>

        <a href="/Account/Logon">Logon</a> to RSVP for this event!

    <% } %>

    </div>
```

Code snippet 1-85.txt

The `Ajax.ActionLink` helper method in the previous code is built into ASP.NET MVC and is similar to the `Html.ActionLink` helper method except that instead of performing a standard navigation, it makes an AJAX call to the action method. Above we are calling the `"Register"` action method on the `"RSVP"` Controller and passing the `DinnerID` as the `id` parameter to it. The final `AjaxOptions` parameter we are passing indicates that we want to take the content returned from the action method and update the HTML `<div>` element on the page whose ID is `"rsvpmsg"`.

And now when users browse to a Dinner they aren't registered for yet, they'll see a link to RSVP for it (see Figure 1-128).


Details - Windows Internet Explorer
http://localhost:44593/dinners/details/2
Bing
Favorites
Details
Page
Safety
Welcome BillG! [Log Off]
NerdDinner
Find Dinner
Host Dinner
About

Geek Out

When: 7/6/2010 @ 2:00 AM

Where: One Microsoft Way, Redmond WA, USA

Description: All things geek allowed

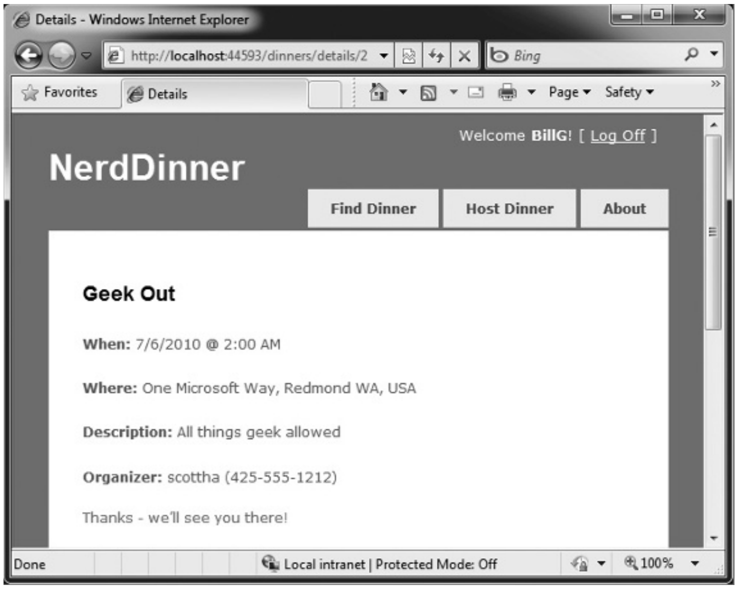
Organizer: scottha (425-555-1212)

RSVP for this event!

Done
Local intranet | Protected Mode: Off
100%

FIGURE 1-128

If they click the "RSVP for this event" link, they'll make an AJAX call to the `Register` action method on the `RSVP` Controller, and when it completes, they'll see an updated message like that shown in Figure 1-129.


Details - Windows Internet Explorer
http://localhost:44593/dinners/details/2
Bing
Favorites
Details
Page
Safety
Welcome BillG! [Log Off]
NerdDinner
Find Dinner
Host Dinner
About
Done
Local intranet | Protected Mode: Off
100%

Geek Out

When: 7/6/2010 @ 2:00 AM

Where: One Microsoft Way, Redmond WA, USA

Description: All things geek allowed

Organizer: scottha (425-555-1212)

Thanks - we'll see you there!

FIGURE 1-129

The network bandwidth and traffic involved when making this AJAX call are really lightweight. When the user clicks on the "RSVP for this event" link, a small HTTP-POST network request is made to the `/Dinners/Register/1` URL that looks like the following on the wire:

```
POST /Dinners/Register/49 HTTP/1.1
X-Requested-With: XMLHttpRequest
Content-Type: application/x-www-form-urlencoded; charset=utf-8
Referer: http://localhost:8080/Dinners/Details/49
```

Code snippet 1-86.txt

And the response from our `Register` action method is simply:

```
HTTP/1.1 200 OK
Content-Type: text/html; charset=utf-8
Content-Length: 29
Thanks - we'll see you there!
```

Code snippet 1-87.txt

This lightweight call is fast and will work even over a slow network.

Adding a jQuery Animation

The AJAX functionality we implemented works well and fast. Sometimes it can happen so fast, though, that a user might not notice that the RSVP link has been replaced with new text. To make the outcome a little more obvious, we can add a simple animation to draw attention to the updates message.

The default ASP.NET MVC project template includes jQuery — an excellent (and very popular) open source JavaScript library that is also supported by Microsoft. jQuery provides several features, including a nice HTML DOM selection and effects library.

To use jQuery, we'll first add a script reference to it. Because we are going to be using jQuery within a variety of places within our site, we'll add the script reference within our Site.master Master Page file so that all pages can use it.

```
<script src="/Scripts/jQuery-1.4.1.js" type="text/javascript"></script>
```

If you are using ASP.NET MVC 2 with Visual Studio 2008, make sure you have installed the JavaScript IntelliSense hotfix for VS 2008 SP1 that enables richer IntelliSense support for JavaScript files (including jQuery). You can download it from: `http://tinyurl.com/vs2008javascripthotfix`.

For Visual Studio 2010 there is no hotfix needed.

Code written using jQuery often uses a global `$()` JavaScript method that retrieves one or more HTML elements using a CSS selector. For example, `$("#rsvpmsg")` selects any HTML element with the ID of `rsvpmsg`, while `$(".something")` would select all elements with the `"something"` CSS class name. You can also write more advanced queries like "return all of the checked radio buttons" using a selector query like `$("input[@type=radio][@checked]")`.

Once you've selected elements, you can call methods on them to take action, such as hiding them: `$("#rsvpmsg").hide();`.

For our RSVP scenario, we'll define a simple JavaScript function named `AnimateRSVPMessage` that selects the `"rsvpmsg"` `<div>` and animates the size of its text content. The next code starts the text small and then causes it to increase over a 400-millisecond (400-ms) time frame:

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```
<script type="text/javascript">

    function AnimateRSVPMessage() {
        $("#rsvpmsg").animate({fontSize: "1.5em"}, 400);
    }

</script>
```

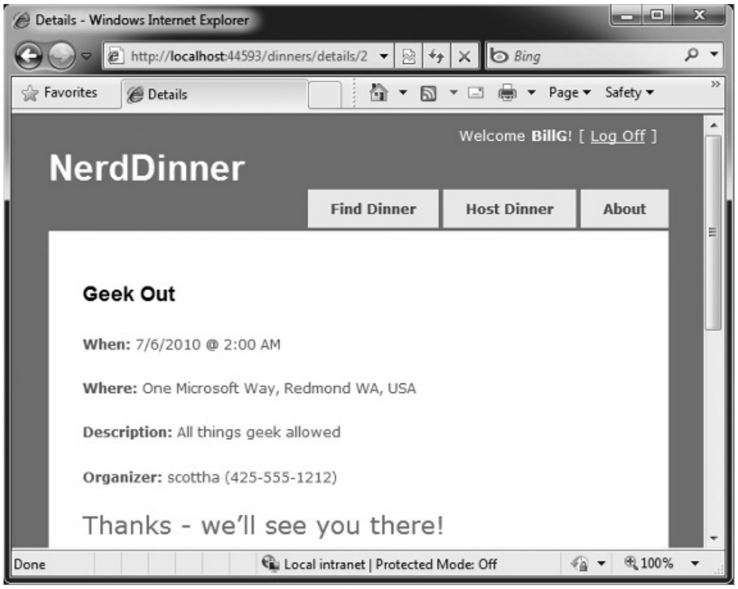
Code snippet 1-88.txt

We can then wire up this JavaScript function to be called after our AJAX call successfully completes by passing its name to our `Ajax.ActionLink` helper method (via the `AjaxOptions OnSuccess` event property):

```
<%: Ajax.ActionLink( "RSVP for this event",
                     "Register", "RSVP",
                     new { id=Model.DinnerID },
                     new AjaxOptions { UpdateTargetId="rsvpmsg",
                                 OnSuccess="AnimateRSVPMessage" }) %>
```

Code snippet 1-89.txt

And now when the "RSVP for this event" link is clicked and our AJAX call completes successfully, the content message sent back will animate and grow larger (see Figure 1-130).


Details - Windows Internet Explorer
http://localhost:44593/dinners/details/2
Bing
Favorites
Details
Page
Safety
Welcome BillG! [Log Off]
NerdDinner
Find Dinner
Host Dinner
About
Done
Local intranet | Protected Mode: Off
100%

Geek Out

When: 7/6/2010 @ 2:00 AM

Where: One Microsoft Way, Redmond WA, USA

Description: All things geek allowed

Organizer: scottha (425-555-1212)

Thanks - we'll see you there!

FIGURE 1-130

In addition to providing an `OnSuccess` event, the `AjaxOptions` object exposes `OnBegin`, `OnFailure`, and `OnComplete` events that you can handle (along with a variety of other properties and useful options).

Cleanup — Refactor Out a RSVP Partial View

Our Details View template is starting to get a little long, which over time will make it a little harder to understand. To help improve the code readability, let's finish up by creating a Partial View — RSVPStatus.ascx — that encapsulates all of the RSVP View code for our Details page.

We can do this by right-clicking the \Views\Dinners folder and then choosing the Add ➪ View menu command. We'll have it take a `Dinner` object as its strongly typed ViewModel. We can then copy/paste the RSVP content from our Details.aspx View into it.

Once we've done that, let's also create another Partial View — EditAndDeleteLinks.ascx — that encapsulates our Edit and Delete link View code. We'll also have it take a `Dinner` object as its strongly typed ViewModel, and copy/paste the Edit and Delete logic from our Details.aspx View into it.

Our Details View template can then just include two `Html.RenderPartial` method calls at the bottom:

```
<% Html.RenderPartial("RSVPStatus"); %>
<% Html.RenderPartial("EditAndDeleteLinks"); %>
```

This makes the code cleaner to read and maintain.

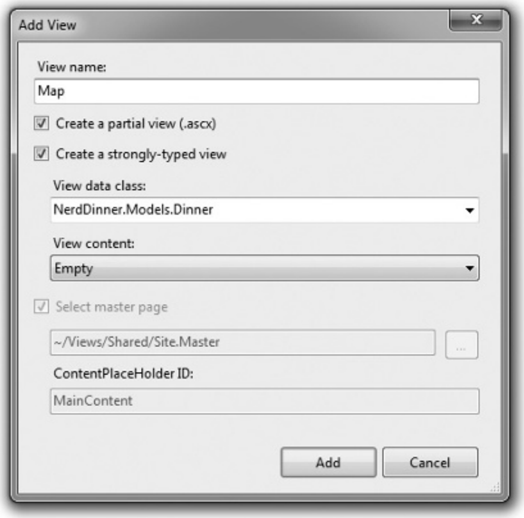
INTEGRATING AN AJAX MAP

We'll now make our application a little more visually exciting by integrating AJAX mapping support. This will enable users who are creating, editing, or viewing Dinners to see the location of the Dinner graphically.

Creating a Map Partial View

We are going to use mapping functionality in several places within our application. To keep our code DRY, we'll encapsulate the common map functionality within a single Partial template that we can reuse across multiple Controller actions and Views. We'll name this Partial View map.ascx and create it within the \Views\Dinners directory.

We can create the map.ascx Partial by right-clicking the \Views\Dinners directory and choosing the Add ➪ View menu command. We'll name the view *Map.ascx*, check it as a Partial View, and indicate that we are going to pass it a strongly typed `Dinner` model class (see Figure 1-131).



View name: Map
[✓] Create a partial view (.ascx)
[✓] Create a strongly-typed view
View data class: NerdDinner.Models.Dinner
View content: Empty
[✓] Select master page
~/Views/Shared/Site.Master
ContentPlaceHolder ID:
MainContent

FIGURE 1-131

When we click the Add button, our Partial template will be created. We'll then update the Map.ascx file to have the following content:

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```
<script src="http://dev.virtualearth.net/mapcontrol/mapcontrol.ashx?v=6.2"
 type="text/javascript"></script>

<script src="/Scripts/Map.js" type="text/javascript"></script>

<div id="theMap">
</div>
<script type="text/javascript">

    $(document).ready(function() {
        var latitude = <%:Model.Latitude %>;
        var longitude = <%:Model.Longitude %>;

        if ((latitude == 0) || (longitude == 0))
            LoadMap();
        else
            LoadMap(latitude, longitude, mapLoaded);
        });

       function mapLoaded() {
            var title = "<%: Model.Title %>";
            var address = "<%: Model.Address %>";

            LoadPin(center, title, address);
            map.SetZoomLevel(14);
        }

    </script>
```

Code snippet 1-90.txt

The first `<script>` reference points to the Microsoft Virtual Earth 6.2 mapping library. The second `<script>` reference points to a map.js file that we will shortly create, which will encapsulate our common JavaScript mapping logic. The `<div id="theMap">` element is the HTML container that Virtual Earth will use to host the map.

We then have an embedded `<script>` block that contains two JavaScript functions specific to this View. The first function uses jQuery to wire up a function that executes when the page is ready to run client-side script. It calls a `LoadMap` helper function that we'll define within our Map.js script file to load the Virtual Earth map control. The second function is a callback event handler that adds a pin to the map that identifies a location.

Notice how we are using a server-side `<%: %>` block within the client-side script block to embed the latitude and longitude of the Dinner we want to map into the JavaScript. This is a useful technique to output dynamic values that can be used by client-side script (without requiring a separate AJAX call back to the server to retrieve the values — which makes it faster). The `<%: %>` blocks will execute when the View is rendering on the server — and so the output of the HTML will just end up with embedded JavaScript values (e.g., `var latitude = 47.64312;`).

Creating a Map.js Utility Library

Let's now create the Map.js file that we can use to encapsulate the JavaScript functionality for our map (and implement the preceding `LoadMap` and `LoadPin` methods). We can do this by right-clicking the \Scripts directory within our project, and then choose the Add ➪ New Item menu command, select the JScript item, and name it *Map.js*.

We'll add the following JavaScript code to the Map.js file, which will interact with Virtual Earth to display our map and add location pins to it for our Dinners:

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```
var map = null;
var points = [];
var shapes = [];
var center = null;

function LoadMap(latitude, longitude, onMapLoaded) {
    map = new VEMap('theMap');
    options = new VEMapOptions();
```

```
        options.EnableBirdseye = false;

        // Makes the control bar less obtrusive.
        map.SetDashboardSize(VEDashboardSize.Small);

        if (onMapLoaded != null)
            map.onLoadMap = onMapLoaded;

        if (latitude != null && longitude != null) {
            center = new VELatLong(latitude, longitude);
        }

        map.LoadMap(center, null, null, null, null, null, null, options);
    }

    function LoadPin(LL, name, description) {
        var shape = new VEShape(VEShapeType.Pushpin, LL);

        //Make a nice Pushpin shape with a title and description
        shape.SetTitle("<span class=\"pinTitle\"> " + escape(name) + "</span>");
        if (description !== undefined) {
            shape.SetDescription("<p class=\"pinDetails\">" +
            escape(description) + "</p>");
        }
        map.AddShape(shape);
        points.push(LL);
        shapes.push(shape);
    }

    function FindAddressOnMap(where) {
        var numberOfResults = 20;
        var setBestMapView = true;
        var showResults = true;

        map.Find("", where, null, null, null,
               numberOfResults, showResults, true, true,
               setBestMapView, callbackForLocation);
    }

    function callbackForLocation(layer, resultsArray, places,
                hasMore, VEErrorMessage) {

        clearMap();

        if (places == null)
            return;

        //Make a pushpin for each place we find
        $.each(places, function(i, item) {
            var description = "";
            if (item.Description !== undefined) {
                description = item.Description;
            }
            var LL = new VELatLong(item.LatLong.Latitude,
                            item.LatLong.Longitude);

            LoadPin(LL, item.Name, description);
        });

        //Make sure all pushpins are visible
        if (points.length > 1) {
            map.SetMapView(points);
        }

        //If we've found exactly one place, that's our address.
        if (points.length === 1) {
            $("#Latitude").val(points[0].Latitude);
            $("#Longitude").val(points[0].Longitude);
        }
    }

    function clearMap() {
        map.Clear();
        points = [];
        shapes = [];
    }
```

Code snippet 1-91.txt

Integrating the Map with Create and Edit Forms

We'll now integrate the Map support with our existing Create and Edit scenarios. The good news is that this is pretty easy to do and doesn't require us to change any of our Controller code. Because our Create and Edit Views share a common DinnerForm Partial View used to implement the Dinner form UI, we can add the map in one place and have both our Create and Edit scenarios use it.

All we need to do is to open the \Views\Dinners\DinnerForm.ascx Partial View and update it to include our new map Partial. Following is what the updated DinnerForm will look like once the map is added (the HTML form elements are omitted from the following code snippet for brevity):

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```
<%: Html.ValidationSummary() %>

<% using (Html.BeginForm()) { %>

    <fieldset>

        <div id="dinnerDiv">
            <p>
                  [HTML Form Elements Removed for Brevity]
            </p>
            <p>
               <input type="submit" value="Save" />
```

```
                </p>
            </div>

            <div id="mapDiv">
                <% Html.RenderPartial("Map", Model.Dinner); %>
            </div>

        </fieldset>

        <script type="text/javascript">

            $(document).ready(function() {
                $("#Address").blur(function(evt) {
                    $("#Latitude").val("");
                    $("#Longitude").val("");

                    var address = jQuery.trim($("#Address").val());
                    if (address.length < 1)
                        return;

                    FindAddressOnMap(address);
                });
            });

        </script>

    <% } %>
```

Code snippet 1-92.txt

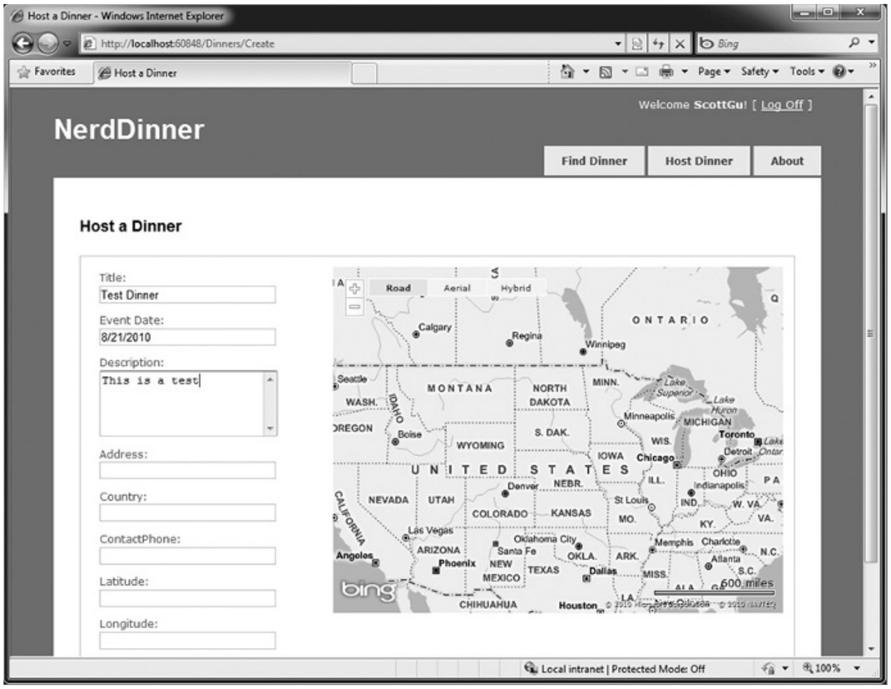
The DinnerForm Partial above takes an object of type `DinnerFormViewModel` as its Model type (because it needs both a `Dinner` object and a `SelectList` to populate the dropdown list of countries). Our map Partial just needs an object of type `Dinner` as its Model type, and so when we render the map Partial, we are passing just the `Dinner` subproperty of `DinnerFormViewModel` to it:

```
<% Html.RenderPartial("Map", Model.Dinner); %>
```

The JavaScript function we've added to the Partial uses jQuery to attach a *blur* event to the Address HTML textbox. You've probably heard of *focus* events that fire when a user clicks or tabs into a textbox. The opposite is a blur event that fires when a user exits a textbox. The event handler in the previous code clears the latitude and longitude textbox values when this happens, and then plots the new address location on our map. A callback event handler that we defined within the map.js file will then update the longitude and latitude textboxes on our form using values returned by Virtual Earth based on the address we gave it.

And now when we run our application again and click the Host Dinner tab, we'll see a default map displayed along with our standard Dinner form elements (Figure 1-132).

When we type in an address and then tab away, the map will dynamically update to display the location, and our event handler will populate the latitude/longitude textboxes with the location values (Figure 1-133).


Host a Dinner - Windows Internet Explorer
http://localhost:60848/Dinners/Create
Favorites
Host a Dinner
Welcome ScottGu! [Log Off]
NerdDinner
Find Dinner
Host Dinner
About
Road
Aerial
Hybrid
Local intranet | Protected Mode: Off

Host a Dinner

Title: Test Dinner

Event Date: 8/21/2010

Description: This is a test

Address:

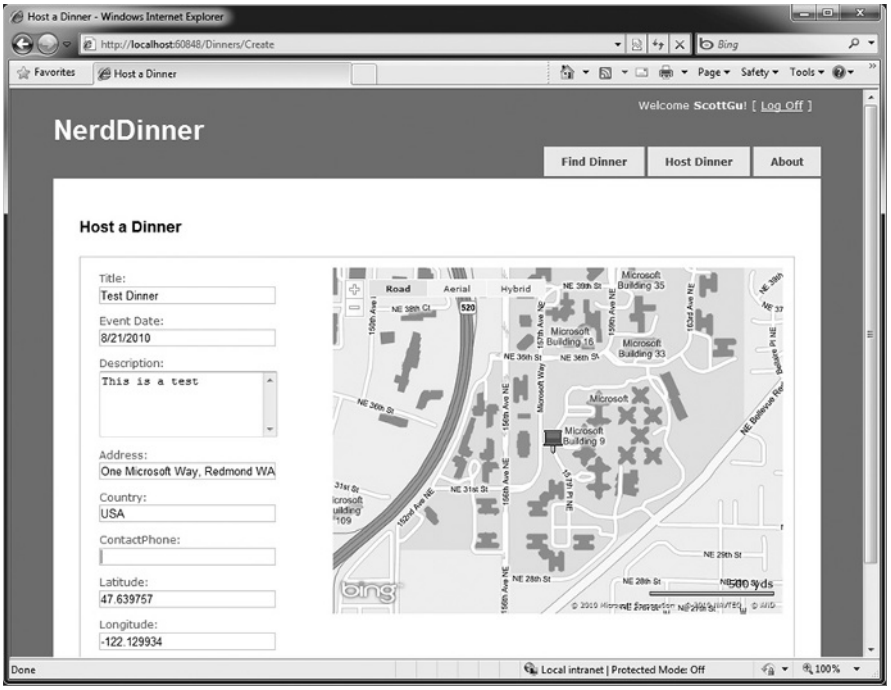
Country:

ContactPhone:

Latitude:

Longitude:

FIGURE 1-132


Host a Dinner - Windows Internet Explorer
http://localhost:60848/Dinners/Create
Favorites
Host a Dinner
Welcome ScottGu! [Log Off]
NerdDinner
Find Dinner
Host Dinner
About
Road
Aerial
Hybrid
Microsoft Building 9
Done
Local intranet | Protected Mode: Off

Host a Dinner

Title: Test Dinner

Event Date: 8/21/2010

Description: This is a test

Address: One Microsoft Way, Redmond WA

Country: USA

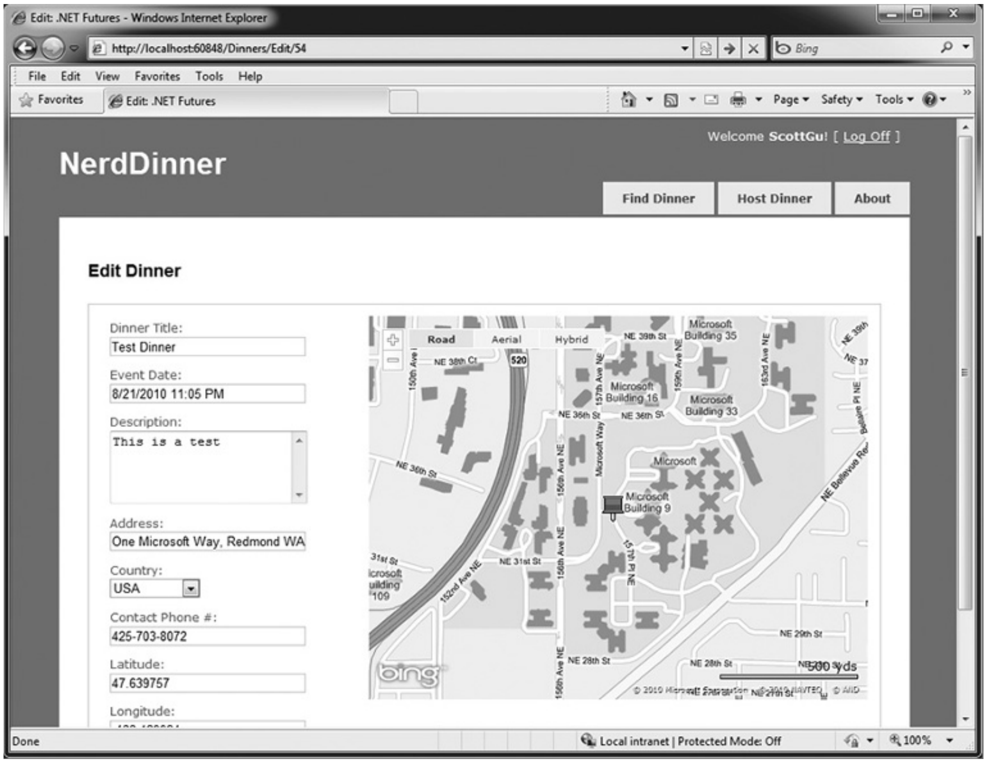
ContactPhone:

Latitude: 47.639757

Longitude: -122.129934

FIGURE 1-133

If we save the new Dinner and then open it again for editing, we'll find that the map location is displayed when the page loads (Figure 1-134).


Edit: .NET Futures - Windows Internet Explorer
http://localhost:60848/Dinners/Edit/54
File Edit View Favorites Tools Help
Favorites
Edit: .NET Futures
Page Safety Tools
Welcome ScottGu! [Log Off]
NerdDinner
Find Dinner
Host Dinner
About
Road
Aerial
Hybrid
Microsoft Building 9
500 yds
Done
Local intranet | Protected Mode: Off
100%

Edit Dinner

Dinner Title:
Test Dinner

Event Date:
8/21/2010 11:05 PM

Description:
This is a test

Address:
One Microsoft Way, Redmond WA

Country:
USA

Contact Phone #:
425-703-8072

Latitude:
47.639757

Longitude:

FIGURE 1-134

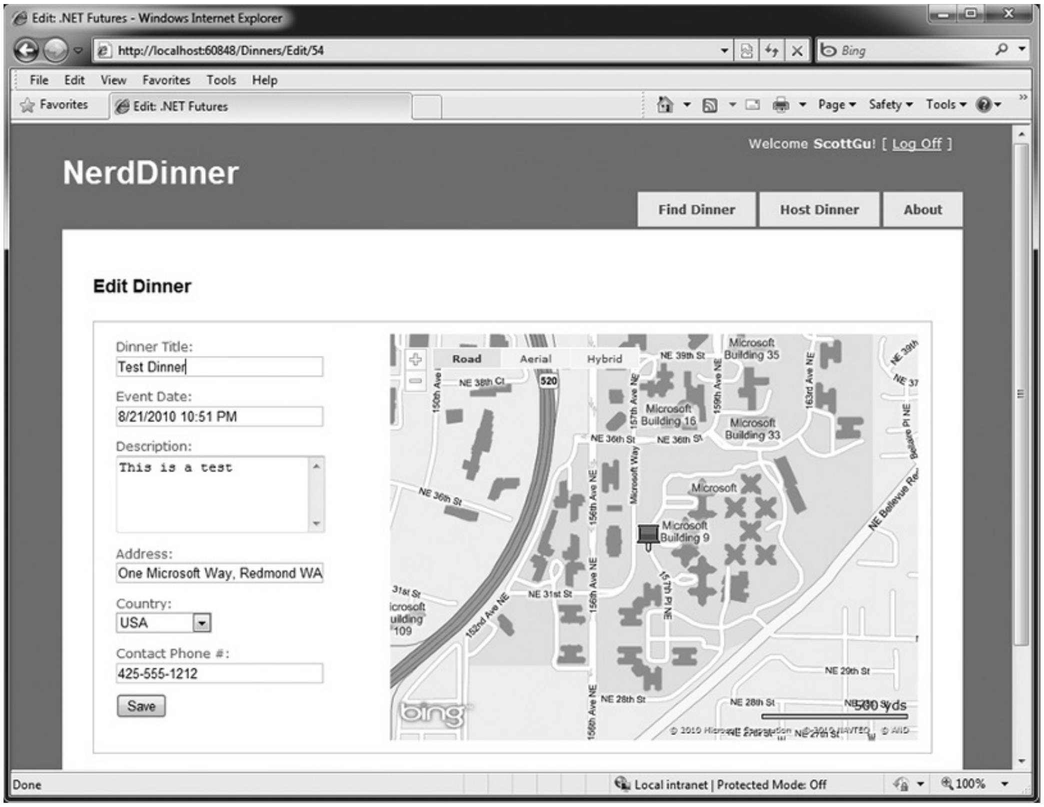
Every time the address field is changed, the map and the latitude/longitude coordinates will update.

Now that the map displays the Dinner location, we can also change the Latitude and Longitude form fields from being visible textboxes to instead be hidden elements (since the map is automatically updating them each time an address is entered). To do this, we'll switch from using the `Html.TextBox` HTML helper to using the `Html.Hidden` helper method:

```
<p>
    <%: Html.Hidden("Latitude", Model.Dinner.Latitude)%>
    <%: Html.Hidden("Longitude", Model.Dinner.Longitude)%>
</p>
```

Code snippet 1-93.txt

And now our forms are a little more user-friendly (Figure 1-135) and avoid displaying the raw latitude/longitude (while still storing them with each Dinner in the database).


Edit: .NET Futures - Windows Internet Explorer
http://localhost:60848/Dinners/Edit/54
File Edit View Favorites Tools Help
NerdDinner
Welcome ScottGu! [Log Off]
Find Dinner
Host Dinner
About
Road
Aerial
Hybrid
Save
Done
Local intranet | Protected Mode: Off

Edit Dinner

Dinner Title: Test Dinner

Event Date: 8/21/2010 10:51 PM

Description: This is a test

Address: One Microsoft Way, Redmond WA

Country: USA

Contact Phone #: 425-555-1212

FIGURE 1-135

Integrating the Map with the Details View

Now that we have the map integrated with our Create and Edit scenarios, let's also integrate it with our Details scenario. All we need to do is to call `<% Html.RenderPartial("map"); %>` within the Details View.

The following is what the source code to the complete Details View (with map integration) looks like:

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```
<asp:Content ID="Title" ContentPlaceHolderID="TitleContent" runat="server">
    <%: Model.Title %>
</asp:Content>

<asp:Content ID="details" ContentPlaceHolderID="MainContent" runat="server">

    <div id="dinnerDiv">

        <h2><%: Model.Title %></h2>
```

```
            <p>
                <strong>When:</strong>
                <%: Model.EventDate.ToShortDateString() %>

                <strong>@</strong>
                <%: Model.EventDate.ToShortTimeString() %>
            </p>
            <p>
                <strong>Where:</strong>
                <%: Model.Address %>,
                <%: Model.Country %>
            </p>
             <p>
                <strong>Description:</strong>
                <%: Model.Description %>
            </p>
            <p>
                <strong>Organizer:</strong>
                <%: Model.HostedBy %>
                (<%: Model.ContactPhone %>)
            </p>

            <% Html.RenderPartial("RSVPStatus"); %>
            <% Html.RenderPartial("EditAndDeleteLinks"); %>

        </div>

        <div id="mapDiv">
            <% Html.RenderPartial("map"); %>
        </div>

    </asp:Content>
```

Code snippet 1-94.txt

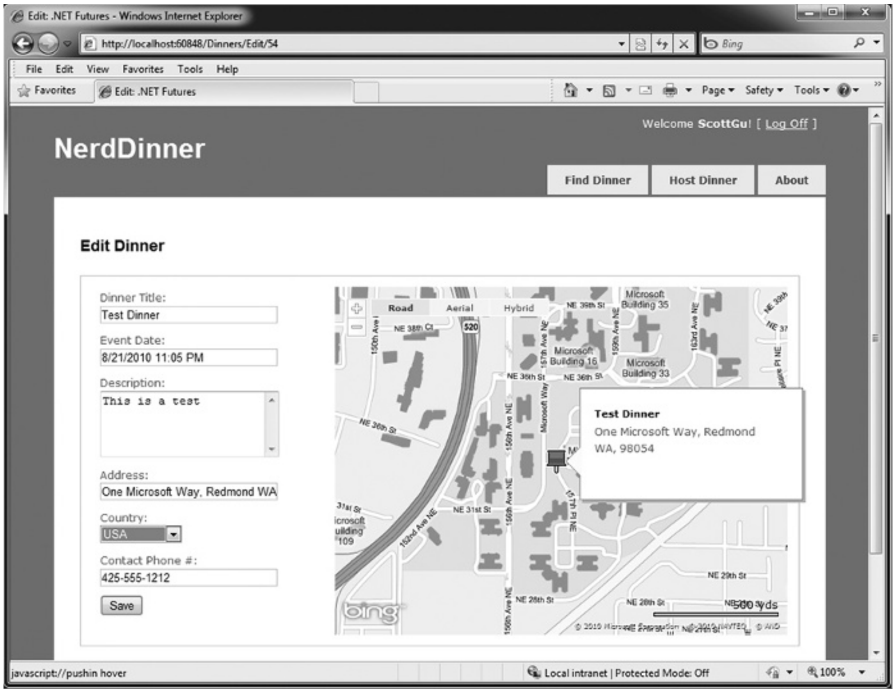
Now when users navigate to a `/Dinners/Details/[id]` URL, they'll see details about the Dinner, the location of the Dinner on the map (complete with a pushpin that, when hovered over, displays the title and address of the Dinner), and have an AJAX link to RSVP for it (see Figure 1-136).

Implementing Location Search in Our Database and Repository

To finish off our AJAX implementation, let's add a map to the home page of the application that allows users to graphically search for Dinners near them (see Figure 1-137).

We'll begin by implementing support within our database and data repository layer to efficiently perform a location-based radius search for Dinners. We could use the geospatial features of SQL Server 2008 (`www.microsoft.com/sqlserver/2008/en/us/spatial-data.aspx`) to implement this, or alternatively we can use a SQL function approach that Gary Dryden discussed in the article at `www.codeproject.com/KB/cs/distancebetweenlocations.aspx`.

To implement this technique, we will open the Server Explorer within Visual Studio, select the NerdDinner database, and then right-click the Functions subnode under it and choose to create a new "Scalar-valued function" (Figure 1-138).


Edit: .NET Futures - Windows Internet Explorer
http://localhost:60848/Dinners/Edit/54
File Edit View Favorites Tools Help
Welcome ScottGu! [Log Off]
NerdDinner
Find Dinner
Host Dinner
About
Road
Aerial
Hybrid
javascript://pushin hover
Local intranet | Protected Mode: Off
100%

Edit Dinner

Dinner Title: Test Dinner

Event Date: 8/21/2010 11:05 PM

Description: This is a test

Address: One Microsoft Way, Redmond WA

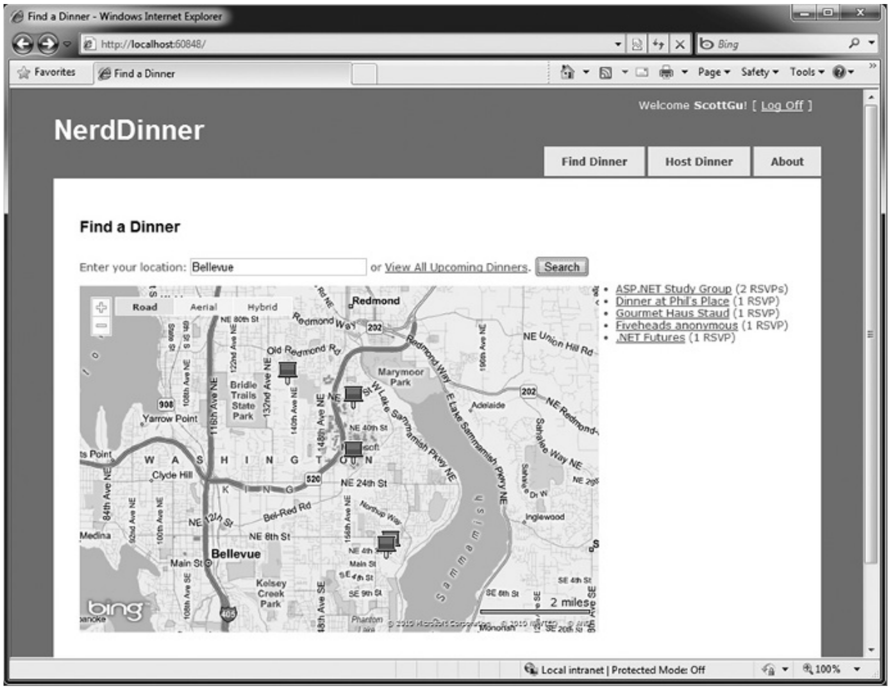
Country: USA

Contact Phone #: 425-555-1212

Save

Test Dinner
One Microsoft Way, Redmond
WA, 98054

FIGURE 1-136


Find a Dinner - Windows Internet Explorer
http://localhost:60848/
Welcome ScottGu! [Log Off]
NerdDinner
Find Dinner
Host Dinner
About
Road
Aerial
Hybrid
Redmond
Bellevue
Local intranet | Protected Mode: Off
100%

Find a Dinner

Enter your location: Bellevue or View All Upcoming Dinners. Search

- ASP.NET Study Group (2 RSVPs)
- Dinner at Phil's Place (1 RSVP)
- Gourmet Haus Staud (1 RSVP)
- Fiveheads anonymous (1 RSVP)
- .NET Futures (1 RSVP)

FIGURE 1-137

We'll then paste in the following `DistanceBetween` function:

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```
CREATE FUNCTION [dbo].[DistanceBetween] (@Lat1 as real,
                @Long1 as real, @Lat2 as real, @Long2 as real)
RETURNS real
AS
BEGIN

DECLARE @dLat1InRad as float(53);
SET @dLat1InRad = @Lat1 * (PI()/180.0);
DECLARE @dLong1InRad as float(53);
SET @dLong1InRad = @Long1 * (PI()/180.0);
DECLARE @dLat2InRad as float(53);
SET @dLat2InRad = @Lat2 * (PI()/180.0);
DECLARE @dLong2InRad as float(53);
SET @dLong2InRad = @Long2 * (PI()/180.0);

DECLARE @dLongitude as float(53);
SET @dLongitude = @dLong2InRad - @dLong1InRad;
DECLARE @dLatitude as float(53);
SET @dLatitude = @dLat2InRad - @dLat1InRad;
/* Intermediate result a. */
DECLARE @a as float(53);
SET @a = SQUARE (SIN (@dLatitude / 2.0)) + COS (@dLat1InRad)
                 * COS (@dLat2InRad)
                 * SQUARE(SIN (@dLongitude / 2.0));
/* Intermediate result c (great circle distance in Radians). */
DECLARE @c as real;
SET @c = 2.0 * ATN2 (SQRT (@a), SQRT (1.0 - @a));
DECLARE @kEarthRadius as real;
/* SET kEarthRadius = 3956.0 miles */
SET @kEarthRadius = 6376.5;        /* kms */

DECLARE @dDistance as real;
SET @dDistance = @kEarthRadius * @c;
return (@dDistance);
END
```

Code snippet 1-95.txt

We'll then create a new "Table-valued Function" in SQL Server that we'll call `NearestDinners` (see Figure 1-139).

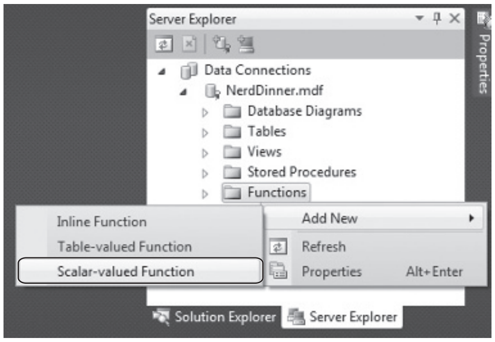

FIGURE 1-138

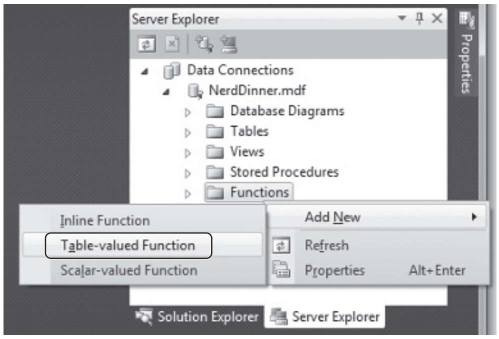

FIGURE 1-139

This `NearestDinners` table function uses the `DistanceBetween` helper function to return all Dinners within 100 miles of the latitude and longitude we supply it:

```
CREATE FUNCTION [dbo].[NearestDinners]
       (
       @lat real,
       @long real
       )
RETURNS  TABLE
AS
       RETURN
       SELECT Dinners.DinnerID
       FROM   Dinners
       WHERE  dbo.DistanceBetween(@lat, @long, Latitude, Longitude) <100
```

Code snippet 1-96.txt

Now that we've added this function to our database, we need to update the entity model from the database so that it knows about the new function.

Open the Entity Designer by double-clicking the NerdDinner.edmx file, as shown in Figure 1-140.

Right-click the design surface and select the Update Model from Database option, as shown in Figure 1-141.

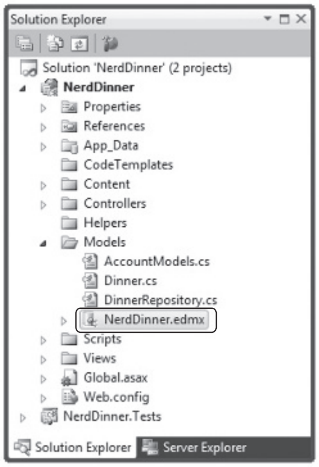

FIGURE 1-140

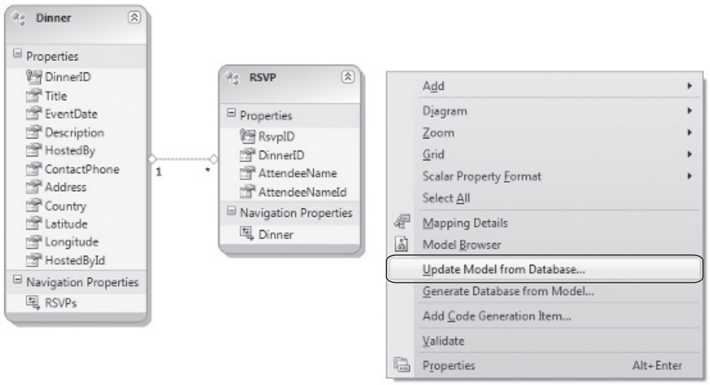

FIGURE 1-141

This brings up an Update Wizard. Our table-valued function shows up within the Stored Procedures node of the Add tab. Expand the Stored Procedures node, select the DistanceBetween option, and click Finish, as seen in Figure 1-142.

After clicking Finish, the entity framework Wizard updates the entity model (EDMX file) with the function. We'll need to tweak the EDMX file to translate SQL Server Real values to .NET floats. To do that, we'll need to open the EDMX file as XML. To do that, right-click the EDMX file and select the Open With option, as shown in Figure 1-143.

This brings up the Open With dialog. Select the XML option, as seen in Figure 1-144.

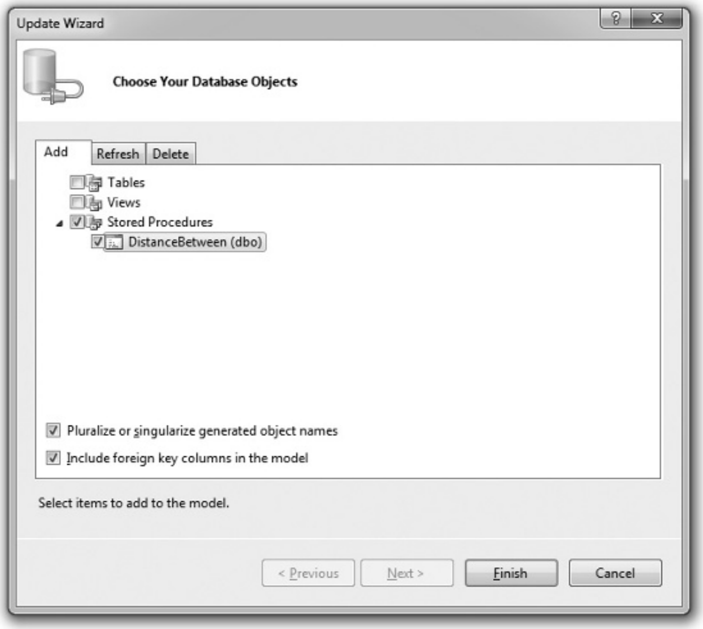
Update Wizard
Choose Your Database Objects
Add
Refresh
Delete
Tables
Views
Stored Procedures
DistanceBetween (dbo)
Pluralize or singularize generated object names
Include foreign key columns in the model
Select items to add to the model.
< Previous
Next >
Finish
Cancel

FIGURE 1-142

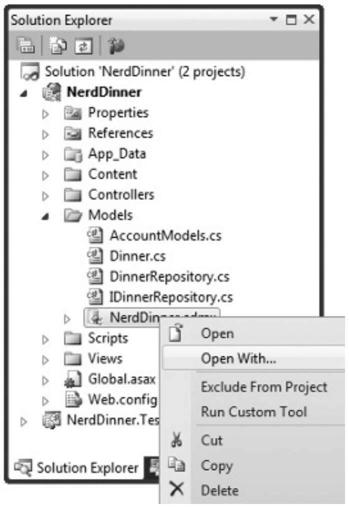

FIGURE 1-143

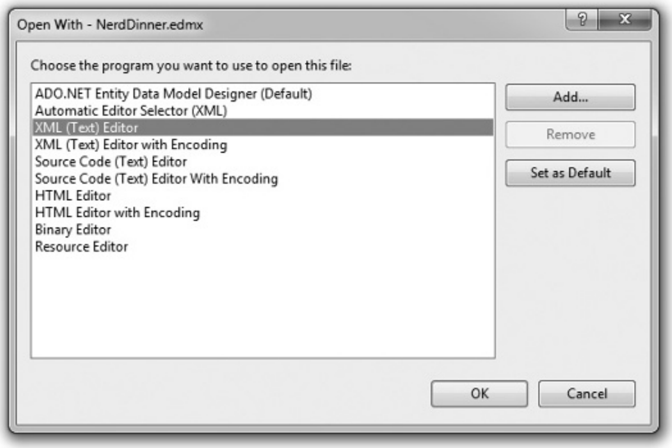
Open With - NerdDinner.edmx
Choose the program you want to use to open this file:
ADO.NET Entity Data Model Designer (Default)
Automatic Editor Selector (XML)
XML (Text) Editor
XML (Text) Editor with Encoding
Source Code (Text) Editor
Source Code (Text) Editor With Encoding
HTML Editor
HTML Editor with Encoding
Binary Editor
Resource Editor
Add...
Remove
Set as Default
OK
Cancel

FIGURE 1-144

Search for the string *DistanceBetween* within the XML. You'll find some XML that looks like the following:

```
<Function Name="DistanceBetween" ReturnType="real" Aggregate="false"
BuiltIn="false" NiladicFunction="false" IsComposable="true"
ParameterTypeSemantics="AllowImplicitConversion" Schema="dbo">
  <Parameter Name="Lat1" Type="real" Mode="In" />
  <Parameter Name="Long1" Type="real" Mode="In" />
  <Parameter Name="Lat2" Type="real" Mode="In" />
  <Parameter Name="Long2" Type="real" Mode="In" />
</Function>
```

Code snippet 1-97.txt

Change the return type and the parameter types from `"real"` to `"float"`. When you are done, the snippet of XML should look like this:

```
<Function Name="DistanceBetween" ReturnType="float" Aggregate="false"
BuiltIn="false" NiladicFunction="false"     IsComposable="true"
ParameterTypeSemantics="AllowImplicitConversion" Schema="dbo">
  <Parameter Name="Lat1" Type="float" Mode="In" />
  <Parameter Name="Long1" Type="float" Mode="In" />
  <Parameter Name="Lat2" Type="float" Mode="In" />
  <Parameter Name="Long2" Type="float" Mode="In" />
</Function>
```

Code snippet 1-98.txt

Now that we have this table-valued function as part of our database, how do we make use of it when building a LINQ query against our entities?

Entity Framework can't call a table-valued function directly so we need to add in a scalar stub function. That allows us to write a LINQ query in C# or VB that calls this stub function, but the function won't actually be executed in the client code. Instead, when the query is translated to a call in the database, the call to the stub function gets translated as a call to our table-valued function in the database.

To set this up, the first thing we'll do is add a new function to `DinnerRepository`.

```
[EdmFunction("NerdDinnerModel.Store", "DistanceBetween")]
public static double DistanceBetween(double lat1, double long1,
  double lat2, double long2)
{
  throw new NotImplementedException("Only call through LINQ expression");
}
```

Code snippet 1-99.txt

This function has the `EdmFunctionAttribute` *applied. You'll need to add the following using statement to the top of this class.*

```
using System.Data.Objects.DataClasses;
```

We can then expose a `FindByLocation` query method on our `DinnerRepository` class that uses the `NearestDinner` function to return upcoming dinners that are within 100 miles of the specified location:

```
public IQueryable<Dinner> FindByLocation(float latitude, float longitude) {

   var dinners = from dinner in FindUpcomingDinners()
                 join i in NearestDinners(latitude, longitude)
                 on dinner.DinnerID equals i.DinnerID
                 select dinner;

    return dinners;
}
```

Implementing a JSON-Based AJAX Search Action Method

We'll now implement a `Controller` action method that takes advantage of the new `FindByLocation` repository method to return a list of Dinner data that can be used to populate a map. We'll have this action method return the Dinner data in a JSON (JavaScript Object Notation) format so that it can be easily manipulated using JavaScript on the client.

To implement this, we'll create a new `SearchController` class by right-clicking the \Controllers directory and choosing the Add ➪ Controller menu command. We'll then implement a `SearchByLocation` action method within the new `SearchController` class like the one that follows:

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```
public class JsonDinner {
    public int      DinnerID    { get; set; }
    public string   Title       { get; set; }
    public double   Latitude    { get; set; }
    public double   Longitude   { get; set; }
    public string   Description { get; set; }
    public int      RSVPCount   { get; set; }
}

public class SearchController : Controller {

    DinnerRepository dinnerRepository = new DinnerRepository();

    //
    // AJAX: /Search/SearchByLocation

    [HttpPost]
    public ActionResult SearchByLocation(float longitude, float latitude) {

        var dinners = dinnerRepository.FindByLocation(latitude, longitude);

        var jsonDinners = from dinner in dinners
                          select new JsonDinner {
                              DinnerID = dinner.DinnerID,
                              Latitude = dinner.Latitude,
                              Longitude = dinner.Longitude,
                              Title = dinner.Title,
                              Description = dinner.Description,
                              RSVPCount = dinner.RSVPs.Count
                          };

        return Json(jsonDinners.ToList());
    }
}
```

Code snippet 1-100.txt

The `SearchController`'s `SearchByLocation` action method internally calls the `FindByLocation` method on `DinnerRespository` to get a list of nearby Dinners. Rather than return the `Dinner` objects directly to the client, though, it instead returns `JsonDinner` objects. The `JsonDinner` class exposes a subset of Dinner properties (e.g., for security reasons it doesn't disclose the names of the people who have RSVP'ed for a Dinner). It also includes an `RSVPCount` property that doesn't exist in Dinner — and that is dynamically calculated by counting the number of `RSVP` objects associated with a particular Dinner.

We are then using the `Json` helper method on the `Controller` base class to return the sequence of Dinners using a JSON-based wire format. JSON is a standard text format for representing simple data structures. The following is an example of what a JSON-formatted list of two `JsonDinner` objects look like when returned from our action method:

```
[{"DinnerID":53,"Title":"Dinner with the Family","Latitude":47.64312,
"Longitude":-122.130609, "Description":"Fun dinner","RSVPCount":2},
{"DinnerID":54, "Title":"Another Dinner","Latitude":47.632546,
"Longitude":-122.21201,"Description":"Dinner with Friends",
"RSVPCount":3}]
```

Code snippet 1-101.txt

Calling the JSON-Based AJAX Method Using jQuery

We are now ready to update the home page of the NerdDinner application to use the `SearchController`'s `SearchByLocation` action method. To do this, we'll open the /Views/Home/Index.aspx View template and update it to have a textbox, search button, our map, and a `<div>` element named `dinnerList`:

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```
<h2>Find a Dinner</h2>

<div id="mapDivLeft">

    <div id="searchBox">
        Enter your location: <%: Html.TextBox("Location") %>
        <input id="search" type="submit" value="Search" />
    </div>

    <div id="theMap">
```

```
        </div>

    </div>

    <div id="mapDivRight">
        <div id="dinnerList"></div>
    </div>
```

Code snippet 1-102.txt

We can then add two JavaScript functions to the page:

```
    <script type="text/javascript">

        $(document).ready(function() {
            LoadMap();
        });

        $("#search").click(function(evt) {
            var where = jQuery.trim($("#Location").val());
            if (where.length < 1)
                return;

            FindDinnersGivenLocation(where);
        });

    </script>
```

The first JavaScript function loads the map when the page first loads. The second JavaScript function wires up a JavaScript `click` event handler on the Search button. When the button is pressed, it calls the `FindDinnersGivenLocation` JavaScript function, which we'll add to our Map.js file:

```
    function FindDinnersGivenLocation(where) {
        map.Find("", where, null, null, null, null, null, false,
           null, null, callbackUpdateMapDinners);
    }
```

Code snippet 1-103.txt

This `FindDinnersGivenLocation` function calls `map.Find` on the Virtual Earth Control to center it on the entered location. When the Virtual Earth map service returns, the `map.Find` method invokes the `callbackUpdateMapDinners` callback method we passed it as the final argument.

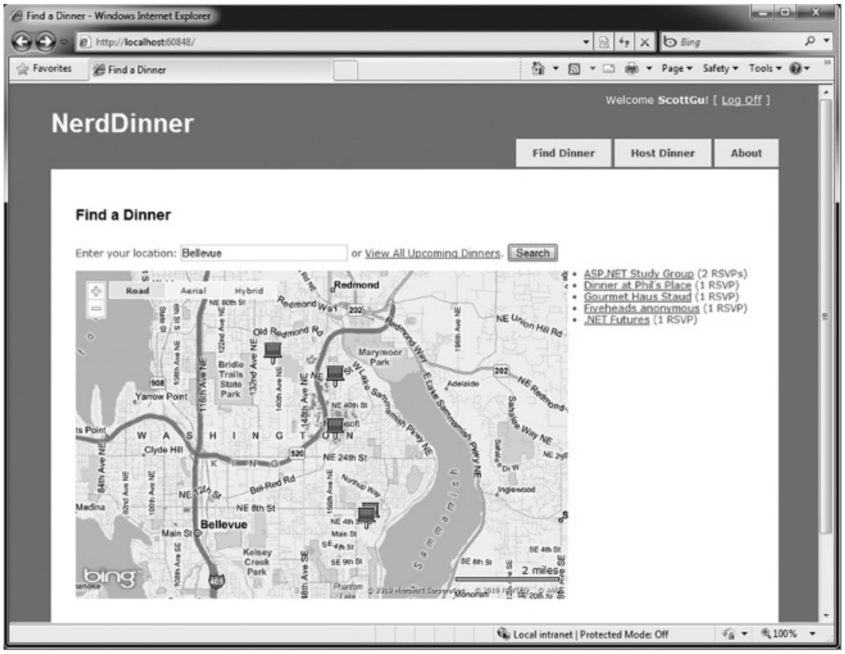
The `callbackUpdateMapDinners` method is where the real work is done. It uses jQuery's `$.post` helper method to perform an AJAX call to our `SearchController`'s `SearchByLocation` action method — passing it the latitude and longitude of the newly centered map. It defines an inline function that will be called when the `$.post` helper method completes, and the JSON-formatted Dinner results returned from the `SearchByLocation` action method will be passed it using a variable called `dinners`. It then does a `foreach` over each returned dinner, and uses the Dinner's latitude and longitude and other properties to add a new pin on the map. It also adds a Dinner entry to the HTML list of Dinners to the right of the map. It then wires up a hover event for both the pushpins and the HTML list so that details about the Dinner are displayed when a user hovers over them:

```
function callbackUpdateMapDinners(layer, resultsArray,
    places, hasMore, VEErrorMessage) {

    $("#dinnerList").empty();
    clearMap();
    var center = map.GetCenter();

    $.post("/Search/SearchByLocation", { latitude: center.Latitude,
                                         longitude: center.Longitude },
    function(dinners) {
        $.each(dinners, function(i, dinner) {

            var LL = new VELatLong(dinner.Latitude,
                                   dinner.Longitude, 0, null);

            var RsvpMessage = "";

            if (dinner.RSVPCount == 1)
                RsvpMessage = "" + dinner.RSVPCount + " RSVP";
            else
                RsvpMessage = "" + dinner.RSVPCount + " RSVPs";

            // Add Pin to Map
            LoadPin(LL, '<a href="/Dinners/Details/' + dinner.DinnerID + '">'
                        + dinner.Title + '</a>',
                        "<p>" + dinner.Description + "</p>" + RsvpMessage);

            //Add a dinner to the <ul> dinnerList on the right
            $('#dinnerList').append($('<li/>')
                            .attr("class", "dinnerItem")
                            .append($('<a/>').attr("href",
                                      "/Dinners/Details/" + dinner.DinnerID)
                            .html(dinner.Title))
                            .append(" ("+RsvpMessage+")"));
        });

        // Adjust zoom to display all the pins we just added.

            if (points.length > 1) {
                     map.SetMapView(points);
            }

        // Display the event's pin-bubble on hover.
        $(".dinnerItem").each(function(i, dinner) {
            $(dinner).hover(
                function() { map.ShowInfoBox(shapes[i]); },
                function() { map.HideInfoBox(shapes[i]); }
            );
        });
    }, "json");
```

Code snippet 1-104.txt

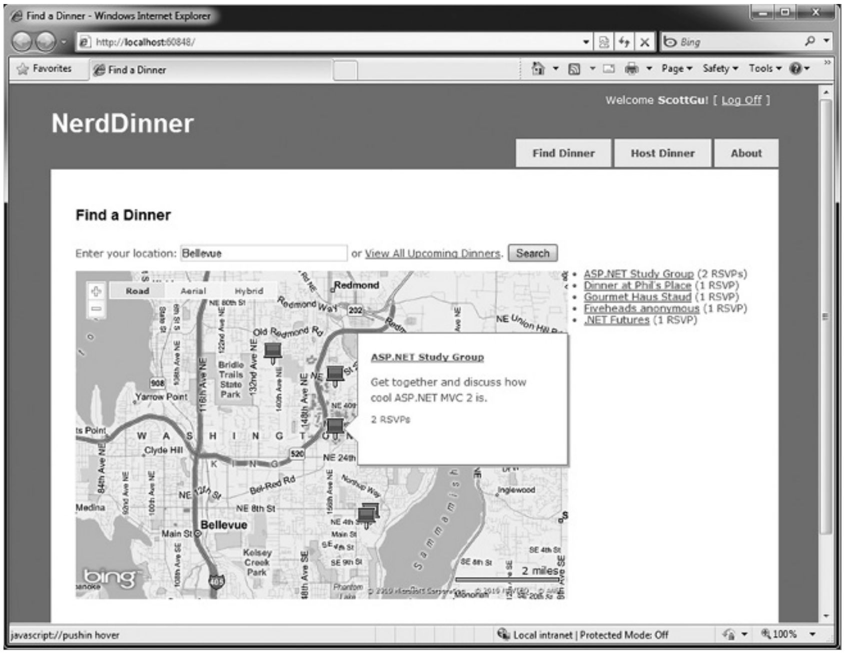
Now when we run the application and visit the home page, we'll be presented with a map. When we enter the name of a city, the map will display the upcoming Dinners near it (see Figure 1-145).

Hovering over a Dinner will display details about it (Figure 1-146).


Find a Dinner - Windows Internet Explorer
http://localhost:60848/
Welcome ScottGu! [Log Off]
NerdDinner
Find Dinner
Host Dinner
About
Find a Dinner
Enter your location: Bellevue
or View All Upcoming Dinners.
Search
Road
Aerial
Hybrid
Redmond
Bellevue
2 miles
Local intranet | Protected Mode: Off
100%

- ASP.NET Study Group (2 RSVPs)
- Dinner at Phil's Place (1 RSVP)
- Gourmet Haus Staud (1 RSVP)
- Fiveheads anonymous (1 RSVP)
- .NET Futures (1 RSVP)

FIGURE 1-145


Find a Dinner - Windows Internet Explorer
http://localhost:60848/
Welcome ScottGu! [Log Off]
NerdDinner
Find Dinner
Host Dinner
About
Find a Dinner
Enter your location: Bellevue
or View All Upcoming Dinners.
Search
Road
Aerial
Hybrid
Redmond
Bellevue
2 miles
javascript://pushin hover
Local intranet | Protected Mode: Off
100%

- ASP.NET Study Group (2 RSVPs)
- Dinner at Phil's Place (1 RSVP)
- Gourmet Haus Staud (1 RSVP)
- Fiveheads anonymous (1 RSVP)
- .NET Futures (1 RSVP)

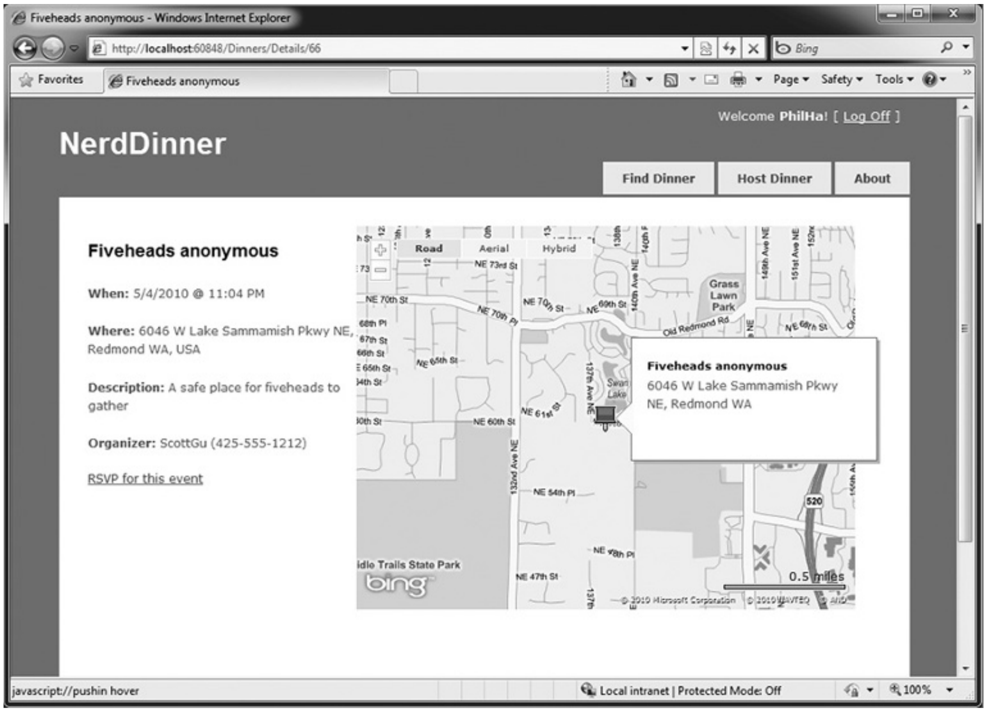
ASP.NET Study Group

Get together and discuss how cool ASP.NET MVC 2 is.

2 RSVPs

FIGURE 1-146

Clicking the Dinner title either in the bubble or on the right-hand side in the HTML list will navigate us to the Dinner — which we can then optionally RSVP for (Figure 1-147).


Fiveheads anonymous - Windows Internet Explorer
http://localhost:60848/Dinners/Details/66
Bing
Favorites
Fiveheads anonymous
Page ▾ Safety ▾ Tools ▾
Welcome PhilHa! [Log Off]
NerdDinner
Find Dinner
Host Dinner
About
Road
Aerial
Hybrid
bing
0.5 miles
© 2010 Microsoft Corporation
javascript://pushin hover
Local intranet | Protected Mode: Off
100%

Fiveheads anonymous

When: 5/4/2010 @ 11:04 PM

Where: 6046 W Lake Sammamish Pkwy NE, Redmond WA, USA

Description: A safe place for fiveheads to gather

Organizer: ScottGu (425-555-1212)

RSVP for this event

Fiveheads anonymous
6046 W Lake Sammamish Pkwy NE, Redmond WA

FIGURE 1-147

UNIT TESTING

Let's develop a suite of automated unit tests that verify our NerdDinner functionality and that will give us the confidence to make changes and improvements to the application in the future.

Why Unit Test?

On the drive into work one morning you have a sudden flash of inspiration about an application you are working on. You realize there is a change you can implement that will make the application dramatically better. It might be a refactoring that cleans up the code, adds a new feature, or fixes a bug.

The question that confronts you when you arrive at your computer is, "How safe is it to make this improvement?" What if making the change has side effects or breaks something? The change might be simple and only take a few minutes to implement, but what if it takes hours to manually test out all of the application scenarios? What if you forget to cover a scenario and a broken application goes into production? Is making this improvement really worth all the effort?

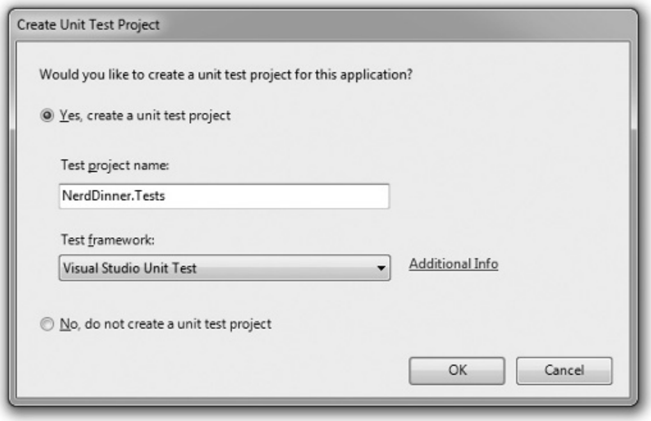
Automated unit tests can provide a safety net that enables you to continually enhance your applications and avoid being afraid of the code you are working on. Having automated tests that quickly verify functionality enables you to code with confidence and empowers you to make improvements you might otherwise not have felt comfortable doing. They also help create solutions that are more maintainable and have a longer lifetime — which leads to a much higher return on investment.

The ASP.NET MVC Framework makes it easy and natural to unit test application functionality. It also enables a Test Driven Development (TDD) workflow that enables test-first-based development.

NerdDinner.Tests Project

When we created our NerdDinner application at the beginning of this tutorial, we were prompted with a dialog asking whether we wanted to create a unit test project to go along with the application project (Figure 1-148).

We kept the "Yes, create a unit test project" radio button selected, which resulted in a NerdDinner.Tests project being added to our solution (Figure 1-149).



Create Unit Test Project

Would you like to create a unit test project for this application?

(●) Yes, create a unit test project

Test project name: NerdDinner.Tests

Test framework: Visual Studio Unit Test

( ) No, do not create a unit test project

FIGURE 1-148

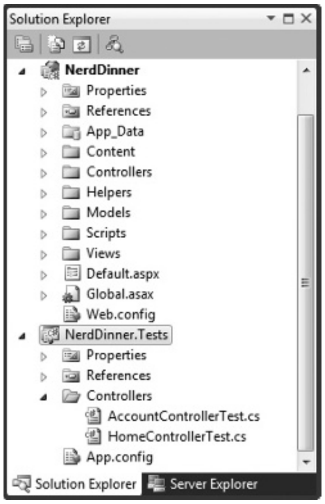


FIGURE 1-149

The NerdDinner.Tests project references the NerdDinner application project assembly and enables us to easily add automated tests to it that verify the application.

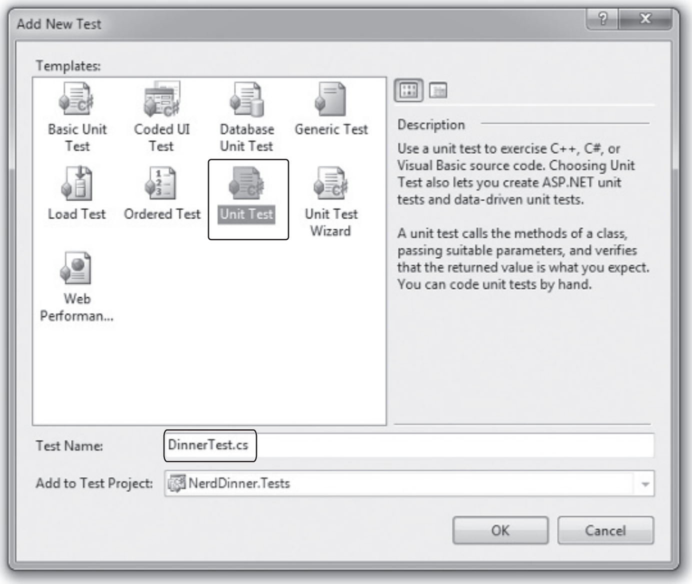
Creating Unit Tests for Our Dinner Model Class

Let's add some tests to our NerdDinner.Tests project that verify the `Dinner` class we created when we built our Model layer.

We'll start by creating a new folder within our test project called *Models*, where we'll place our Model-related tests. We'll then right-click the folder and choose the Add ➪ New Test menu command. This will bring up the "Add New Test" dialog.

We'll choose to create a unit test and name it **DinnerTest.cs** (see Figure 1-150).

When we click the OK button, Visual Studio will add (and open) a DinnerTest.cs file to the project (Figure 1-151).



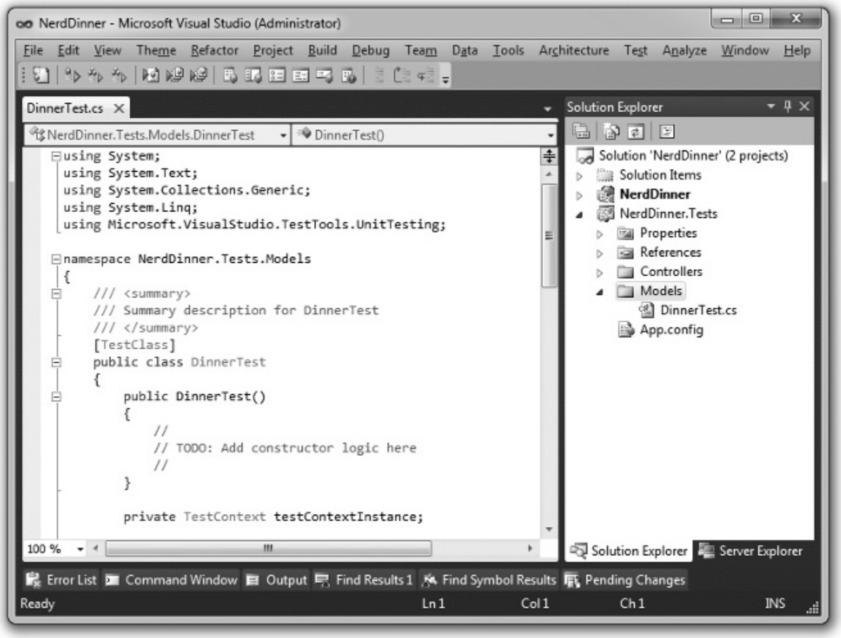
Use a unit test to exercise C++, C#, or Visual Basic source code. Choosing Unit Test also lets you create ASP.NET unit tests and data-driven unit tests.

A unit test calls the methods of a class, passing suitable parameters, and verifies that the returned value is what you expect. You can code unit tests by hand.

Test Name: DinnerTest.cs

Add to Test Project: NerdDinner.Tests

FIGURE 1-150



```
using System;
using System.Text;
using System.Collections.Generic;
using System.Linq;
using Microsoft.VisualStudio.TestTools.UnitTesting;

namespace NerdDinner.Tests.Models
{
    /// <summary>
    /// Summary description for DinnerTest
    /// </summary>
    [TestClass]
    public class DinnerTest
    {
        public DinnerTest()
        {
            //
            // TODO: Add constructor logic here
            //
        }

        private TestContext testContextInstance;
```

FIGURE 1-151

The default Visual Studio Unit Test template has a bunch of boilerplate code within it that I find a little messy. Let's clean it up to just contain the code that follows:

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```
using System;
using System.Collections.Generic;
using System.Linq;
using Microsoft.VisualStudio.TestTools.UnitTesting;
using NerdDinner.Models;

namespace NerdDinner.Tests.Models {

    [TestClass]
    public class DinnerTest {

    }
}
```

Code snippet 1-105.txt

The `[TestClass]` attribute on the preceding `DinnerTest` class identifies it as a class that will contain tests, as well as optional test initialization and teardown code. We can define tests within it by adding public methods that have a `[TestMethod]` attribute on them.

To get warmed up, we'll start with a couple of simple tests that exercise our `Dinner` class. The first test verifies that the `IsHostedBy` method of our `Dinner` returns `true` if the value of the `HostedBy` property matches the supplied username. The second test verifies that the `IsRegistered` method of the `Dinner` class checks its list of RSVPs:

```
[TestClass]
public class DinnerTest {
    [TestMethod]
    public void IsHostedBy_Should_Return_True_When_Dinner_HostedBy_User()
    {
        // Arrange
        Dinner dinner = new Dinner
        {
            HostedBy = "ScottGu"
        };

        // Act
        bool isHostedByScott = dinner.IsHostedBy("ScottGu");

        // Assert
        Assert.IsTrue(isHostedByScott);
    }

    [TestMethod]
    public void IsUserRegistered_Should_Return_True_When_User_RSVPs() {
        // Arrange
        Dinner dinner = new Dinner();
        dinner.RSVPs.Add(new RSVP { AttendeeName = "Haacked" });

        // Act
```

```
            bool haackedIsRegistered = dinner.IsUserRegistered("Haacked");

            // Assert
            Assert.IsTrue(haackedIsRegistered);
        }
    }
```

Code snippet 1-106.txt

You'll notice that our test names are very explicit (and somewhat verbose). We are doing this because we might end up creating hundreds or thousands of small tests, and we want to make it easy to quickly determine the intent and behavior of each of them (especially when we are looking through a list of failures in a test runner). The test names should always be named after the functionality they are testing. In the preceding code, we are using a *Noun_Should_Verb* naming pattern.

We are structuring the tests using the *AAA* testing pattern, which stands for *Arrange*, *Act*, *Assert*:

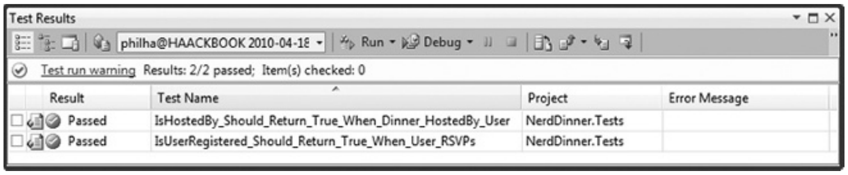
- **Arrange:** Set up the unit being tested.
- **Act:** Exercise the unit under test and capture the results.
- **Assert:** Verify the behavior.

When we write tests, we want to avoid having the individual tests do too much. Instead, each test should verify only a single concept (which will make it much easier to pinpoint the cause of failures). A good guideline is to try to only have a single Assert statement for each test. If you have more than one Assert statement in a test method, make sure that they are all being used to test the same concept. When in doubt, make another test.

Running Tests

Visual Studio 2008 Professional (and higher editions) includes a built-in test runner that can be used to run Visual Studio Unit Test projects within the IDE. We can select the Test ➪ Run ➪ All Tests in Solution menu command (or press Ctrl+R, A) to run all of our unit tests. Or, alternatively, we can position our cursor within a specific test class or test method and use the Test ➪ Run ➪ Tests in Current Context menu command (or press Ctrl+R, T) to run a subset of the unit tests.

Let's position our cursor within the `DinnerTest` class and press Ctrl+R, T to run the two tests we just defined. When we do this, a Test Results window will appear within Visual Studio and we'll see the results of our test run listed within it (see Figure 1-152).



Test run warning Results: 2/2 passed; Item(s) checked: 0

Result	Test Name	Project	Error Message
Passed	IsHostedBy_Should_Return_True_When_Dinner_HostedBy_User	NerdDinner.Tests	
Passed	IsUserRegistered_Should_Return_True_When_User_RSVPs	NerdDinner.Tests	

FIGURE 1-152

The VS Test Results window does not show the Class Name column by default. You can add this by right-clicking within the Test Results window and using the Add/Remove Columns menu command.

Our two tests took only a fraction of a second to run — and as you can see, they both passed. We can now go on and augment them by creating additional tests such as those that validate the negative cases where we make sure that these methods don't return `true` for cases that they shouldn't.

Having all these tests in place for the `Dinner` class will make it much easier and safer to add new business rules in the future. We can add our new rule logic to Dinner, and then within seconds verify that it hasn't broken any of our previous logic functionality.

Notice how using a descriptive test name makes it easy to quickly understand what each test is verifying. I recommend using the Tools ➪ Options menu command, opening the Test Tools/Test Execution configuration screen, and checking the "Double-clicking a failed or inconclusive unit test result displays the point of failure in the test" checkbox. This will allow you to double-click on a failure in the Test Results window and jump immediately to the Assert failure.

Creating DinnersController Unit Tests

Let's now create some unit tests that verify our `DinnersController` functionality. We'll start by right-clicking the Controllers folder within our Test project and then choose the Add ➪ New Test menu command. We'll create a unit test and name it DinnersControllerTest.cs.

We'll create two test methods that verify the `Details` action method on the `DinnersController`. The first will verify that a View is returned when an existing Dinner is requested. The second will verify that a `"NotFound"` View is returned when a nonexistent dinner is requested:

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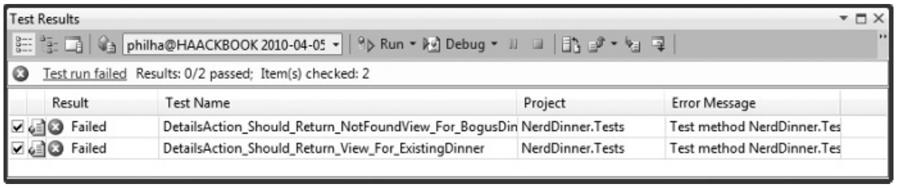
```
[TestClass]
public class DinnersControllerTest {

    [TestMethod]
    public void DetailsAction_Should_Return_View_For_ExistingDinner() {

        // Arrange
        var controller = new DinnersController();

        // Act
        var result = controller.Details(1) as ViewResult;

        // Assert
        Assert.IsNotNull(result, "Expected View");
    }

    [TestMethod]
    public void DetailsAction_Should_Return_NotFoundView_For_BogusDinner() {

        // Arrange
```

```
            var controller = new DinnersController();

            // Act
            var result = controller.Details(999) as ViewResult;

            // Assert
            Assert.AreEqual("NotFound", result.ViewName);
        }
    }
```

Code snippet 1-107.txt

The previous code compiles cleanly. When we run the tests, though, they both fail, as shown in Figure 1-153.



Test Results

philha@HAACKBOOK 2010-04-05 · Run · Debug

Test run failed Results: 0/2 passed; Item(s) checked: 2

Result	Test Name	Project	Error Message
Failed	DetailsAction_Should_Return_NotFoundView_For_BogusDin	NerdDinner.Tests	Test method NerdDinner.Tes
Failed	DetailsAction_Should_Return_View_For_ExistingDinner	NerdDinner.Tests	Test method NerdDinner.Tes

FIGURE 1-153

If we look at the Error Messages, we see that the reason the tests failed was because our `DinnersRepository` class was unable to connect to a database. Our NerdDinner application is using a connection string to a local SQL Server Express file that lives under the \App_Data directory of the NerdDinner application project. Because our NerdDinner.Tests project compiles and runs in a different directory from the application project, the relative path location of our connection string is incorrect.

We *could* fix this by copying the SQL Express database file to our test project, and then add an appropriate test connection string to it in the App.config of our test project. This would get the preceding tests unblocked and running.

Unit testing code using a real database, though, brings with it a number of challenges. Specifically:

- ➤ It significantly slows down the execution time of unit tests. The longer it takes to run tests, the less likely you are to execute them frequently. Ideally, you want your unit tests to be able to be run in seconds — and have it be something you do as naturally as compiling the project.
- ➤ It complicates the setup and cleanup logic within tests. You want each unit test to be isolated and independent of others (with no side effects or dependencies). When working against a real database, you have to be mindful of state and reset it between tests.

Let's look at a design pattern called *dependency injection* that can help us work around these issues and avoid the need to use a real database with our tests.

Dependency Injection

Right now `DinnersController` is tightly *coupled* to the `DinnerRepository` class. *Coupling* refers to a situation in which a class explicitly relies on another class in order to work:

```
public class DinnersController : Controller {

    DinnerRepository dinnerRepository = new DinnerRepository();

    //
    // GET: /Dinners/Details/5

    public ActionResult Details(int id) {

        Dinner dinner = dinnerRepository.FindDinner(id);

        if (dinner == null)
            return View("NotFound");

        return View(dinner);
    }
```

Code snippet 1-108.txt

Because the `DinnerRepository` class requires access to a database, the tightly coupled dependency the `DinnersController` class has on the `DinnerRepository` ends up requiring us to have a database in order for the `DinnersController` action methods to be tested.

We can get around this by using a design pattern called *dependency injection* — which is an approach in which dependencies (like repository classes that provide data access) are no longer created within classes that use them. Instead, dependencies can be passed to the class that uses them, using constructor arguments. If the dependencies are defined using interfaces, we then have the flexibility to pass in *fake* dependency implementations for unit test scenarios. This enables us to create test-specific dependency implementations that do not actually require access to a database.

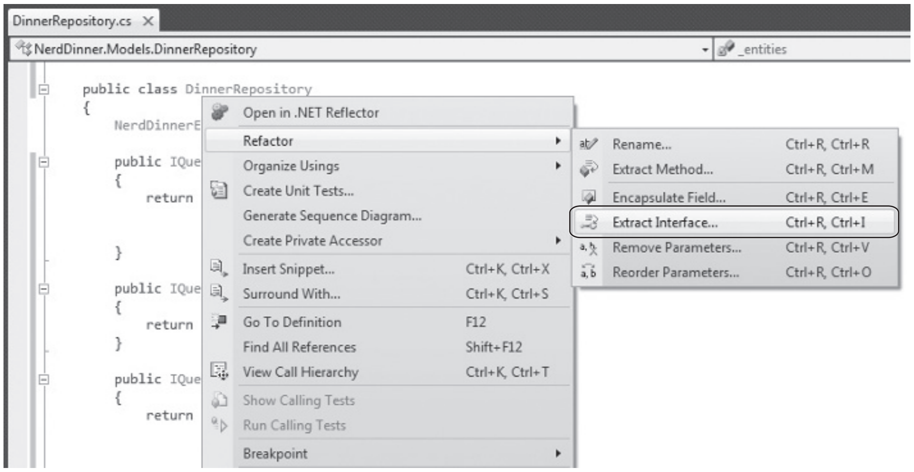
To see this in action, let's implement dependency injection with our `DinnersController`.

Extracting an IDinnerRepository Interface

Our first step will be to create a new `IDinnerRepository` interface that encapsulates the repository contract our Controllers require to retrieve and update dinners.

We can define this interface contract manually by right-clicking the `\Models` folder and then choosing the Add ➪ New Item menu command and creating a new interface named `IDinnerRepository.cs`.

Alternatively, we can use the refactoring tools built into Visual Studio Professional (and higher editions) to automatically extract and create an interface for us from our existing `DinnerRepository` class. To extract this interface using VS, simply position the cursor in the text editor on the `DinnerRepository` class, and then right-click and choose the Refactor ➪ Extract Interface menu command (see Figure 1-154).



DinnerRepository.cs

NerdDinner.Models.DinnerRepository

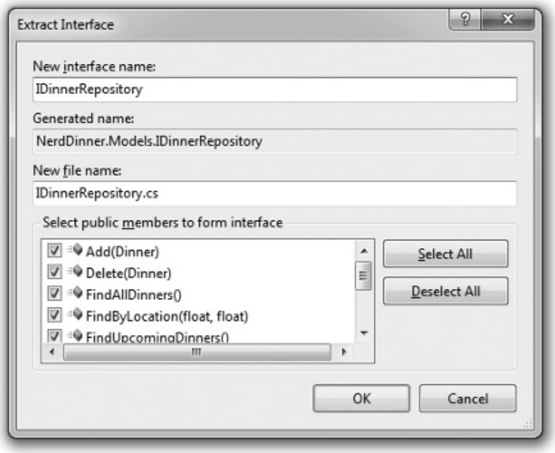
_entities

```
public class DinnerRepository
{
    NerdDinnerE

    public IQue
    {
        return

    }

    public IQue
    {
        return
    }

    public IQue
    {
        return
```

Open in .NET Reflector
Refactor
Organize Usings
Create Unit Tests...
Generate Sequence Diagram...
Create Private Accessor
Insert Snippet... Ctrl+K, Ctrl+X
Surround With... Ctrl+K, Ctrl+S
Go To Definition F12
Find All References Shift+F12
View Call Hierarchy Ctrl+K, Ctrl+T
Show Calling Tests
Run Calling Tests
Breakpoint
Rename... Ctrl+R, Ctrl+R
Extract Method... Ctrl+R, Ctrl+M
Encapsulate Field... Ctrl+R, Ctrl+E
Extract Interface... Ctrl+R, Ctrl+I
Remove Parameters... Ctrl+R, Ctrl+V
Reorder Parameters... Ctrl+R, Ctrl+O

FIGURE 1-154

This will launch the "Extract Interface" dialog and prompt us for the name of the interface to create. It will default to `IDinnerRepository` and automatically select all public members on the existing `DinnerRepository` class to add to the interface (Figure 1-155).



Extract Interface

New interface name: IDinnerRepository

Generated name: NerdDinner.Models.IDinnerRepository

New file name: IDinnerRepository.cs

Select public members to form interface

- [✓] Add(Dinner)
- [✓] Delete(Dinner)
- [✓] FindAllDinners()
- [✓] FindByLocation(float, float)
- [✓] FindUpcomingDinners()

FIGURE 1-155

When we click the OK button, Visual Studio will add a new `IDinnerRepository` interface to our application:

```
public interface IDinnerRepository {

    IQueryable<Dinner> FindAllDinners();
    IQueryable<Dinner> FindByLocation(float latitude, float longitude);
```

```
        IQueryable<Dinner> FindUpcomingDinners();
        Dinner GetDinner(int id);

        void Add(Dinner dinner);
        void Delete(Dinner dinner);

        void Save();
    }
```

Code snippet 1-109.txt

And our existing `DinnerRepository` class will be updated so that it implements the interface:

```
public class DinnerRepository : IDinnerRepository {
    ...
}
```

Code snippet 1-110.txt

Updating DinnersController to Support Constructor Injection

We'll now update the `DinnersController` class to use the new interface.

Currently `DinnersController` is hard-coded such that its `dinnerRepository` field is always a `DinnerRepository` instance:

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```
public class DinnersController : Controller {

    DinnerRepository dinnerRepository = new DinnerRepository();

    ...
}
```

Code snippet 1-111.txt

We'll change it so that the `dinnerRepository` field is of type `IDinnerRepository` instead of `DinnerRepository`. We'll then add two public `DinnersController` constructors. One of the constructors allows an `IDinnerRepository` to be passed as an argument. The other is a default constructor that uses our existing `DinnerRepository` implementation:

```
public class DinnersController : Controller {

    IDinnerRepository dinnerRepository;

    public DinnersController()
        : this(new DinnerRepository()) {
    }

    public DinnersController(IDinnerRepository repository) {
        dinnerRepository = repository;
    }
    ...
}
```

Code snippet 1-112.txt

Because ASP.NET MVC, by default, creates Controller classes using default constructors, our `DinnersController` at run time will continue to use the `DinnerRepository` class to perform data access.

We can now update our unit tests, though, to pass in a *fake* dinner repository implementation using the parameter constructor. This fake dinner repository will not require access to a real database and, instead, will use in-memory sample data.

Creating the FakeDinnerRepository Class

Let's create a `FakeDinnerRepository` class.

We'll begin by creating a Fakes directory within our NerdDinner .Tests project and then add a new `FakeDinnerRepository` class to it (right-click the folder and choose Add ➪ New Class, as shown in Figure 1-156).

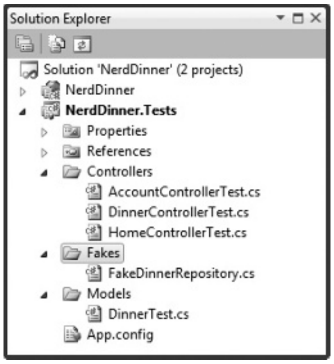
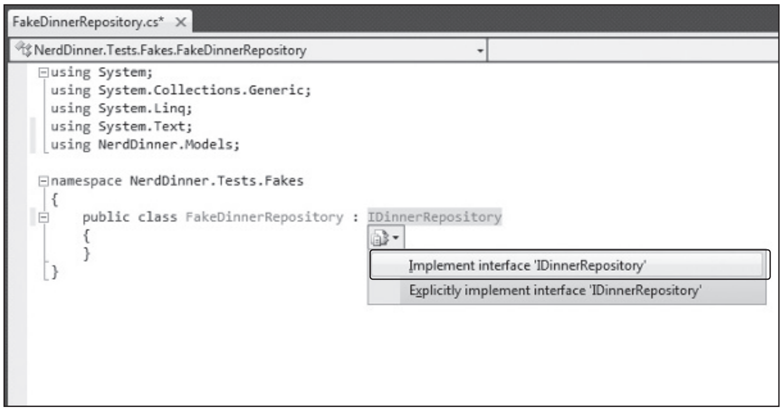


FIGURE 1-156

We'll update the code so that the `FakeDinnerRepository` class implements the `IDinnerRepository` interface. To do so, we can right-click on the interface and choose the Implement interface context menu command or we can place our mouse over the interface and implement the interface via the smart tag (see Figure 1-157).


FakeDinnerRepository.cs*
NerdDinner.Tests.Fakes.FakeDinnerRepository
Implement interface 'IDinnerRepository'
Explicitly implement interface 'IDinnerRepository'

```
using System;
using System.Collections.Generic;
using System.Linq;
using System.Text;
using NerdDinner.Models;

namespace NerdDinner.Tests.Fakes
{
    public class FakeDinnerRepository : IDinnerRepository
    {
    }
}
```

FIGURE 1-157

This will cause Visual Studio to automatically add all of the `IDinnerRepository` interface members to our `FakeDinnerRepository` class with default *stub out* implementations:

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```
public class FakeDinnerRepository : IDinnerRepository {

    public IQueryable<Dinner> FindAllDinners() {
        throw new NotImplementedException();
    }

    public IQueryable<Dinner> FindByLocation(float lat, float long){
            throw new NotImplementedException();
        }

        public IQueryable<Dinner> FindUpcomingDinners() {
            throw new NotImplementedException();
        }

        public Dinner GetDinner(int id) {
            throw new NotImplementedException();
        }

        public void Add(Dinner dinner) {
            throw new NotImplementedException();
        }

        public void Delete(Dinner dinner) {
            throw new NotImplementedException();
        }

        public void Save() {
            throw new NotImplementedException();
        }
    }
```

Code snippet 1-113.txt

We can then update the `FakeDinnerRepository` implementation to work off of an in-memory `List<Dinner>` collection passed to it as a constructor argument:

```
    public class FakeDinnerRepository : IDinnerRepository {

        private List<Dinner> dinnerList;

        public FakeDinnerRepository(List<Dinner> dinners) {
            dinnerList = dinners;
        }

        public IQueryable<Dinner> FindAllDinners() {
            return dinnerList.AsQueryable();
        }

        public IQueryable<Dinner> FindUpcomingDinners() {
            return (from dinner in dinnerList
                    where dinner.EventDate > DateTime.Now
                    select dinner).AsQueryable();
        }

        public IQueryable<Dinner> FindByLocation(float latitude
          , float longitude) {
            return (from dinner in dinnerList
                    where dinner.Latitude == lat && dinner.Longitude == lon
                    select dinner).AsQueryable();
        }

        public Dinner GetDinner(int id) {
            return dinnerList.SingleOrDefault(d => d.DinnerID == id);
        }

        public void Add(Dinner dinner) {
            dinnerList.Add(dinner);
        }

        public void Delete(Dinner dinner) {
            dinnerList.Remove(dinner);
        }

        public void Save() {
        }
    }
```

Code snippet 1-114.txt

We now have a fake `IDinnerRepository` implementation that does not require a database and can instead work off an in-memory list of `Dinner` objects.

Using the FakeDinnerRepository with Unit Tests

Let's return to the `DinnersController` unit tests that failed earlier because the database wasn't available. We can update the test methods to use a `FakeDinnerRepository` populated with sample in-memory dinner data to the `DinnersController` using the code that follows:

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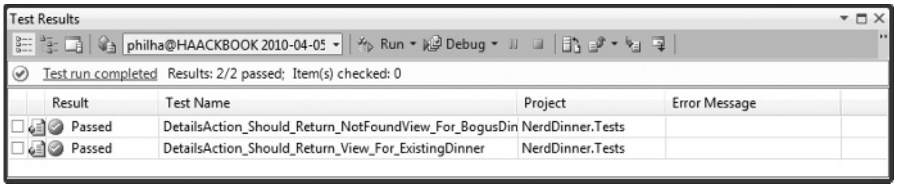
```
    [TestClass]
    public class DinnersControllerTest {

        List<Dinner> CreateTestDinners() {

            List<Dinner> dinners = new List<Dinner>();

            for (int i = 0; i < 101; i++) {

                Dinner sampleDinner = new Dinner() {
                    DinnerID = i,
                    Title = "Sample Dinner",
                    HostedBy = "SomeUser",
                    Address = "Some Address",
                    Country = "USA",
                    ContactPhone = "425-555-1212",
                    Description = "Some description",
                    EventDate = DateTime.Now.AddDays(i),
                    Latitude = 99,
                    Longitude = -99
                };
                dinners.Add(sampleDinner);
            }
            return dinners;
        }

        DinnersController CreateDinnersController() {
            var repository = new FakeDinnerRepository(CreateTestDinners());
            return new DinnersController(repository);
        }

        [TestMethod]
        public void DetailsAction_Should_Return_View_For_Dinner() {

            // Arrange
            var controller = CreateDinnersController();

            // Act
            var result = controller.Details(1);

            // Assert
            Assert.IsInstanceOfType(result, typeof(ViewResult));
        }

        [TestMethod]
        public void DetailsAction_Should_Return_NotFoundView_For_BogusDinner() {

            // Arrange
            var controller = CreateDinnersController();

            // Act
            var result = controller.Details(999) as ViewResult;

            // Assert
            Assert.AreEqual("NotFound", result.ViewName);
        }
    }
```

Code snippet 1-115.txt

Now when we run these tests, they both pass (see Figure 1-158).



Test run completed Results: 2/2 passed; Item(s) checked: 0

Result	Test Name	Project	Error Message
Passed	DetailsAction_Should_Return_NotFoundView_For_BogusDin	NerdDinner.Tests	
Passed	DetailsAction_Should_Return_View_For_ExistingDinner	NerdDinner.Tests	

FIGURE 1-158

Best of all, they take only a fraction of a second to run and do not require any complicated setup/cleanup logic. We can now unit test all of our `DinnersController` action method code (including listing, paging, details, create, update, and delete) without ever needing to connect to a real database.

DEPENDENCY INJECTION FRAMEWORKS

Performing manual dependency injection (as we are doing) works fine, but does become harder to maintain as the number of dependencies and components in an application increases.

Several dependency injection frameworks exist for .NET that can help provide even more dependency management flexibility. These frameworks, also sometimes called *inversion of control* (*IoC*) containers, provide mechanisms that enable an additional level of configuration support for specifying and passing dependencies to objects at run time (most often using constructor injection). Some of the more popular OSS (Open Source Software) Dependency Injection/IoC frameworks in .NET include Autofac, Ninject, Spring.NET, StructureMap, and Windsor.

ASP.NET MVC exposes extensibility APIs that enable developers to participate in the resolution and instantiation of Controllers and that enable Dependency Injection/IoC frameworks to be cleanly integrated within this process. Using a DI/IoC framework would also enable us to remove the default constructor from our `DinnersController`, which would completely remove the coupling between it and the `DinnerRepository`.

We won't be using a Dependency Injection/IoC framework with our NerdDinner application. But it is something we could consider for the future if the NerdDinner code-base and capabilities grew.

Creating Edit Action Unit Tests

Let's now create some unit tests that verify the `Edit` functionality of the `DinnersController`. We'll start by testing the HTTP-GET version of our `Edit` action:

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```
//
// GET: /Dinners/Edit/5

[Authorize]
public ActionResult Edit(int id) {

    Dinner dinner = dinnerRepository.GetDinner(id);

    if (!dinner.IsHostedBy(User.Identity.Name))
        return View("InvalidOwner");

    return View(new DinnerFormViewModel(dinner));
}
```

Code snippet 1-116.txt

We'll create a test that verifies that a View backed by a `DinnerFormViewModel` object is rendered back when a valid dinner is requested:

```
[TestMethod]
public void EditAction_Should_Return_View_For_ValidDinner() {

    // Arrange
    var controller = CreateDinnersController();

    // Act
    var result = controller.Edit(1) as ViewResult;

    // Assert
    Assert.IsInstanceOfType(result.ViewData.Model,
                            typeof(DinnerFormViewModel));
}
```

Code snippet 1-117.txt

When we run the test, though, we'll find that it fails because a null reference exception is thrown when the `Edit` method accesses the `User.Identity.Name` property to perform the `Dinner.IsHostedBy` check.

The `User` object on the `Controller` base class encapsulates details about the logged-in user and is populated by ASP.NET MVC when it creates the Controller at run time. Because we are testing the `DinnersController` outside of a web-server environment, the `User` object isn't set (hence the null reference exception).

Mocking the User.Identity.Name Property

Mocking frameworks make testing easier by enabling us to dynamically create fake versions of dependent objects that support our tests. For example, we can use a mocking framework in our `Edit` action test to dynamically create a `User` object that our `DinnersController` can use to look up a simulated username. This will prevent a null reference from being thrown when we run our test.

There are many .NET mocking frameworks that can be used with ASP.NET MVC (you can see a list of them at `www.mockframeworks.com/`). For testing our NerdDinner application, we'll use an open source mocking framework called *Moq*, which can be downloaded for free from `http://code.google.com/p/moq/`. The samples in this book assume Moq version 4.0.423.5.

Once it is downloaded, we'll add a reference in our NerdDinner.Tests project to the `Moq.dll` assembly (see Figure 1-159).

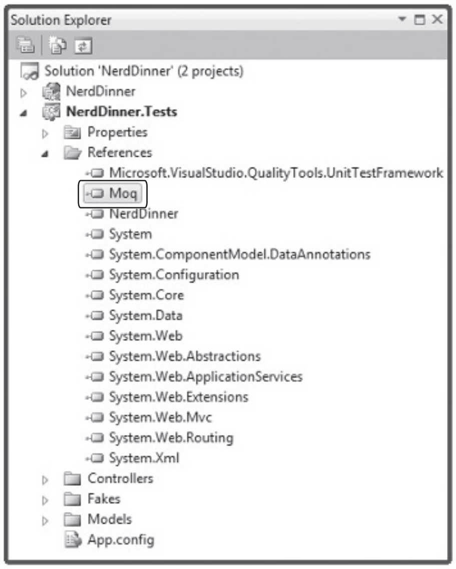

FIGURE 1-159

We'll then add an overloaded `CreateDinnersControllerAs(username)` helper method to the test class, which takes a username as a parameter and then *mocks* the `User.Identity.Name` property on the `DinnersController` instance:

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```
DinnersController CreateDinnersControllerAs(string userName) {

    var mock = new Mock<ControllerContext>();
    mock.SetupGet(p => p.HttpContext.User.Identity.Name).Returns(userName);
    mock.SetupGet(p => p.HttpContext.Request.IsAuthenticated).Returns(true);

    var controller = CreateDinnersController();
    controller.ControllerContext = mock.Object;

    return controller;
}
```

Code snippet 1-118.txt

In this, we are using Moq to create a `Mock` object that fakes a `ControllerContext` object (which is what ASP.NET MVC passes to Controller classes to expose runtime objects like `User`, `Request`, `Response`, and `Session`). We are calling the `SetupGet` method on the `Mock` to indicate that the `HttpContext.User.Identity.Name` property on `ControllerContext` should return the username string we passed to the helper method.

We can mock any number of `ControllerContext` properties and methods. To illustrate this, I've also added a `SetupGet` call for the `Request.IsAuthenticated` property (which isn't actually needed for the tests below but helps illustrate how you can mock `Request` properties). When we are done, we assign an instance of the `ControllerContext` mock to the `DinnersController` our helper method returns.

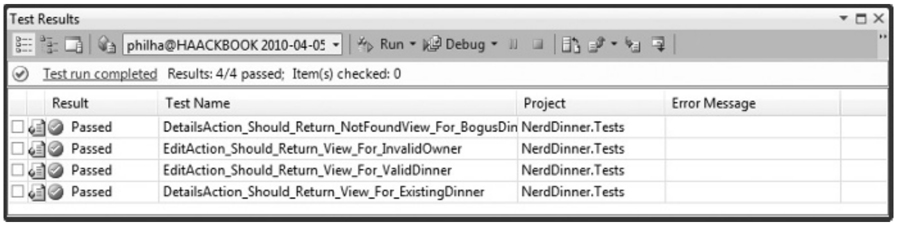
We can now write unit tests that use this helper method to test Edit scenarios involving different users:

```
[TestMethod]
public void EditAction_Should_Return_EditView_When_ValidOwner() {

    // Arrange
    var controller = CreateDinnersControllerAs("SomeUser");

    // Act
    var result = controller.Edit(1) as ViewResult;

    // Assert
    Assert.IsInstanceOfType(result.ViewData.Model,
                            typeof(DinnerFormViewModel));
}

[TestMethod]
public void EditAction_Should_Return_InvalidOwnerView_When_InvalidOwner() {

    // Arrange
    var controller = CreateDinnersControllerAs("NotOwnerUser");

    // Act
```

```
        var result = controller.Edit(1) as ViewResult;

        // Assert
        Assert.AreEqual(result.ViewName, "InvalidOwner");
    }
```

Code snippet 1-119.txt

Now when we run the tests, they pass (see Figure 1-160).



Test Results

philha@HAACKBOOK 2010-04-05 | Run | Debug

Test run completed Results: 4/4 passed; Item(s) checked: 0

Result	Test Name	Project	Error Message
Passed	DetailsAction_Should_Return_NotFoundView_For_BogusDin	NerdDinner.Tests	
Passed	EditAction_Should_Return_View_For_InvalidOwner	NerdDinner.Tests	
Passed	EditAction_Should_Return_View_For_ValidDinner	NerdDinner.Tests	
Passed	DetailsAction_Should_Return_View_For_ExistingDinner	NerdDinner.Tests	

FIGURE 1-160

Testing UpdateModel Scenarios

We've created tests that cover the HTTP-GET version of the `Edit` action. Let's now create some tests that verify the HTTP-POST version of the `Edit` action:

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```
//
// POST: /Dinners/Edit/5

[HttpPost, Authorize]
public ActionResult Edit (int id, FormCollection collection) {
    Dinner dinner = dinnerRepository.GetDinner(id);

    if (!dinner.IsHostedBy(User.Identity.Name))
        return View("InvalidOwner");

    if(TryUpdateModel(dinner)) {
        dinnerRepository.Save();

        return RedirectToAction("Details", new { id=dinner.DinnerID });
    }
    return View(new DinnerFormViewModel(dinner));
}
```

Code snippet 1-120.txt

The interesting new testing scenario for us to support with this action method is its usage of the `UpdateModel` helper method on the `Controller` base class. We are using this helper method to bind form-post values to our `Dinner` object instance.

The following code has two tests that demonstrate how we can supply form-posted values for the `UpdateModel` helper method to use. We'll do this by creating and populating a `FormCollection` object, and then assign it to the `ValueProvider` property on the Controller.

The first test verifies that upon a successful save, the browser is redirected to the Details action. The second test verifies that when invalid input is posted, the action redisplays the Edit view again with an error message.

```
public void EditAction_Should_Redirect_When_Update_Successful() {

    // Arrange
    var controller = CreateDinnersControllerAs("SomeUser");

    var formValues = new FormCollection() {
        { "Title", "Another value" },
        { "Description", "Another description" }
    };

    controller.ValueProvider = formValues;

    // Act
    var result = controller.Edit(1, formValues) as RedirectToRouteResult;

    // Assert
    Assert.AreEqual("Details", result.RouteValues["Action"]);
}


[TestMethod]
public void EditAction_Should_Redisplay_With_Errors_When_Update_Fails() {

    // Arrange
    var controller = CreateDinnersControllerAs("SomeUser");

    var formValues = new FormCollection() {
        { "EventDate", "Bogus date value!!!"}
    };

    controller.ValueProvider = formValues;

    // Act
    var result = controller.Edit(1, formValues) as ViewResult;

    // Assert
    Assert.IsNotNull(result, "Expected redisplay of view");
    Assert.IsTrue(result.ViewData.ModelState.Count > 0, "Expected errors");
}
```

Code snippet 1-121.txt

Testing Wrap-Up

We've covered the core concepts involved in unit testing Controller classes. We can use these techniques to easily create hundreds of simple tests that verify the behavior of our application.

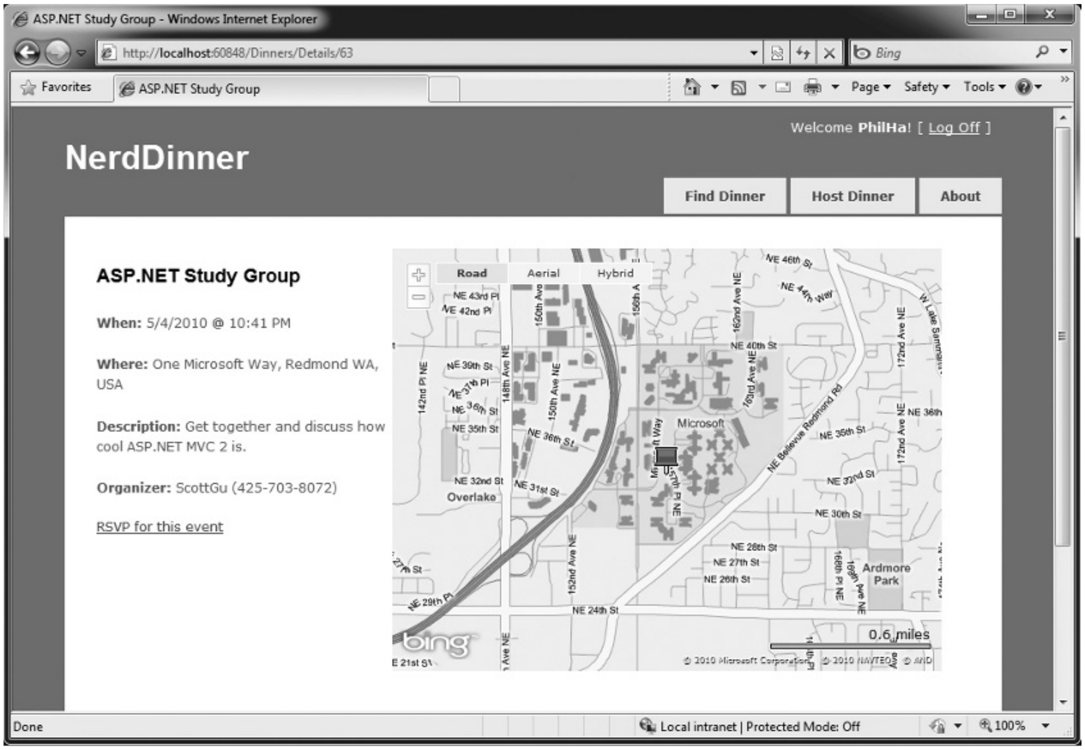
Because our Controller and Model tests do not require a real database, they are extremely fast and easy to run. We'll be able to execute hundreds of automated tests in seconds, and immediately get feedback as to whether a change we made broke something. This will help provide us the confidence to continually improve, refactor, and refine our application.

We covered testing as the last topic in this chapter — but not because testing is something you should do at the end of a development process! On the contrary, you should write automated tests as early as possible in your development process. Doing so enables you to get immediate feedback as you develop, helps you think thoughtfully about your application's use case scenarios, and guides you to design your application with clean layering and coupling in mind.

A later chapter in this book will discuss Test Driven Development (TDD) and how to use it with ASP.NET MVC. TDD is an iterative coding practice wherein you first write the tests that your resulting code will satisfy. With TDD you begin each feature by creating a test that verifies the functionality you are about to implement. Writing the unit test first helps ensure that you clearly understand the feature and how it is supposed to work. Only after the test is written (and you have verified that it fails) do you then implement the actual functionality the test verifies. Because you've already spent time thinking about the use case of how the feature is supposed to work, you will have a better understanding of the requirements and how best to implement them. When you are done with the implementation, you can re-run the test and get immediate feedback as to whether the feature works correctly. We'll cover TDD more in Chapter 10.

NERDDINNER WRAP-UP

Our initial version of our NerdDinner application is now complete and ready to deploy on the Web (Figure 1-161).



ASP.NET Study Group

When: 5/4/2010 @ 10:41 PM

Where: One Microsoft Way, Redmond WA, USA

Description: Get together and discuss how cool ASP.NET MVC 2 is.

Organizer: ScottGu (425-703-8072)

RSVP for this event

FIGURE 1-161

We used a broad set of ASP.NET MVC features to build NerdDinner. I hope that the process of developing it shed some light on how the core ASP.NET MVC features work and provided context on how these features integrate within an application.

The following chapters will go into more depth on ASP.NET MVC and discuss its features in detail.