Software Testing with Visual Studio 2010

Jeff Levinson

Praise for *Software Testing with Visual Studio 2010*

"Jeff Levinson has written a remarkable book. Remarkable because it distills a massive amount of information into a clear, readable book that will teach you how to best use the Visual Studio 2010 Testing Tools. Remarkable because it shows not just how to use the strengths of the tools, but also how to work around any of their weaknesses. Remarkable because Jeff walks you through the implementation strategies that can bring real business value, not just to the testing team, but also to test the entire organization. If you are implementing the test tools, this book belongs on your desk. My dog-eared and marked-up copy sits on mine."

—Steven Borg, Owner, Northwest Cadence

"Testing—and testers—don't get enough respect. By providing a great mix of the what, why, and how of testing with Visual Studio 2010, this book will help change that. More important, it will help make the software we use better."

—David Chappell, Principal, Chappell & Associates

"Jeff has once again written a great book, filled with nice nuggets of testing wisdom. A great addition to your testing and ALM library for anyone using Visual Studio 2010 and Team Foundation Server 2010."

—Mickey Gousset, Microsoft ALM MVP and Senior Technical Developer, Infront Consulting Group

"Jeff's book is by far the most in-depth investigation of the Test features in Visual Studio ALM I have seen. His insight and experience help the readers understand the impact of poor testing and how they can improve the quality of their software. I particularly liked the obvious real-world understanding of the realities of software testing when applied in practice and the effort by the author to show the readers the ways around those realities."

—Martin Hinshelwood, Visual Studio ALM MVP and Visual Studio ALM Ranger

"Software Testing defines much more than the usage of a testing tool; it shows the practical way in which we test at Microsoft Corporation. Additionally, this book provides the definitive process to using Microsoft Test Manager with the rigor that we test here at Microsoft."

—Randy Miller, ALM Architect, Microsoft

"Jeff provides the rare combination of deep, insider knowledge of Microsoft's 2010 testing tools coupled with pragmatic details about how to plan, manage, and execute testing in the real world."

—Mark Mydland, Director of Test, Visual Studio Ultimate, Microsoft

"With Jeff's extensive knowledge with Microsoft's ALM offering, this book will get you started on the right track with all the new testing capabilities offered by the Visual Studio 2010 suite. Whether you are a new or veteran tester, the personal insights the author brings to the testing topic are very interesting and useful…."

—Etienne Tremblay, Microsoft ALM MVP

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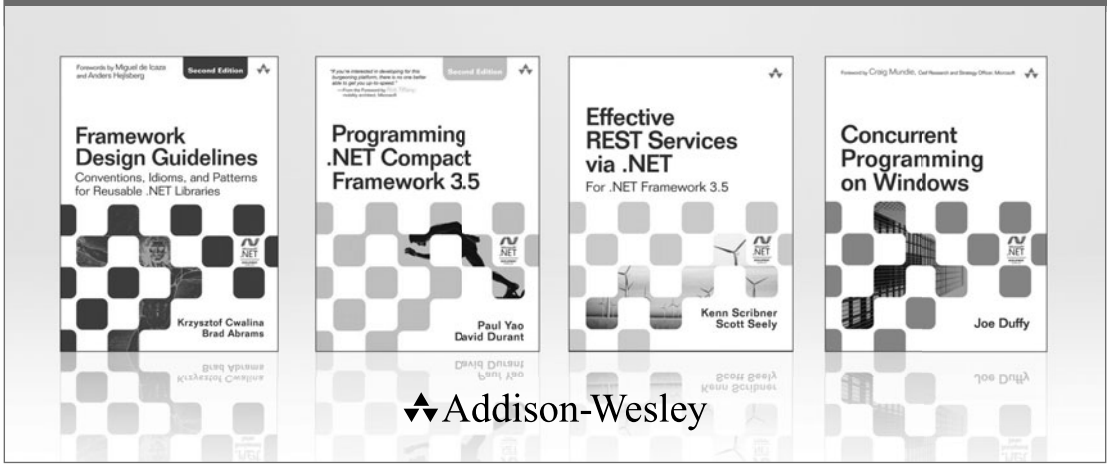

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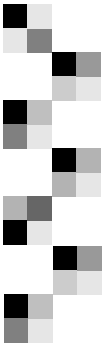

Software Testing with Visual Studio® 2010

Jeff Levinson

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To my wife, Tami, and my daughter, Caitlin, who supported
me and had to deal with me for the last year.
And my new son, Sean: I hope you start sleeping through the night soon.

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Foreword

OUR PRODUCT TEAM LIKES TO SAY that when we started building Visual Studio Test Professional 2010 we wanted to deliver world peace as a feature. To make our ship date, we reduced our aspirations to making peace between software developers and software testers.

Even with this drastic reduction in scope, we faced a daunting task. Our profession often creates substantial separation, organizationally and sometimes physically, between those responsible for creating and maintaining software and those responsible for validating that the software meets the needs of businesses and customers. Because of the separation developers and testers often communicate by throwing information "over the wall," which results in poor communication of issues (bugs); in uncertainty about what features, bug fixes, and improvements development has added to a particular build; and in mistrust between the development and test organizations. All of which, in turn, contribute to the quality issues, schedule delays, and outright project cancellations that continue to plague our industry. Many of the QA tools currently available in the market exacerbate the communication problems by managing the planning, testing, and tracking of the test effort independently from the tools used to track planning and development.

As we began to dig into the source of the communication breakdowns, we found, somewhat to our surprise, that manual black-box style testing accounts for approximately 70 percent of all testing in our industry. To succeed with this style of testing, testers develop deep domain knowledge around the products they test but spend less time cultivating their knowledge

of the deep technical and architectural aspects of the system. To manage their testing efforts, these testers relied largely on Microsoft Word, Microsoft Excel, handwritten notes, and whiteboards. Worse, testers had no tool support for running tests and therefore spent significant portions of the day on time-consuming and often menial tasks such as deploying software, writing bug reports, and finding clear steps to reproduce bugs.

As a software development company, Microsoft clearly recognizes the importance of allowing all members of software development teams, developers, testers, architects, project and program managers, and business analysts to participate fully in the development process. We built Microsoft Visual Studio Test Professional 2010 and the Lab Management capability of Microsoft Team Foundation Server 2010 to help eliminate the friction between developers and testers by providing self-documenting builds that include tests impacted by developers' changes, single-click actionable bugs that eliminate the "No Repro" problem, and work item-based test planning and management that enables visibility and traceability by all project stakeholders. To streamline the test effort and increase the effectiveness of testing, we added streamlined virtual build, deploy and test, fast forward for manual testing, and the capability to generate an automated Coded UI test based on a previously completed manual test.

During development, we relied heavily on feedback and advice from a number of external sources who could provide both industry perspective and feedback based on extensive personal experience. In that capacity, Jeff Levinson helped to shape Microsoft's test offering and TFS's Lab Management capability in just about every way possible. Jeff participated in every formal design review, special interest group, technology preview, and beta program that existed. Beyond the formal interactions, Jeff spent days and weeks of his "free time" installing, using, and testing our product followed by hours spent with me and other members of the team providing feedback, pushing for improvements, and making suggestions. I can't say that all Jeff's feedback made it into the final product, but our product is better for his effort.

As much as I would like to believe that Jeff spent all this time and effort just to make my life easier, I know that Jeff's real motivation came from his passion for helping teams to build quality software. In his book, Jeff brings

a pragmatic approach, years of experience, and a clear understanding of how the entire development team must work together to build truly great software. The combination of Jeff's insider knowledge and deep understanding of Microsoft Visual Studio Test Professional 2010 with his proven approach to software testing create a roadmap that can help any team to build high-quality software while avoiding the pitfalls and friction that so often lead to "death marches," missed deadlines, and unsatisfied customers.

Mark Mydland
Director of Test, Microsoft

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Preface

As a process improvement professional, I have experienced many team challenges. Big challenges. It is not unusual to see teams that seem so perfectly compatible start in excitement only to fizzle in different directions and end up not working together. Products suffer, customers suffer, and ultimately relationships suffer. When Microsoft introduced a new set of tools to help ensure quality applications and bring teams together in an evolutionary way, I was at first skeptical, but not now.

From one company to the next, one organization to the next, or even within a given team, the same problems arise. Granted, the circumstances can make basic problems much more challenging, but you can consistently identify the following issues:

- Challenged or poor communication between developers and testers
- Constant churning with precious little progress due to fixing the same things over and over again
- Organizational structures that sabotage quality work and the capability to productively manage resources
- Management that focuses on the shipping date with no consideration of the long-term cost of poor quality
- Lack of proven toolsets to maximize productivity and efficiency of teams

Enter Microsoft Test Manager. Now there is this single point at which teams can coalesce: quality. Microsoft Test Manager offers the following proposition: Do you want to build a better quality product with less rework,

less divisiveness in a shorter period of time? If so, what are you willing to do to achieve this goal? The response seems simple enough:

- Incorporate a basic process with some good old-fashioned common sense.
- Use common tools.
- Share data.

In my experience, there is one obvious set of tools: Team Foundation Server, Visual Studio, and Microsoft Test Manager. Using these tools has been proven to break down barriers, get teams talking, and deliver the promises of the preceding proposition. It is my goal to demonstrate how to accomplish this to as many people as possible. With the tools that Microsoft provides, the level of effort required to use them is minimal and the benefits are huge. Will the tools work for everyone? Well, with the wide variety of tools and platforms that individuals need to test against, I can't make any promises. But if, for the most part, the platforms and languages you test against are somewhat commonplace, you can reap benefits from using this tool suite.

It's funny how we see the process differently depending on our role on a project. I have served in many roles (some better than others). As a developer, I couldn't stand testers because they always broke my code because they didn't know how to use the application. As a tester, I couldn't stand developers because they didn't know how to code. As an architect, I looked on much of the process as a necessary evil. As a process improvement expert, I realized (even though this may be patently obvious) that without testers I couldn't get the metrics I needed to make a difference. As an author, I hope to communicate that by bringing testers and developers together to work *cooperatively* we can make positive changes across the board in a fun and cooperative environment. We can accomplish this by objectively assessing and learning about these unique and valuable new tools from Microsoft.

Thank you for reading this book, and I hope it helps you improve the quality of your software. If you have questions, errata, suggestions, additions, or disagreements with anything you read, please drop me a note at jeffstuff@jtlevinson.com.

Who Should Read This Book?

This book is primarily for software testers or people who test software as one of their primary job roles—from the professional tester or developer to the business analyst who needs to verify software for end users.

The testing process with Microsoft Test Professional 2010 and Visual Studio 2010 Ultimate is structured in a way that the tester can perform manual testing, and the *developer* can automate the tests. For this reason, developers can also find this book useful because considerable resources are dedicated to the developer's role in the testing process. Further, much of this book covers best practices for developers and testers working together. Chapter 6, "Automating Test Cases," and Chapter 7, "Executing Automated Test Cases," are especially relevant to the topic.

For those new, or relatively new, testers Chapter 2, "Software Quality and Testing Overview" provides a solid introduction to the goals of testing, approaches to testing, and considerations when testing. This is designed to be a primer and can be skipped by those already familiar with testing processes.

Test and development managers, in particular those looking for a better understanding of the overall process or those wanting to leverage the reporting offered in Team Foundation Server, can also benefit from reading this book. Understanding reporting is often a conduit for discovering that a seemingly insurmountable problem can actually be fixed. Add to that mix the capability to quantify metrics and improve them over time, and you have a powerful tool for managers. Chapter 1, "State of Testing," Chapter 3, "Planning Your Testing," and Chapter 9, "Reporting and Metrics," are most applicable to managers.

I hope you find this book helpful in your organization and as a guide for your testing teams.

What This Book Does Not Cover

One topic not covered is the virtualization infrastructure required to run Lab Management. The lab infrastructure requires a network administrator and people familiar with virtualization technologies including hardware and software. It would have been too complicated to include everything and would have been beyond the scope of this book. This includes information such as

System Center Virtual Machine Manager and Hyper-V. Setup of the Test Agent, Test Controller, and Build Hosts are discussed because these are items the testing or development team will probably need to deal with at some point—especially if teams switch back and forth between user interface testing and unit testing.

Additionally, you will not find information on load testing, stress testing, and Web performance testing, and only minimal information on unit testing is available. The information on unit testing is presented from the perspective of how a tester or developer might execute these automated tests and relate them to requirements. You will not find any in-depth discussions on the philosophy of unit testing or specific unit testing techniques.

About the Application Used in This Book

The application used throughout this book (and in the exercises) is the BlogEngine.NET application because it is a popular real-world application used by many individuals. It is also open source with a thriving community behind it. BlogEngine.NET was created by Al Nyveldt and Mads Kristensen. You can get more information about it from dotnetblogengine.net and download the original version of this application at blogengine.codeplex.com.

The version used in this book has been modified somewhat because it was ported to Visual Studio 2010 and converted to a Web Application for use with Team Build. You can download the source from here: informit.com/title/9780321734488. This download includes a readme file describing how to set up the application so that you can follow along with the examples. Aside from these modifications, no other material modifications have been made to the source code. The Database project and the MSDeploy project were added to support the different capabilities of the tools demonstrated.

Other software is required to follow these examples. You must have either Visual Studio Ultimate or Premium to create Coded UI tests. You must also have Microsoft Test Professional or Visual Studio Ultimate to get Microsoft Test Manager. Although not a tested configuration, you might run these examples with Microsoft's all-up Lab Management virtual machine. This virtual machine can be downloaded here: www.microsoft.com/downloads/details.aspx?FamilyID=592e874d-8fcd-4665-8e55-7da0d44b0dee&displaylang=en.

How This Book Is Organized

This book is structured to not only be used as a reference but also as a step-by-step guide for a process. The book guides you through the testing process as it would occur on an application. The book starts with a discussion of problems the industry faces and quickly moves to development methodologies and the role of testers. From there, you learn how to plan the testing process using Microsoft Test Manager to write first-draft Test Cases and execute those Test Cases. During the course of execution, bugs can be filed, and developers can fix those bugs. Testers can verify the fix and then determine which Test Cases to automate. Developers automate the Test Cases and then they can be executed by developers and testers in a physical or a virtual environment. Finally, the book ends with a discussion of reporting and metrics and offers some ideas that you can apply to your processes to improve quality.

- Chapter 1, "State of Testing"—This chapter provides an introduction to the problems facing software development teams today from a quality perspective. It covers the cost of poor quality, legal actions because of poor quality, and other commonly known but frequently ignored issues. It also discusses the author's philosophy of software testing and the goals of this book. Finally, it covers some of the basic software development methodologies and where software testing fits in with these methodologies. This chapter provides an overview of the Microsoft technology stack and end-to-end process flow.
- Chapter 2, "Software Quality and Testing Overview"—This chapter presents an introduction to software testing. This includes why we need to do software testing, what the goals of software testing are, different types of software testing and software testing techniques. It provides a foundational view of the tester's world.
- Chapter 3, "Planning Your Testing"—First, you must plan for testing. This chapter shows you how to use the tools in Microsoft Test Manager (MTM). It also details how to navigate MTM, create test settings, and structure Test Cases. It explains how to manage the testing process using the Test Case work item type and requirements.

- Chapter 4, "Executing Manual Tests"—This is your introduction to executing tests with Microsoft Test Manager and Test Runner. You learn how to create Test Cases, reuse test steps, execute manual tests, and file bugs. When teams first start using MTM, this is what they do on a day-to-day basis. This chapter also covers exploratory testing.
- Chapter 5, "Resolving Bugs"—When you file a bug, the process and lifecycle of the bug is critical to reducing rework and driving reporting. This chapter discusses the Bug work item type, some customizations you might want to make to it, and how it serves as a communication mechanism for testers and developers. You are also introduced to how developers can use the Bug work item type to fix software correctly the first time and then how testers can verify that fix. This chapter introduces Test Impact Analysis.
- Chapter 6, "Automating Test Cases"—This is largely a developer-focused chapter on creating automated Test Cases. These Test Cases can be manual (recorded by testers) or automated (unit sting and other types of tests). One key item in this chapter is associating any type of automated test with a requirement. The features in this chapter require Visual Studio 2010 Premium or Ultimate.
- Chapter 7, "Executing Automated Test Cases "—After automating the Test Cases, teams need to execute those automated tests. This chapter describes all possible ways to execute an automated test. This is both a developer-focused chapter (using Visual Studio to execute the tests) and a tester-focused chapter (using Microsoft Test Manager to execute the tests). You also learn how to execute tests as part of the build process.
- Chapter 8, "Lab Management"—This chapter focuses on the Lab Management features of Microsoft Test Professional 2010 and Visual Studio 2010 Ultimate. You learn how to use the virtualization platform to test applications and how to snapshot environments to help developers reproduce bugs. This chapter also focuses on both developers and testers: Developers learn how to set up the code to be deployed in a lab environment and executed through the build process. Testers learn

how to execute both manual and automated tests in a virtual environment and file actionable bugs.

- Chapter 9, "Reporting and Metrics"—This chapter covers reporting and metrics. By following the processes in this book, a team has detailed metrics by which they can determine the quality of their product and where the testing process can be improved. You explore the built-in reports provided by TFS but also how to do custom reporting on the data cube to get detailed information about your testing endeavors. This also serves as a brief guide to what type of customizations you can make to the Test Case work item type to capture more detailed information.

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Acknowledgments

WRITING THIS BOOK HAS been a labor of love over the last year, and there is no way I could have done it alone. Writing about beta software requires cooperation from the teams at Microsoft, and in this case I got more than I could have imagined. The number of people who provided input is long. If I have left anyone out, my apologies. First a special thanks to Mark Mydland, Ram Cherala, and Euan Garden—all of them put up with me for what seemed like hours on end. Long before starting the book, I pestered them on the philosophy of testing and their approaches to it and tools to implement it. I learned a lot from all of them. Other members of the testing team helped with everything from technical aspects to the understanding of specific decisions made during the creation of Microsoft Test Manager, Lab Management, and the Coded UI features. Many thanks to Naysawn Nadiri, David "Dr. Will" Williamson, Dominic Hopton, Pradeep Narayan, Ravi Shanker, Chris Patterson, Anutthara Bharadwaj, Daryush Laqab, Shay Mandel, Vinod Malhotra, Gautam Goenka, Vijay Machiraju, and Mathew Aniyan.

One other group of individuals helped as well, whether they knew it—the Application Lifecycle Management (ALM) Most Valuable Professionals (MVPs). They put up with hundreds of e-mails and provided responses that helped shape my approach to using the testing tools. Many were supportive during the writing process. I am honored to be included in this exceptionally talented and knowledgeable group of people.

On a personal note, my wife Tami and daughter Caitlin have had to put up with an absentee husband and father for the last several months. Needless to say I could not have done this without their love and support.

My four reviewers deserve a big thank-you. Mario Cardinal, Etienne Tremblay, and Mike Vincent are fellow ALM MVPs who thoroughly vetted my content not once but twice. The book is better for their input. And to Anutthara Bharadwaj (a member of the test team), even after a long plane flight with no power and bad service, she provided excellent feedback and comments and continued to teach me even after I thought I "knew it all." Thank you, Anu, for putting up with me.

I want to call out Mike Vincent specifically here for not only his help but his contributions. Mike was the last reviewer of this book. During the production of this book many ideas were discussed as to what this book should be about and what it should cover. Late in the process we decided that Chapter 2 should be added to provide an introduction for those just coming into the testing space. I did not have time at that point in the schedule to write this chapter. In came Mike to the rescue. Chapter 2 was contributed by Mike and helps round out the book in a way that makes it better than it was before. Thanks Mike!

For Brian Keller, a senior technical evangelist with Visual Studio, I can only say "Thank you." I am just in awe of his ability to quickly read, distill, and correct information or add the tiny details that were missed. And to Sam Guckenheimer for helping iron out the most difficult part of any technical book—the direction.

And to my co-workers at Northwest Cadence who were supportive of the entire process from beginning to end and through the days, weeks, and months of the writing process.

Most important, thanks to my editor Joan Murray and assistant editor Olivia Basegio, without whom this book would not have been possible. As with any endeavor, it isn't the big stuff that trips you up; it's the small stuff. And to the rest of the team at Addison-Wesley from San Dee Phillips my copy editor to Andrew Beaster who shepherded the book through production twice, thank you for sticking with it!

About the Author

Jeff Levinson has 16 years of experience in software development in many different roles—developer, tester, architect, project manager, and scrum master at several large companies. Jeff is currently a Senior Application Lifecycle Management (ALM) Consultant for Northwest Cadence, which is a company that specializes in Team Foundation Server, Visual Studio, methodologies, and process improvement. In his day-to-day work, Jeff helps teams, organizations, and companies adopt more efficient processes, improve quality, and reduce costs associated with software development. Jeff is a frequent speaker at industry events and writes a twice-monthly column for *Visual Studio Magazine* Online. This is his fourth book on software development. His other books are *Building Client/Server Applications with VB.NET* (Apress 2003), *Pro Visual Studio Team System 2005* (Apress 2006), and *Pro Visual Studio Team System with Team Edition for Database Professionals* (Apress 2007). Jeff has a master's degree in software engineering from Carnegie Mellon University and is an MCP, MCAD, MCSD, MCDBA, and MCT.

Jeff currently lives in Washington State with his wife and two children.

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3

Planning Your Testing

TO BEGIN, YOU NEED A PLAN. The plan does not need to be 500 pages of documentation or a massive Gantt chart. This chapter covers how to create a Test Plan with Microsoft Test Manager (MTM) and the various options that the Test Plan provides to you. More important, this chapter covers *what* to test and how to get involved as a tester early in the development process. In addition, Microsoft provides a little-used Test Plan Word template that can help answer some questions about the testing process up front.

Another key item covered here is how to plan and test for multiple iterations. Can you reuse your Test Cases, and does it make sense to do that? Many items come into play when planning the testing for an entire release versus a single iteration. By the end of this chapter, you will know how to use the Plan tab of MTM, create new plans, and create a framework for testers to work in for a given period of time.

As mentioned in Chapter 1, "State of Testing," testers should be involved, ideally, during the requirements gathering process. In a waterfall cycle this is during the Analysis phase. In an agile cycle this is during the period of time in which the business analyst or product owner fills in the details for items on the Product Backlog but before introducing the item into an Iteration Backlog. This chapter covers what the testers' responsibilities should be and what they can do to help reduce the potential for bugs to be introduced into the software.

TEST APPROACH

When starting any testing endeavor, you need an approach to the process. Consider what is acceptable, what are the criteria for release, how you can perform each type of test, and other information that forms the framework of the approach. If you use the MSF for Agile v5.0 process template, there is a Test Approach Word template located in the sample documents on the SharePoint site. (The path to the document is Documents/Samples and Templates/Test/Document Template - Test Approach.dotx.) You can also find a sample document showing how the Test Approach looks when filled out.

Microsoft Test Manager

Microsoft provides a separate tool for testers: Microsoft Test Manager (MTM) where you can create Test Plans and add and update Test Cases and where manual and automated tests are executed from. Before getting into the details of creating Test Plans, you need to understand how to navigate within MTM. Figure 3-1 shows the navigation controls.

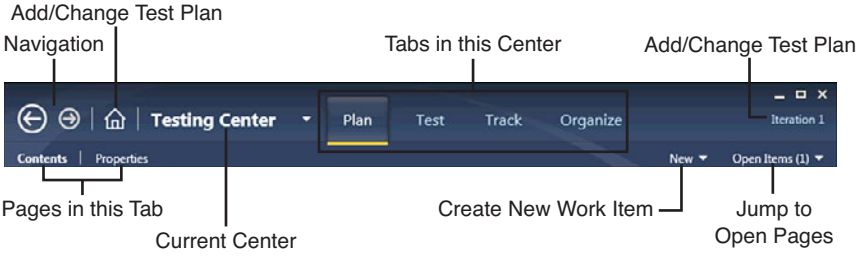

FIGURE 3-1: MTM navigation controls

MTM is organized into Centers, Tabs, and Pages, as shown in Figure 3-2.

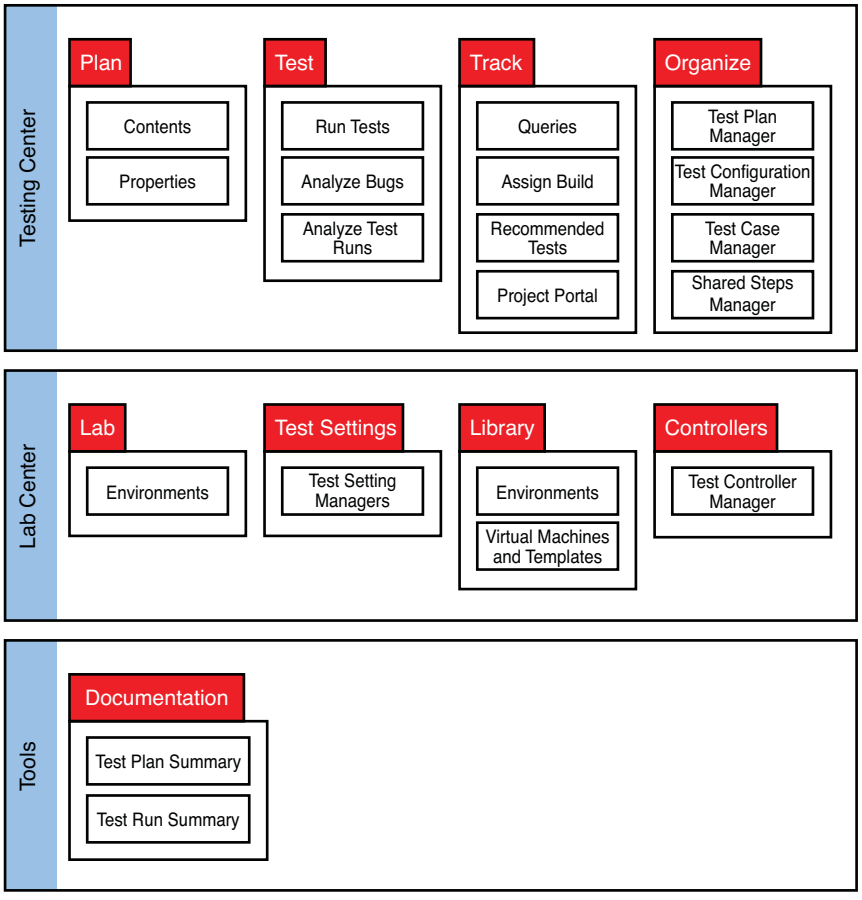

FIGURE 3-2: Microsoft Test Manager navigation layout

Table 3-1 briefly describes each section. These pages and the options they enable are described throughout the book.

TABLE 3-1: MTM Pages Described

Center	Tab	Page	Description
Testing	Plan	Contents	Contains the settings for the given Test Plan including manual and automated test settings, test configurations, and the build in use
		Properties	Contains the suites and Test Cases that need testing for the selected plan

TABLE 3-1: Continued

Center	Tab	Page	Description
	Test	Run Tests	Main page for executing test runs
		Verify Bugs	Contains bugs that have been resolved that the tester can quickly get to and verify
		Analyze Test Runs	Shows all test runs (manual and automated) but used mainly to view an automated test run and take appropriate actions based on the outcome of the test runs
	Track	Queries	Same as in Team Explorer; it enables you to execute stored work item queries or create new queries
		Assign Build	Enables a tester to assign an automated build to the Test Plan
		Recommended Tests	Shows the list of all tests that have been impacted by a code change
		Project Portal	Provides a quick link to the project portal (opens a web browser)
	Organize	Test Plan Manager	Lists all the Test Plans in the current Team Project
		Test Configuration Manager	Lists all test configurations
		Test Case Manager	Lists all Test Cases in the current Team Project
		Shared Steps Manager	Lists all the shared steps (reusable test steps) in the current Team Project
Lab	Lab	Environments	Contains all the physical and virtual environments ready for testing purposes

Center	Tab	Page	Description
	Test Settings	Test Settings Manager	Contains all manual and automated test settings
	Library	Environments	Lists all the environments prepped for use in testing, including environments that have been deployed
		Virtual Machines and Templates	Contains all the virtual machines available to be composed into a test environment
	Controllers	Test Controller Manager	Contains a list of all test controllers and all agents associated with those controllers
Tools	Documentation	Test Plan Summary	Generates a document with the selected Test Plans, associated Test Suites, Test Cases, Test Steps and related work items
		Test Run Summary	Generates a document with the results of the selected test runs

TEST SCRIBE AND THE TOOLS CENTER

The Tools Center does not exist when you first install MTM. After the release of Visual Studio 2010, Microsoft released a Test Scribe tool (available at http://visualstudiogallery.msdn.microsoft.com/en-us/e79e4a0f-f670-47c2-9b8a-3b6f664bf4ae.) (Or you can Bing "Test Scribe Visual Studio Gallery," and this link will be the first one.)

This addition is critically important to most organizations and should be installed immediately after installing MTM. The documentation it generates can be provided to users or external testers and serves as an excellent, detailed document showing the tests and test runs.

When you first start MTM, you will be asked to connect to a server (Figure 3-3), select a Team Project (Figure 3-4), and then select a Test Plan (Figure 3-5).

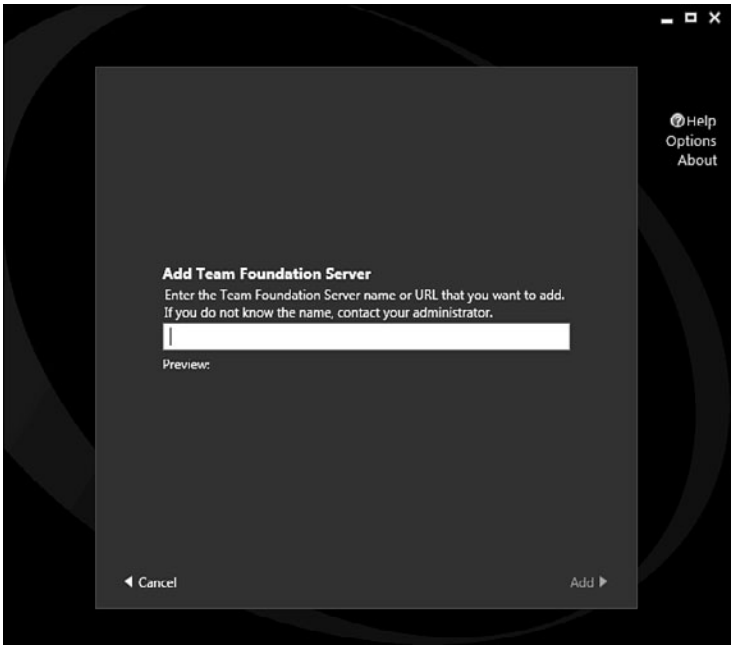

Figure 3-3: Connect to a Team Foundation Server

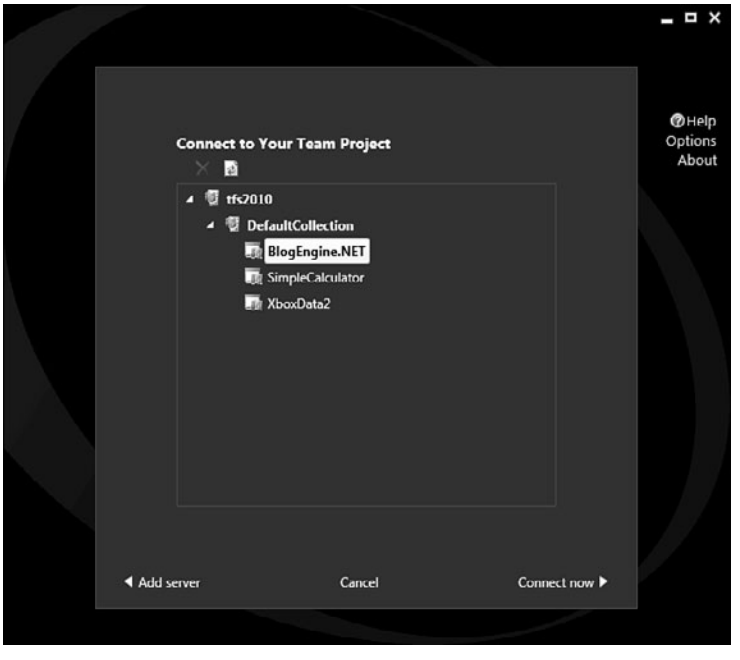

Figure 3-4: Connect to Your Team Project

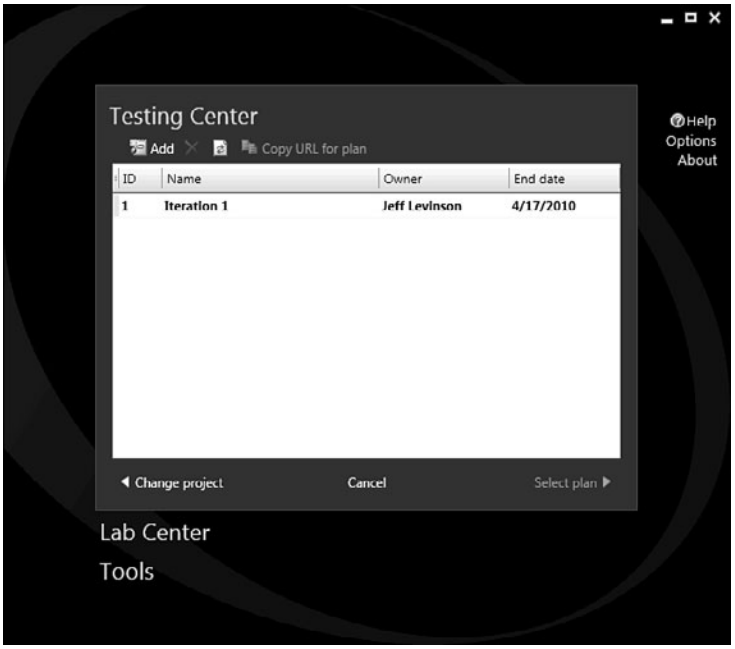

FIGURE 3-5: Select or add a Test Plan

Note the Copy URL for the plan option in Figure 3-5. MTM enables you to provide URLs to specific plans, so you can send the URL to someone who can then click it and have MTM open to the right plan. Only Active plans show up in this dialog. You can view all plans (Active and Closed) from the Testing Center, Organize Tab, Test Plan Manager page.

MTM enables you to work in one Team Project and only one Plan in that Team Project at a time, although you can change plans and projects as needed. After doing this the first time, MTM remembers your last selection, so MTM can open to the last selected Plan.

Before starting the exercises, see the section "About the Application Used in This Book" in the front matter. These exercises assume that you have followed the steps in that section.

Test Plans

Before using the testing tools, you need to understand where all the various artifacts fit together because it matters when you start to manage an actual project. Figure 3-6 shows a container view of the artifacts.

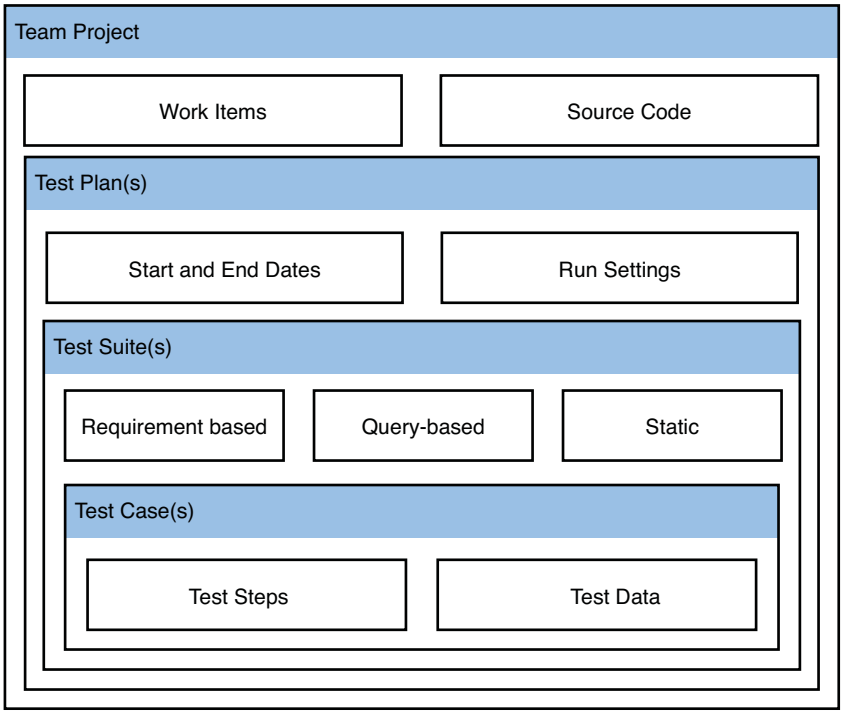

Figure 3-6: Relationships between Team Projects, Test Plans, Test Suites, and Test Cases

Figure 3-6 shows that a Test Plan in MTM is associated with a specific Team Project. A Test Plan is composed of one or more Test Suites, and each Test Suite is composed of one or more Test Cases. This is a straightforward structure that enables flexible reporting and easy management of the Test Plans.

EXERCISE 3-1

Create a New Test Plan

This step assumes that you have not used MTM before. If you have, but you want to work through this exercise, you need to select the Home button in the upper-left corner of the screen and select Change Project:

1. Open MTM.
2. Select Add Server, or select an existing server if the correct server is listed.
3. Select the BlogEngine.NET project, and click Connect Now.
4. On the Testing Center screen, click Add to create a new Test Plan.
5. Enter the name as **Iteration 1** and click Add.
6. Highlight the Plan, and click Select Plan.

Figure 3-7 shows the Iteration 1 Test Plan.

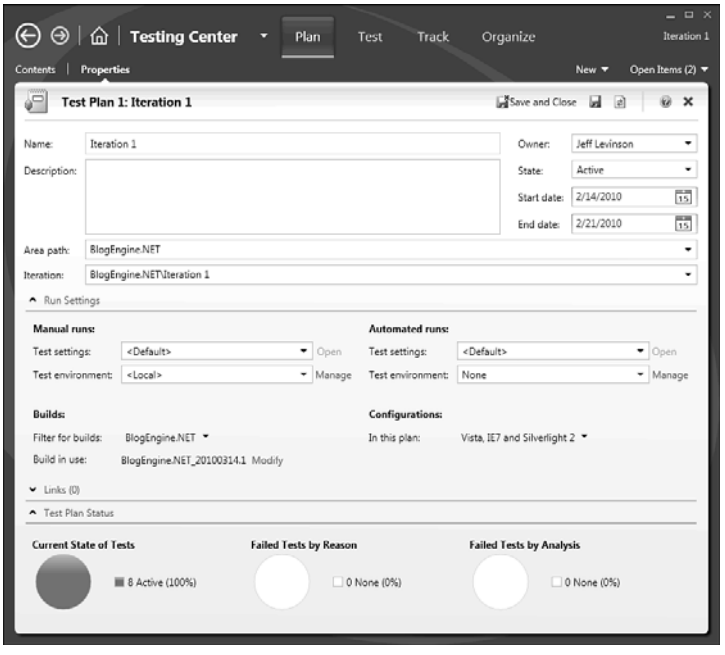

FIGURE 3-7: Test Plan

Properties

Test Plans have a name and a description, and if you use multiple Test Plans concurrently, you need to give them a descriptive name and also a more detailed description. The owner is usually the test manager but can also be a test lead if a lead is responsible for the testing that occurs within a plan. The state can either be Active or Inactive depending on whether it is currently used, and this is not customizable. Inactive Test Plans can either be previously completed Test Plans or Test Plans that have yet to be started and are still being created. The default state for new Test Plans is Active, but you might want to set the plan to Inactive if it is still being designed.

The area and iteration are the standard work item classification scheme. In general Test Plans should be related to iterations in some way (or whatever scheme the development team uses to produce software) because the testing follows the requirements or the coding, which are distinct phases in any methodology whether they are called out.

Test Plans are not work items such as a requirement, user story, or task. They are independent of the work item system. This is both a benefit and a disadvantage. The benefits are in the flexibility: the Test Plan contains more information and is more dynamic than a work item. On the other hand, items such as the Start and End date cannot be reported through a simple mechanism. You need to use the data warehouse (refer to Chapter 9, "Reporting and Metrics") to report on Test Plans.

Run Settings

Run settings define where tests execute and what diagnostic data adapters are implemented. Figure 3-7 shows the two categories of Run settings: Manual and Automated. Manual Run settings relate to any tests executed with the Test Runner (refer to Chapter 4, "Executing Manual Tests"). Automated Run settings relate to the execution of any automated tests (refer to Chapter 6, "Automating Test Cases") through MTM.

CHANGE THE TEST SETTINGS IMMEDIATELY

When the test settings are set to <Default> you have no control over them. You cannot set any diagnostic data adapters to run specifically or any other options associated with manual or automated runs. For the manual settings, simply select the drop-down list, and pick Local Test Run, or create a new test setting and change the properties as needed.

To create a new Run setting, go to the Lab Center, Test Settings tab, Test Settings Manager page, and copy an existing setting or add a new setting. These can then be assigned in the Test Plan Properties page. Figure 3-8 shows the Test Settings creation screen.

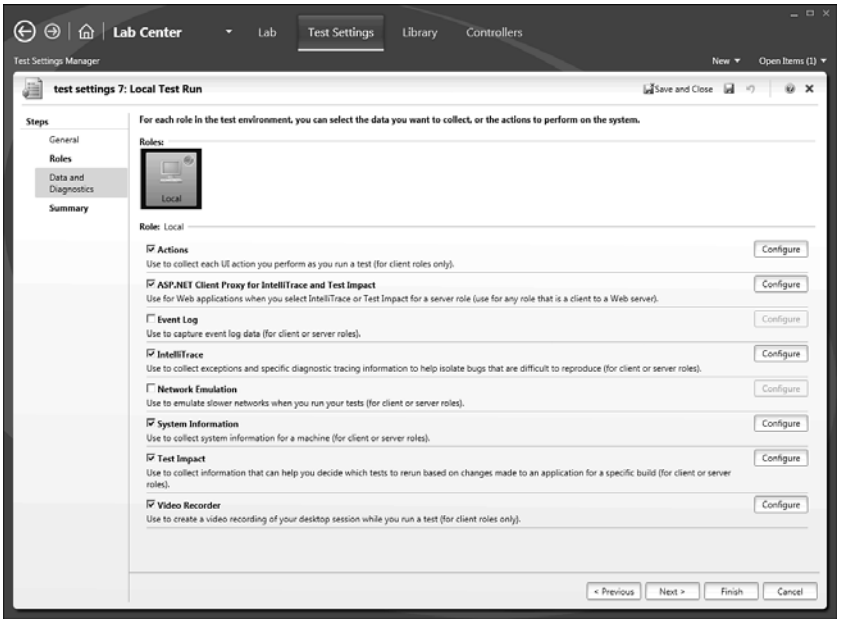

FIGURE 3-8: Test settings

Depending on whether you create an automated or manual setting, the options will be slightly different. Figure 3-8 shows a manual test setting on the Data and Diagnostics tab that contains the diagnostic data adapters. Table 3-2 lists the default diagnostic data adapters you can choose.

Table 3-2: Default Diagnostic Data Adapters

Collector	Description
Action Recording and Action Log	Records each step that the tester takes in the application during a manual test run.
ASP.NET Client Proxy for IntelliTrace and Test Impact	Enables you to capture IntelliTrace and Test Impact information during a test execution of an ASP.NET application. Note: This setting does not actually perform the capture; you must check the IntelliTrace and/or Test Impact collectors in addition to this collector.
Event Log	Captures selected events written to the Event Log during a test run.
IntelliTrace	Enables capturing of the debug log.
Network Emulation	Throttles the network performance based on the specified settings.
System Information	Captures system configuration information for the system on which the test is performed.
Test Impact	Records Test Impact information for calculating Test Cases affected by modified code.
Video Recorder	Records a video of all actions taken on the screen during a test run.

Diagnostic data adapters enable the test infrastructure to gather data—any particular piece of data you want. They are fully extensible and easy to create and modify (literally 20 lines of code plus whatever code is needed to collect data).

Builds

If you aren't using automated builds right now, you should be. Automated builds are one of the most effective ways to reduce the amount of time it takes to find and fix bugs. These automated builds can be Continuous Integration builds (the process of running a build immediately upon check-in to determine if the check-in broke anything) or nightly builds, and they can discover

build breaks faster and with fewer lines of code to review to find the problem. They are also critical to manual testing; although not required for automated testing, they will certainly make things easier.

Builds enable you to specify which build you can execute the tests against. After you select a build to execute the Test Cases against, MTM provides you with information related to the build. Automated builds help light up the Test Impact Analysis results and provide the testing team with a list of all changes made to the code since the build they were previously using.

The build filter enables you to filter by build definition and build quality. Chapter 5, "Resolving Bugs," discusses build quality.

Configurations

On one hand configurations play an important part in test execution, and on the other hand they provide only metadata. Configurations enable you to specify various pieces of information about the tests you execute in the Test Plan. They also have a material effect on the number of tests that you need to execute and how you plan your Test Suites. For example, the default setting in MTM is Windows 7 and IE 8. If you have a Test Suite with 20 Test Cases, you need to execute 20 Test Cases. For every configuration that you add to a suite, all the tests need to be executed against the additional configurations as well. (By default, but you can change this.) So, if you have three configurations that you need to test against, you need to run 60 tests. The effect of configuration on testing and reporting are discussed in the "Assigning Test Configurations" section later in this chapter.

> Obviously, you do not have to execute any Test Cases you don't want to, and in many cases you can't execute every Test Case because of the time available to you.

The "Test Configurations" section covers Test Configuration details.

Test Plan Status

This section provides status on the current Test Plan. The first pie chart lists the total number of tests broken down by successful tests, failed tests, and tests that have not yet been executed. The Failures by Type pie chart breaks down the categories of each failure. Table 3-3 shows the available categories.

Table 3-3: Failure Categories

Category	Description
None	Use if the test failure is a nonissue.
Regression	Where the previous test results indicate a pass.
New issue	Has not been seen before.
Known issue	Possibly because a previous run found this bug or the development team has notified the testing team that the build is ready to test, but it knows about this particular failure.
Unknown	An error occurred, but the tester is not sure what the classification of the issue is. A test lead or manager should look further at Unknown issues.

You can also provide a category for a failure type before or after it has been fixed, but leave this empty until the defect has been fixed. Table 3-4 lists the analysis categories.

Table 3-4: Analysis Categories (Also Called Resolution Type)

Category	Description
None	No resolution at this time.
Needs investigation	The test team has decided to do a further investigation because it isn't sure of the cause.
Test issue	Usually set if the Test Case were at fault or the setup for the test were incorrect. This might be cause for concern because if a Test Case is wrong, the requirement it is based on might also have potential inaccuracies that need to be investigated.
Product issue	A valid failure occurred in the code.
Configuration issue	Usually a failure in the configuration files or on the machine on which the test was deployed.

FAILURE AND RESOLUTION EXTENSIBILITY

You can customize the Resolution type through the process template or the object model; however, you cannot customize the Failure type. (It looks like you can do it by editing the process template, but it does not actually work because of technical reasons.)

These graphs are updated as changes are made to the Test Plan and as test runs are completed and analyzed. (For performance reasons you might need to click the Refresh button to see the latest data.) This is a great view that quickly enables a testing team to see the progress of its testing within a given plan (as shown at the bottom of Figure 3-7).

Contents

The Contents portion of a Test Plan contains information on what will be tested; that is, it contains a list of all the Test Cases broken down into *Test Suites*. Figure 3-9 shows the Contents page of the Plan tab.

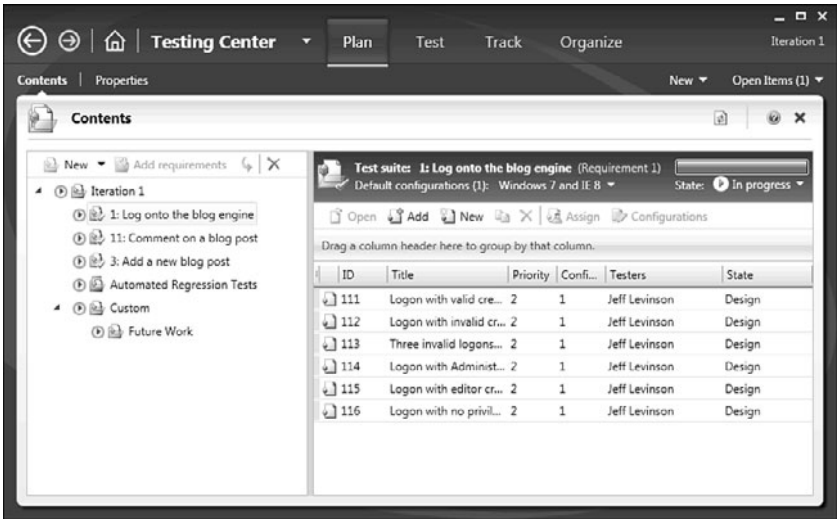

FIGURE 3-9: Test Plan contents

Refer to Figure 3-3 for the relationships between items. Test Suites can be composed in three ways: requirement-based, query-based, or customized with a static suite, and there are good uses for each of the three. The type of Test Suite is differentiated by icons next to the suite name (see Figure 3-10).

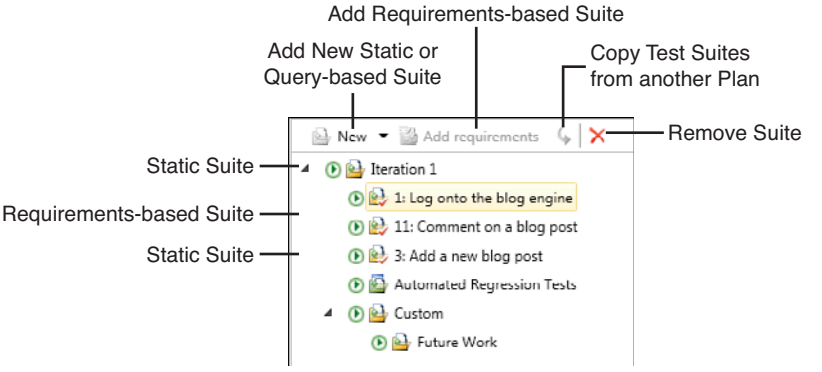

Figure 3-10: Test Suites

Requirements-Based Suites

For most teams developing line-of-business applications, the entire application is based around completing requirements; therefore, it makes sense that testers should test in relationship to the requirements that the developers finish. In other words, testers can rarely perform testing on partially completed requirements. They also can't perform testing on random pieces of the application because, in general, functional and integration testing relies on complete features. Even performing boundary tests must be done in the context of a requirement.

And, for the most part, customers want to know the status of their requirements. Are they close to completion? Did they pass their tests? How many bugs does a given requirement have? This is true regardless of what type of methodology you use. Grouping suites by requirement makes it extremely easy to report this information back to the customer.

To create requirements-based suites, simply select a static suite (the root node or another static suite) and click Add Requirements; then choose one or more requirements. Each requirement becomes its own suite. Any Test Cases already associated with the requirement are automatically added to the suite.

REQUIREMENTS AND WORK ITEM TYPES

Whether you use the MSF for Agile or CMMI templates, you have a requirement work item type. For the CMMI template, it is a Requirement, and for the Agile template it is a User Story. What determines a requirement from the perspective of a requirements-based suite is the category that the requirement is in. Categories are new to TFS 2010 and are a classification scheme for work item types. MTM operates on the requirement, Test Case, and bug categories. The reason it operates on categories is so that you can create a custom work item type, for example, called a Use Case that also appears in MTM if it is in the requirement category. In addition, you can create a Defect work item type that generates when you file a bug.

Query-Based Suites

These are suites created based on the results of a work item query. An example of why you might want to create a suite of this type is the need to test a specific area of your application that might be involved in different functionality. Using the requirement-based suite, you could not do this. Another reason for this type of suite can be the need to test all the bug fixes regardless of what requirement they are related to. The query-based suite simply provides you with more flexibility in selecting what you test and also enables you to run Test Cases from multiple Team Projects or requirements at the same time.

When creating this type of suite, you are limited to the results of the query, and the query specifies that you can query only work items in the Test Case category. So a query-based suite is specific to Test Cases. Because this type of suite is based on the results of a query, if the results of that query change, so will your Test Suite. Use this suite for short-term suites or suites where you don't mind them changing. An example of where this is effective is automated regression testing. You can create a query where Automation Status = Yes; when you execute the suite, all the automated tests execute.

Static Suites

A static suite is a fully custom suite; you provide the title of the suite and then add Test Cases as needed. One benefit of a static suite is that you can nest suites. This is not possible with the other two suite types. The reasons to use this type of suite can vary; however, an example of this might include final application testing where you might have time to only test requirements from various areas and iterations, and you want to break those up into subsuites so that you can roll the results up. In MTM when you select the New drop-down to add a new suite, the only two options you see are Suite and Query-Based Suite. The Suite option is the static suite.

Adding Suites and Test Cases to Your Plan

The mechanics of using the Contents window are fairly straightforward but offer a lot of options to help you control what happens when testers begin testing. The list of Test Suites is on the left side. Figure 3-6 shows a series of Test Suites starting with the Root Test Suite that is always the name of the Test Plan (Iteration 1 here). The Root Test Suite is a static suite, so you can add Test Cases directly to the root. Icons that have a red check on them are requirements-based suites. Another way to know this is to look above the list of Test Cases in the right pane; you can click the Requirement 1 link to open the requirement that these Test Cases relate to.

The Automated Regression Tests Suite in Figure 3-6 is a query-based suite, which you can tell by looking at the icon. The last suite listed, Custom, is a static suite with a Future Work subsuite that enables you to easily compose and manage your Test Suites.

You can change the default configuration for all the Test Cases here, or you can change the configuration for only individual tests. (This is not recommended because it can be difficult to keep track of which test is supposed to be run on which configuration.) You can change who the Test Cases are assigned to—either individually by selecting a Test Case and clicking the Assign button or by right-clicking the Test Suite on the left and selecting Assign Testers for All Tests (or any combination of testers to Test Cases).

In addition notice where it says State: In Progress in the upper-right corner. You can set the state to be one of three states: In Planning, In Progress,

or Completed. In Progress is the default, and tests in a Test Suite that is In Progress may be executed. A Test Suite that is In Planning will not show up on the Test tab, so those tests cannot be executed. The same is also true for Completed suites.

You can also change the columns displayed for the Test Cases by right-clicking the column headers. You can filter certain columns (any column with a discrete list) to limit what displays. (For example, you can filter the Priority column in the default list of columns.)

Finally, you have the option to open a Test Case that has been added to a suite, add Test Cases that already exist in the suite, or create new Test Cases from within MTM. Any Test Cases you create or add are automatically linked with the requirement (or user story) if the suite is a requirements-based suite with a Tested By link type. The opposite is also true; if you remove a Test Case from a requirements-based suite, the Test Case is no longer in a relationship with the requirement. (The Tests/Tested By link is deleted, but the Test Case is not deleted.)

EXERCISE 3-2

Create a Test Suite

This exercise assumes that you have completed Exercise 3-1.

1. Open MTM, if it's not already open.
2. Select Testing Center, Test Plan, Contents tab.
3. Select the Iteration 1 suite, which is the root suite and the only one that exists at this point.
4. Click Add Requirements from the toolbar for the suite name.
5. In the Add Existing Requirements to This Plan page, click Run (see Figure 3-11).
6. Select the requirement As the Blog Author I Want to be Able to Log onto the Blog Engine, and click Add Requirements to Plan in the lower-right corner.

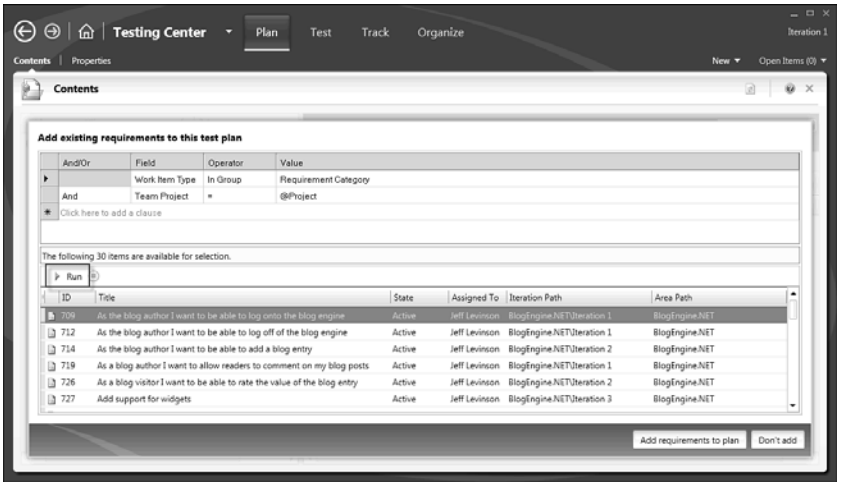

FIGURE 3-11: Add Existing Requirements to This Test Plan page

Testing Configurations

Testing configurations are configurable and can have an impact on the number of tests that need to be executed (mentioned previously). Test configurations specify any particular piece of information needed to ensure that your software is tested against all possible configuration options users could have on their machine.

> As of this release, test configurations are strictly metadata. That is, they do not have any impact on the test runs and cannot be used to specify the hardware or software a particular test is actually executed against.

The most typical example is using different browsers to ensure the rendering works correctly. Added to that may be the operating system those browsers run on. The two default configuration options are Operating System and Browser; to this you can add other things such as a Silverlight version or a particular piece of hardware, such as a webcam.

The biggest benefit to using test configurations is reporting results. All your test results can be broken down into configurations. In addition you have to write the Test Cases only one time, but this presents other issues, such as that the actions you take on one configuration may not be valid on another configuration. In some cases the differences may be so great it doesn't make sense to use the same Test Case. Consider these items when deciding on how to use test configurations.

Managing Test Configurations

You can access the Test Configuration Manager in two ways. The first is to go to Testing Center, Plan, Properties and select the drop-down arrow next to the configuration; then click Manage. The easier way is to go to Testing Center, Organize, Test Configuration Manager. This brings up the screen shown in Figure 3-12.

FIGURE 3-12: Test Configuration Manager

The Manage Configuration Variables option enables to you create new configuration categories. You can also add new values to an existing configuration variable.

EXERCISE 3-3

Adding a New Configuration Variable

To add a new configuration variable, follow these steps:

1. Click Manage Configuration Variables.
2. Click New Configuration Variable.
3. Enter **Silverlight Version** for the name.
4. Enter **Default Silverlight Versions** for the description.
5. In Allowed Values, enter the following (shown in Figure 3-13): **1**, **2**, **3**, and **4**.
6. Click Save Configuration Variables.

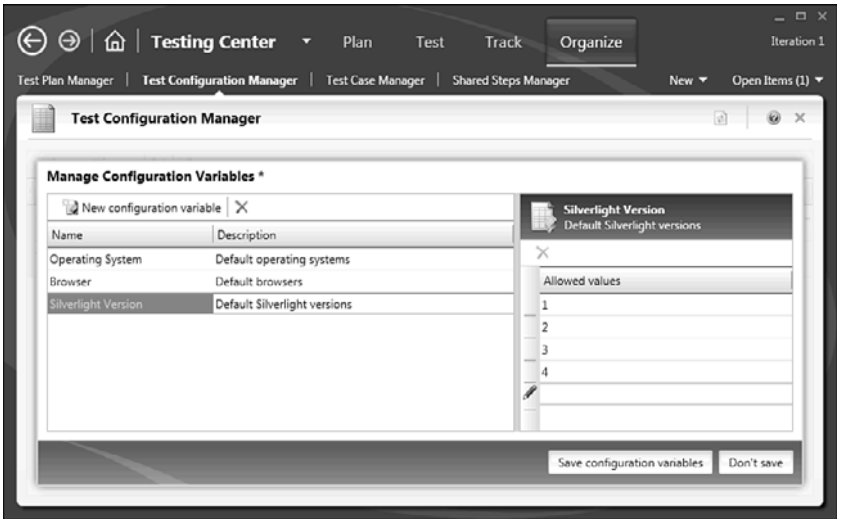

FIGURE 3-13: Silverlight Version Configuration Variable

The variables themselves cannot be used directly. You need to create an actual configuration composed of one or more configuration variables.

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