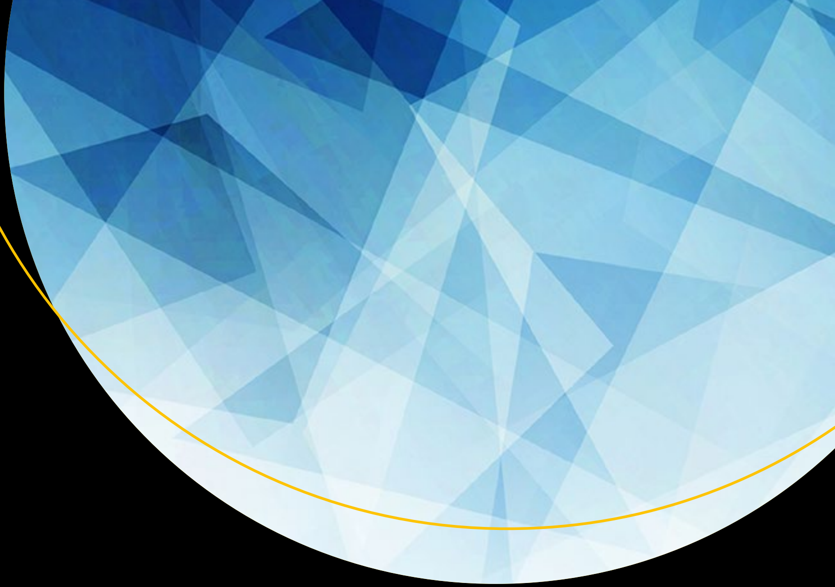

Azure and Xamarin Forms

Cross Platform Mobile Development

Russell Fustino

Apress®

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Azure and Xamarin Forms: Cross Platform Mobile Development

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New Port Richey, Florida, USA

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Printed on acid-free paper

This book is dedicated to Nicholas, Justine, John, James, Olivia, and Melissa. It is also dedicated to my two brothers, Rich and Gary Fustino, and their families. They all inspire me, and I love them all dearly.

Table of Contents

About the Author

Russell Fustino is CEO of Fustino Brothers, Inc., makers of the endorsed "Jethro Tull" app, and a Microsoft MVP in Windows development. He is a former developer evangelist for Microsoft, as well as for Russ' ToolShed Network, Xamarin, Raygun, and ComponentOne. Russ is also a former Azure senior cloud solutions architect for Opsgility. He is highly experienced in developing cross platform apps using Xamarin and C# for UWP, Android, and iOS. Russ is a Xamarin Certified Mobile Developer. He has a passion for conveying relevant, current, and future software development technologies and tools through live seminars, teaching, and Internet video productions. Russ heads the Mobile Application Dev Tampa (`www.MADTampa.com`) user group in the Tampa, Florida, area. He is also the local PC handyman for his community, fixing viruses, providing tune-ups, and helping neighbors who have fallen prey to computer scams. Please like `www.facebook.com/PCHandymanRussFustino/` and `www.facebook.com/Fustinobrothers/` on Facebook. You can follow Russ on Twitter at `@FustinoBrothers` and `@RussFustino` and on LinkedIn at `https://www.linkedin.com/in/russfustino/`. Russ has enlightened, entertained, and educated more than 1 million developers in his career and is a recipient of the INETA (International .NET Association) Lifetime Achievement award.

About the Technical Reviewer

Sunny Mukherjee is a software developer, architect, and mentor with a wealth of technical knowledge in various software disciplines, including ASP.NET, Web Services, Web API, Angular, WPF, Xamarin Forms, SQL, and Azure. He holds an MBA from the University of South Florida. He is always looking to bring value to technology solutions. In his personal time, he loves motorcycles, astronomy, movies, video games, exercising, meditation, and photography. If you want to learn about technology trends and career tips, you can follow his LinkedIn posts at `www.linkedin.com/in/sunnymukherjee/`.

Acknowledgments

I would like to acknowledge the Microsoft MVP program and community. Both have provided me years of networking with lots of great minds, as well as software that I use to run my business, not to mention incredible MVP Summits providing top-notch education. Joe Darko is my Program Manager Evangelist for MVPs in my neck of the woods, and his efforts are greatly appreciated. It's all about personalization and localization, and Joe gets that.

Introduction

It's as easy as 1-2-3. I often have been asked to recommend good books on getting started with Xamarin Forms or Azure or on how to use both tools. You are reading the book that I can now wholeheartedly recommend!

So, what exactly do I mean by "as easy as 1-2-3"? This refers to how this book will cover Azure and Xamarin Forms in depth, as no other book to date, specifically by means of the following steps:

1. Create a database for your app.
2. Serve up data in a service for the Xamarin Forms app to consume.
3. Consume the service from Azure in a Xamarin Forms app and display and/or update the data.

The preceding are the three steps in the Azure Mobile App Xamarin Forms Quick Start. They constitute my new "file new" when creating a future app. But wait, there's more! I will also cover both building a new app and modifying an existing app to Azure-ize it, including offline synchronization! If that is not enough, after reading this book, you should feel extremely comfortable using the Azure portal, with all the ins and outs of ramping up, and alleviate any related fears, including usage charges.

So why Xamarin Forms? To be honest, knowing C# and about 30 other languages, I simply did not want to learn Yet Another Language, YAL, with Objective-C, Java, Swift…and the list goes on. Not that I have anything against those languages, I just did not want to spend the time learning them. Time is too precious. Building apps that cross platforms is a necessity. For example, when I completed a Windows prototype version of the Jethro Tull fan app a few years ago, I said to my brothers, Rich and

Gary, “This app is a great fan app, and maybe we should actually show it to Jethro Tull.” So, I sent an e-mail to Jethro Tull, with screenshots. Within six hours, they replied, “This looks great, do you also work with iPhone and Android”? Heck yah! We do now! Enter Xamarin.

My point is, in this day and age, you need apps for all of the platforms: Android, iOS, Windows. I could even imagine using Xamarin for more platforms on the horizon—for the Mac, watches, and other devices. Remember the slogan that propelled Java? “Write once. Run anywhere.” Well, the saying lives on for C# and the .NET stack.

Let’s talk about Xamarin and Xamarin Forms. Xamarin is the underlying platform that provides about 80 percent code-sharing. Xamarin Forms sits on top of the Xamarin platform, and it also shares the user interface layer. My Xamarin Forms apps typically provide 95 percent shared code. Let’s say I am building a Windows UWP app with Xamarin Forms. When I am done with the UWP app, so will I be with the iOS and Android versions! No need to have three different skill sets and three sets of code from different languages. Only one skill set is required: Xamarin Forms and C#. When I worked as an evangelist for Xamarin, it was commonly said that anything you can do in Objective-C and Java, you can do with Xamarin. That’s quite a statement, isn’t it? It drove me to do deep-dive learning about Xamarin and get my Xamarin certification, that is for certain.

As for Azure, a common fear is cost. Be assured that there are many tools that I will cover in this book that can help you with this. When I was initially learning Azure, I felt it was an incredibly huge arena of technology. I now simply enjoy using Azure to build solutions, and it is easy to use as well. I have always been a proponent of third-party tools. Perhaps it was because third-party controls, for example, only require setting up a few properties, or calling some of the controls methods, and, presto, magic… you have created an app. Well, it is the same with setting properties on Azure blades. Once completed, you are well on your way to implementation. Azure just makes sense, period. The modern enterprise is cutting-edge and must be, to stay ahead of the competition.

Technology is advancing at an incredible rate. I sometimes think how I now program tasks, such as notifying millions of users simultaneously, using Azure, and it only takes a few lines of code. It is really mind-boggling. After reading this book, you will realize that Azure is a platform that is efficient, scalable, secure, easy-to-use, cost-effective, performant, well-documented, and well-supported. You will be surprised at how fast you can build your solutions from end-to-end with Azure and Xamarin Forms.

Enjoy the ride. I hope this book motivates you to begin a deep dive yourself. So, where do I focus my technology time without the fear of a white elephant? The answer: Azure and Xamarin Forms.

I am extremely honored to have written the first book combining two of today's hottest technologies for building cross platform apps and utilizing the cloud, via Azure and Xamarin Forms. The best news is that it's as easy as 1-2-3.

CHAPTER 1

Installing Visual Studio 2017

In this chapter, you will learn how to install Visual Studio 2017, which will be used to complete the examples in this book.

Note The source code and assets for this book can be downloaded from `https://github.com/Apress/azure-and-xamarin-forms`

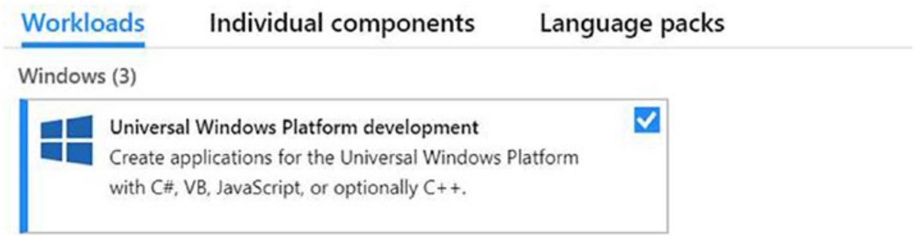
Installing Visual Studio 2017 and Tools on Windows

This chapter covers how to install the required products to complete all the examples in this book.

- Windows 10 Pro or higher is required to run the emulators and cross platform development for iOS, Android, and Universal Windows Platform (UWP).
- Download and install Visual Studio Community 2017 or later versions, available at `www.visualstudio.com/thank-you-downloading-visual-studio/?sku=Community`.

R. Fustino, *Azure and Xamarin Forms*, https://doi.org/10.1007/978-1-4842-3561-4_1

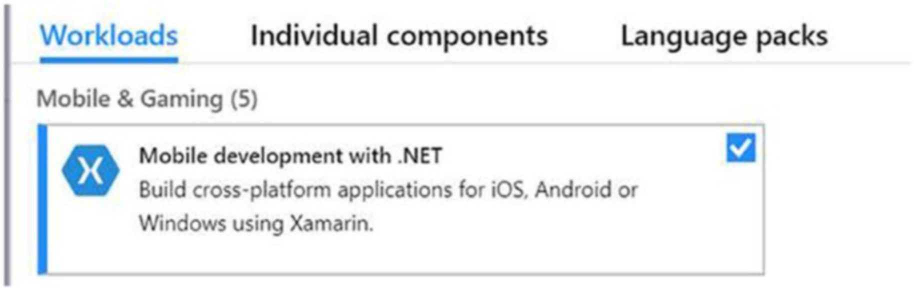
- Select and install the UWP development workload, (Figure 1-1) under the Windows section, and Mobile development with .NET.
- Select the .NET (cross platform development using Xamarin) option, under the Mobile & Gaming section (Figure 1-2) on the Visual Studio (VS) 2017 Installer.



Universal Windows Platform development
Create applications for the Universal Windows Platform with C#, VB, JavaScript, or optionally C++.

☑

Figure 1-1. *Select Universal Windows Platform development*

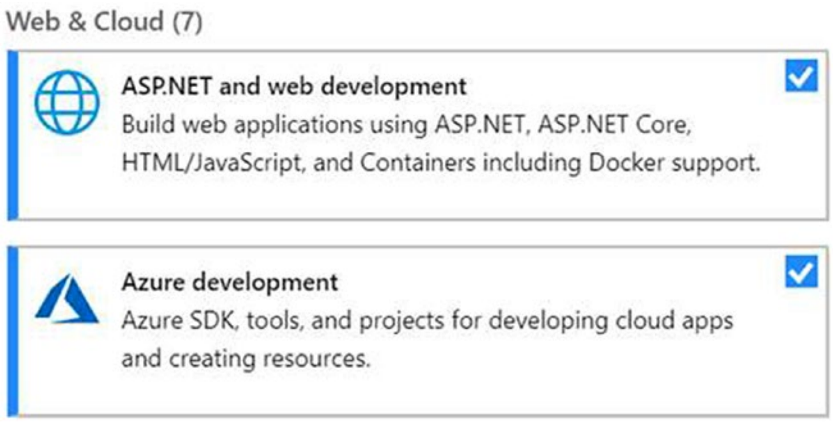


Mobile development with .NET
Build cross-platform applications for iOS, Android or Windows using Xamarin.

☑

Figure 1-2. *Select Mobile development with .NET*

Install ASP.NET and web development ➤ Azure development under the Web & Cloud section (Figure 1-3).

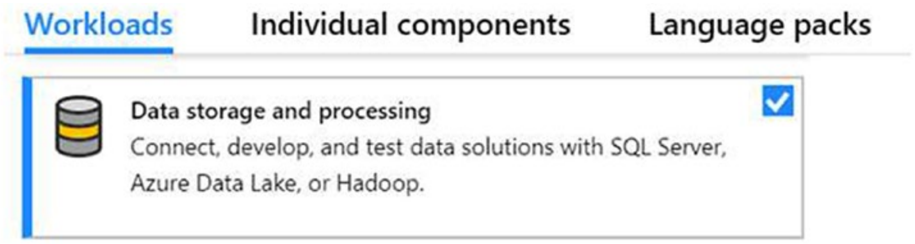

Web & Cloud (7)

ASP.NET and web development
Build web applications using ASP.NET, ASP.NET Core, HTML/JavaScript, and Containers including Docker support. ✓

Azure development
Azure SDK, tools, and projects for developing cloud apps and creating resources. ✓

Figure 1-3. *Select ASP.NET and web development ➤ Azure development*

Install Data storage and processing, under the same section (Figure 1-4).

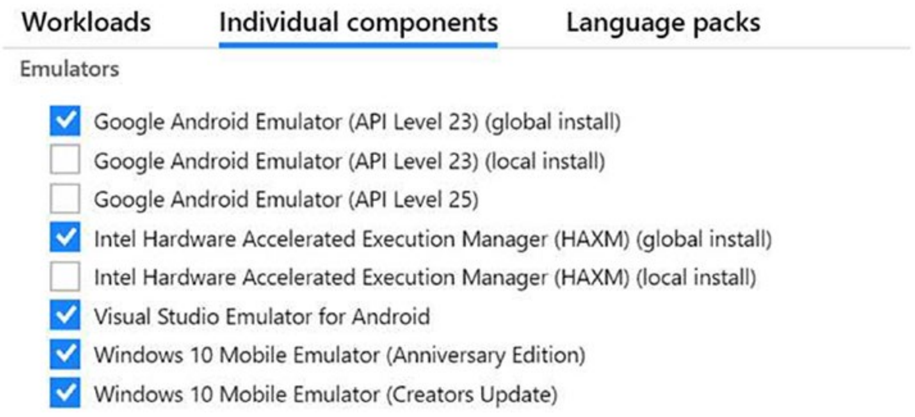


Data storage and processing
Connect, develop, and test data solutions with SQL Server, Azure Data Lake, or Hadoop. ✓

Figure 1-4. *Select Data storage and processing*

Under the Individual components tab, under the Emulators section, check off the following (Figure 1-5):

- Google Android Emulator (global)
- Intel Hardware Accelerated Execution Manager (global)
- Visual Studio Emulator for Android
- All Windows 10 Mobile Emulator (Anniversary Edition AND Creators Update)



Emulators

- [✓] Google Android Emulator (API Level 23) (global install)
- [ ] Google Android Emulator (API Level 23) (local install)
- [ ] Google Android Emulator (API Level 25)
- [✓] Intel Hardware Accelerated Execution Manager (HAXM) (global install)
- [ ] Intel Hardware Accelerated Execution Manager (HAXM) (local install)
- [✓] Visual Studio Emulator for Android
- [✓] Windows 10 Mobile Emulator (Anniversary Edition)
- [✓] Windows 10 Mobile Emulator (Creators Update)

Figure 1-5. *Select Google Android Emulator (global), Intel Hardware Accelerated Execution Manager (global), Visual Studio Emulator for Android, and Windows 10 Mobile Emulator (Anniversary Edition and Creators Update)*

If you do not see Google Android Emulator listed, this means that you do not have Hyper-V enabled. See Chapter 2 for how to enable Hyper-V. In the meantime, start the install.

Installing Visual Studio 2017 and Tools on the Mac

Optionally, install Visual Studio for the Mac. The purpose for a Mac installation would be to run, test, and deploy iOS and Android versions of your app in a Mac environment (UWP not supported). To build iOS apps on a PC, you must be wired to a Mac on the same network. Most of the examples in this book will use either the Android emulator or UWP local machine on a PC, so the Mac install is optional for the book. Instructions are available at `https://developer.xamarin.com/guides/ios/getting_started/installation/mac/`.

Other Tools

- Postman (`www.getpostman.com` and install)
- SQL Server Management Studio (`https://docs.microsoft.com/en-us/sql/ssms/download-sql-server-management-studio-ssms`). This tool will be used to verify our database contents.
- Firefox (`www.mozilla.org/firefox/new/`). Firefox has a nicely formatted view when looking at JSON data coming back from a web service.

Summary

In this chapter, you learned how to install Visual Studio 2017, which will be used to complete the examples in this book, and some other tools, such as Postman, SQL Server Management Studio, and Firefox. Visual Studio for the Mac is an optional installation. In the next chapter, we will build a Xamarin Forms app.

CHAPTER 2

Introduction to Xamarin Forms

Xamarin Forms is an awesome cross platform environment from which to build iOS, Android, and UWP apps, as well as other potential platforms in the future.

Project Overview

In this chapter, you'll get your feet wet with Xamarin Forms via five projects. Each project builds on the prior one. Several topics will be covered in this introductory chapter, including how to create a Xamarin Forms solution, as well as emulator tips, navigation, images, event handlers, device form factors, and list views. The result will be a typical app with a main navigation page, a list view page, and a detail page that you can use as a template for building future apps! We will be creating a book list project that has a main navigation page that looks like that in Figure 2-1.

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R. Fustino, *Azure and Xamarin Forms*, https://doi.org/10.1007/978-1-4842-3561-4_2

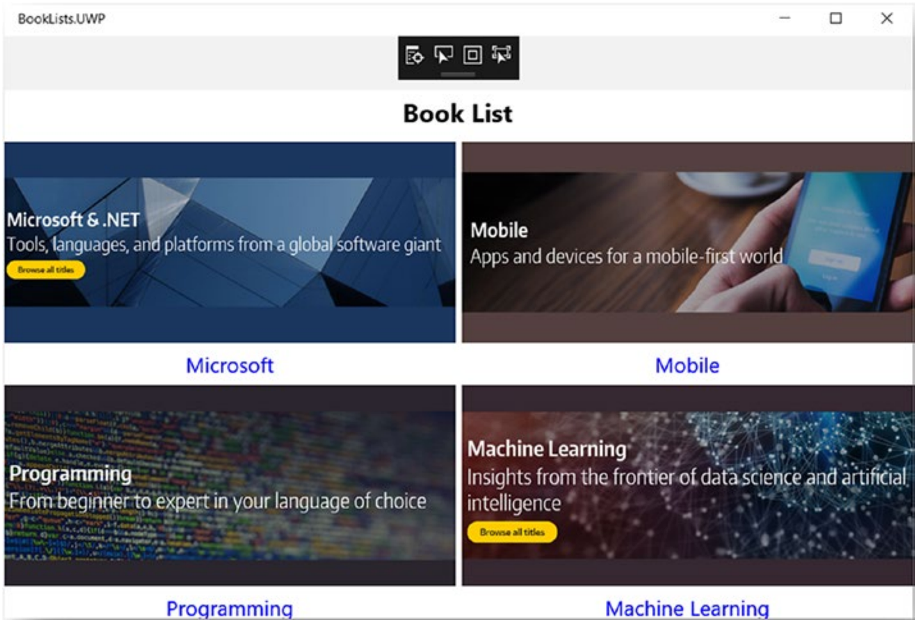
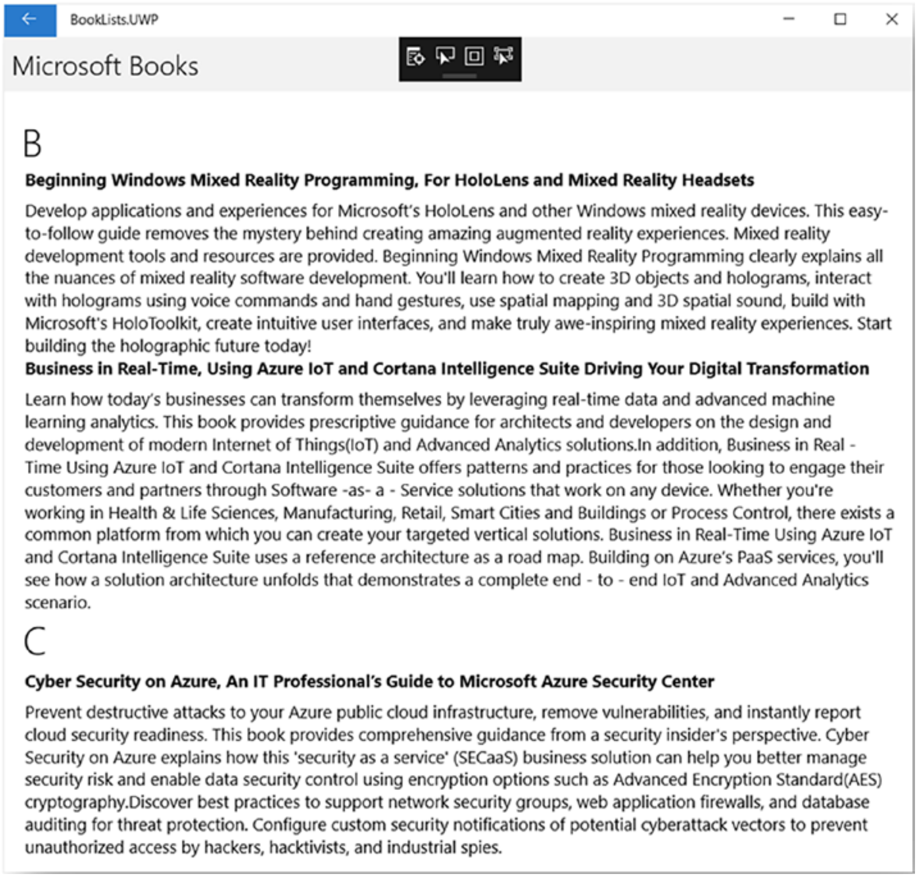

BookLists.UWP
Book List
Microsoft & .NET
Tools, languages, and platforms from a global software giant
Browse all titles
Mobile
Apps and devices for a mobile-first world
Microsoft
Mobile
Programming
From beginner to expert in your language of choice
Machine Learning
Insights from the frontier of data science and artificial intelligence
Browse all titles
Programming
Machine Learning

Figure 2-1. *Main navigation page in the completed project*

It has a list view page that looks like that in Figure 2-2.



Microsoft Books

B

Beginning Windows Mixed Reality Programming, For HoloLens and Mixed Reality Headsets

Develop applications and experiences for Microsoft's HoloLens and other Windows mixed reality devices. This easy-to-follow guide removes the mystery behind creating amazing augmented reality experiences. Mixed reality development tools and resources are provided. Beginning Windows Mixed Reality Programming clearly explains all the nuances of mixed reality software development. You'll learn how to create 3D objects and holograms, interact with holograms using voice commands and hand gestures, use spatial mapping and 3D spatial sound, build with Microsoft's HoloToolkit, create intuitive user interfaces, and make truly awe-inspiring mixed reality experiences. Start building the holographic future today!

Business in Real-Time, Using Azure IoT and Cortana Intelligence Suite Driving Your Digital Transformation

Learn how today's businesses can transform themselves by leveraging real-time data and advanced machine learning analytics. This book provides prescriptive guidance for architects and developers on the design and development of modern Internet of Things(IoT) and Advanced Analytics solutions.In addition, Business in Real - Time Using Azure IoT and Cortana Intelligence Suite offers patterns and practices for those looking to engage their customers and partners through Software -as- a - Service solutions that work on any device. Whether you're working in Health & Life Sciences, Manufacturing, Retail, Smart Cities and Buildings or Process Control, there exists a common platform from which you can create your targeted vertical solutions. Business in Real-Time Using Azure IoT and Cortana Intelligence Suite uses a reference architecture as a road map. Building on Azure's PaaS services, you'll see how a solution architecture unfolds that demonstrates a complete end - to - end IoT and Advanced Analytics scenario.

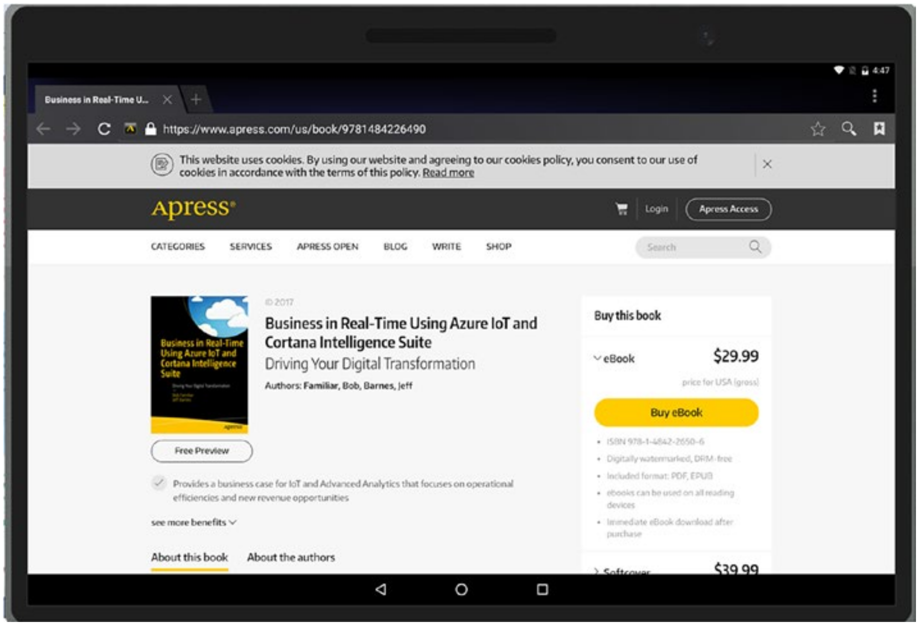
C

Cyber Security on Azure, An IT Professional's Guide to Microsoft Azure Security Center

Prevent destructive attacks to your Azure public cloud infrastructure, remove vulnerabilities, and instantly report cloud security readiness. This book provides comprehensive guidance from a security insider's perspective. Cyber Security on Azure explains how this 'security as a service' (SECaaS) business solution can help you better manage security risk and enable data security control using encryption options such as Advanced Encryption Standard(AES) cryptography.Discover best practices to support network security groups, web application firewalls, and database auditing for threat protection. Configure custom security notifications of potential cyberattack vectors to prevent unauthorized access by hackers, hacktivists, and industrial spies.

Figure 2-2. *ListView page in the completed project*

The app will navigate to a detail page on the Apress site for the book selected from a list such as that in Figure 2-3.



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Business in Real-Time Using Azure IoT and Cortana Intelligence Suite

Driving Your Digital Transformation

Authors: Familiar, Bob, Barnes, Jeff

Provides a business case for IoT and Advanced Analytics that focuses on operational efficiencies and new revenue opportunities

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Figure 2-3. *Detail page in the completed project*

- We'll first create a new Xamarin Forms application and review the structure of the solution. We'll then run the application for Android, UWP, and, optionally, iOS, if connected with a Mac server. As this is a cross platform app, you can use any mix of the platform projects, depending on your development environment (Mac or Windows).
- We will then enhance the app, to have a main navigation page, with `StackLayout` and `GridLayout`, which considers device form factors for phones and tablets, using device-specific logic.
- We will use XAML and code behind to control your layout form factors for tablets and phones.

- We will also use embedded resource images of the MainPage.
- A ListView page will be added with a selection event handler. You can also run these examples on Visual Studio (VS) for Mac; however, this does not support UWP.

Note Run all the exercises in this book from your laptop/PC and not an Azure virtual machine.

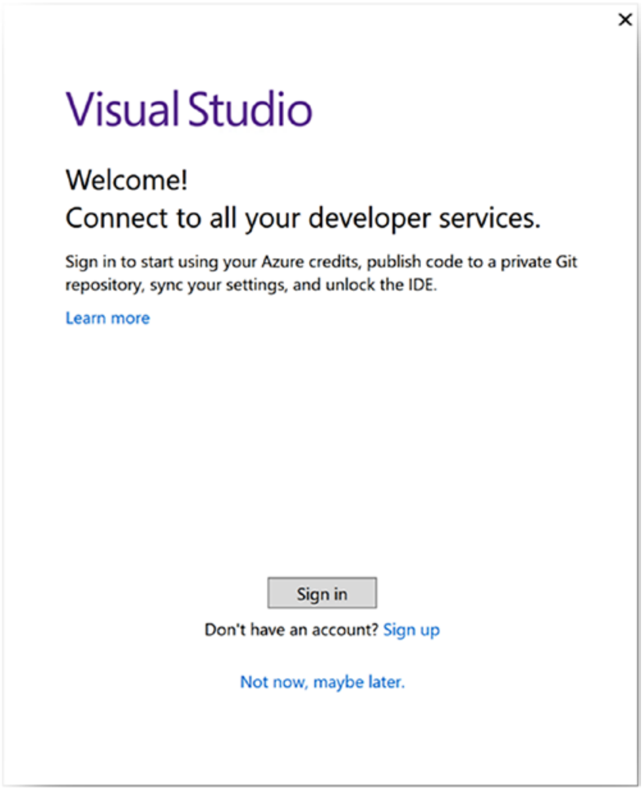
Time Estimate
70 Minutes

Project 2-1: Creating Your First Xamarin Forms Application

Time Estimate
20 Minutes

In this project, you will create your first Xamarin Forms application. You will see how to get started in Visual Studio 2017 and build a Xamarin Forms application by choosing a built-in template to get stated with. Then you will get your emulators working and add a page and navigate between the two.

1. Start Visual Studio 2017. Sign in with the same credentials as your Azure or developer account. Figure 2-4 shows Sign in.



Visual Studio

Welcome!
Connect to all your developer services.

Sign in to start using your Azure credits, publish code to a private Git repository, sync your settings, and unlock the IDE.

Figure 2-4. *Visual Studio Welcome screen sign in*

2. From the File menu, select New ➤ Project. See Figure 2-5.

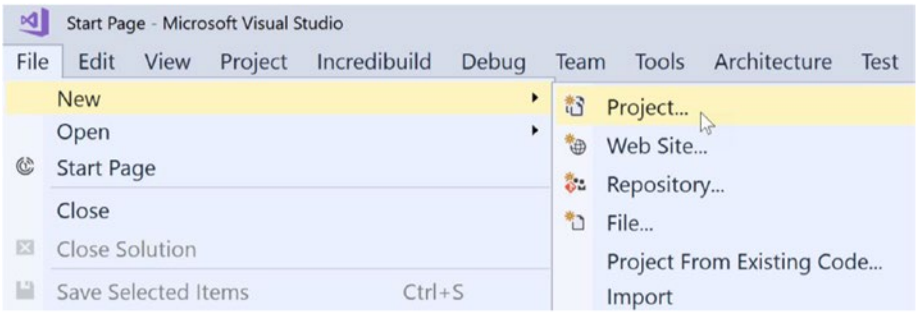
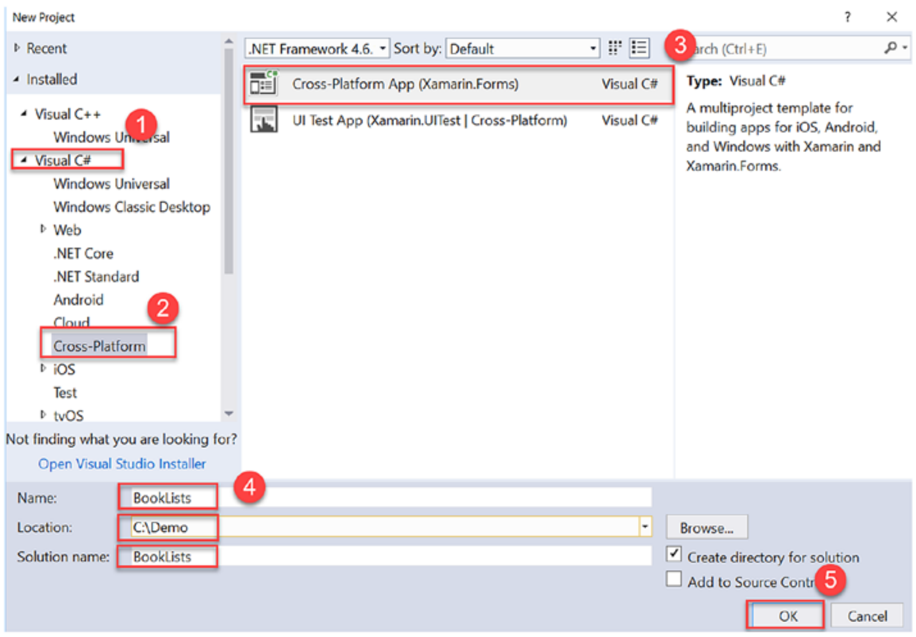


Figure 2-5. *Visual Studio File ➤ New ➤ Project*

3. Expand Templates ➤ Visual C# ➤ Cross-Platform and select Cross Platform App and use **BookLists** as the Name at a location near your root **(C\Demo)**. It is always advisable to select a Location near your root, as Android will often complain about the file path being too long. See Figure 2-6.



Cross-Platform App (Xamarin.Forms) Visual C#
UI Test App (Xamarin.UITest | Cross-Platform) Visual C#

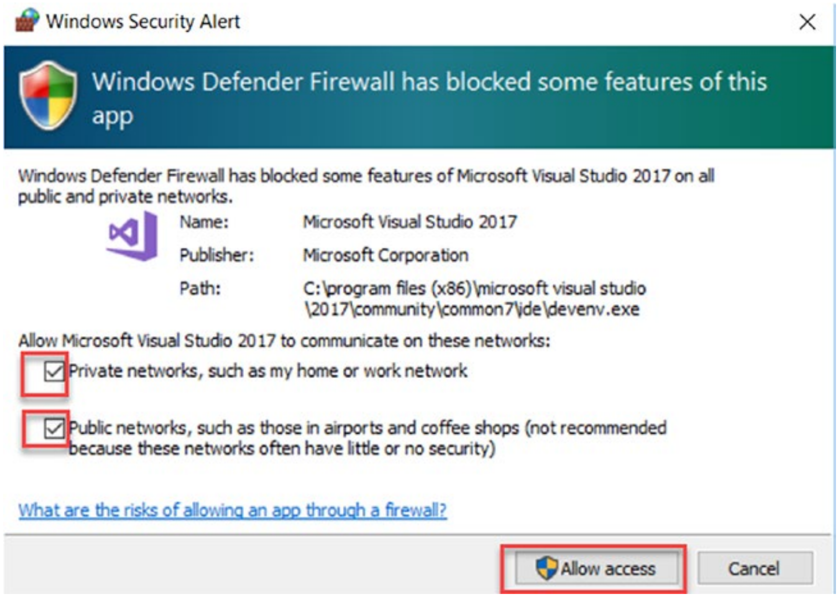
Type: Visual C#

A multiproject template for building apps for iOS, Android, and Windows with Xamarin and Xamarin.Forms.

Name: BookLists
Location: C:\Demo
Solution name: BookLists
[✓] Create directory for solution
[ ] Add to Source Control

Figure 2-6. *Open the Cross-Platform Xamarin.Forms application template.*

4. If you get prompted by a Windows Security Alert, select both the private and public options and click Allow access. See Figure 2-7.


Windows Security Alert

Windows Defender Firewall has blocked some features of this app

Windows Defender Firewall has blocked some features of Microsoft Visual Studio 2017 on all public and private networks.

Name: Microsoft Visual Studio 2017
Publisher: Microsoft Corporation
Path: C:\program files (x86)\microsoft visual studio \2017\community\common7\ide\devenv.exe

Allow Microsoft Visual Studio 2017 to communicate on these networks:

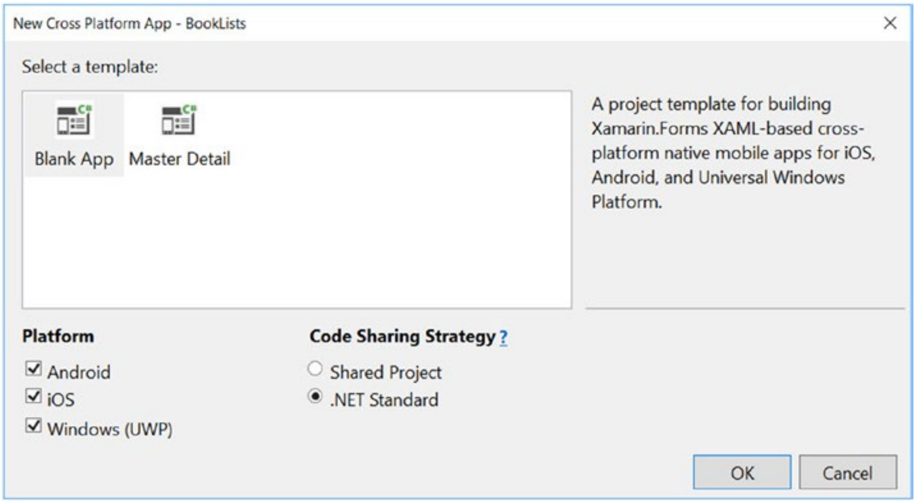
☑ Private networks, such as my home or work network

☑ Public networks, such as those in airports and coffee shops (not recommended because these networks often have little or no security)

What are the risks of allowing an app through a firewall?

Figure 2-7. *Allowing access to a security alert*

5. A screen similar to that in Figure 2-8 appears. Choose the Blank App template, and the shared .NET Standard Code Sharing Strategy options. Then click OK.


New Cross Platform App - BookLists

Select a template:

Blank App Master Detail

A project template for building Xamarin.Forms XAML-based cross-platform native mobile apps for iOS, Android, and Universal Windows Platform.

Platform

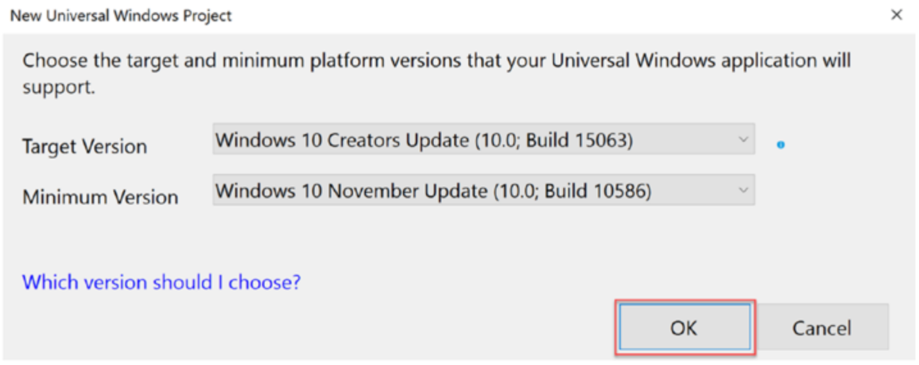
- ☑ Android
- ☑ iOS
- ☑ Windows (UWP)

Code Sharing Strategy ?

- ○ Shared Project
- ● .NET Standard

Figure 2-8. *Choosing the Blank App template, and the .NET Standard Code Sharing Strategy options*

6. If prompted for UWP versions, accept the defaults and click OK. See Figure 2-9.

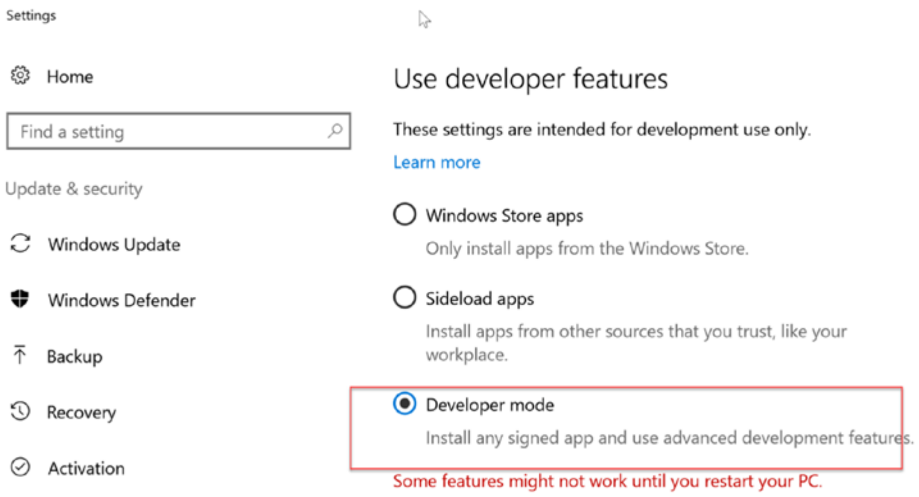

New Universal Windows Project

Choose the target and minimum platform versions that your Universal Windows application will support.

Target Version	Windows 10 Creators Update (10.0; Build 15063)
Minimum Version	Windows 10 November Update (10.0; Build 10586)

Figure 2-9. *Accepting the defaults for Target Version and Minimum Version UWP application support*

7. If prompted to use the User developer features, select Developer mode when your settings are displayed. This will allow you to deploy to devices. See Figure 2-10.



Use developer features

These settings are intended for development use only.

Learn more

( ) Windows Store apps
Only install apps from the Windows Store.

( ) Sideload apps
Install apps from other sources that you trust, like your workplace.

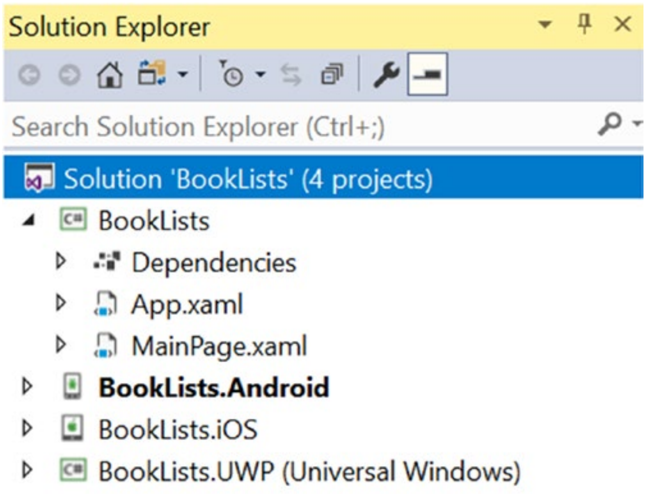
(●) Developer mode
Install any signed app and use advanced development features.

Some features might not work until you restart your PC.

Figure 2-10. *If prompted, select Developer mode in your settings*

8. If you are prompted for the Mac Server, ignore it or, if you have the required setup on the Mac, connect it. This is an optional setup for this book. Details can be found here: `https://developer.xamarin.com/guides/ios/getting_started/installation/mac/`. You will require a Mac, to compile, emulate, and deploy your iOS applications. You can also use VS for Mac, but UWP is not supported there.

9. Review the solution architecture in the Solution Explorer window (Figure 2-11). You will see four projects in this solution: one for each of the head projects—Android, iOS, and Universal Windows (UWP)—and one for shared projects. The head projects are for your startup projects to select from, depending on which platform you want to run. The shared .NET Standard project is where you will put most of your code. This could be more than 95 percent.


Solution Explorer

Search Solution Explorer (Ctrl+;)

Solution 'BookLists' (4 projects)
- BookLists
  - Dependencies
  - App.xaml
  - MainPage.xaml
- **BookLists.Android**
- BookLists.iOS
- BookLists.UWP (Universal Windows)

Figure 2-11. *Solution Explorer contains shared, Android, iOS, and UWP projects*

10. Select BookLists.Android as the project you wish to run, right-click it, and select Set as StartUp Project, as shown in Figure 2-12.

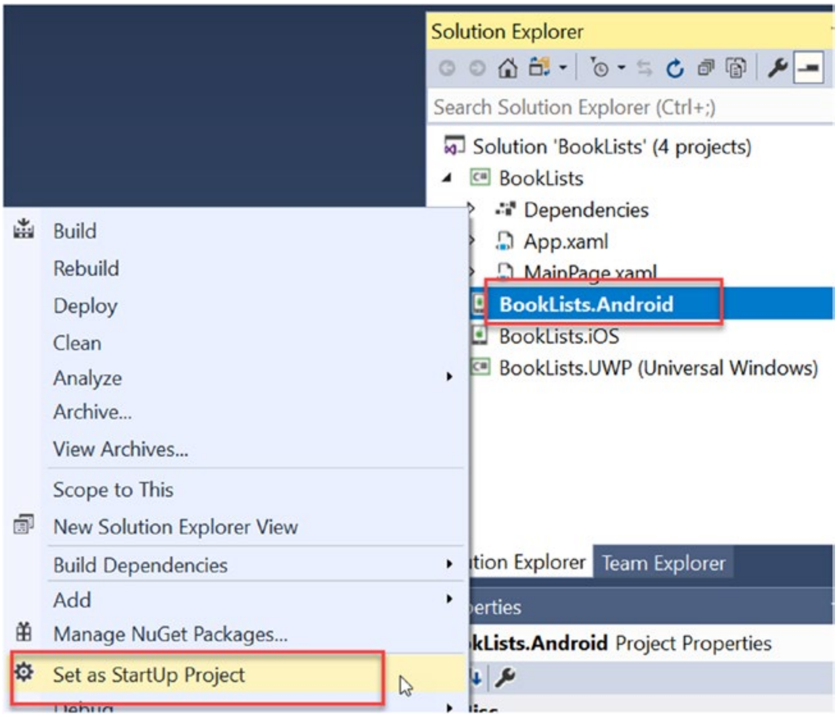


Figure 2-12. *Android Set as StartUp Project*

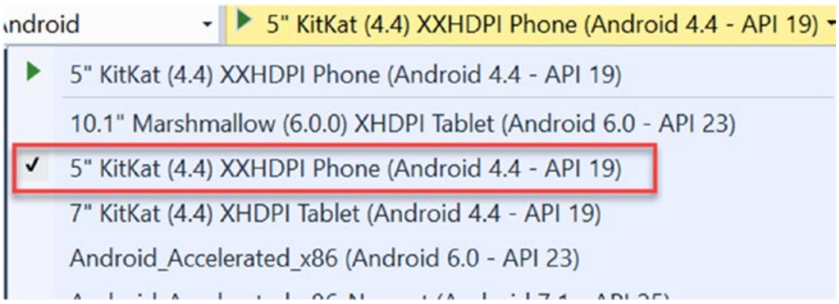
Note You will see the sections “Try{…}” and “Catch{…}” in among the following steps.

In code, we often use `Try/Catch` in error-handling. For those of you who are unfamiliar with this, try some code, and if it does not work, handle it in the `Catch` clause.

In instructions throughout this book, you also may see these terms without text in braces following. In such cases, the terms suggest that you try something, and if this does not work, to check the `Catch` section(s) that immediately follow, for a possible solution.

---

11. **Try:** Run the app, selecting the emulator for the 5" KitKat. The emulators that begin with the size of the device are the VS 2017 Android emulators. These are the fastest Android emulators. See Figure 2-13.



ndroid

5" KitKat (4.4) XXHDPI Phone (Android 4.4 - API 19)

5" KitKat (4.4) XXHDPI Phone (Android 4.4 - API 19)

10.1" Marshmallow (6.0.0) XHDPI Tablet (Android 6.0 - API 23)

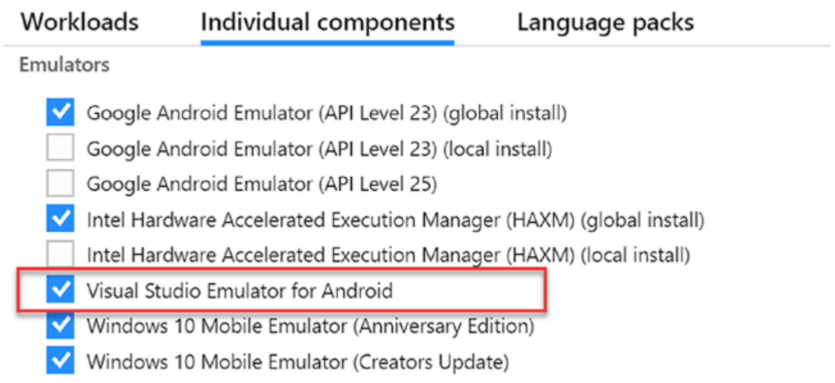
✓ 5" KitKat (4.4) XXHDPI Phone (Android 4.4 - API 19)

7" KitKat (4.4) XHDPI Tablet (Android 4.4 - API 19)

Android_Accelerated_x86 (Android 6.0 - API 23)

Figure 2-13. *5" KitKat selected*

12. **Catch:** If you do not see the VS 2017 Android emulators, you will have to run the VS 2017 Installer Program, modify it for your installed version, and select the Individual Components tab. Scroll down until you see the Emulators section. Check Visual Studio Emulator for Android. This will take several minutes to install, and you may have to reboot. See Figure 2-14.



✓ Google Android Emulator (API Level 23) (global install)
☐ Google Android Emulator (API Level 23) (local install)
☐ Google Android Emulator (API Level 25)
✓ Intel Hardware Accelerated Execution Manager (HAXM) (global install)
☐ Intel Hardware Accelerated Execution Manager (HAXM) (local install)
✓ Visual Studio Emulator for Android
✓ Windows 10 Mobile Emulator (Anniversary Edition)
✓ Windows 10 Mobile Emulator (Creators Update)

Figure 2-14. *Selecting Visual Studio Emulator for Android in VS Installer*

13. **Catch:** {If you do not see the Visual Studio Emulator for Android in the list, this means that you are not running Hyper-V. To run Hyper-V, you must change your bios settings to support virtualization. Close all applications. Right-click the start button and select Run. Type "shutdown/r/o." This will reboot your machine with options and allow you to troubleshoot advanced options, to bring up the firmware settings for the bios. Once in the bios, use the arrow keys to navigate to the desired section and look for an option to enable virtualization. Then repeat the step above.} See Figures 2-15 and 2-16.

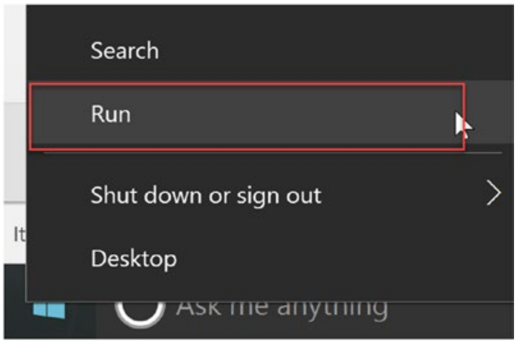
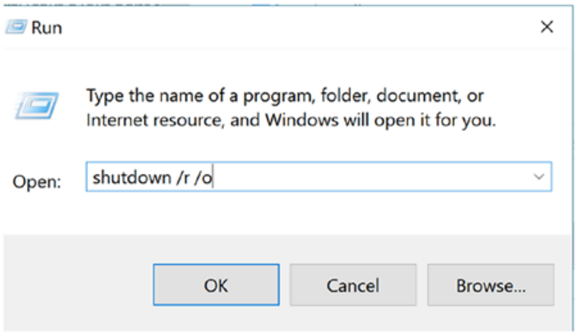


Figure 2-15. *Right-click Start and select Run*



Type the name of a program, folder, document, or Internet resource, and Windows will open it for you.

Open: shutdown /r /o

Figure 2-16. *Type "shutdown/r/o" to restart with options*

14. **Catch:** {Some machines are too fast for the emulator. If your app starts in the VS Android emulator but exits quickly, perform the following steps (Android app starts and immediately closes, debugging stops):

    a. Close the Android simulator window, to shut down the virtual machine.

    b. Go to the properties of the Android project, hit tab Android options, and unselect Use Fast Deployment.

c. Start Hyper-V Manager (This is the Microsoft program to manage virtual machines in Windows; you have it installed.)

d. Select the emulator you are trying to use. If the desired emulator does not appear, you must either launch it first from either Visual Studio or from the Visual Studio Emulator for Android.

e. Right-click for context menu, then hit Settings.

f. In the Settings dialog, expand Processor.

g. Click Compatibility.

h. In the right pane set check box "Migrate to a physical computer with a different processor version"

i. Start the debugging in Visual Studio to restart the simulator.}See Figure 2-17.

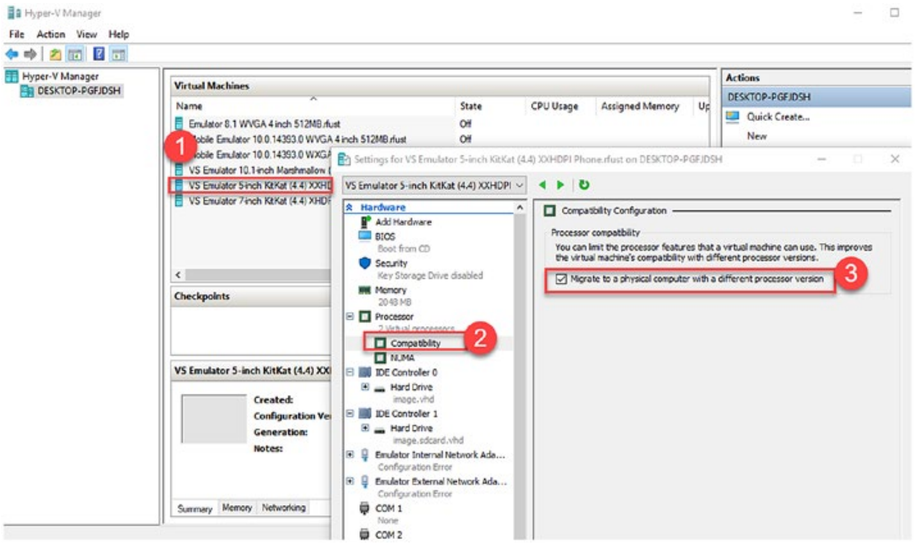

Hyper-V Manager
File Action View Help
Hyper-V Manager
DESKTOP-PGFJDSH
Virtual Machines
Name
State
CPU Usage
Assigned Memory
Emulator 8.1 WVGA 4 inch 512MB.rust
Off
Mobile Emulator 10.0.14393.0 WVGA 4 inch 512MB.rust
Off
Mobile Emulator 10.0.14393.0 WXGA
VS Emulator 10.1-inch Marshmallow
VS Emulator 5-inch KitKat (4.4) XXHD
VS Emulator 7-inch KitKat (4.4) XHD
1
Checkpoints
VS Emulator 5-inch KitKat (4.4) XX
Created:
Configuration Ve
Generation:
Notes:
Summary Memory Networking
Actions
DESKTOP-PGFJDSH
Quick Create...
New
Settings for VS Emulator 5-inch KitKat (4.4) XXHDPI Phone.rust on DESKTOP-PGFJDSH
VS Emulator 5-inch KitKat (4.4) XXHDPI
Hardware
Add Hardware
BIOS
Boot from CD
Security
Key Storage Drive disabled
Memory
2048 MB
Processor
2 Virtual processors
Compatibility
2
NUMA
IDE Controller 0
Hard Drive
image.vhd
IDE Controller 1
Hard Drive
image.sdcard.vhd
Emulator Internal Network Ada...
Configuration Error
Emulator External Network Ada...
Configuration Error
COM 1
None
COM 2
Compatibility Configuration
Processor compatibility
You can limit the processor features that a virtual machine can use. This improves the virtual machine's compatibility with different processor versions.
☑ Migrate to a physical computer with a different processor version
3

Figure 2-17. *In Hyper-V Manager, select the emulator that ends the app quickly, select Settings ➤ Compatibility, and check the Migrate option*

15. Rotate the phone, slide the lock to unlock it, and you should see "Welcome to Xamarin Forms." See Figures 2-18 and 2-19.

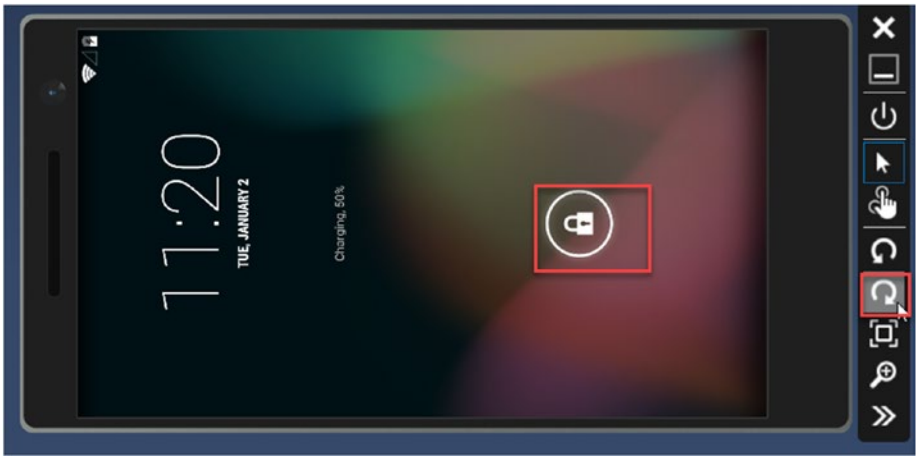


Figure 2-18. *Selecting the rotate to right button and sliding up the lock*

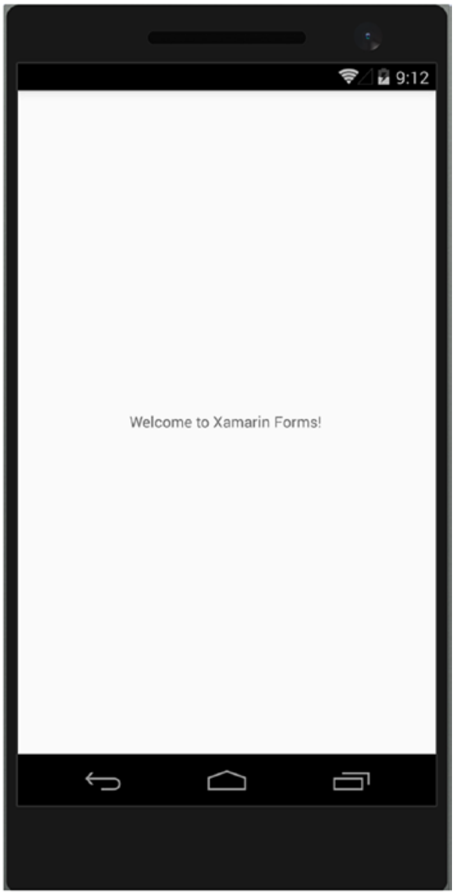


Figure 2-19. *Your first app appears in Android, using Xamarin Forms!*

16. Now right-click and select the UWP project and make it the Startup project. See Figure 2-20.

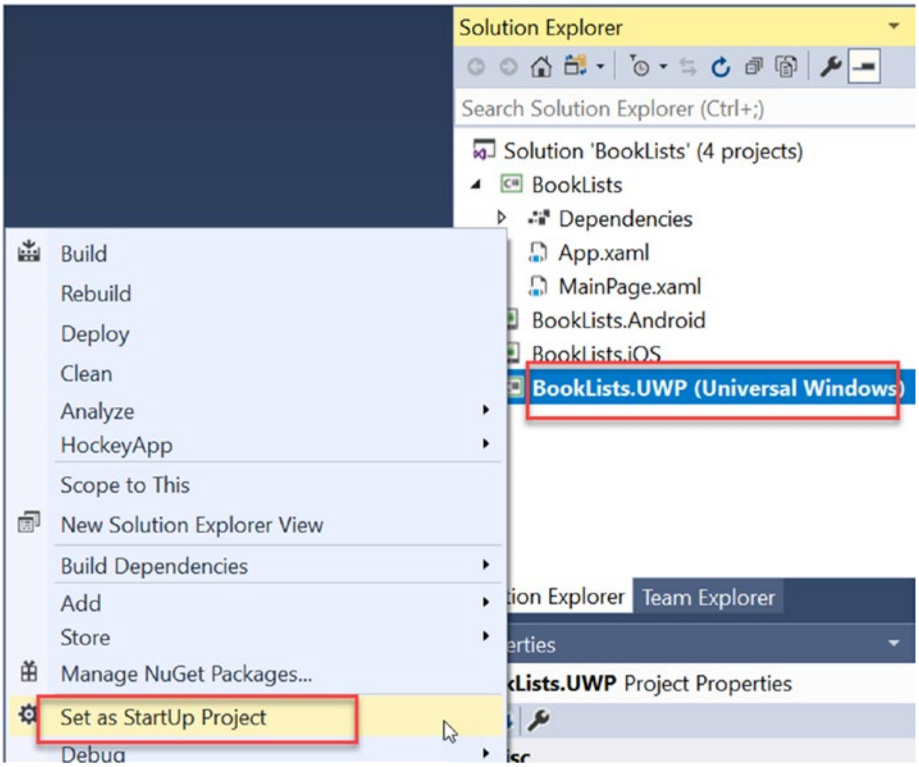


Figure 2-20. *Select UWP as the Startup project*

17. **Try:** Run the app on the Local Machine. See Figures 2-21 and 2-22.

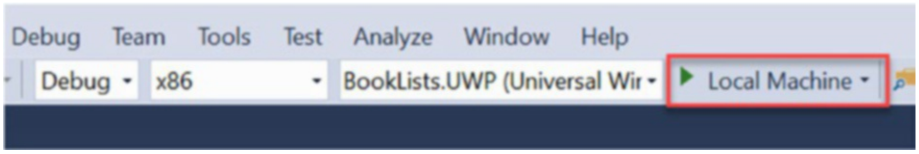


Figure 2-21. *Selecting Local Machine*

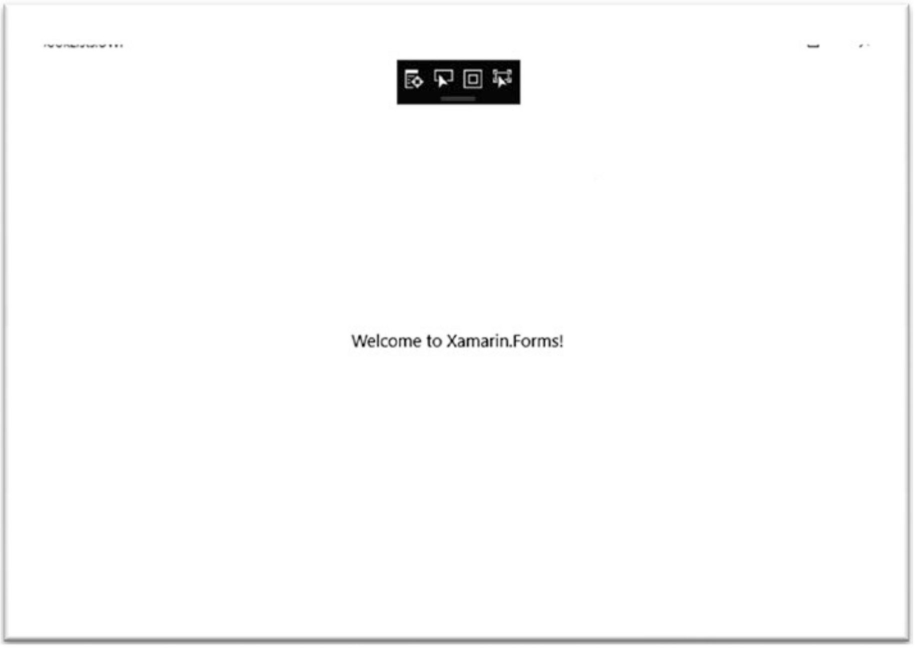


Figure 2-22. *Your first app on UWP, using Xamarin Forms*

18. **Catch:** {The first time you go to run a project on UWP, you may have to check the build configuration first and make sure that the deploy and build options are checked and are x64. Under the Build menu, select Configuration Manager...}
    See Figures 2-23 and 2-24.

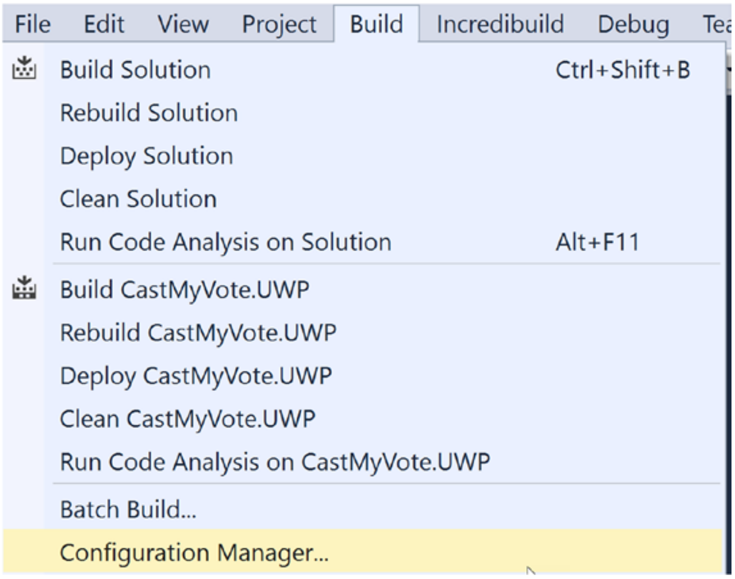
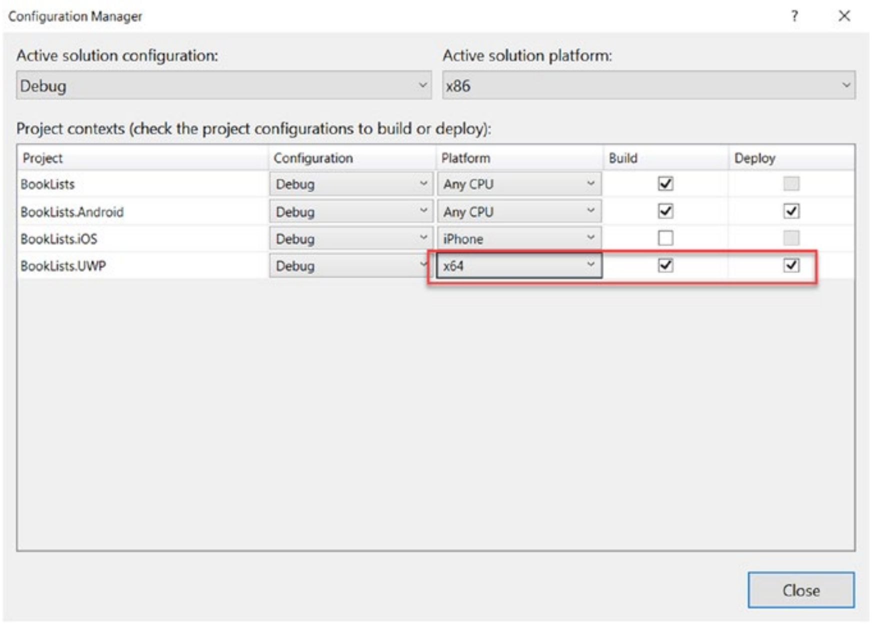


Figure 2-23. *Selecting the Build ➤ Configuration Manager... option*



Active solution configuration: Debug

Active solution platform: x86

Project contexts (check the project configurations to build or deploy):

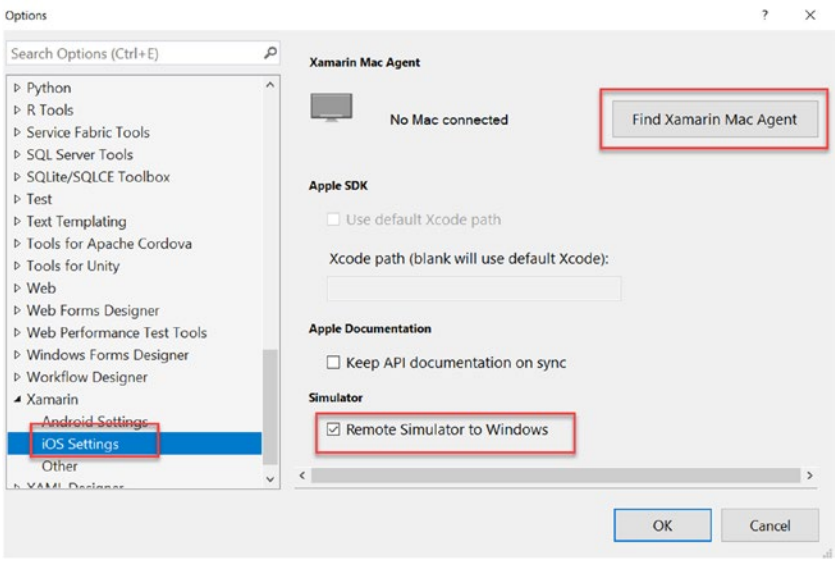
Project	Configuration	Platform	Build	Deploy
BookLists	Debug	Any CPU	✓	
BookLists.Android	Debug	Any CPU	✓	✓
BookLists.iOS	Debug	iPhone		
BookLists.UWP	Debug	x64	✓	✓

Figure 2-24. *Selecting Build and Deploy for UWP*

19. If you have optionally installed VS for the Mac, follow the next few steps; otherwise, skip to step 25.

20. Right-click the iOS project in the solution and set as Startup Project.

21. Select Tools ➤ Options ➤ Xamarin ➤ iOS and check off Remote Simulator to Windows, which will allow you to see the simulator on the PC when you run. Then select Find Xamarin Mac Agent and read the three-step procedure for remote login on the Mac. See Figures 2-25 through 2-28.



Xamarin Mac Agent

No Mac connected

Apple SDK

☐ Use default Xcode path

Xcode path (blank will use default Xcode):

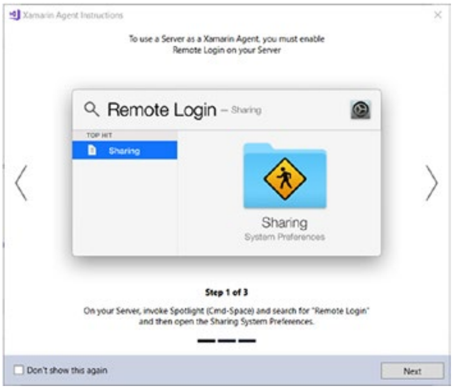
Apple Documentation

☐ Keep API documentation on sync

Simulator

☑ Remote Simulator to Windows

Figure 2-25. *Select Tools, Options, Xamarin, and iOS Settings. Check Remote Simulator and click Find Xamarin Mac Agent.*

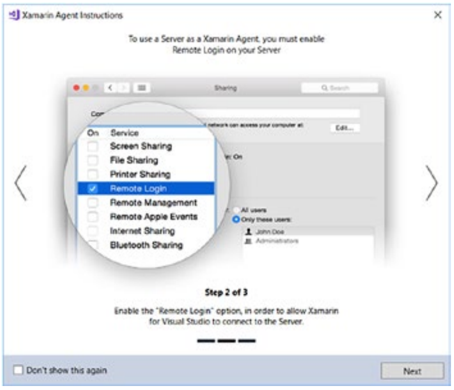


To use a Server as a Xamarin Agent, you must enable Remote Login on your Server

Step 1 of 3

On your Server, invoke Spotlight (Cmd-Space) and search for "Remote Login" and then open the Sharing System Preferences.

Figure 2-26. *Step 1 of 3 for Remote Login*

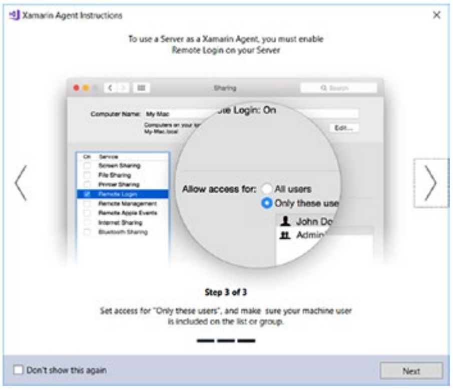


To use a Server as a Xamarin Agent, you must enable Remote Login on your Server

Step 2 of 3

Enable the "Remote Login" option, in order to allow Xamarin for Visual Studio to connect to the Server.

Figure 2-27. *Step 2 of 3 for Remote Login*


Xamarin Agent Instructions

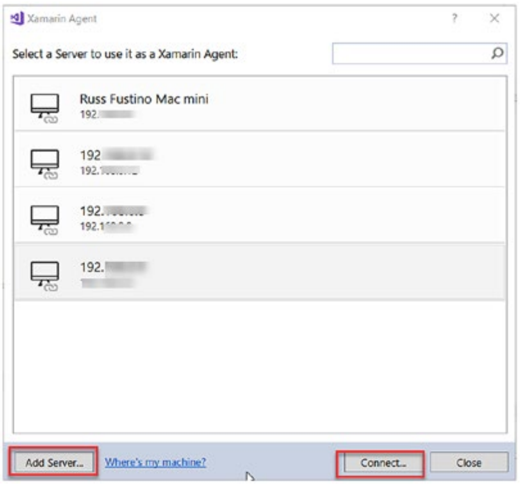
To use a Server as a Xamarin Agent, you must enable Remote Login on your Server

Step 3 of 3

Set access for "Only these users", and make sure your machine user is included on the list or group.

Figure 2-28. *Step 3 of 3 for Remote Login*

22. On the Mac, find the IP address by clicking the Apple logo in the upper-left corner and then select System Preferences and Network. Copy the IP address. Back on the PC, click Add Server and enter the Mac IP address. You will be prompted for your username and password on the Mac. You should see the connection machine turn green. See Figure 2-29.


Xamarin Agent

Select a Server to use it as a Xamarin Agent:

Russ Fustino Mac mini
192.[redacted]

192[redacted]
192.[redacted]

192.[redacted]
192.1[redacted]

192.[redacted]
[redacted]

Figure 2-29. *Select Add Server, or Connect, if you have a previous connection*

23. To run in the iOS simulator, select iPhoneSimulator, the small drop-down arrow will provide a list of simulators. Select iPhone 8 iOS. You may have to close the simulator once, if it does not start up the first time in a minute or two, and rerun. (See Figures 2-30 and 2-31.) If the simulator does not appear, know that it sometimes runs behind your Visual Studio window. So just move windows around till you see it, or cycle through your open apps using an Alt+Tab key combination.

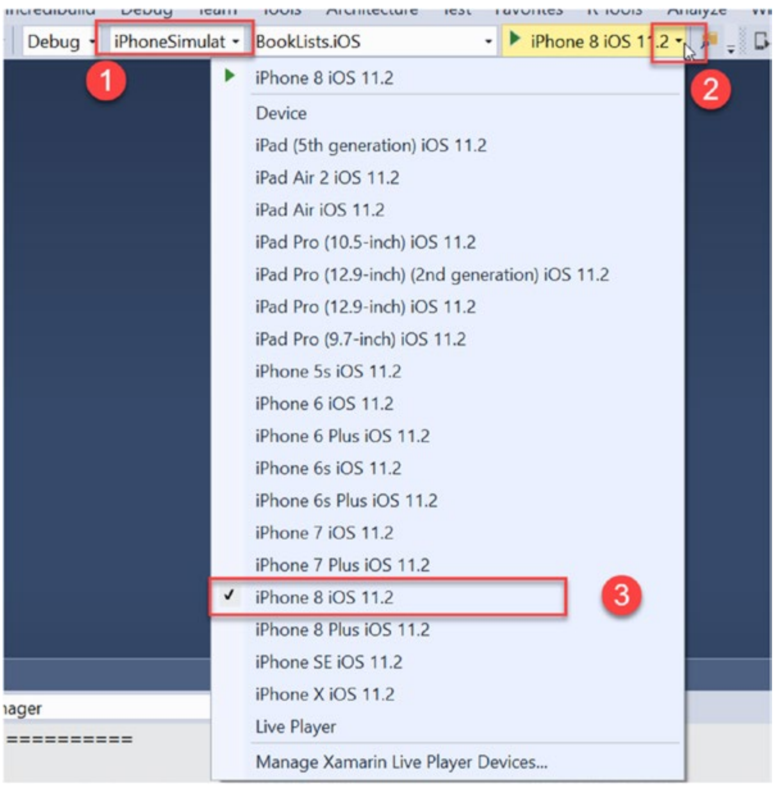
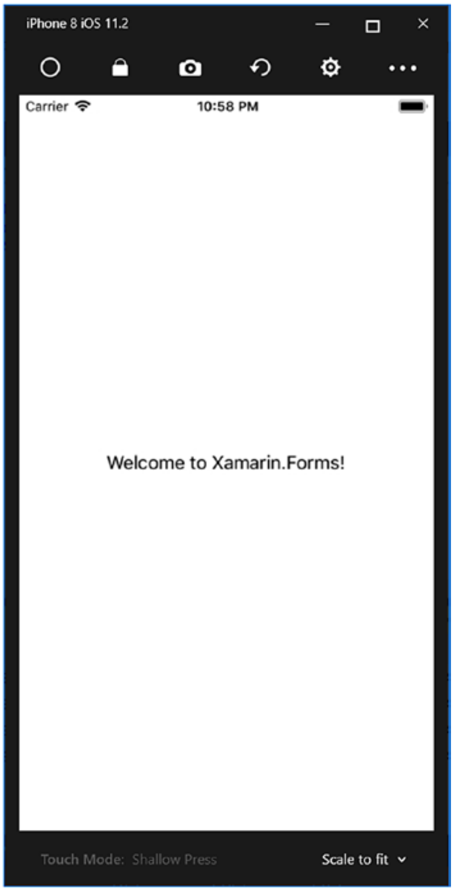


Figure 2-30. *Select iPhoneSimulator (1), the tiny drop-down arrow (2), and the simulator model, such as iPhone 8 iOS (3)*



Welcome to Xamarin.Forms!

Figure 2-31. *The iPhoneSimulator displays running the app*

24. Stop the app. Add a new page to the shared .NET Standard project. Right-click the shared .NET Standard project, select Add ➤ New Item. See Figure 2-32.

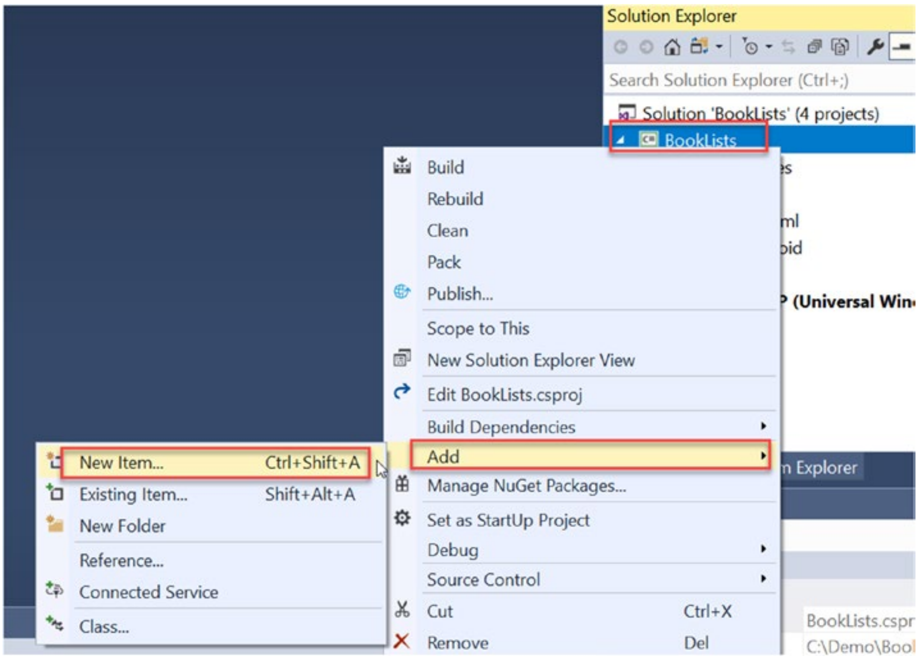
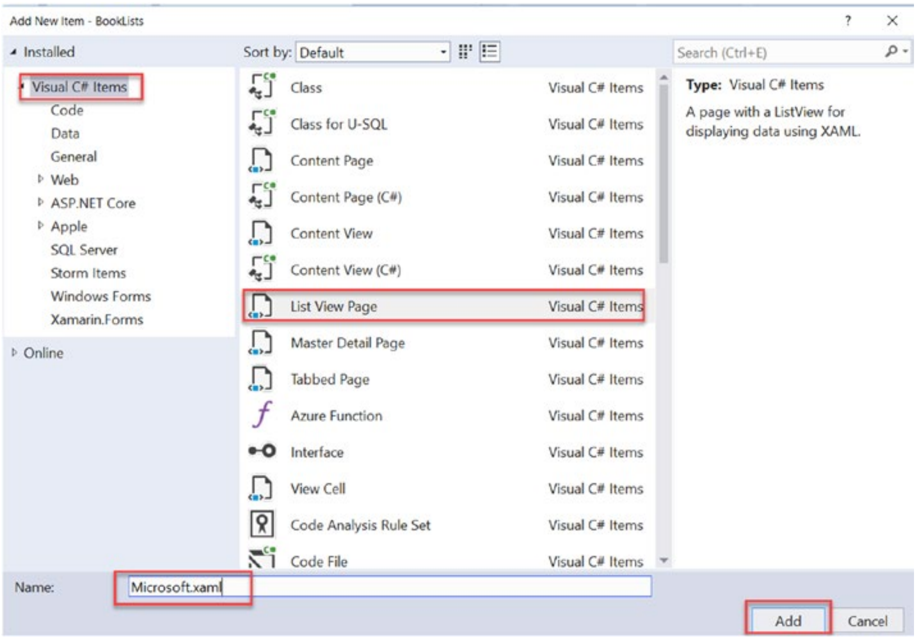


Figure 2-32. *Right-click BookLists and select Add ➤ New Item....*

25. Select Visual C# Items ➤ List View Page and name the page `Microsoft.xaml`. See Figure 2-33.


Add New Item - BookLists
Installed
Visual C# Items
Code
Data
General
Web
ASP.NET Core
Apple
SQL Server
Storm Items
Windows Forms
Xamarin.Forms
Online
Sort by: Default
Class — Visual C# Items
Class for U-SQL — Visual C# Items
Content Page — Visual C# Items
Content Page (C#) — Visual C# Items
Content View — Visual C# Items
Content View (C#) — Visual C# Items
List View Page — Visual C# Items
Master Detail Page — Visual C# Items
Tabbed Page — Visual C# Items
Azure Function — Visual C# Items
Interface — Visual C# Items
View Cell — Visual C# Items
Code Analysis Rule Set — Visual C# Items
Code File — Visual C# Items
Search (Ctrl+E)
Add
Cancel

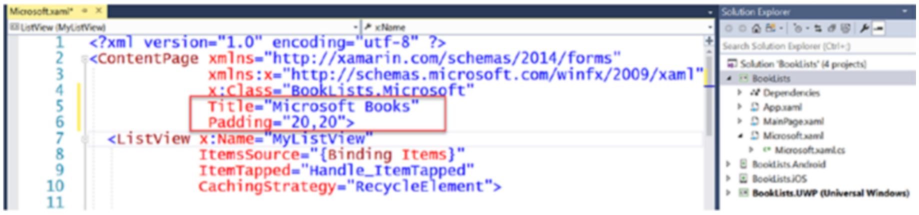
Type: Visual C# Items

A page with a ListView for displaying data using XAML.

Name: Microsoft.xaml

Figure 2-33. *Select the List View Page template and name the page* `Microsoft.xaml`

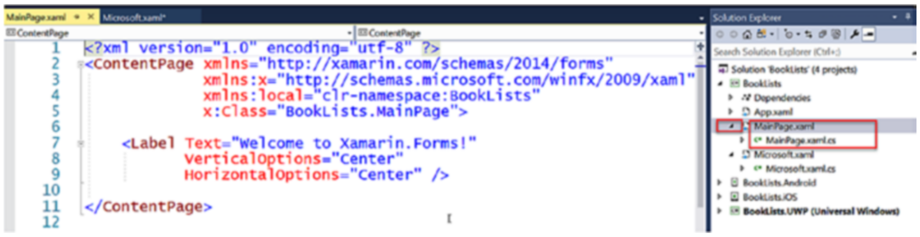
26. Open `Microsoft.xaml` and set the following: Padding = `"20,20"` and Title = `"Microsoft Books"`. This will provide some spacing around the children views of the content page and give it a title. Always use double quotes around values in XAML. See Figure 2-34.



```
<?xml version="1.0" encoding="utf-8" ?>
<ContentPage xmlns="http://xamarin.com/schemas/2014/forms"
             xmlns:x="http://schemas.microsoft.com/winfx/2009/xaml"
             x:Class="BookLists.Microsoft"
             Title="Microsoft Books"
             Padding="20,20">
  <ListView x:Name="MyListView"
            ItemsSource="{Binding Items}"
            ItemTapped="Handle_ItemTapped"
            CachingStrategy="RecycleElement">
```

Figure 2-34. *Add Title =* `"Microsoft Books"` *and Padding =* `"20,20"`

27. In Solution Explorer, double-click the `MainPage.xaml` page in the shared .NET Standard project, to see the XAML. Also, note that when you expand the XAML page, there is a code behind file associated with it in Solution Explorer. See Figure 2-35.



```
<?xml version="1.0" encoding="utf-8" ?>
<ContentPage xmlns="http://xamarin.com/schemas/2014/forms"
             xmlns:x="http://schemas.microsoft.com/winfx/2009/xaml"
             xmlns:local="clr-namespace:BookLists"
             x:Class="BookLists.MainPage">

    <Label Text="Welcome to Xamarin.Forms!"
           VerticalOptions="Center"
           HorizontalOptions="Center" />

</ContentPage>
```

Figure 2-35. *Each XAML file has a related code behind the `xaml.cs` file*

28. Replace the Label view with a `StackLayout` that contains a button with the following markup.

    Replace this

```
<Label Text="Welcome to Xamarin.Forms!"
       VerticalOptions="Center"
       HorizontalOptions="Center" />
```

with this

```
<StackLayout>
    <Button Margin="20,20"
            WidthRequest="100"
            Text="Press to see ListView Page">
    </Button>
</StackLayout>
```

Note Newer versions of Visual Studio may already have the StackLayout on the default template. If so, just replace the Label with the Button and keep the existing StackLayout.

29. Now add a clicked event to the button…

    Your code should now look like this in `MainPage.xaml`:

    ```
    <StackLayout>
        <Button Margin="20,20"
                WidthRequest="100"
                Text="Press to see ListView Page"
                Clicked="MicrosoftBooks_Clicked">
        </Button>
    </StackLayout>
    ```

30. Open the code behind page, `MainPage.xaml.cs`, and add an event handler for `MicrosoftBooks_Clicked` after the MainPage constructor, if one is not already there, as follows:

    ```
    using System;
    using System.Collections.Generic;
    using System.Linq;
    using System.Text;
    using System.Threading.Tasks;
    using Xamarin.Forms;
    ```

```
namespace BookLists
{
        public partial class MainPage : ContentPage
        {
                public MainPage()
                {
                        InitializeComponent();
                }

        private void MicrosoftBooks_Clicked(object
        sender, EventArgs e)
        {
            Navigation.PushAsync(new Microsoft());
        }

    }
}
```

31. Open `App.xaml.cs` and comment out the code to start the MainPage and replace it by starting a NavigationPage. You can find pages in the solution by typing in the search window in Solution Explorer. Here you see two `app.xaml` files: one in the shared .NET Standard project, and one in the UWP project. The user interface (UI) code goes in the shared .NET Standard project. See Figure 2-36.

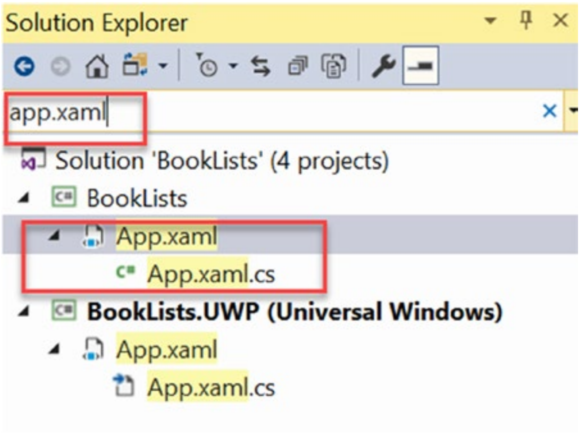


Figure 2-36. *Searching on `app.xaml` in Solution Explorer yields two sets. Use the one in BookLists.*

```
        public App ()
        {
                        InitializeComponent();

            // MainPage = new BookLists.MainPage();

            MainPage = new NavigationPage(new
            MainPage());
      }
```

32. Select the UWP head project, or whichever head project you desire as the Startup project. Run the app, and you should be able to navigate to the ListPage and back to the MainPage.

33. Open `MainPage.xaml` and modify the text property to `"Microsoft Books"`

```
<StackLayout>
    <Button Margin=" 20,20"
            Text="Microsoft Books"
            Clicked="MicrosoftBooks_Clicked">
    </Button>
</StackLayout>
```

34. Run the app and click the Microsoft Books button. Then navigate to the Microsoft Books ListView page. See Figure 2-37.

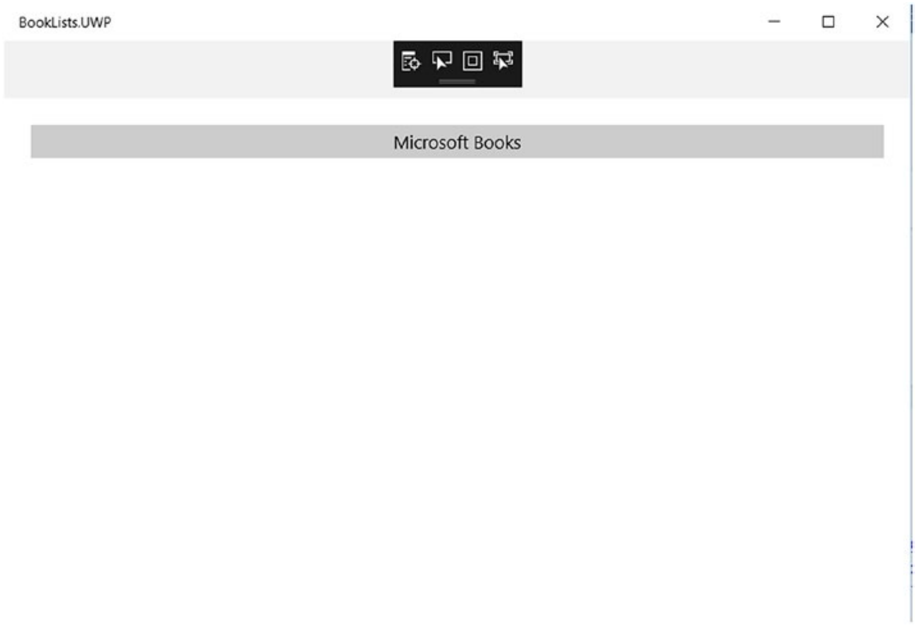
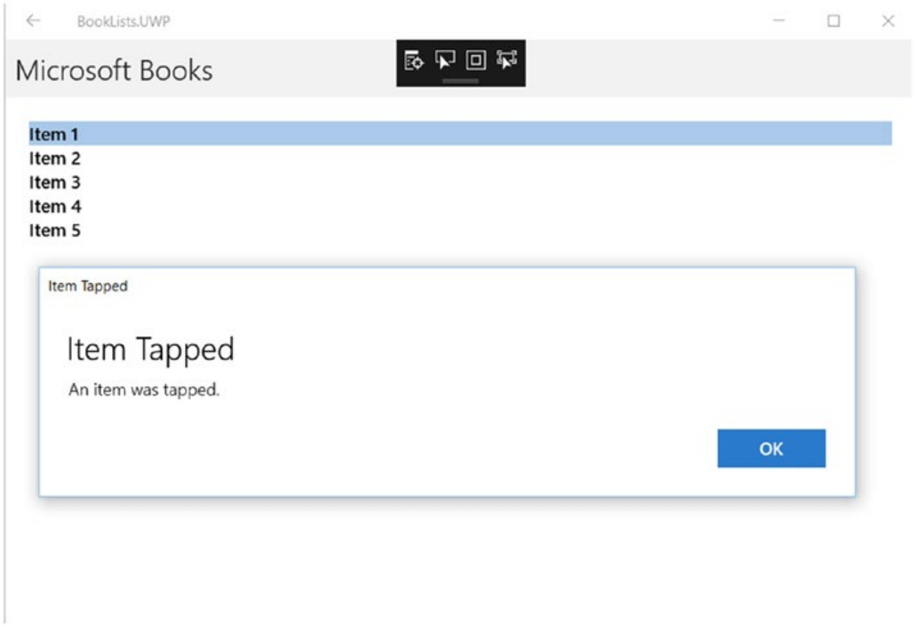


Figure 2-37. *See the home Navigation page* `MainPage.xaml`

35. You should see the Microsoft Books ListView page and a list of items, as well as a tapped event handler, when you click on an item. See Figure 2-38.



Item Tapped

An item was tapped.

Figure 2-38. *By selecting Item, you will see a message that an item was tapped*

Congratulations! You have just created your first Xamarin app.

Project 2-2: Working with the User Interface

Time Estimate

15 Minutes

In this project, you will create a user interface (UI) and employ the `StackLayout` and `GridLayout` classes. These are very popular building blocks for your UI. `StackLayout` flows similarly to an HTML page, with UI items that relate to each other, in a vertical or horizontal stack, for example. `GridLayout` is useful for layouts that are best defined by rows and columns. For example, StackLayout might be good for the phone, as you typically scroll up and down in a phone app, whereas GridLayout might be good for a tablet, to help users take advantage of all the additional real estate on the device.

1. Continue with the same app. We will now place four buttons on the main page. Replace the StackLayout markup XAML in MainPage.xaml with the following markup:

```
<StackLayout>
  <Button Margin="20,20"
      WidthRequest="100"
      Text="Microsoft Books"
      Clicked="MicrosoftBooks_Clicked">
  </Button>
  <Button Margin="20,20"
      WidthRequest="100"
      Text="Programming"
      Clicked="Programming_Clicked">
  </Button>
  <Button Margin="20,20"
      WidthRequest="100"
      Text="Mobile"
      Clicked="Mobile_Clicked">
  </Button>
  <Button Margin="20,20"
      WidthRequest="100"
      Text="Machine Learning"
      Clicked="MachineLearning_Clicked">
  </Button>
</StackLayout>
```

2. Create clicked event handlers for each button and leave the new handlers empty for now, as follows in `MainPage.xaml.cs`:

```
namespace BookLists
{
    public partial class MainPage : ContentPage
    {
            public MainPage()
            {
                    InitializeComponent();
            }

        private void MicrosoftBooks_Clicked(object
        sender, EventArgs e)
        {
            Navigation.PushAsync(new Microsoft());
        }
        private void Programming_Clicked(object sender,
        EventArgs e)
        {

        }
        private void Mobile_Clicked(object sender,
        EventArgs e)
        {

        }
        private void MachineLearning_Clicked(object
        sender, EventArgs e)
        {

        }
    }
}
```

3. In a stack layout, the children are displayed in the order they appear in the XAML. Also, the default `StackLayout` orientation is vertical. Run the app, and you should see the buttons listed vertically, as in Figure 2-39.

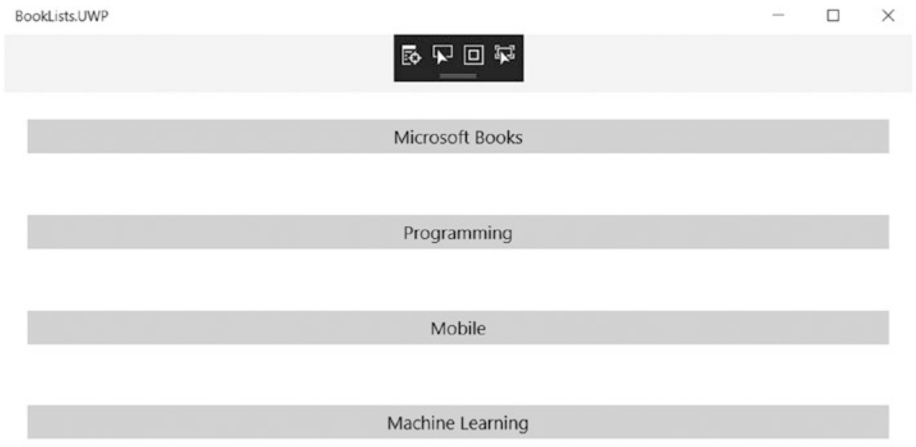


Figure 2-39. *All the new buttons are displayed*

4. You may be wondering why the buttons stretch across the width of the page, although we have specified `WidthRequest` only to 100. That is because the default value for `StackLayout` `HorizontalOptions` with a vertical orientation is `FillAndExpand`. These sizes are not pixels. Instead, they are device-independent units recognized independently by each platform. Let's modify each button to include the following:

   ```
   HorizontalOptions="Center"
   WidthRequest ="300"
   ```

   This `StackLayout` XAML should look like the following:

   ```
       <StackLayout>
           <Button Margin="20,20"
                   WidthRequest="300"
                   HorizontalOptions="Center"
                   Text="Microsoft Books"
                   Clicked="MicrosoftBooks_Clicked">
                   </Button>
           <Button Margin="20,20"
                   WidthRequest="300"
                   HorizontalOptions="Center"
                   Text="Programming"
                   Clicked="Programming_Clicked"></Button>
           <Button Margin="20,20"
                   WidthRequest="300"
                   HorizontalOptions="Center"
                   Text="Mobile"
                   Clicked="Mobile_Clicked"></Button>
   ```

```
            <Button Margin="20,20"
                    WidthRequest="300"
                    HorizontalOptions="Center"
                    Text="Machine Learning"
                    Clicked="MachineLearning_Clicked">
                    </Button>
        </StackLayout>
```

5. Now run it to see the resized buttons in Figure 2-40.

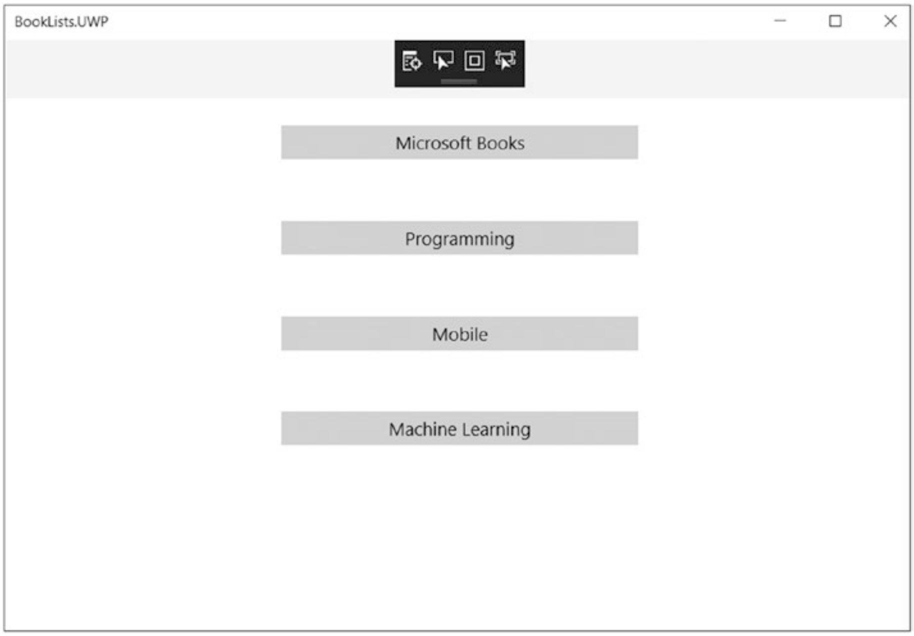


Figure 2-40. *Buttons are now displayed centered, with a width of 300*

6. Comment out the StackLayout XAML, as we will use this later. To comment out a section of code in Visual Studio, select the desired code that you want to comment and then press CTRL+K and then CTRL+C. (To uncomment, use CTRL+K, CTRL+U.)

```
<!--<StackLayout>
    <Button Margin="20,20"
            WidthRequest="300"
            HorizontalOptions="Center"
            Text="Microsoft Books"
            Clicked="MicrosoftBooks_Clicked">
            </Button>
    <Button Margin="20,20"
            WidthRequest="300"
            HorizontalOptions="Center"
            Text="Programming"
            Clicked="Programming_Clicked"></Button>
    <Button Margin="20,20"
            WidthRequest="300"
            HorizontalOptions="Center"
            Text="Mobile"
            Clicked="Mobile_Clicked"></Button>
    <Button Margin="20,20"
            WidthRequest="300"
            HorizontalOptions="Center"
            Text="Machine Learning"
            Clicked="MachineLearning_Clicked">
            </Button>
</StackLayout>-->
```

7. Now let's add a grid, as follows, directly below the commented `StackLayout` XAML. `GridLayout` uses row definitions and column definitions to set up the format of the grid. Star (*) sizing means the row or column will use up all the available space proportionally. For example, if you have two columns that use * and *, each will be 50 percent of the available width. If you specify the first as * and the second as 2*, the first will be one-third of the width and the second will be two-thirds of the width available. A height or width set to Auto in the definitions will size automatically to the largest value in the row or column.

```
<Grid>
    <Grid.RowDefinitions>
        <RowDefinition Height="200"></RowDefinition>
        <RowDefinition Height="200"></RowDefinition>
    </Grid.RowDefinitions>
    <Grid.ColumnDefinitions>
        <ColumnDefinition Width="*">
        </ColumnDefinition>
        <ColumnDefinition Width="*">
        </ColumnDefinition>
    </Grid.ColumnDefinitions>
    <Button Grid.Row="0" Grid.Column="0"
    Margin="20,20"
            HorizontalOptions="Center"
            WidthRequest="300"
            Text="Microsoft Books"
            Clicked="MicrosoftBooks_Clicked">
            </Button>
```

```
                <Button Grid.Row="0" Grid.Column="1"
                Margin="20,20"
                        HorizontalOptions="Center"
                        WidthRequest="300"
                       Text="Programming"
                        Clicked="Programming_Clicked"></Button>
                <Button Grid.Row="1" Grid.Column="0"
                Margin="20,20"
                        HorizontalOptions="Center"
                        WidthRequest="300"
                        Text="Mobile"
                        Clicked="Mobile_Clicked"></Button>
                <Button Grid.Row="1" Grid.Column="1"
                Margin="20,20"
                        HorizontalOptions="Center"
                        WidthRequest="300"
                       Text="Machine Learning"
                        Clicked="MachineLearning_Clicked">
                        </Button>
         </Grid>
```

8. Run it, and you should see something like Figure 2-41.

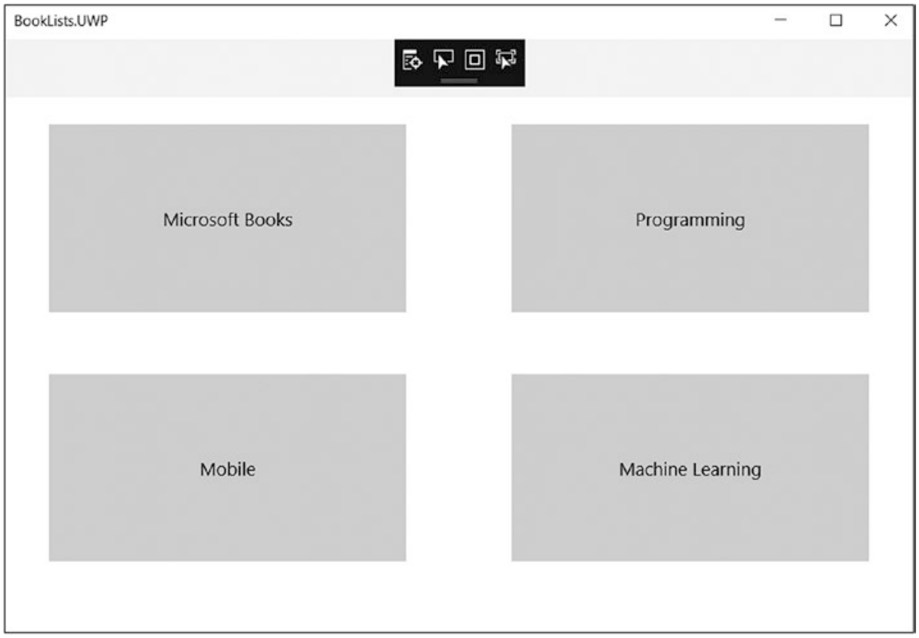


Figure 2-41. *Using `GridLayout` for buttons*

Now let's look at how we use these in tablet and phone form factors.

Project 2-3: Dealing with Tablet and Phone Form Factors

Time Estimate

10 Minutes

In this task, you will use XAML and code behind to control your layout form factors for a tablet and a phone. `ScrollView` can be used in a phone form factor to represent the main page of an application. Many phone apps are typically used in portrait or landscape mode and have a single column which you must scroll down to see all the content. In a tablet form factor, the screen is wider, and a grid view on a main page can be used to maximize the real estate, because one can easily create columns. With that said, it is not uncommon to mix and match grid and stack layouts to achieve the desired interface throughout the application.

1. Uncomment the `StackLayout` code, so that both the grid and stack layouts are uncommented and run the app. You will only see the grid layout, if it is below the stack layout. This is because only one view can be returned for a page, and the last one in wins. We will fix that next. See Figure 2-42.

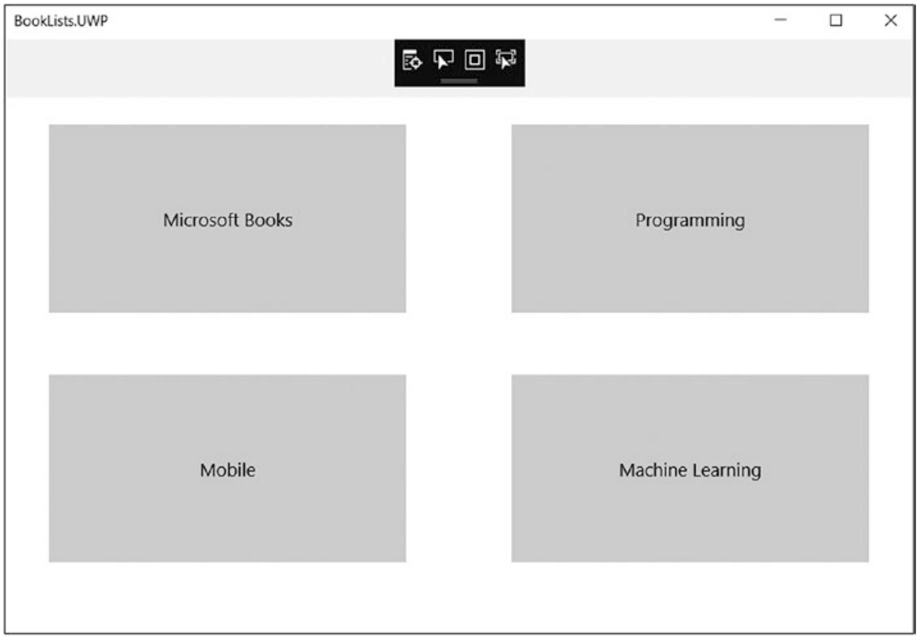
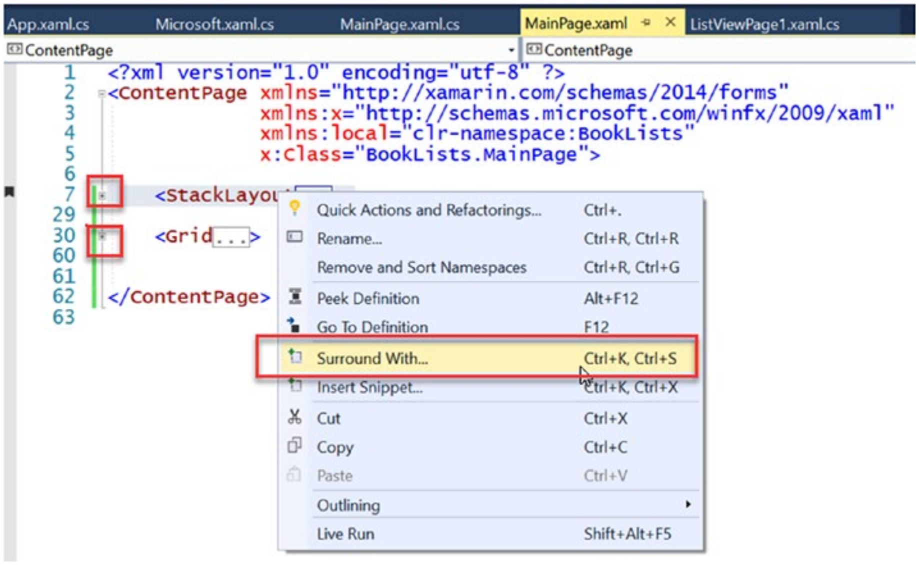


Figure 2-42. *Only the grid view shows when both layouts are uncommented. The last one in wins.*

2. **Try:** {What we would like to do is use the stack layout for the phone and the grid layout for the tablet. First, let's wrap both the grid and stack layout into one `StackLayout` view. Each section of the XAML can expand or contract using the – and + symbols on the left edge. Contract both grid and stack Layout sections, select both sections contracted, right-click and select Surround With... `StackLayout`.} See Figure 2-43.



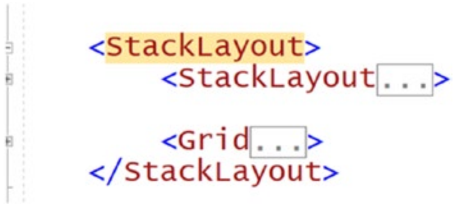
```
<?xml version="1.0" encoding="utf-8" ?>
<ContentPage xmlns="http://xamarin.com/schemas/2014/forms"
             xmlns:x="http://schemas.microsoft.com/winfx/2009/xaml"
             xmlns:local="clr-namespace:BookLists"
             x:Class="BookLists.MainPage">

    <StackLayou
    <Grid...>

</ContentPage>
```

Figure 2-43. *Selecting Surround With...*

3. **Catch:** {Visual Studio may surround the code with a grid by default. Change it to a stack layout.} See Figure 2-44.



```
<StackLayout>
    <StackLayout...>

    <Grid...>
</StackLayout>
```

***Figure 2-44.** `StackLayout` surrounds both `StackLayout` and `Grid`*

4. Run the app, and you will see that both sections are displayed on the page, which is almost where we want to be. See Figure 2-45.

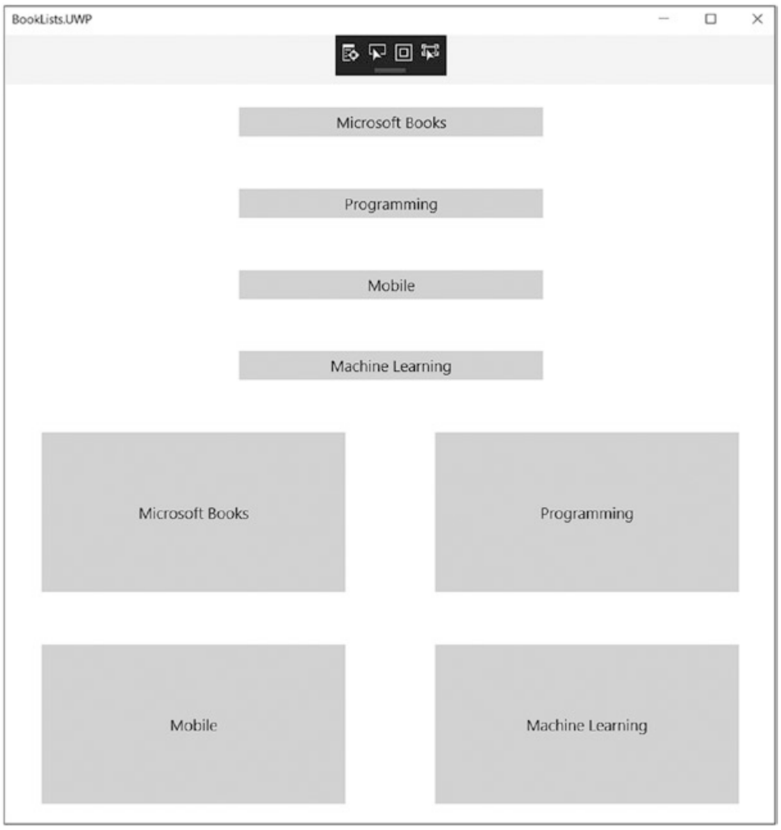
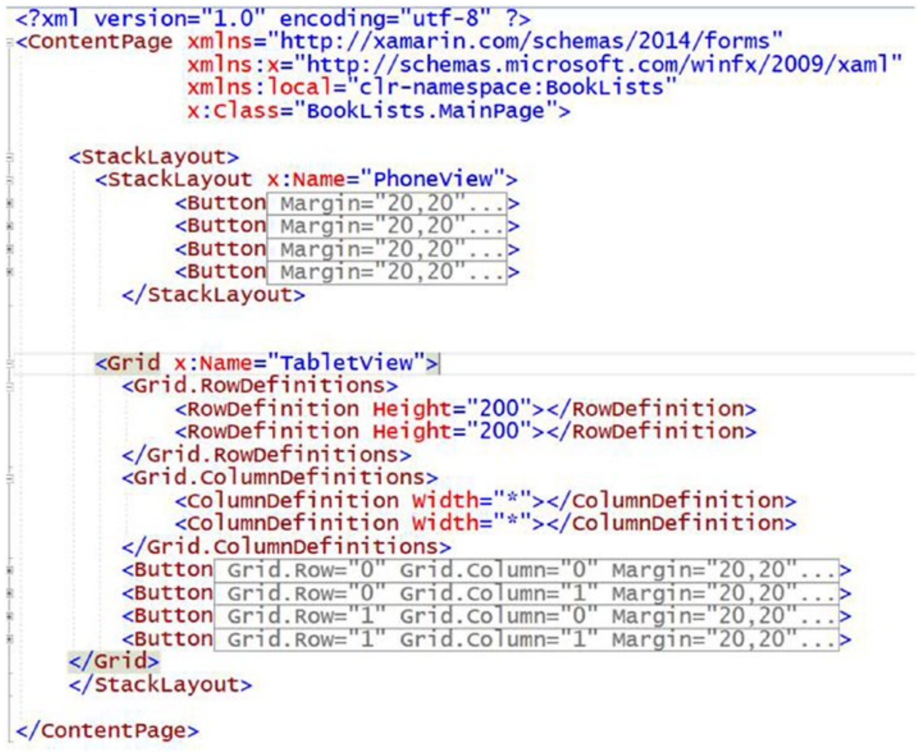


***Figure 2-45.** Both the `Grid` and `StackLayout` views are displayed when wrapped into a `StackLayout`*

5. Now let's make only the phone version view available on the phone and hide the tablet view, then make only the tablet view display on a tablet and hide the phone view. To do so, add a Name to the Tablet section called `TabletView` and the Phone section called `PhoneView` in the XAML, so we can refer to it in the code behind.

```
    <StackLayout>
        <StackLayout x:Name="PhoneView">
...
        <Grid x:Name="TabletView">
    </StackLayout>
```

6. After collapsing the buttons, it should look like Figure 2-46.



```
<?xml version="1.0" encoding="utf-8" ?>
<ContentPage xmlns="http://xamarin.com/schemas/2014/forms"
             xmlns:x="http://schemas.microsoft.com/winfx/2009/xaml"
             xmlns:local="clr-namespace:BookLists"
             x:Class="BookLists.MainPage">

    <StackLayout>
      <StackLayout x:Name="PhoneView">
            <Button Margin="20,20"...>
            <Button Margin="20,20"...>
            <Button Margin="20,20"...>
            <Button Margin="20,20"...>
        </StackLayout>


      <Grid x:Name="TabletView">
        <Grid.RowDefinitions>
            <RowDefinition Height="200"></RowDefinition>
            <RowDefinition Height="200"></RowDefinition>
        </Grid.RowDefinitions>
        <Grid.ColumnDefinitions>
            <ColumnDefinition Width="*"></ColumnDefinition>
            <ColumnDefinition Width="*"></ColumnDefinition>
        </Grid.ColumnDefinitions>
        <Button Grid.Row="0" Grid.Column="0" Margin="20,20"...>
        <Button Grid.Row="0" Grid.Column="1" Margin="20,20"...>
        <Button Grid.Row="1" Grid.Column="0" Margin="20,20"...>
        <Button Grid.Row="1" Grid.Column="1" Margin="20,20"...>
    </Grid>
    </StackLayout>

</ContentPage>
```

Figure 2-46. *`MainPage.xaml` should look like this*

7. Use `Device.Idiom` to detect if the device running this app is a phone in the code behind. In `MainPage.xaml.cs`, add this code in the constructor, right after `InitializeComponent()`. If it is a phone that is running the app, we are going to hide the tablet view and show the phone view and vice-versa.

```
if (Device.Idiom == TargetIdiom.Phone)
{
    TabletView.IsVisible = false;
    PhoneView.IsVisible = true;
}
```

```
else
{
    TabletView.IsVisible = true;
    PhoneView.IsVisible = false;
}
```

8. Build the .NET Standard project and run the app in the desired phone and tablet emulators or attached devices. For example, right-click the Android project and select as startup, then select the 5" KitKat. Run. See Figures 2-47 and 2-48.

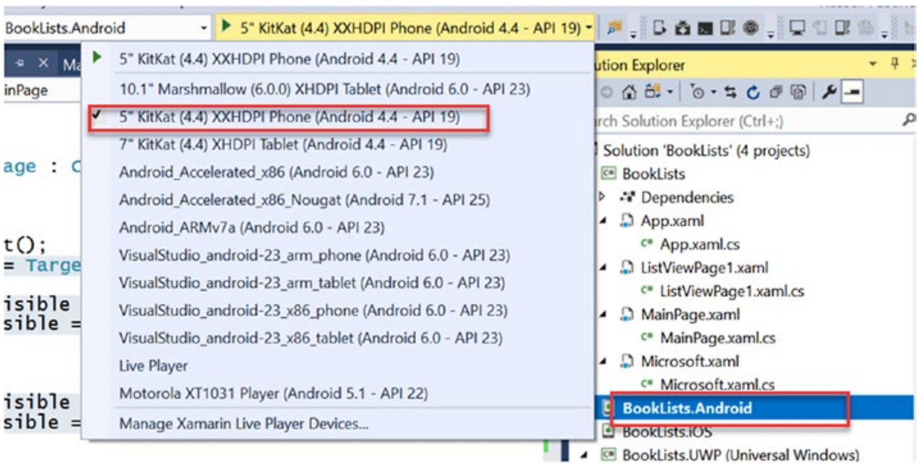

BookLists.Android
5" KitKat (4.4) XXHDPI Phone (Android 4.4 - API 19)
5" KitKat (4.4) XXHDPI Phone (Android 4.4 - API 19)
10.1" Marshmallow (6.0.0) XHDPI Tablet (Android 6.0 - API 23)
5" KitKat (4.4) XXHDPI Phone (Android 4.4 - API 19)
7" KitKat (4.4) XHDPI Tablet (Android 4.4 - API 19)
Android_Accelerated_x86 (Android 6.0 - API 23)
Android_Accelerated_x86_Nougat (Android 7.1 - API 25)
Android_ARMv7a (Android 6.0 - API 23)
VisualStudio_android-23_arm_phone (Android 6.0 - API 23)
VisualStudio_android-23_arm_tablet (Android 6.0 - API 23)
VisualStudio_android-23_x86_phone (Android 6.0 - API 23)
VisualStudio_android-23_x86_tablet (Android 6.0 - API 23)
Live Player
Motorola XT1031 Player (Android 5.1 - API 22)
Manage Xamarin Live Player Devices...
ution Explorer
rch Solution Explorer (Ctrl+;)
Solution 'BookLists' (4 projects)
BookLists
Dependencies
App.xaml
App.xaml.cs
ListViewPage1.xaml
ListViewPage1.xaml.cs
MainPage.xaml
MainPage.xaml.cs
Microsoft.xaml
Microsoft.xaml.cs
BookLists.Android
BookLists.iOS
BookLists.UWP (Universal Windows)

Figure 2-47. *Right-click Android project, set to startup, and then Select 5" KitKat from the drop-down menu*

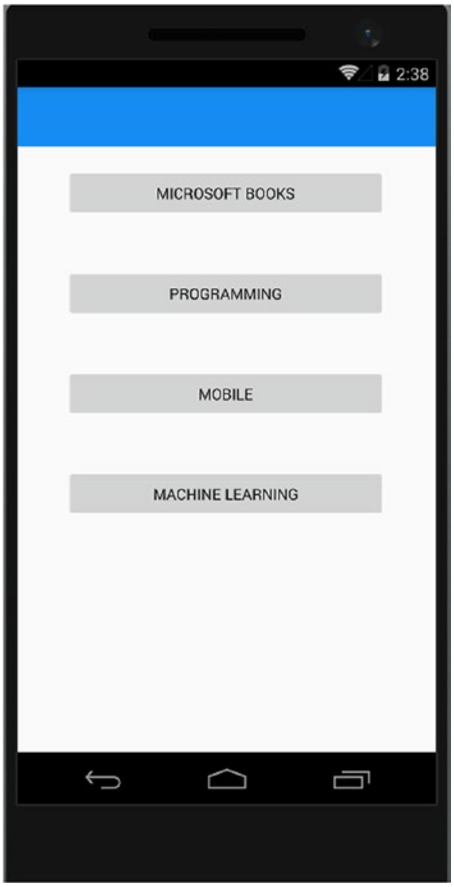


Figure 2-48. *The Android phone view shows a stack layout*

9. Then select UWP as the startup project and select Local Machine to run the tablet view on your laptop or desktop. See Figure 2-49.

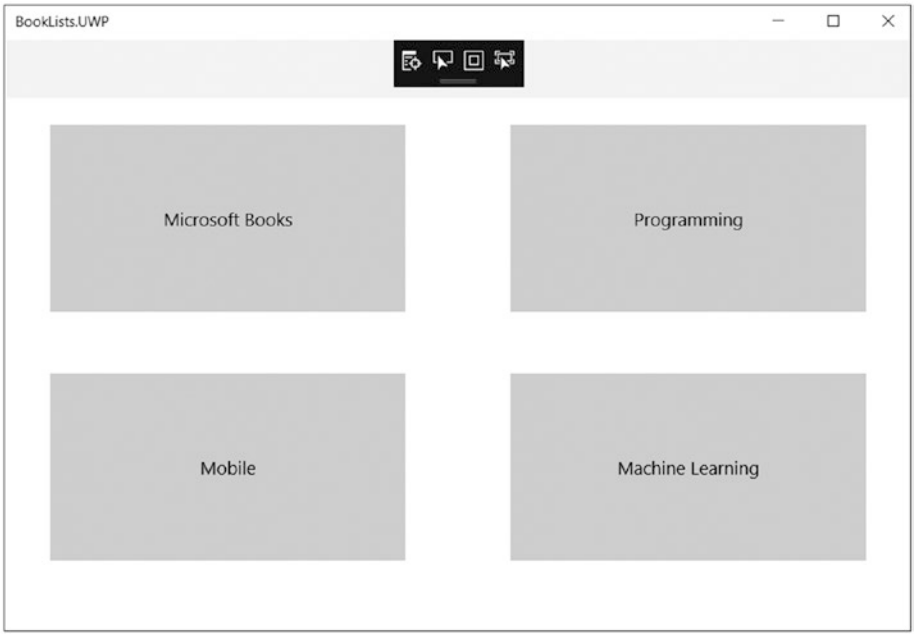
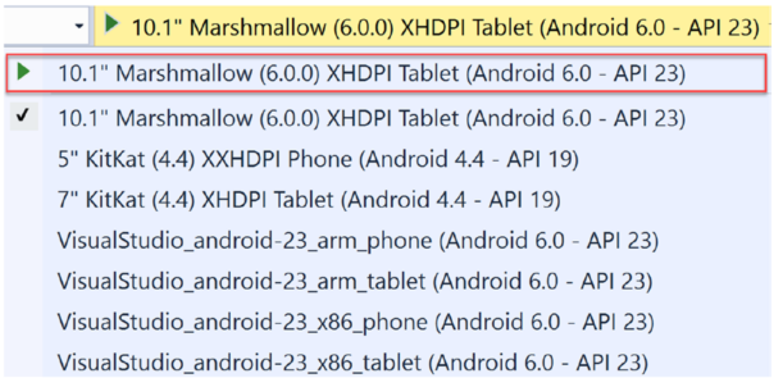


Figure 2-49. *Tablet view shows a grid layout*

10. Right-click Android project and set as startup. Select the 10.1" Marshmallow Tablet in Android from the emulator drop-down. See Figure 2-50.



10.1" Marshmallow (6.0.0) XHDPI Tablet (Android 6.0 - API 23)
10.1" Marshmallow (6.0.0) XHDPI Tablet (Android 6.0 - API 23)
✓ 10.1" Marshmallow (6.0.0) XHDPI Tablet (Android 6.0 - API 23)
5" KitKat (4.4) XXHDPI Phone (Android 4.4 - API 19)
7" KitKat (4.4) XHDPI Tablet (Android 4.4 - API 19)
VisualStudio_android-23_arm_phone (Android 6.0 - API 23)
VisualStudio_android-23_arm_tablet (Android 6.0 - API 23)
VisualStudio_android-23_x86_phone (Android 6.0 - API 23)
VisualStudio_android-23_x86_tablet (Android 6.0 - API 23)

Figure 2-50. *Selecting the 10.1" Marshmallow tablet*

Note Some emulators for older tablet models may not report back the expected device idiom, as in the case of older actual devices, such as the 7" KitKat tablet. For testing Android device tablet idioms, use the 10.1" Marshmallow tablet in Android. If you do not see this listed in the Android emulators drop-down, you may have to download it in the Visual Studio Emulator for Android app. See Figures 2-51 and 2-52.

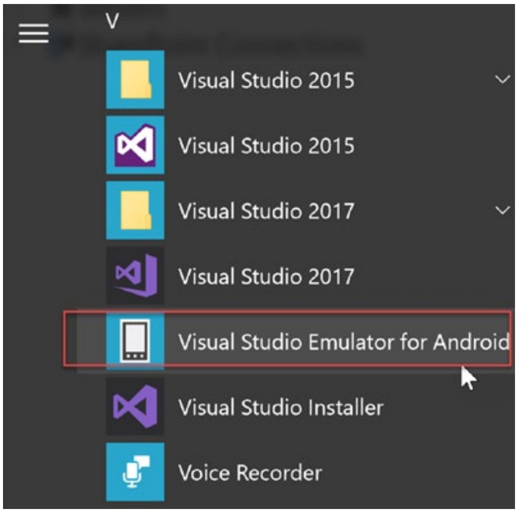


Figure 2-51. *Start the Visual Studio Emulator for Android app, if needed, to download and install a 10.1" Marshmallow emulator*

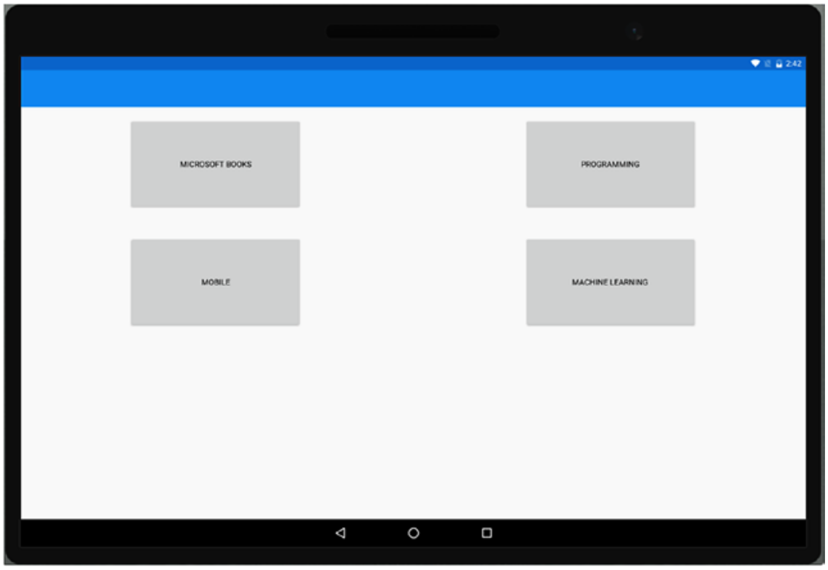


Figure 2-52. *Android tablet shows* `Grid` *view*

Project 2-4: Working with Images

Time Estimate

15 Minutes

1. In this project, you will learn how to access images locally, as embedded resources and Uniform Resource Identifiers (URIs). Also, you will use gesture recognizers to provide click event handlers. You could set the Button Image property to the image file name, but this really behaves differently across the platforms and causes many headaches. Plus, you cannot easily use aspect ratios on a button image. It is simpler to replace the buttons with image views. One problem, however, is that the image does not have a click event. So, we can use a gesture handler for this on the image, which will provide us a tapped event handler.

2. Let's replace the button text with images. But how? Images can be read locally from file or as embedded resources or can be downloaded from a URI.

3. To access local images from files, each file can be added to each application project and referenced from Xamarin Forms' shared .NET Standard code. To use a single image across all apps, the same file name must be used on every platform, and it should be a valid Android resource name (i.e., only lowercase letters, numerals, underscores, and periods are allowed. Also, the image cannot begin with a number).

4. For iOS, place images in the `Resources` folder with `Build Action: BundleResource`. Retina versions of the image should also be supplied—at two and three times the resolution, with @2x or @3x suffixes on the file name, before the file extension (e.g., `myimage@2x.png` and `myimage@3x.png`).

5. For Android, place images in the `Resources/drawable` directory with `Build Action: AndroidResource`. High- and low-DPI versions of an image can also be supplied (in appropriately named resources subdirectories, such as `drawable-ldpi`, `drawable-hdpi`, and `drawable-xhdpi`).

6. For Windows/UWP, place images in the application's root directory with `Build Action: Content`.

7. We are going to use embedded resources in our example. Create a new folder in the .NET Standard project called Images by right-clicking the project and selecting Add ➤ New Folder. See Figure 2-53.

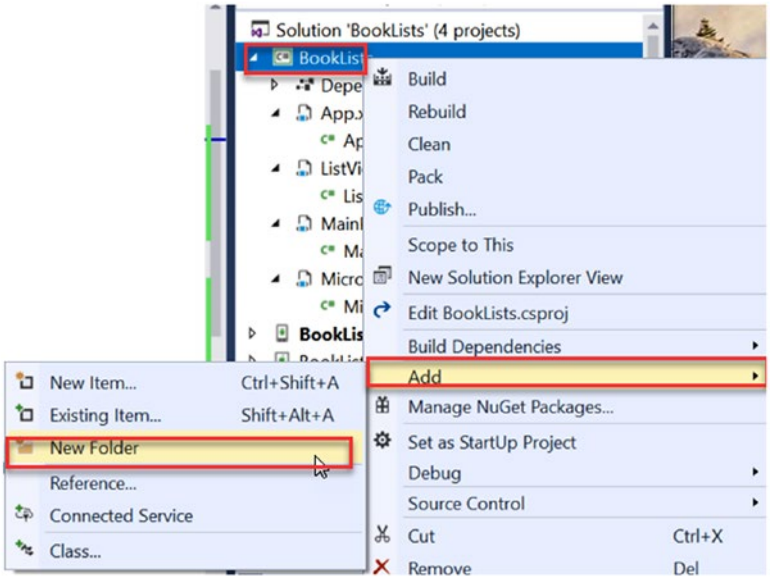


Figure 2-53. *Add New Folder and call it Images*

8. Add all four existing images to the `Images` folder in the Shared .NET Standard project from the book's `/Assets` folder or any set of four images that are of the dimensions 800 wide × 450 high. Right-click the `Images` folder and select Add ➤ Existing Item. See Figure 2-54.

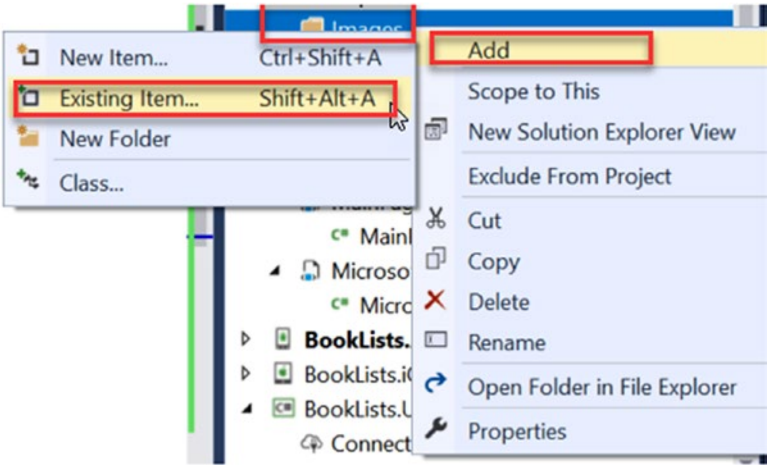
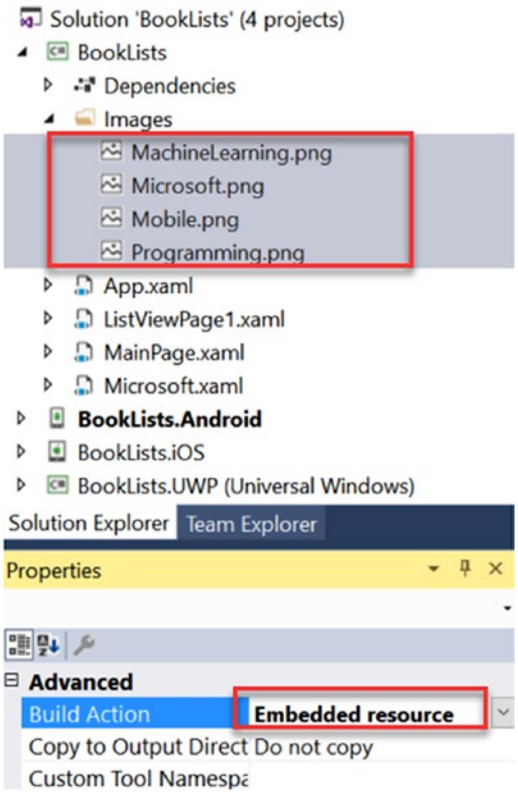


Figure 2-54. *Adding existing images to the project `Images` folder from book `/Assets` folder*

9. Select all four images in the .NET Standard `Images` folder and set the Build Action to Embedded resource. See Figure 2-55.



Solution 'BookLists' (4 projects)
BookLists
Dependencies
Images
MachineLearning.png
Microsoft.png
Mobile.png
Programming.png
App.xaml
ListViewPage1.xaml
MainPage.xaml
Microsoft.xaml
BookLists.Android
BookLists.iOS
BookLists.UWP (Universal Windows)

Advanced
Build Action Embedded resource
Copy to Output Direct Do not copy
Custom Tool Namespa

Figure 2-55. *Setting all four images to the Embedded resource Build Action*

10. Add a class to the .NET Standard project and call it `ImageResourceExtension`. See Figure 2-56.

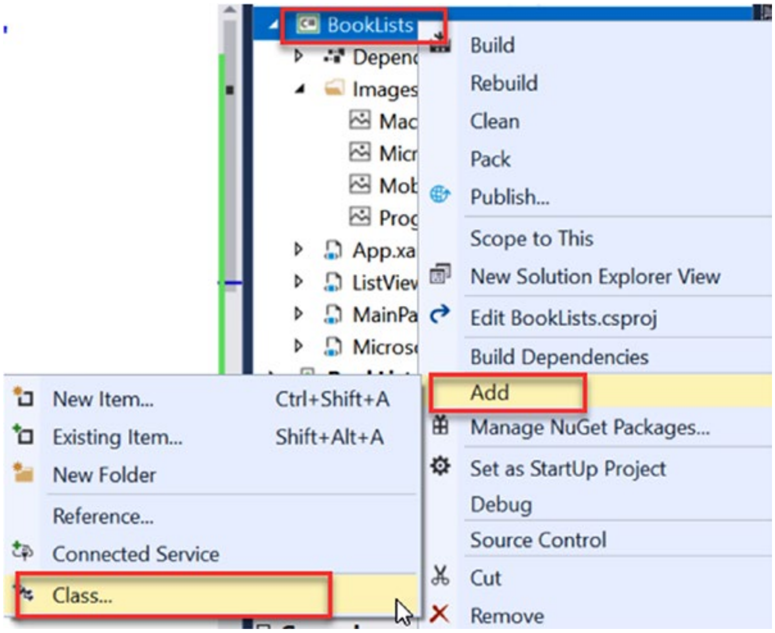


Figure 2-56. *Adding a new class to the project called* `ImageResourceExtension.cs`

11. We must add a method to do a translation lookup for the XAML markup, by inheriting `IMarkupExtension`. Change the class to public and add the following code and using statements:

```
using System;
using Xamarin.Forms;
using Xamarin.Forms.Internals;
using Xamarin.Forms.Xaml;
using System.Reflection;

namespace BookLists
{
    // You exclude the 'Extension' suffix when using in
    // XAML markup
```

```
        [Preserve(AllMembers = true)]
        [ContentProperty("Source")]
        public class ImageResourceExtension :
        IMarkupExtension
        {
            public string Source { get; set; }

            public object ProvideValue(IServiceProvider
            serviceProvider)
            {
                if (Source == null)
                    return null;

                // Do your translation lookup here, using
                // whatever method you require
                var imageSource = ImageSource.
                FromResource(Source, Assembly.
                GetExecutingAssembly());

                return imageSource;
            }
        }

    }
```

12. Here is the new grid markup for the tablet version, using images, gesture recognizers, and labels. Verify your XAML and copy it, if necessary, to match for `TabletView`:

```
            <Grid x:Name="TabletView"
            VerticalOptions="FillAndExpand" Horizontal
            Options="FillAndExpand">
                <Grid.RowDefinitions>
```

```
        <RowDefinition Height="40">
        </RowDefinition>
        <RowDefinition Height="*">
        </RowDefinition>
        <RowDefinition Height="Auto">
        </RowDefinition>
        <RowDefinition Height="*">
        </RowDefinition>
        <RowDefinition Height="Auto">
        </RowDefinition>
    </Grid.RowDefinitions>
    <Grid.ColumnDefinitions>
        <ColumnDefinition Width="*">
        </ColumnDefinition>
        <ColumnDefinition Width="*">
        </ColumnDefinition>
    </Grid.ColumnDefinitions>

    <Label Grid.Row="0" Grid.Column="0" Grid.
    ColumnSpan="2" VerticalOptions="Center"
    HorizontalOptions="Center"
    FontSize="Medium" FontAttributes="Bold"
    Text="Book List"></Label>
    <Image Grid.Row="1" Grid.
    Column="0" Aspect="AspectFill"
    Source="{local:ImageResource BookLists.
    Images.Microsoft.png}" >
        <Image.GestureRecognizers>
            <TapGestureRecognizer
           NumberOfTapsRequired="1"
           Tapped="MicrosoftBooks_Clicked"/>
        </Image.GestureRecognizers>
    </Image>
```

```
<Label Grid.Row="2" Grid.Column="0"
VerticalOptions="Center" FontSize="Small"
HorizontalTextAlignment="Center"
TextColor="Blue" Text="Microsoft"></Label>

<Image Grid.Row="3" Grid.Column="0"
Aspect="AspectFill"   Source="{local:
ImageResource BookLists.Images.Programming.
png}" >
    <Image.GestureRecognizers>
        <TapGestureRecognizer
       NumberOfTapsRequired="1"
       Tapped="Programming_Clicked"/>
    </Image.GestureRecognizers>
</Image>
<Label Grid.Row="4" Grid.Column="0"
VerticalOptions="Center" FontSize="Small"
HorizontalTextAlignment="Center"
TextColor="Blue"  Text="Programming">
</Label>
<Image  Grid.Row="1" Grid.Column="1"
Aspect="AspectFill"  Source="{local:Image
Resource BookLists.Images.Mobile.png}" >
    <Image.GestureRecognizers>
        <TapGestureRecognizer
       NumberOfTapsRequired="1"
       Tapped="Mobile_Clicked"/>
    </Image.GestureRecognizers>
</Image>
```

```
                    <Label Grid.Row="2" Grid.Column="1"
                    VerticalOptions="Center" FontSize="Small"
                    HorizontalTextAlignment="Center"
                    TextColor="Blue"  Text="Mobile"></Label>
                    <Image Grid.Row="3" Grid.
                    Column="1" Aspect="AspectFill"
                    Source="{local:ImageResource BookLists.
                    Images.MachineLearning.png}" >
                        <Image.GestureRecognizers>
                            <TapGestureRecognizer
                           NumberOfTapsRequired="1"
                           Tapped="MachineLearning_Clicked"/>
                        </Image.GestureRecognizers>
                    </Image>
                    <Label Grid.Row="4" Grid.
                    Column="1" VerticalOptions="Center"
                    FontSize="Small"  HorizontalTextAlignment
                    ="Center" TextColor="Blue" Text="Machine
                    Learning"></Label>

                </Grid>
```

13. Run the app and click the Microsoft image on the home screen. You will see the mocked-up data `ListView` page. See Figure 2-57.

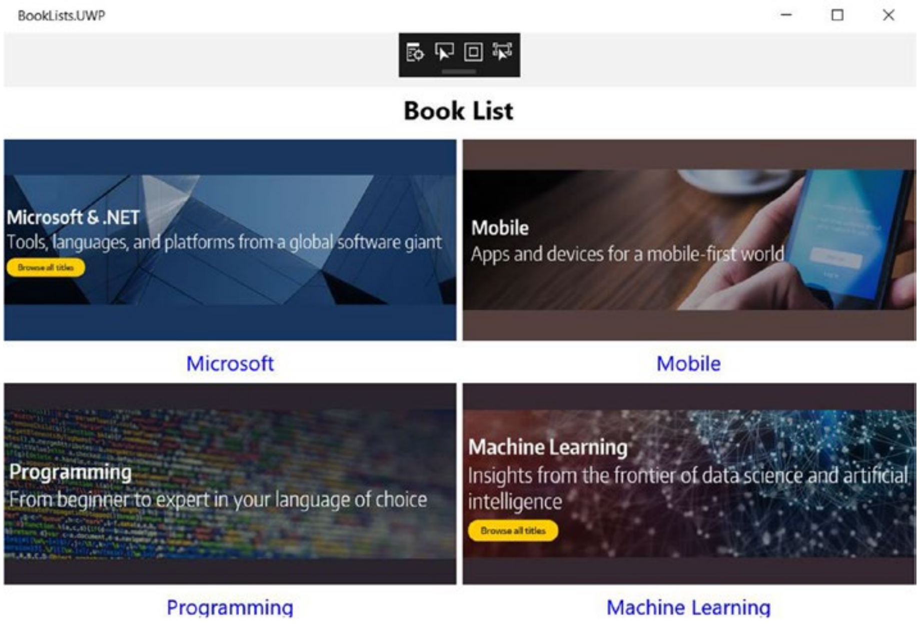

BookLists.UWP
Book List
Microsoft & .NET
Tools, languages, and platforms from a global software giant
Mobile
Apps and devices for a mobile-first world
Microsoft
Mobile
Programming
From beginner to expert in your language of choice
Machine Learning
Insights from the frontier of data science and artificial intelligence
Programming
Machine Learning

Figure 2-57. *Embedded images now show on `MainPage` and are clickable*

Project 2-5: Working with ListView

Time Estimate

10 Minutes

In this project, you will use the `ListViewPage` template with `TextCell` and `ViewCell` and the Caching strategy for recycling elements. You will use the `ListView` item, header, and footer templates.

1. Add a folder called `ViewModels` to the Booklists project. See Figure 2-58.

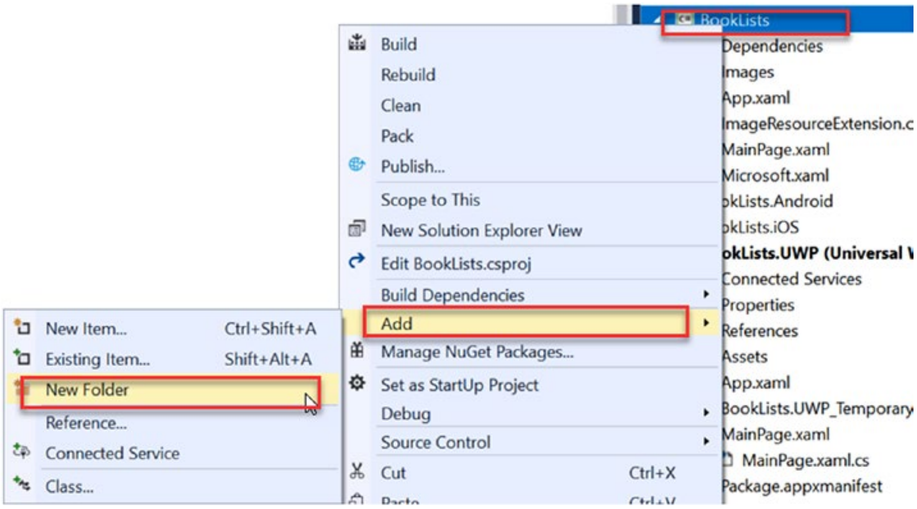


Figure 2-58. *Adding new folder called* `ViewModels`

2. Add exiting item from the /Assets folder for the book called **BookViewModel.cs**. This code contains a public class called `Item`, which has values for `Item`, `Detail`, and `URL`. It also has `ObservableCollection`, which has populated a few sample data records for Books. See Figure 2-59.

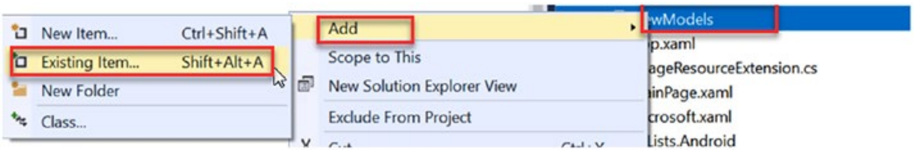


Figure 2-59. *Add existing item* `BookViewModel.cs` *to* `ViewModels` *folder*

Here is the code in **BookViewModel.cs** that uses MVVM and Databinding. The MVVM pattern enforces a separation between three software layers. The underlying data is called the Model. The XAML user interface is called the View, and an intermediary that sits between the View and the Model is called the ViewModel. The View and the ViewModel are often connected through data bindings that are defined in the XAML file. `BindingContext` for View is usually an instance of `ViewModel`. Note the use of the `INotifyPropertyChanged` interface. The class doesn't invoke the `PropertyChanged` event unless the property has actually changed.

```
using System;
using System.Collections.Generic;
using System.Collections.ObjectModel;
using System.ComponentModel;
using System.Runtime.CompilerServices;
using System.Text;
using System.Threading.Tasks;
using System.Windows.Input;
using Xamarin.Forms;
using System.Linq;

namespace BookLists.ViewModels
{
    public class MicrosoftBooksViewModel :
    INotifyPropertyChanged
    {
        public ObservableCollection<Item> Items { get; }

        public ObservableCollection<Grouping<string,
        Item>> ItemsGrouped { get; }

        public MicrosoftBooksViewModel()
        {
            Items = new ObservableCollection<Item>(new[]
            {
                new Item { Text = "Beginning Entity
                Framework Core 2.0",
                    URL ="https://www.apress.com/us/
                    book/9781484233740",
                    Detail = "Use the valuable Entity
                    Framework Core 2.0 tool in ASP.
                    NET and the .NET Framework to
                    eliminate the tedium around
                    accessing databases and the data
                    they contain. Entity Framework
                    Core 2.0 greatly simplifies access
                    to relational databases such as
                    SQL Server that are commonly
                    deployed in corporate settings.
                    By eliminating tedious data
                    access code that developers are
                    otherwise forced to use, Entity
                    Framework Core 2.0 enables you to
                    work directly with the data in a
                    database through domain-specific
                    objects and methods." },

                new Item { Text = "Beginning Windows
                Mixed Reality Programming, For HoloLens
                and Mixed Reality Headsets",
                    URL ="https://www.apress.com/us/
                    book/9781484227688",
                    Detail = "Develop applications
                    and experiences for Microsoft’s
                    HoloLens and other Windows mixed
                    reality devices. This easy-to-
                    follow guide removes the mystery
                    behind creating amazing augmented
                    reality experiences. Mixed reality
                    development tools and resources
                    are provided. Beginning Windows
                    Mixed Reality Programming clearly
                    explains all the nuances of mixed
                    reality software development.
                    You'll learn how to create 3D
                    objects and holograms, interact
                    with holograms using voice commands
                    and hand gestures, use spatial
                    mapping and 3D spatial sound,
                    build with Microsoft's HoloToolkit,
                    create intuitive user interfaces,
                    and make truly awe-inspiring mixed
                    reality experiences. Start building
                    the holographic future today!" },
                new Item { Text = "Business in Real-
                Time, Using Azure IoT and Cortana
                Intelligence Suite Driving Your Digital
                Transformation",
                    URL ="https://www.apress.com/us/
                    book/9781484226490",
                    Detail = "Learn how today’s
                    businesses can transform themselves
                    by leveraging real-time data
                    and advanced machine learning
                    analytics. This book provides
                    prescriptive guidance for architects
                    and developers on the design and
                    development of modern Internet of
                    Things(IoT) and Advanced Analytics
                    solutions.In addition, Business
                    in Real - Time Using Azure IoT and
                    Cortana Intelligence Suite offers
                    patterns and practices for those
                    looking to engage their customers
                    and partners through Software
                    -as- a - Service solutions that
                    work on any device. Whether you're
                    working in Health & Life Sciences,
                    Manufacturing, Retail, Smart
                    Cities and Buildings or Process
                    Control, there exists a common
                    platform from which you can create
                    your targeted vertical solutions.
                    Business in Real-Time Using Azure
                    IoT and Cortana Intelligence Suite
                    uses a reference architecture as
                    a road map. Building on Azure’s
                    PaaS services, you'll see how a
                    solution architecture unfolds that
                    demonstrates a complete end - to -
                    end IoT and Advanced Analytics
                    scenario." },
                new Item { Text = "Cyber Security on
                Azure, An IT Professional’s Guide to
                Microsoft Azure Security Center",
                    URL ="https://www.apress.com/us/
                    book/9781484227398",
                    Detail = "Prevent destructive
                    attacks to your Azure public
                    cloud infrastructure, remove
                    vulnerabilities, and instantly
                    report cloud security readiness.
                    This book provides comprehensive
                    guidance from a security insider's
                    perspective. Cyber Security on
                    Azure explains how this 'security
                    as a service' (SECaaS) business
                    solution can help you better manage
                    security risk and enable data
                    security control using encryption
                    options such as Advanced Encryption
                    Standard(AES) cryptography.Discover
                    best practices to support network
                    security groups, web application
                    firewalls, and database auditing
                    for threat protection. Configure
                    custom security notifications of
                    potential cyberattack vectors
                    to prevent unauthorized access
                    by hackers, hacktivists, and
                    industrial spies." },
                new Item { Text = "Essential Angular
                for ASP.NET Core MVC",
                    URL ="https://www.apress.com/us/
                    book/9781484229156",
                    Detail = "Angular 5 and .NET Core
                    2 updates for this book are now
                    available. Follow the Download
                    Source Code link for this book
                    on the Apress website. Discover
                    Angular, the leading client-side
                    web framework, from the point
                    of view of an ASP.NET Core MVC
                    developer. Best-selling author
                    Adam Freeman brings these two key
                    technologies together and explains
                    how to use ASP.NET Core MVC to
                    provide back-end services for
                    Angular applications. This fast -
                    paced, practical guide starts from
                    the nuts and bolt and gives you
                    the knowledge you need to combine
                    Angular(from version 2.0 up) and
                    ASP.NET Core MVC in your projects.
                    " },

             });

            var sorted = from item in Items
                         orderby item.Text
                         group item by item.Text[0].
                         ToString() into itemGroup
                         select new Grouping<string,
                         Item>(itemGroup.Key,
                         itemGroup);
```

```
    ItemsGrouped = new ObservableCollection
    <Grouping<string, Item>>(sorted);

    RefreshDataCommand = new Command(
        async () => await RefreshData());
}

public ICommand RefreshDataCommand { get; }

async Task RefreshData()
{
    IsBusy = true;
    //Load Data Here
    await Task.Delay(2000);

    IsBusy = false;
}

bool busy;
public bool IsBusy
{
    get { return busy; }
    set
    {
        busy = value;
        OnPropertyChanged();
        ((Command)RefreshDataCommand).
        ChangeCanExecute();
    }
}
```

```
            public event PropertyChangedEventHandler
            PropertyChanged;
            void OnPropertyChanged([CallerMemberName]string
            propertyName = "") =>
                PropertyChanged?.Invoke(this, new Property
                ChangedEventArgs(propertyName));

            public class Item
            {
                public string Text { get; set; }
                public string Detail { get; set; }
                public string URL { get; set; }
                public override string ToString() => URL;
            }

            public class Grouping<K, T> :
            ObservableCollection<T>
            {
                public K Key { get; private set; }

                public Grouping(K key, IEnumerable<T> items)
                {
                    Key = key;
                    foreach (var item in items)
                        this.Items.Add(item);
                }
            }
        }
    }
```

3. Open the code behind page `Microsoft.xaml.cs`.
4. Add this line under `InitializeComponent()`:

```
BindingContext = new MicrosoftBooksViewModel();
```

5. You will also need to add this using statement:

   ```
   using BookLists.ViewModels;
   ```

6. Comment out the following lines:

   ```
         //        Items = new ObservableCollection<string>
         //        {
         //            "Item 1",
         //            "Item 2",
         //            "Item 3",
         //            "Item 4",
         //            "Item 5"
         //        };

         //MyListView.ItemsSource = Items;
   ```

7. Comment out the Handle_ItemTapped event code and add the **Handle_ItemSelected** event handler with this code:

   ```
        void Handle_ItemSelected(object sender,
        SelectedItemChangedEventArgs e)
           {
               if (e.SelectedItem == null)
                   return;

              // await DisplayAlert("Selected",
              // e.SelectedItem.ToString(), "OK");
               //    navigate to the URL with the native
               // browser

               Device.OpenUri(new Uri(e.SelectedItem.
               ToString()));
   ```

```
                //Deselect Item
            ((ListView)sender).SelectedItem = null;
            }
        }
```

8. Your `Microsoft.xaml.cs` file should now look like this:

```
using BookLists.ViewModels;
using System;
using Xamarin.Forms;
using Xamarin.Forms.Xaml;

namespace BookLists
{
    [XamlCompilation(XamlCompilationOptions.Compile)]
    public partial class Microsoft : ContentPage
    {
        public Microsoft()
        {
            InitializeComponent();
            BindingContext = new
            MicrosoftBooksViewModel();
               //         Items = new
               // ObservableCollection<string>
               //         {
               //             "Item 1",
               //             "Item 2",
               //             "Item 3",
               //             "Item 4",
               //             "Item 5"
               //         };

               //MyListView.ItemsSource = Items;
        }
```

```
         void Handle_ItemSelected(object sender,
         SelectedItemChangedEventArgs e)
            {
                if (e.SelectedItem == null)
                    return;
               // await DisplayAlert("Selected",
               // e.SelectedItem.ToString(), "OK");
               // navigate to the URL with the native browser
                Device.OpenUri(new Uri(e.SelectedItem.
                ToString()));
            }
        }
    }
```

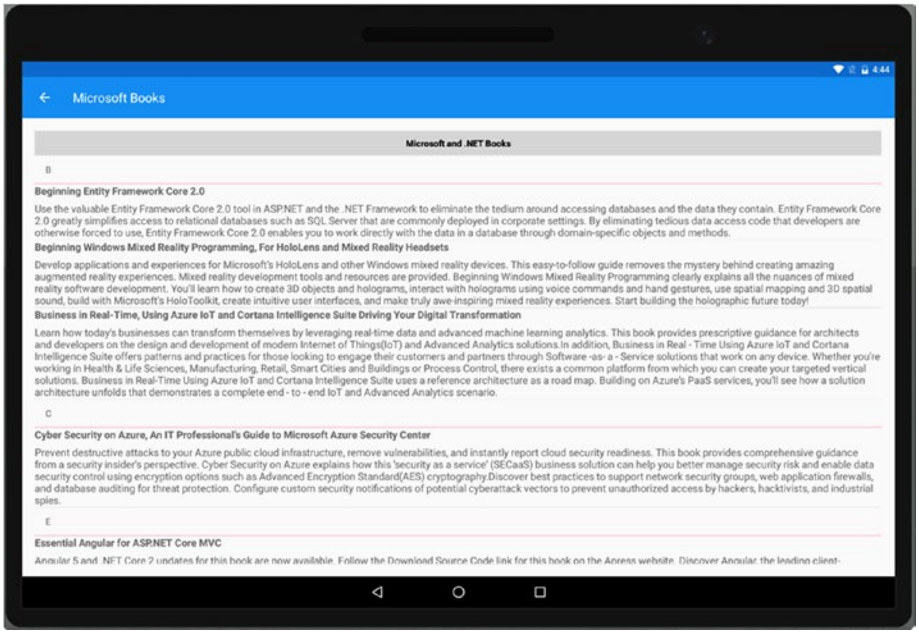
9. Open `Microsoft.xaml` and replace the `ListView` with the following XAML (note that it uses a custom `ViewCell` with a Header, `ItemTemplate`, and `Footer`).

```
<ListView x:Name="BookListView"
ItemsSource="{Binding ItemsGrouped}"
        ItemSelected="Handle_ItemSelected"
        HasUnevenRows="true"
        GroupShortNameBinding="{Binding Key}"
        IsGroupingEnabled="true"
        GroupDisplayBinding="{Binding Key}"
        IsPullToRefreshEnabled="true"
        CachingStrategy="RecycleElement"
        IsRefreshing="{Binding IsBusy, Mode=OneWay}"
        RefreshCommand="{Binding RefreshDataCommand}"
        >
        <!--Built in Cells-->
<!--<ListView.ItemTemplate>
    <DataTemplate>
        <TextCell Text="{Binding .}" />
    </DataTemplate>
</ListView.ItemTemplate>-->

<!--Custom View Cells-->
    <ListView.Header>
        <StackLayout Padding="10"
               Orientation="Horizontal"
               HorizontalOptions="FillAndExpand"
               BackgroundColor="#dadada">
            <Label Text="Microsoft and .NET Books"
           HorizontalTextAlignment="Center"
           HorizontalOptions="FillAndExpand"
           TextColor="Black"
           FontAttributes="Bold"/>
        </StackLayout>
    </ListView.Header>
    <ListView.ItemTemplate>
  <DataTemplate>
    <ViewCell>
      <StackLayout>
        <Label Text="{Binding Text}"
               Style="{DynamicResource
               ListItemTextStyle}"
               FontAttributes="Bold"/>
```

```
                <Label Text="{Binding Detail}"
                       Style="{DynamicResource
                       ListItemDetailTextStyle}"/>
              </StackLayout>
            </ViewCell>
          </DataTemplate>
        </ListView.ItemTemplate>
            <ListView.Footer>
                <StackLayout Padding="10"
                       Orientation="Horizontal"
                       HorizontalOptions="FillAndExpand"
                       BackgroundColor="#dadada">
                    <Label Text="Visit www.apress.com"
                   HorizontalTextAlignment="Center"
                   HorizontalOptions="FillAndExpand"
                   TextColor="Black"
                   FontAttributes="Bold"/>
                </StackLayout>
            </ListView.Footer>
        </ListView>
```

10. Run the app and click the Microsoft image on the home screen. You will see something like Figures 2-60 and 2-61.



Microsoft and .NET Books

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Use the valuable Entity Framework Core 2.0 tool in ASP.NET and the .NET Framework to eliminate the tedium around accessing databases and the data they contain. Entity Framework Core 2.0 greatly simplifies access to relational databases such as SQL Server that are commonly deployed in corporate settings. By eliminating tedious data access code that developers are otherwise forced to use, Entity Framework Core 2.0 enables you to work directly with the data in a database through domain-specific objects and methods.

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Develop applications and experiences for Microsoft's HoloLens and other Windows mixed reality devices. This easy-to-follow guide removes the mystery behind creating amazing augmented reality experiences. Mixed reality development tools and resources are provided. Beginning Windows Mixed Reality Programming clearly explains all the nuances of mixed reality software development. You'll learn how to create 3D objects and holograms, interact with holograms using voice commands and hand gestures, use spatial mapping and 3D spatial sound, build with Microsoft's HoloToolkit, create intuitive user interfaces, and make truly awe-inspiring mixed reality experiences. Start building the holographic future today!

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C

Cyber Security on Azure, An IT Professional's Guide to Microsoft Azure Security Center

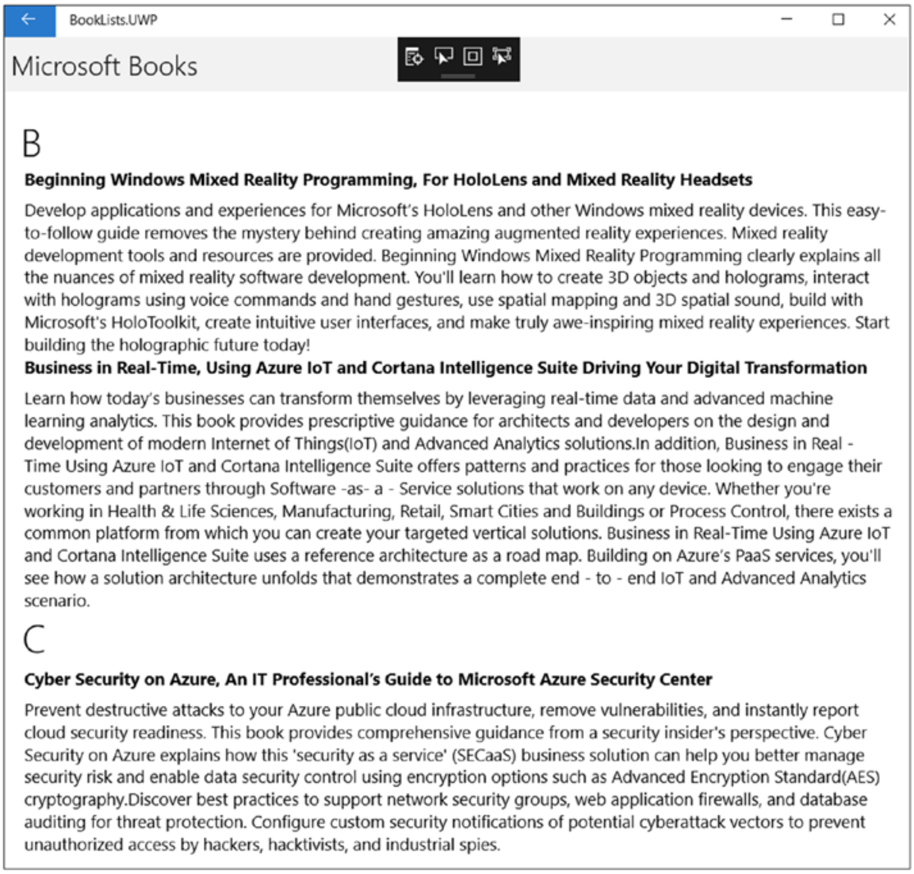
Prevent destructive attacks to your Azure public cloud infrastructure, remove vulnerabilities, and instantly report cloud security readiness. This book provides comprehensive guidance from a security insider's perspective. Cyber Security on Azure explains how this 'security as a service' (SECaaS) business solution can help you better manage security risk and enable data security control using encryption options such as Advanced Encryption Standard(AES) cryptography.Discover best practices to support network security groups, web application firewalls, and database auditing for threat protection. Configure custom security notifications of potential cyberattack vectors to prevent unauthorized access by hackers, hacktivists, and industrial spies.

E

Essential Angular for ASP.NET Core MVC

Angular 5 and .NET Core 2 updates for this book are now available. Follow the Download Source Code link for this book on the Apress website. Discover Angular, the leading client-

Figure 2-60. *`ListView` on Android tablet with header, groupings, and footer*



Microsoft Books

B

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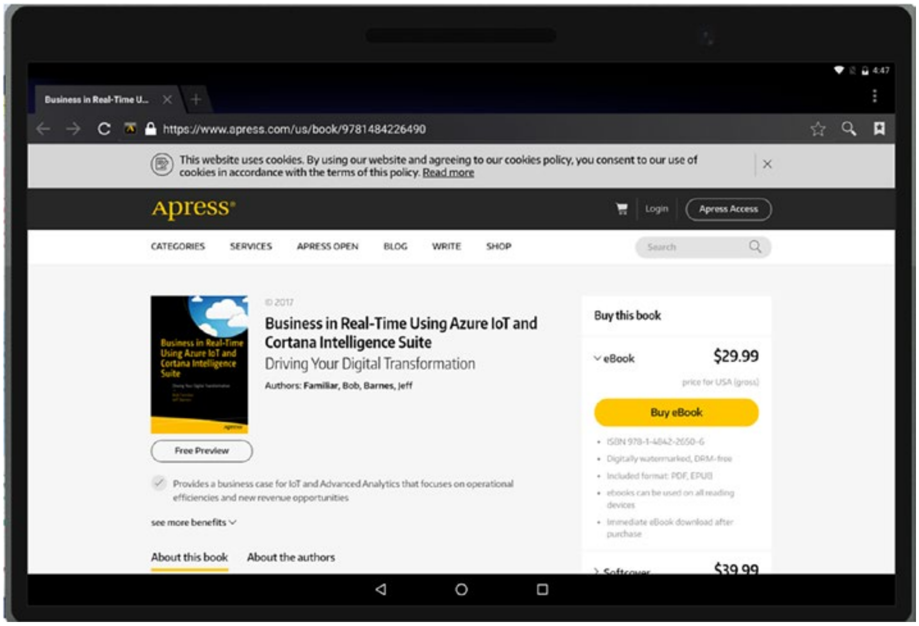
Figure 2-61. *`ListView` on UWP with header, groupings, and footer*

11. **Try:** Click an item in the list, and it will open an external browser to the desired URL. See Figure 2-62.



Business in Real-Time U...

https://www.apress.com/us/book/9781484226490

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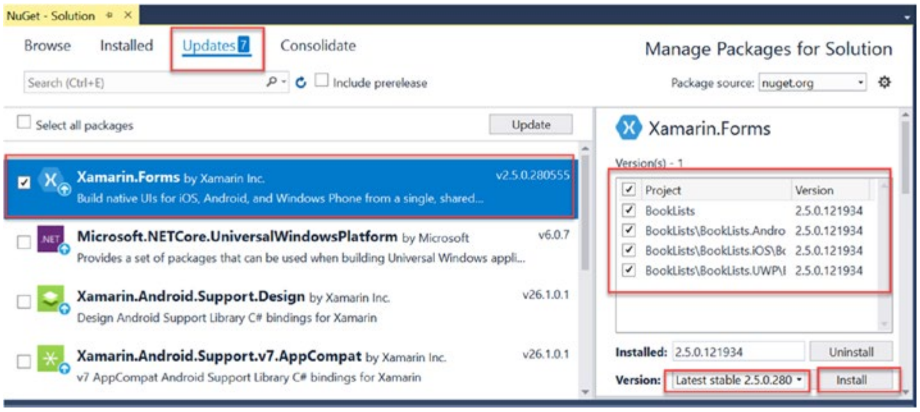
Figure 2-62. *URL displayed in native browser on device*

12. **Catch:** The UWP `ListView` may have an error only on clicking and getting the correct selected item in the list when using the `ListView` group optionally. (Android and iOS should work.) This has been fixed with version 2.5.0.280555 of Xamarin Forms. Right-click the solution and select Manage NuGet Packages to verify that you have a minimum version of 2.5.0.280555. If not, check the updates panel to install. See Figure 2-63.


NuGet - Solution

Browse Installed Updates 7 Consolidate

Manage Packages for Solution

Search (Ctrl+E) Include prerelease

Package source: nuget.org

Select all packages Update

Xamarin.Forms by Xamarin Inc. v2.5.0.280555
Build native UIs for iOS, Android, and Windows Phone from a single, shared...

Microsoft.NETCore.UniversalWindowsPlatform by Microsoft v6.0.7
Provides a set of packages that can be used when building Universal Windows appli...

Xamarin.Android.Support.Design by Xamarin Inc. v26.1.0.1
Design Android Support Library C# bindings for Xamarin

Xamarin.Android.Support.v7.AppCompat by Xamarin Inc. v26.1.0.1
v7 AppCompat Android Support Library C# bindings for Xamarin

Xamarin.Forms

Version(s) - 1

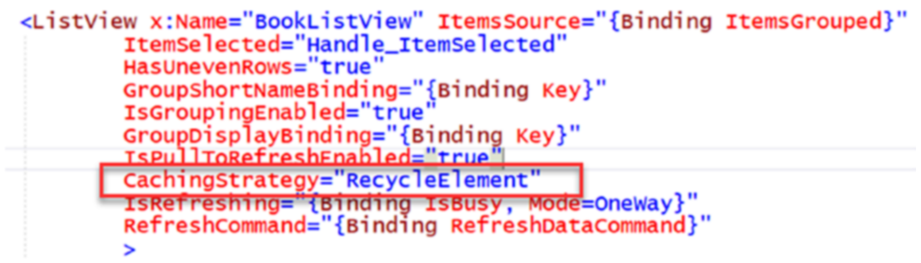
Project	Version
✓ BookLists	2.5.0.121934
✓ BookLists\BookLists.Andro	2.5.0.121934
✓ BookLists\BookLists.iOS\Bc	2.5.0.121934
✓ BookLists\BookLists.UWP\I	2.5.0.121934

Installed: 2.5.0.121934 Uninstall

Version: Latest stable 2.5.0.280 Install

Figure 2-63. *Verifying that the installed Xamarin Forms NuGet package is a minimum version of 2.5.0.280555. If not, select the Updates tab and intall it.*

13. One important property on the ListView, especially for Android apps, is **CachingStrategy**. Note that the `ListView` template page has it set to `"RecycleElement"`. This is not the default on `ListView` for backward compatibility and must be specified to take effect. This option provides significant performance improvements, particularly in Android. `RetainElement` is the default, and it's not optimal, especially when dealing with large lists. However, the UWP platform ignores `ListViewCachingStrategy.RetainElement`, because it always uses caching to improve performance. See Figure 2-64.



```
<ListView x:Name="BookListView" ItemsSource="{Binding ItemsGrouped}"
        ItemSelected="Handle_ItemSelected"
        HasUnevenRows="true"
        GroupShortNameBinding="{Binding Key}"
        IsGroupingEnabled="true"
        GroupDisplayBinding="{Binding Key}"
        IsPullToRefreshEnabled="true"
        CachingStrategy="RecycleElement"
        IsRefreshing="{Binding IsBusy, Mode=OneWay}"
        RefreshCommand="{Binding RefreshDataCommand}"
        >
```

Figure 2-64. *Specify `CachingStrategy="RecycleElement"`, as it is not a default*

Summary

In this chapter, you created a new Xamarin Forms application. The application can run on Android, UWP, and, optionally, iOS, if connected with a Mac server. As this is a cross platform app, you can use any mix of the platform projects, depending on your development environment (Mac or Windows). You enhanced the app with `StackLayout` and `GridLayout` to have a main navigation page and used device form factors for phones and tablets, with device specific logic. The main page uses embedded resource images. A `ListView` page template was added with a customization for selection event handlers and content. Next up? You get to learn Azure. Let the games begin!

CHAPTER 3

Introduction to Azure: A Developer's Perspective

From a developer's perspective, Azure is about getting your apps to market faster. Azure is a worldwide network of managed service centers that facilitate building, testing, and deploying apps. You can build applications using any dev tool or language, including Node.js, Java, and .NET, with best-of-class tools in Visual Studio and Visual Studio Code, on either your PC or Mac. But wait, there's more! You have a choice of more than 100 services to provide your users richer experiences, whether through responsive web apps, native mobile apps, or new features, such as mixed reality and bots. Azure provides an end-to-end management experience by using your choice of management tools, including Power Shell, BASH, the Azure portal, or REST APIs. We will look at how Azure can provide cross-device experiences with support for all major mobile platforms.

This chapter will guide you through taking your first steps in working with Azure and provide a tour of the portal. You will see how to get a free $200 30-day account, as well as several per-month usage credit options. This benefit is subject to change. The "free credit" may just do the job of getting your feet wet in learning Azure, and the recurring monthly credits may just do the job, period.

R. Fustino, *Azure and Xamarin Forms*, https://doi.org/10.1007/978-1-4842-3561-4_3

I will cover the following in this chapter:

- Monitoring your billing and usage
- Creating a virtual machine
- ASP.NET web services
- Deploying from GitHub and Visual Studio
- Deployment models and resource groups
- Azure command-line interface (CLI)
- Creating SQL (Structured Query Language) database and scalability
- How to grow your solutions and find useful resources on `azure.microsoft.com` related to support and architectures
- How to delete learning resources

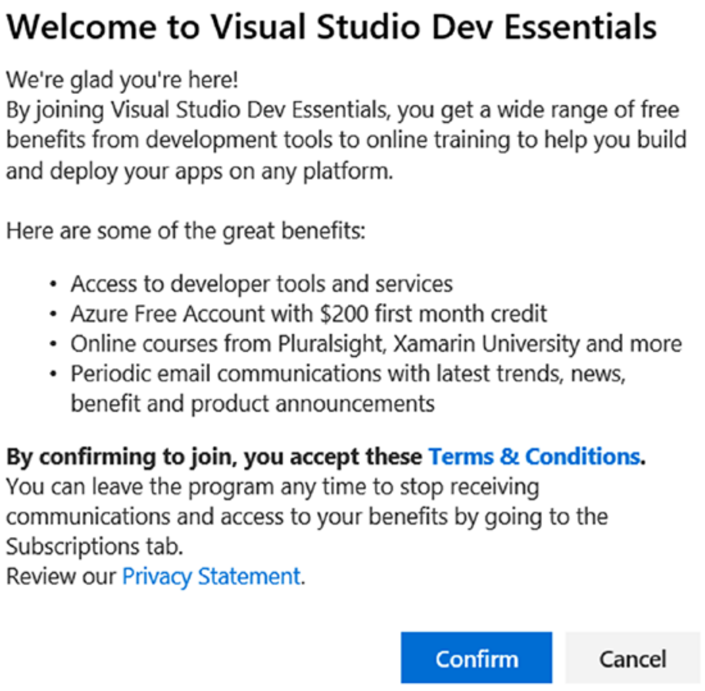
Time Estimate
120 Minutes

Free Azure Accounts and Credits

There are various offers available for free credits on Azure usage, specifically for developers. In this section, we will look at how to use Azure for free initially and how to get recurring free credits.

Signing up for a free account is a great way to explore Azure, without any commitment. As part of the free account, you are getting an Azure subscription that lets you create, manage, and scale resources and a $200 credit to spend on Azure services for 30 days. You can use those credits to try out any combination of Azure services.

If you do not have a Microsoft account or have used up your free credits in the past, create a new account at `https://signup.live.com` and then join the Visual Studio Dev Essentials program with that account at `www.visualstudio.com/dev-essentials/` and claim some free stuff. See Figure 3-1.



Welcome to Visual Studio Dev Essentials

We're glad you're here!
By joining Visual Studio Dev Essentials, you get a wide range of free benefits from development tools to online training to help you build and deploy your apps on any platform.

Here are some of the great benefits:

- Access to developer tools and services
- Azure Free Account with $200 first month credit
- Online courses from Pluralsight, Xamarin University and more
- Periodic email communications with latest trends, news, benefit and product announcements

By confirming to join, you accept these Terms & Conditions.
You can leave the program any time to stop receiving communications and access to your benefits by going to the Subscriptions tab.
Review our Privacy Statement.

Figure 3-1. *Visual Studio Dev Essentials benefits*

The Free Visual Studio Dev Essentials account is completely free, and you won't be charged for anything during the term of usage. Even when your 30 days are over, Microsoft will not automatically convert your account to a paid account and start charging you. The only reason Microsoft asks for a credit card is to verify your identity and prevent fraud.

You can always see the number of remaining days of your trial and remaining credit when you log on to the Azure portal, so you always know where you stand. In case you use all your credits, or your 30-day trial is over, Microsoft will notify you, so you can decide if you want to transition to a pay-as-you-go subscription. If you do, great. You start paying for the services you want to use. If not, don't worry, you won't be billed for anything, but you will no longer be able to access previous services.

I hope you enjoy your free accounts and make good use of your $200 credit. In addition to the Azure $200 credit, there are many more benefits available on the Azure site, including downloads for Visual Studio Community, Visual Studio for the Mac, and more, so be sure to look at these great developer benefits.

1. To start, click the Azure Activate offer for a free account and a $200 credit. See Figure 3-2.

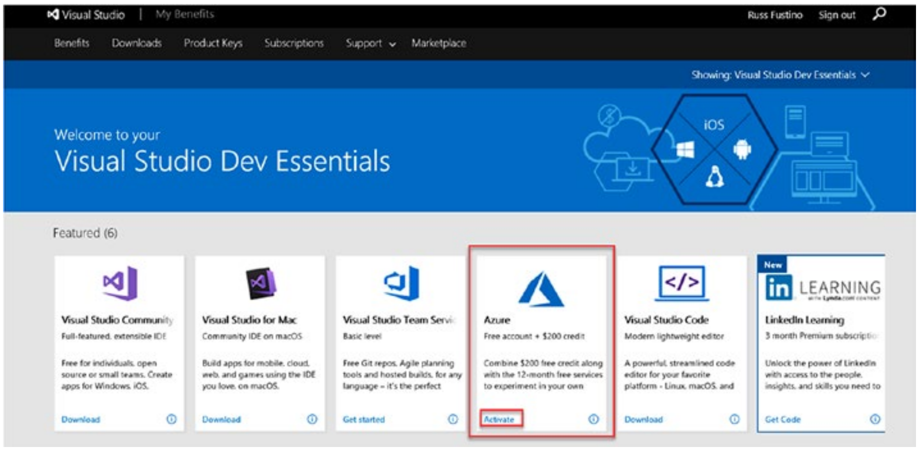
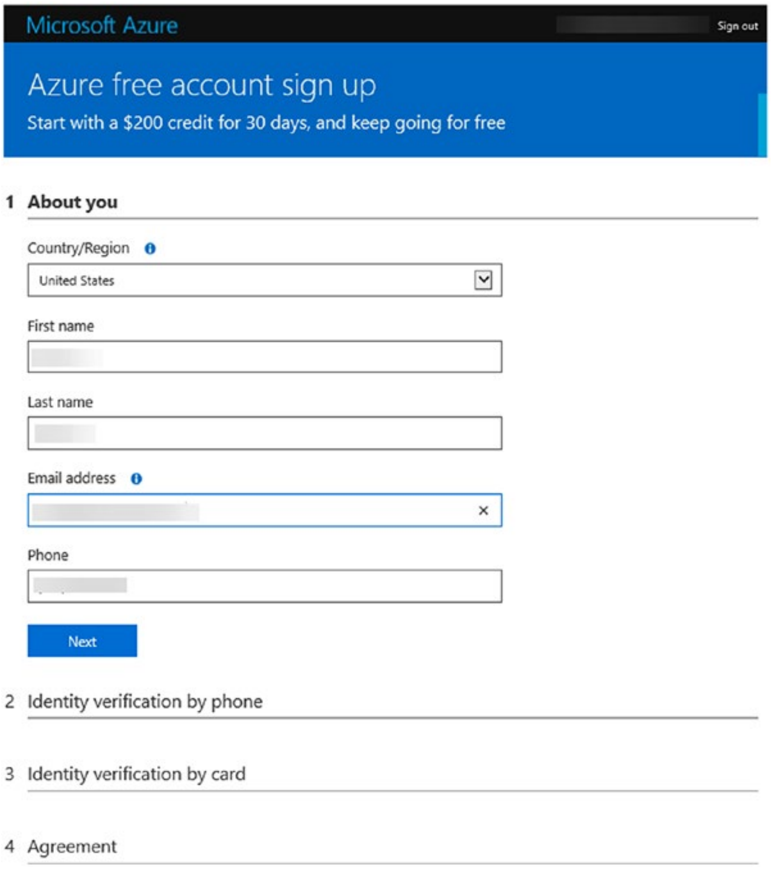

Visual Studio | My Benefits
Russ Fustino Sign out
Benefits Downloads Product Keys Subscriptions Support Marketplace
Showing: Visual Studio Dev Essentials
Welcome to your
Visual Studio Dev Essentials
iOS
Featured (6)
Visual Studio Community
Full-featured, extensible IDE
Free for individuals, open source or small teams. Create apps for Windows, iOS,
Download
Visual Studio for Mac
Community IDE on macOS
Build apps for mobile, cloud, web, and games using the IDE you love, on macOS.
Download
Visual Studio Team Servi
Basic level
Free Git repos, Agile planning tools and hosted builds, for any language – it's the perfect
Get started
Azure
Free account + $200 credit
Combine $200 free credit along with the 12-month free services to experiment in your own
Activate
Visual Studio Code
Modern lightweight editor
A powerful, streamlined code editor for your favorite platform - Linux, macOS, and
Download
New
in LEARNING
LinkedIn Learning
3 month Premium subscriptio
Unlock the power of LinkedIn with access to the people, insights, and skills you need to
Get Code

Figure 3-2. *Activating the free Azure credit*

2. You will then be prompted for personal information. Fill out the About You, Identity verification by phone, Identity verification by card, and Agreement sections. See Figure 3-3.



Azure free account sign up

Start with a $200 credit for 30 days, and keep going for free

1 About you

Country/Region: United States

First name

Last name

Email address

Phone

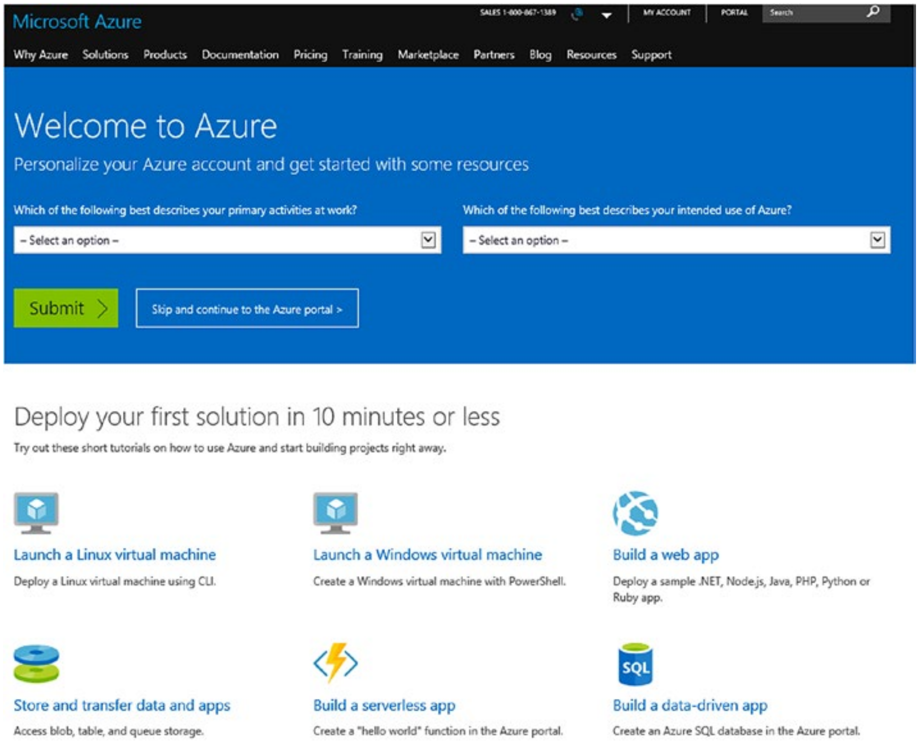
2 Identity verification by phone

3 Identity verification by card

4 Agreement

Figure 3-3. *Azure free account signup*

3. You will then be directed to the Azure portal welcome page, with usage questions, resources, tutorials, and webcasts. See Figure 3-4.



Welcome to Azure

Personalize your Azure account and get started with some resources

Which of the following best describes your primary activities at work? – Select an option –

Which of the following best describes your intended use of Azure? – Select an option –

Deploy your first solution in 10 minutes or less

Try out these short tutorials on how to use Azure and start building projects right away.

Launch a Linux virtual machine
Deploy a Linux virtual machine using CLI.

Launch a Windows virtual machine
Create a Windows virtual machine with PowerShell.

Build a web app
Deploy a sample .NET, Node.js, Java, PHP, Python or Ruby app.

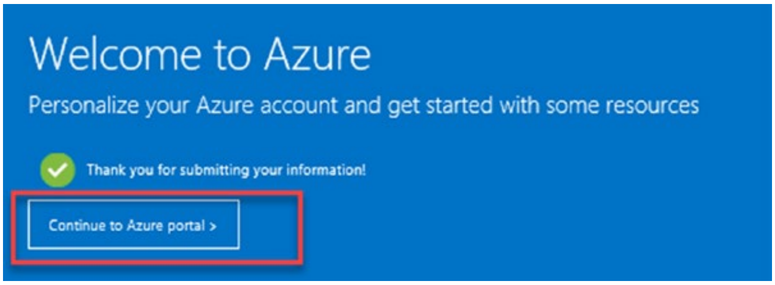
Store and transfer data and apps
Access blob, table, and queue storage.

Build a serverless app
Create a "hello world" function in the Azure portal.

Build a data-driven app
Create an Azure SQL database in the Azure portal.

Figure 3-4. *Azure welcome page*

4. Once the questions have been answered, you can bookmark this page, to return to it, and then click Continue to Azure portal. See Figures 3-5 and 3-6.



Welcome to Azure

Personalize your Azure account and get started with some resources

Thank you for submitting your information!

Figure 3-5. *Continue to portal*

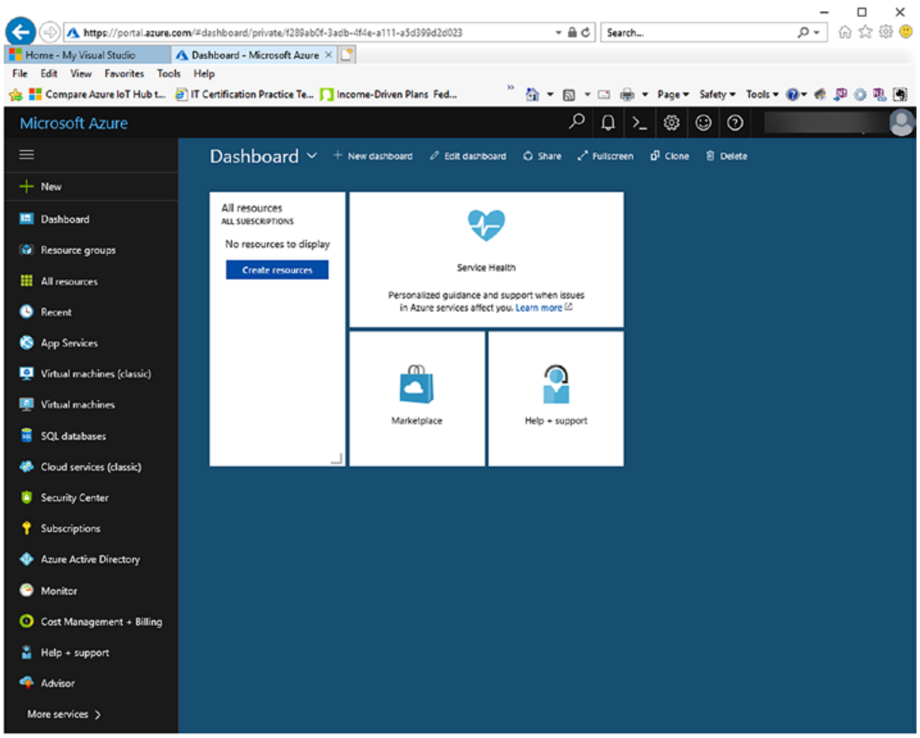
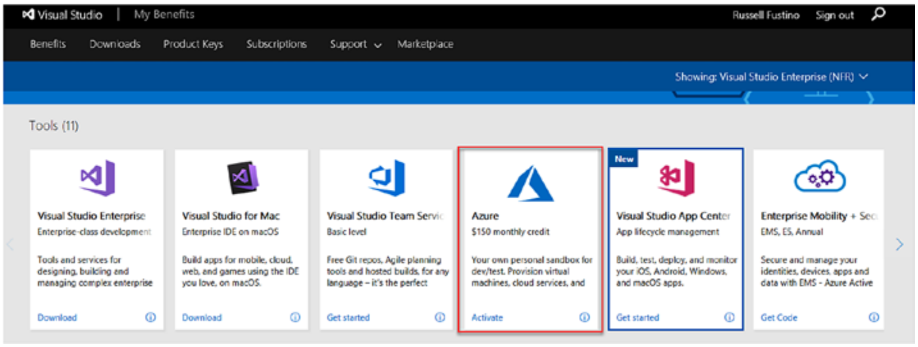


Figure 3-6. *https://portal.azure.com*

5. Also, if you have a Visual Studio Professional Subscription, you can receive a $50 monthly credit, or, with a Visual Studio Enterprise Subscription, a $150 monthly credit. See Figure 3-7.


Visual Studio | My Benefits
Russell Fustino Sign out
Benefits Downloads Product Keys Subscriptions Support Marketplace
Showing: Visual Studio Enterprise (NFR)
Tools (11)
New
Download
Download
Get started
Activate
Get started
Get Code

Visual Studio Enterprise
Enterprise-class development
Tools and services for designing, building and managing complex enterprise

Visual Studio for Mac
Enterprise IDE on macOS
Build apps for mobile, cloud, web, and games using the IDE you love, on macOS.

Visual Studio Team Servic
Basic level
Free Git repos, Agile planning tools and hosted builds, for any language – it's the perfect

Azure
$150 monthly credit
Your own personal sandbox for dev/test. Provision virtual machines, cloud services, and

Visual Studio App Center
App lifecycle management
Build, test, deploy, and monitor your iOS, Android, Windows, and macOS apps.

Enterprise Mobility + Sec
EMS, E5, Annual
Secure and manage your identities, devices, apps and data with EMS - Azure Active

Figure 3-7. *$150 monthly Azure credit for Visual Studio Enterprise*

6. If you are a Microsoft Partner, you can receive a $100 monthly Azure credit through an Action Pack subscription purchase. For details, see `https://partner.microsoft.com/en-us/membership/action-pack`.

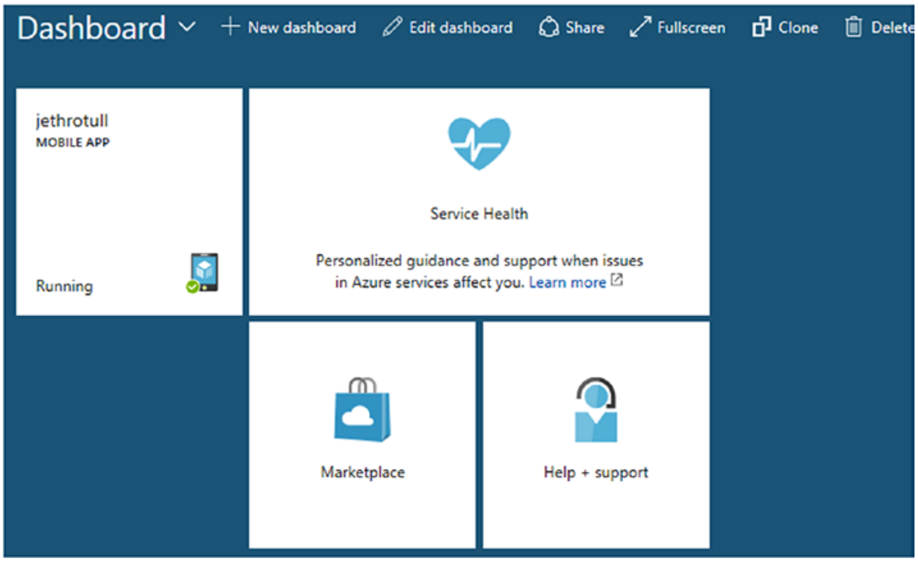
7. Through the Microsoft startup program BizSpark, you can receive a $150-per-month Azure credit for up to five developers. For details, see `https://bizspark.microsoft.com/`.

Once you have an Azure subscription, you can start creating and managing resources in Azure. The easiest way to start doing that is through the Azure portal.

Azure Portal

To get to the Azure portal, you can either go to `azure.microsoft.com` and click the portal link at the top of the page or simply navigate to `portal.azure.com`.

After you log on to the portal, you will see the main dashboard. You will see your recent resources, some health information, and some Get Started content. See Figure 3-8.



Personalized guidance and support when issues in Azure services affect you. Learn more

Figure 3-8. *The Azure portal dashboard shows resources, health information, and help and support, which includes getting started information*

On the left, there is a navigation pane that helps you browse your resources by type. You can see your virtual machines, databases, or go back and see all the resources. The list of resources on this navigator includes only your favorites, and if you click More services, you can see the full list. You can scroll through the list and mark additional resource types as favorites. See Figure 3-9.

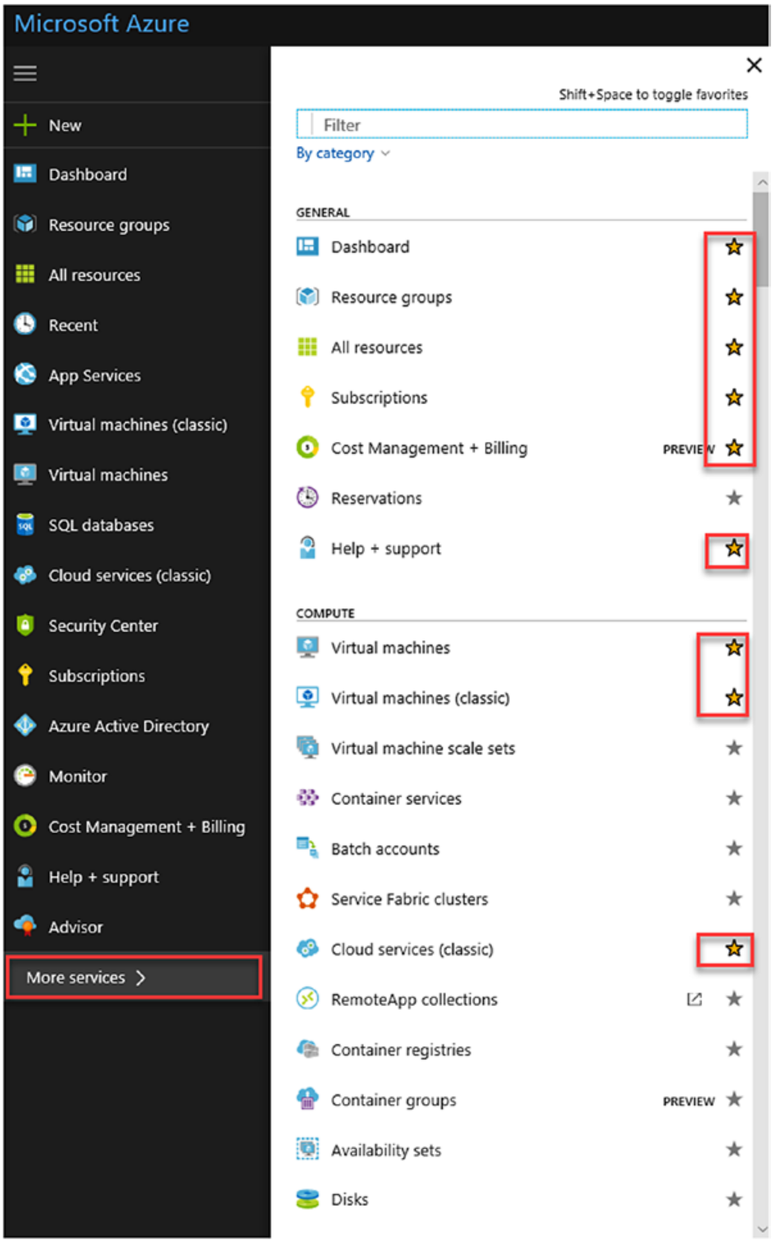


Figure 3-9. *Azure navigation pane. Click More services to see all choices. Mark your favorites by clicking a star.*

Use the Search box to filter. Type in a search for SQL. See Figure 3-10.

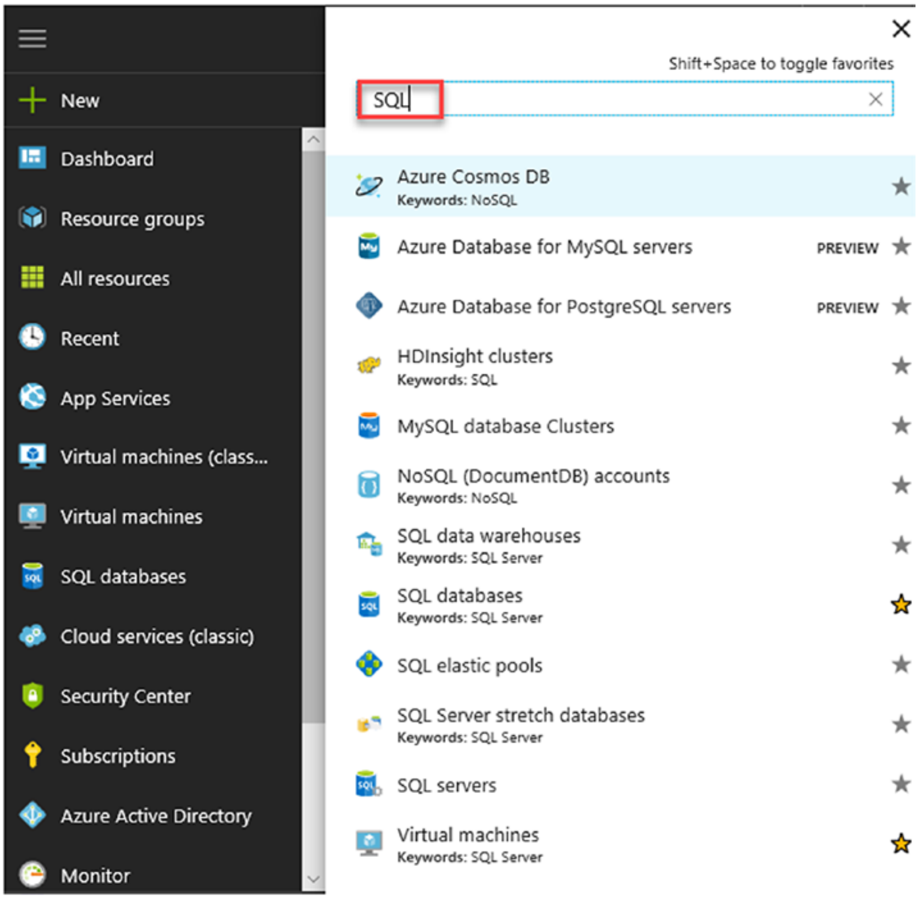
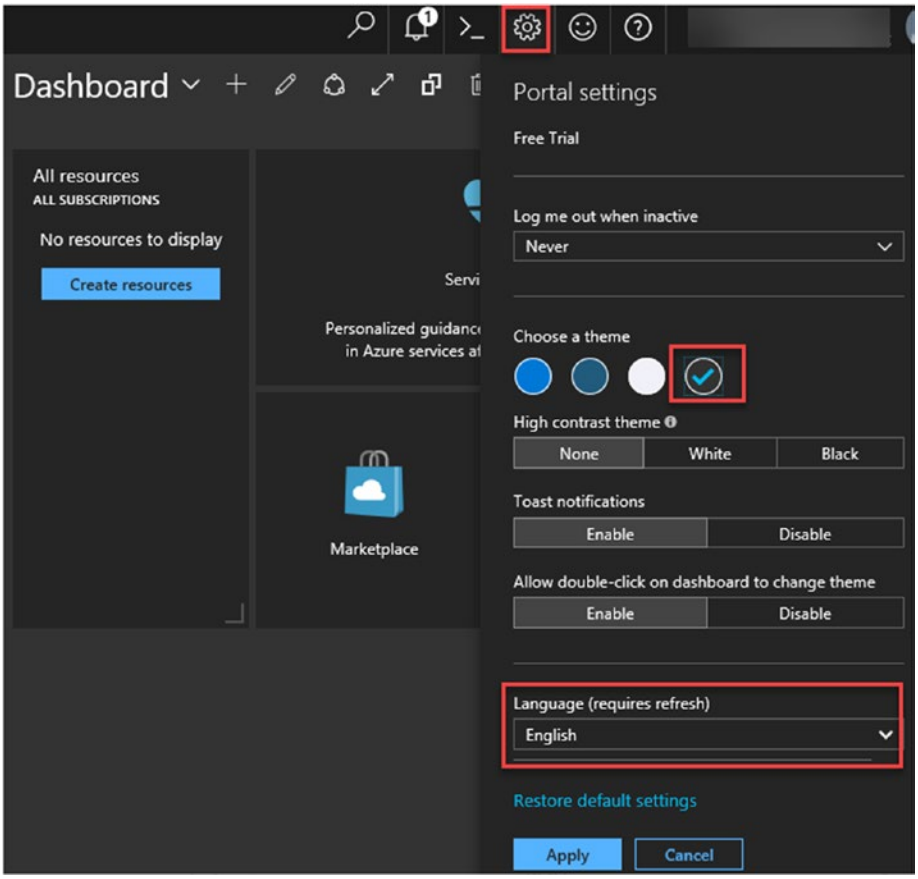


Figure 3-10. *Search results for SQL*

On the top bar, there is a settings area that lets you pick different themes and change the portal's language. See Figure 3-11.



Portal settings

Free Trial

Log me out when inactive: Never

Choose a theme

High contrast theme: [✓ None] White Black

Toast notifications: [✓ Enable] Disable

Allow double-click on dashboard to change theme: [✓ Enable] Disable

Language (requires refresh): English

Restore default settings

Apply Cancel

***Figure 3-11.** Azure portal settings for theme and language*

From the Help button, you can submit support requests and see all the keyboard shortcuts, which become very useful. For example, you can always click "?" to show and hide the keyboard shortcuts page and press the G and slash to get to the search bar and search for resources. See Figures 3-12 and 3-13.

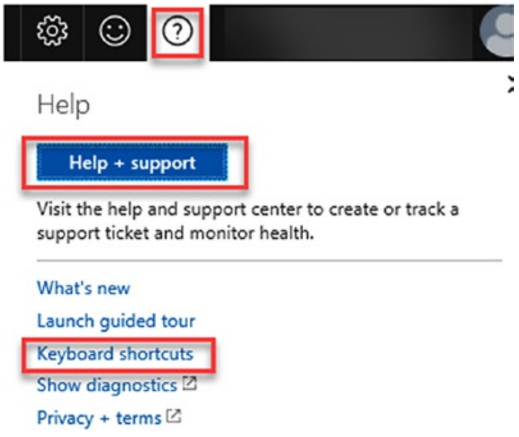
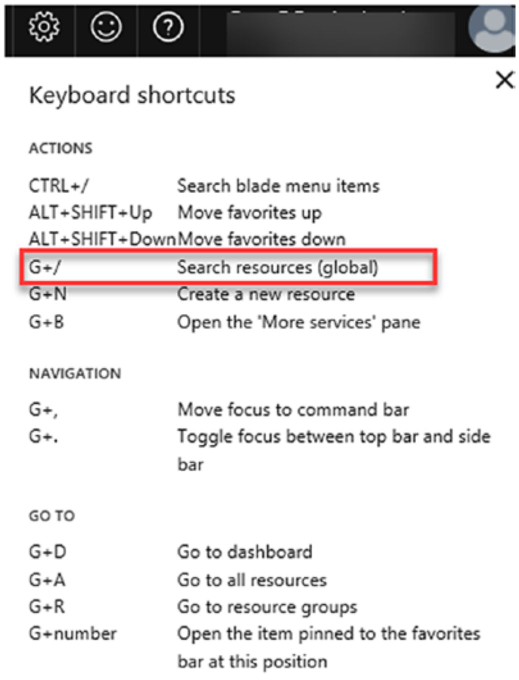


Figure 3-12. *Azure portal Help menu*


Keyboard shortcuts

ACTIONS

CTRL+/	Search blade menu items
ALT+SHIFT+Up	Move favorites up
ALT+SHIFT+Down	Move favorites down
G+/	Search resources (global)
G+N	Create a new resource
G+B	Open the 'More services' pane

NAVIGATION

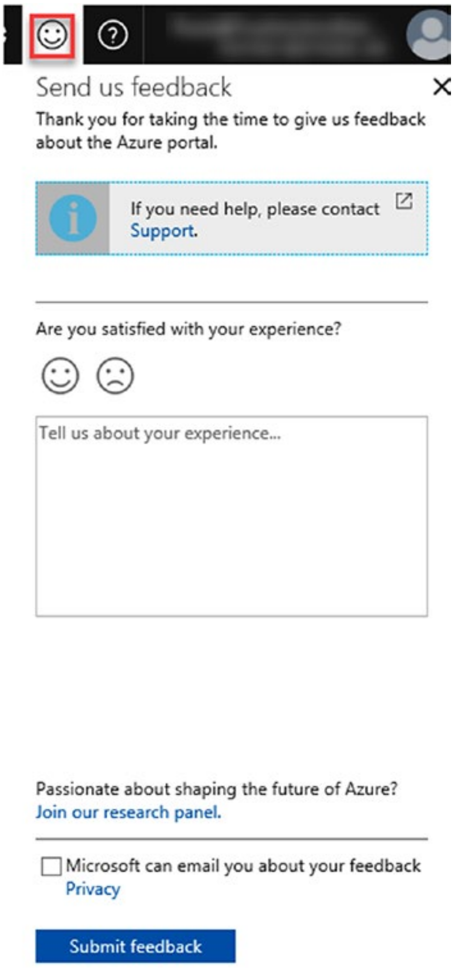
G+,	Move focus to command bar
G+.	Toggle focus between top bar and side bar

GO TO

G+D	Go to dashboard
G+A	Go to all resources
G+R	Go to resource groups
G+number	Open the item pinned to the favorites bar at this position

Figure 3-13. *Azure portal keyboard shortcuts. Use G+/ to search resources.*

Using the smiley face at the top, you can contact support and provide feedback about your experience with the portal. The portal team listens carefully and improves the experience, based on customer feedback. See Figure 3-14.



[redacted]

Send us feedback

Thank you for taking the time to give us feedback about the Azure portal.

If you need help, please contact Support.

Are you satisfied with your experience?

Tell us about your experience...

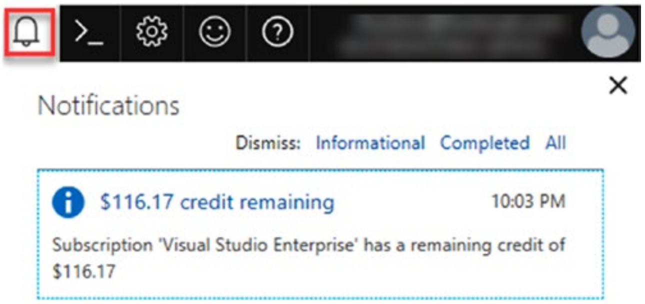
Passionate about shaping the future of Azure?
Join our research panel.

☐ Microsoft can email you about your feedback
Privacy

Submit feedback

Figure 3-14. *Azure portal feedback*

You also have a notification icon that updates you on any changes since your last login and shows you your remaining credit. See Figure 3-15.



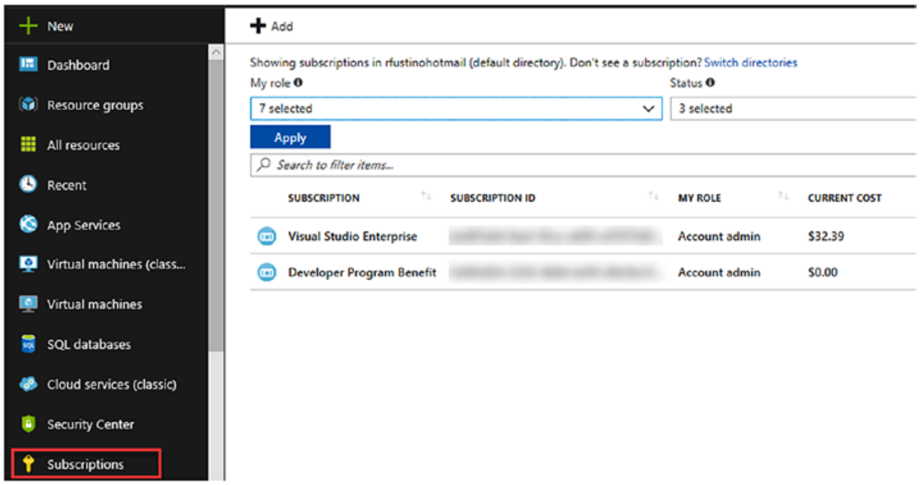
$116.17 credit remaining 10:03 PM

Subscription 'Visual Studio Enterprise' has a remaining credit of $116.17

Figure 3-15. *Azure notifications with remaining credits*

Billing and Usage

If you want to drill deeper into your billing information, to see how you are spending your credits, you can go to the subscription section through the navigator on the left. On the subscription information page, you can see all your subscriptions, your burn rate, how much you spend per resource, and, if you click on invoices, your most recent invoices for the subscription. So, you can get good visibility on where you are spending your money or trial credits. See Figures 3-16 and 3-17.



Showing subscriptions in rfustinohotmail (default directory). Don't see a subscription? Switch directories

My role: 7 selected
Status: 3 selected
Apply
Search to filter items...

SUBSCRIPTION	SUBSCRIPTION ID	MY ROLE	CURRENT COST
Visual Studio Enterprise	[redacted]	Account admin	$32.39
Developer Program Benefit	[redacted]	Account admin	$0.00

Figure 3-16. *Subscription information*

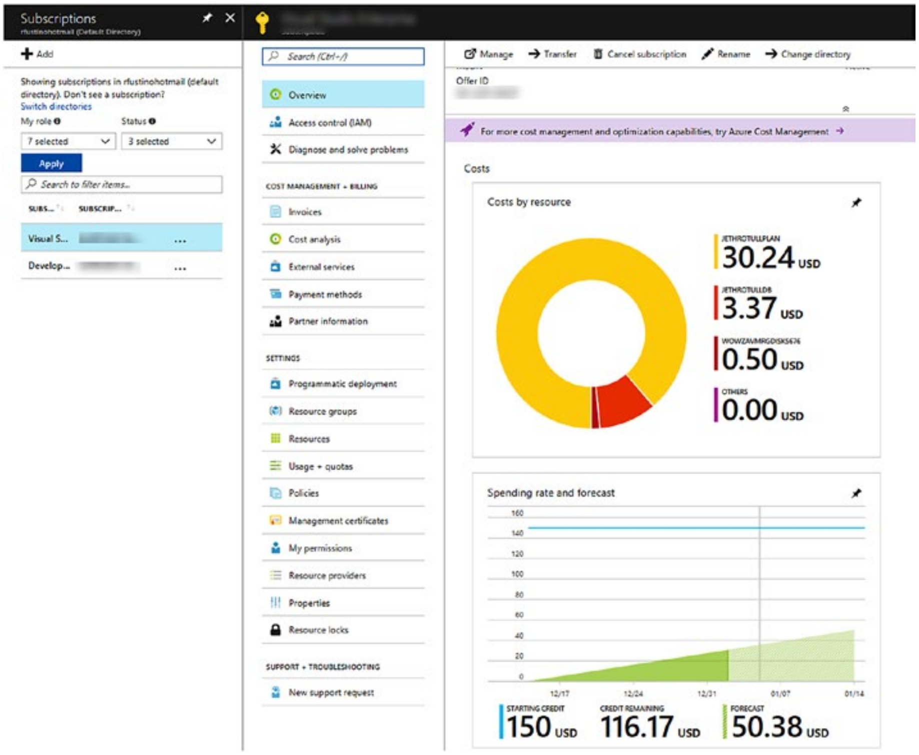


Figure 3-17. *Drilling down into resources used and burn rate*

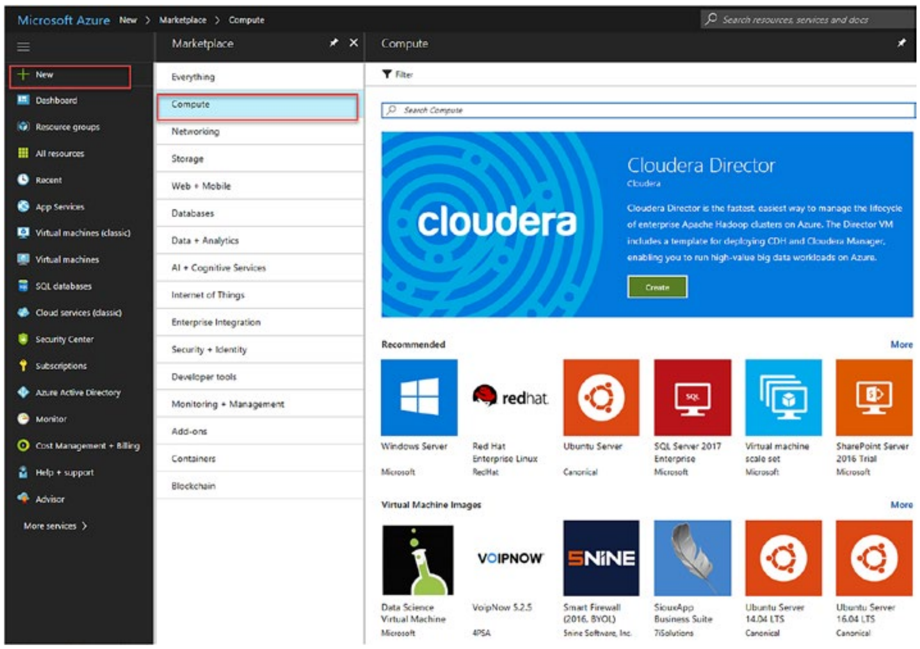
Now that we have one of the biggest fears, on measuring costs in Azure, under control, let's move on to one of the biggest reasons for using Azure: the Marketplace.

Marketplace

The Marketplace is the top destination for all your developer needs, optimized and certified to run on Azure. It is a great place to find the solutions you need, in a rich catalog of thousands of end-to-end solutions and products. For example, later in the chapter, I will show how to provision a virtual machine with Visual Studio already installed from the

Marketplace. This provisioning takes only about 10 minutes. Compare that if you were to install Visual Studio alone on a standalone machine. It could take an hour or two. You can also leverage free trials from independent software vendors (ISVs), to deploy and use the software in your subscription. Happy surfing in the Marketplace. Let's get started.

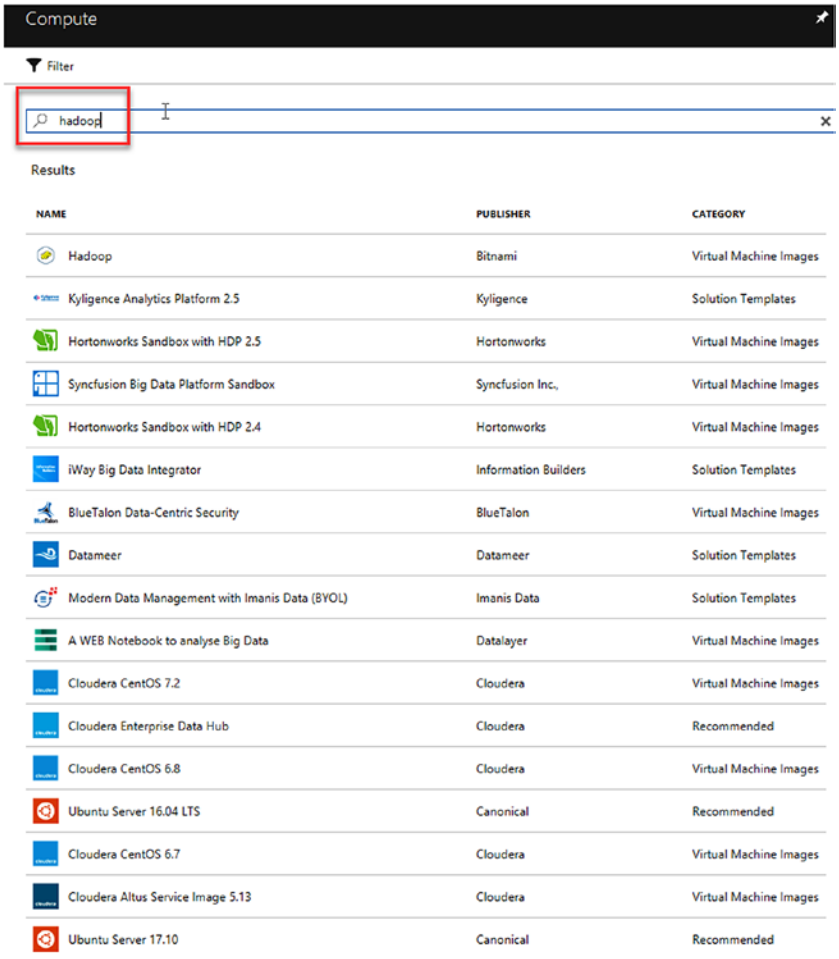
If you press *G* and *N* on your keyboard or click the +New link, you can start creating resources in Azure. You can scroll through the categories and select which item you would like to create. For example, you can create Windows or Linux virtual machines from the Compute category, create web apps from the Web and Mobile category, or create new relational or NoSQL databases from the Databases category. See Figure 3-18.



Cloudera Director is the fastest, easiest way to manage the lifecycle of enterprise Apache Hadoop clusters on Azure. The Director VM includes a template for deploying CDH and Cloudera Manager, enabling you to run high-value big data workloads on Azure.

***Figure 3-18.** Click +New to create a resource*

You can also open the Marketplace and see a comprehensive list of thousands of items, not just from Microsoft, but from other vendors as well. These items can be provisioned or purchased. You can search everything (search for Hadoop), or explore by categories. Currently, the Marketplace has about 3,500 items, from numerous vendors, to choose from. See Figure 3-19.



NAME	PUBLISHER	CATEGORY
Hadoop	Bitnami	Virtual Machine Images
Kyligence Analytics Platform 2.5	Kyligence	Solution Templates
Hortonworks Sandbox with HDP 2.5	Hortonworks	Virtual Machine Images
Syncfusion Big Data Platform Sandbox	Syncfusion Inc.	Virtual Machine Images
Hortonworks Sandbox with HDP 2.4	Hortonworks	Virtual Machine Images
iWay Big Data Integrator	Information Builders	Solution Templates
BlueTalon Data-Centric Security	BlueTalon	Virtual Machine Images
Datameer	Datameer	Solution Templates
Modern Data Management with Imanis Data (BYOL)	Imanis Data	Solution Templates
A WEB Notebook to analyse Big Data	Datalayer	Virtual Machine Images
Cloudera CentOS 7.2	Cloudera	Virtual Machine Images
Cloudera Enterprise Data Hub	Cloudera	Recommended
Cloudera CentOS 6.8	Cloudera	Virtual Machine Images
Ubuntu Server 16.04 LTS	Canonical	Recommended
Cloudera CentOS 6.7	Cloudera	Virtual Machine Images
Cloudera Altus Service Image 5.13	Cloudera	Virtual Machine Images
Ubuntu Server 17.10	Canonical	Recommended

Figure 3-19. *Search results in Marketplace for Hadoop*

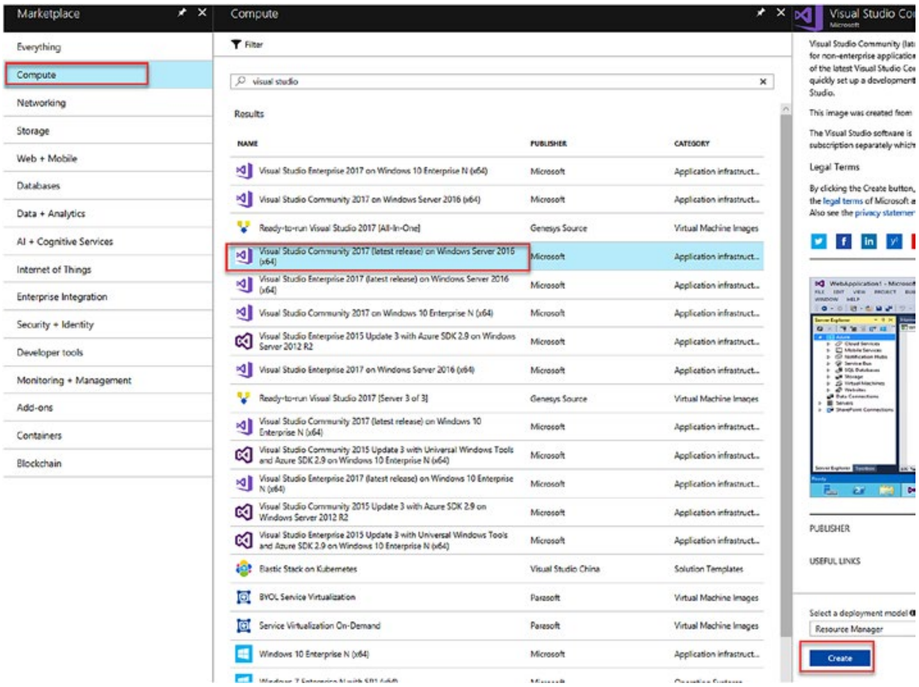
Now that you have a handle on the overview of Marketplace, let's start using it to provision a virtual machine.

Windows Virtual Machines

One of the earliest uses of Azure was to create virtual machines (VMs). Why? VMs are the root of any company considering to "lift and shift" data-center operations to the cloud. For example, instead of running servers on-site, they can be run from the cloud. Benefits include lower costs for operation and support and ease of scalability.

Now let's create a virtual machine in the cloud. You can either search for the virtual machine image you want or browse through what is available in the Marketplace. Azure has a huge gallery of virtual machine images to pick from. There are preconfigured VMs for such things as SQL and Drupal and complete multi-VM solution templates for larger systems, such as SharePoint or WebSphere.

If you want to create a Linux VM, you can search for popular images like Ubuntu, Red Hat, or more, but in this section, you will create a developer VM Windows 10 machine with Visual Studio installed. We have lots of different versions to choose from, so, first, search on Visual Studio. See Figure 3-20.



NAME	PUBLISHER	CATEGORY
Visual Studio Enterprise 2017 on Windows 10 Enterprise N (x64)	Microsoft	Application infrastruct...
Visual Studio Community 2017 on Windows Server 2016 (x64)	Microsoft	Application infrastruct...
Ready-to-run Visual Studio 2017 [All-In-One]	Genesys Source	Virtual Machine Images
Visual Studio Community 2017 (latest release) on Windows Server 2016 (x64)	Microsoft	Application infrastruct...
Visual Studio Enterprise 2017 (latest release) on Windows Server 2016 (x64)	Microsoft	Application infrastruct...
Visual Studio Community 2017 on Windows 10 Enterprise N (x64)	Microsoft	Application infrastruct...
Visual Studio Enterprise 2015 Update 3 with Azure SDK 2.9 on Windows Server 2012 R2	Microsoft	Application infrastruct...
Visual Studio Enterprise 2017 on Windows Server 2016 (x64)	Microsoft	Application infrastruct...
Ready-to-run Visual Studio 2017 [Server 3 of 3]	Genesys Source	Virtual Machine Images
Visual Studio Community 2017 (latest release) on Windows 10 Enterprise N (x64)	Microsoft	Application infrastruct...
Visual Studio Community 2015 Update 3 with Universal Windows Tools and Azure SDK 2.9 on Windows 10 Enterprise N (x64)	Microsoft	Application infrastruct...
Visual Studio Enterprise 2017 (latest release) on Windows 10 Enterprise N (x64)	Microsoft	Application infrastruct...
Visual Studio Community 2015 Update 3 with Azure SDK 2.9 on Windows Server 2012 R2	Microsoft	Application infrastruct...
Visual Studio Enterprise 2015 Update 3 with Universal Windows Tools and Azure SDK 2.9 on Windows 10 Enterprise N (x64)	Microsoft	Application infrastruct...
Elastic Stack on Kubernetes	Visual Studio China	Solution Templates
BYOL Service Virtualization	Parasoft	Virtual Machine Images
Service Virtualization On-Demand	Parasoft	Virtual Machine Images
Windows 10 Enterprise N (x64)	Microsoft	Application infrastruct...

Visual Studio Community (lat
for non-enterprise applicatio
of the latest Visual Studio Co
quickly set up a development
Studio.

This image was created from

The Visual Studio software is
subscription separately which

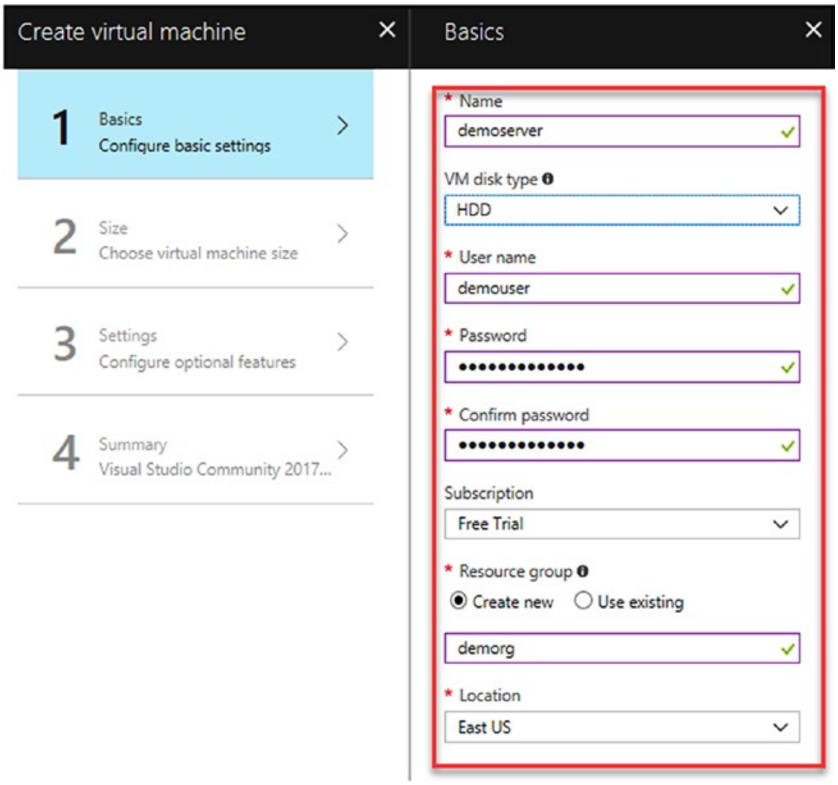
By clicking the Create button,
the legal terms of Microsoft a
Also see the privacy statemer

Figure 3-20. *Search results in Visual Studio. Select VS Community 2017 (latest release) on Windows Server 2016.*

If you have an MSDN subscription, you can select the same for Windows 10 for UWP dev in this book. You will not be able to do UWP dev on a Windows Server machine.

1. After selecting VS Community 2017 (latest release) on Windows Server 2016, click Create virtual machine. If you have a MSDB subscription, you can select the Windows 10 version to create the UWP apps in this book. At the time of writing, Windows 10 is not available with the free $200 credit offer.

2. Enter "Demo@pass123" as the password. Choose a location near you (use this location for the remainder of this chapter) and the remainder of the basics, as shown in Figure 3-21. In the Basics settings, we create a Resource group that is a container of multiple resources used for an app. In this case, because we are creating a single VM, we create a new resource group, using the name "demorg." If we group resources under the same name, we can easily delete them, for example, altogether, by simply deleting the resource group. Click OK.


Create virtual machine
1 Basics Configure basic settings
2 Size Choose virtual machine size
3 Settings Configure optional features
4 Summary Visual Studio Community 2017...
Basics

* Name: demoserver

VM disk type: HDD

* User name: demouser

* Password: •••••••••••••

* Confirm password: •••••••••••••

Subscription: Free Trial

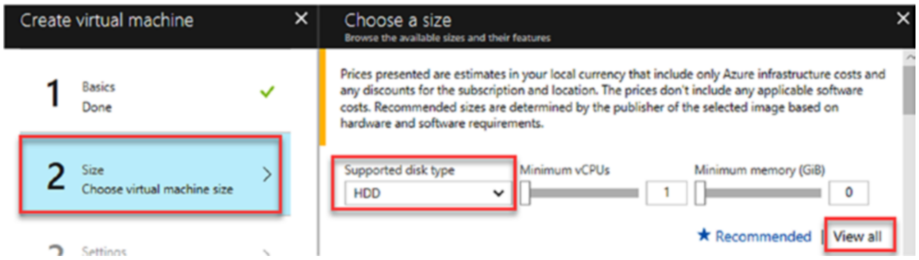
* Resource group: (● Create new) ○ Use existing

demorg

* Location: East US

Figure 3-21. *Enter basic info for your VM*

3. Under Choose a size, click View all, then click on one of the least expensive options, as you will be deleting this at the end of this chapter. Select A1 Basic, which will work for this chapter. This machine will be very sluggish, and it will be a throwaway, as we are only creating it to demonstrate how to use it. See Figures 3-22 and 3-23.



Create virtual machine

1 Basics Done ✓

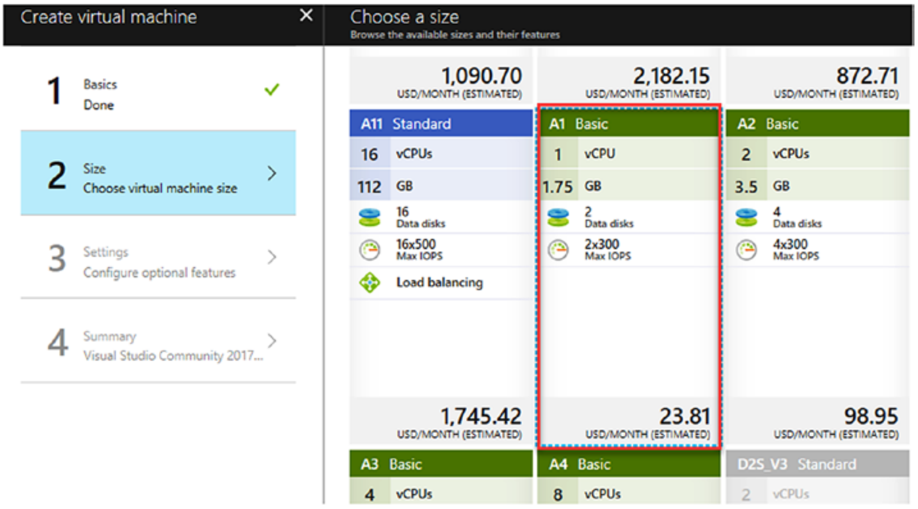
2 Size Choose virtual machine size

Choose a size
Browse the available sizes and their features

Prices presented are estimates in your local currency that include only Azure infrastructure costs and any discounts for the subscription and location. The prices don't include any applicable software costs. Recommended sizes are determined by the publisher of the selected image based on hardware and software requirements.

Supported disk type: HDD
Minimum vCPUs: 1
Minimum memory (GiB): 0

Figure 3-22. *Select View all*



Create virtual machine

1 Basics Done ✓

2 Size Choose virtual machine size

3 Settings Configure optional features

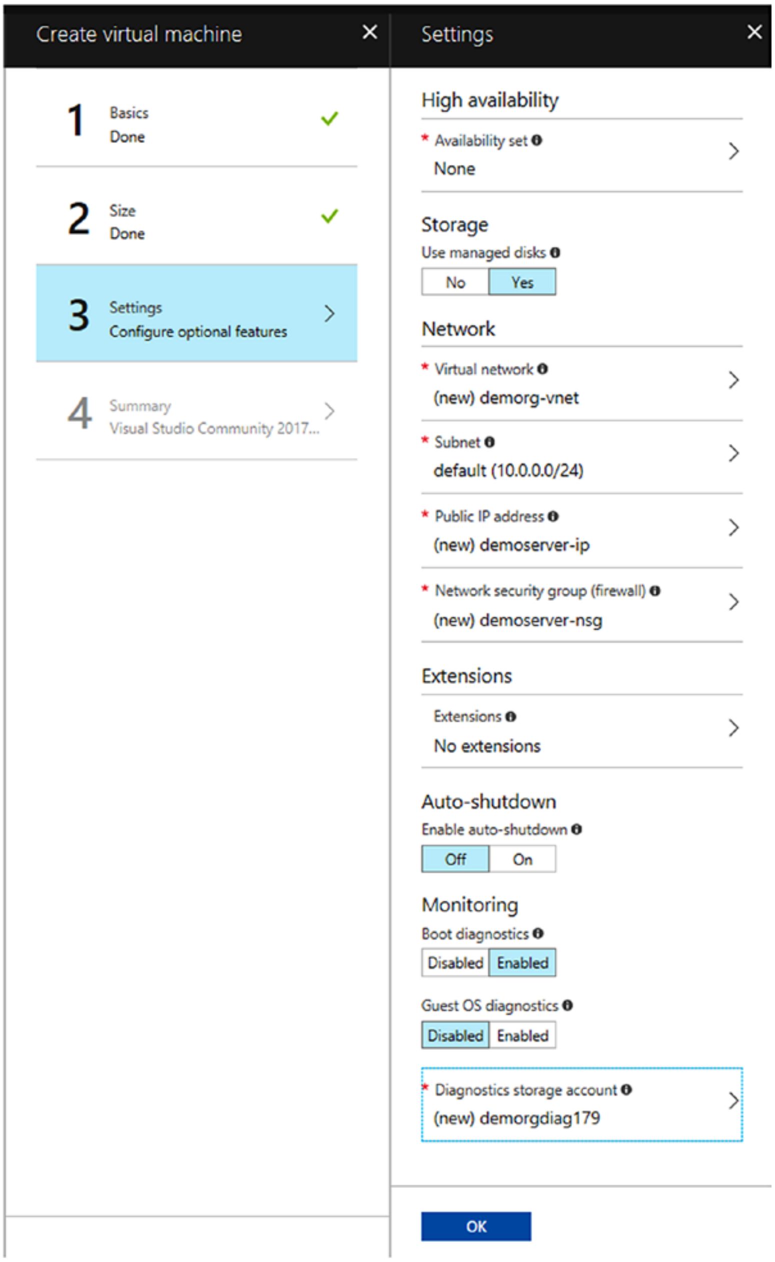
4 Summary Visual Studio Community 2017...

Choose a size
Browse the available sizes and their features

1,090.70 USD/MONTH (ESTIMATED)	2,182.15 USD/MONTH (ESTIMATED)	872.71 USD/MONTH (ESTIMATED)
A11 Standard	A1 Basic	A2 Basic
16 vCPUs	1 vCPU	2 vCPUs
112 GB	1.75 GB	3.5 GB
16 Data disks	2 Data disks	4 Data disks
16x500 Max IOPS	2x300 Max IOPS	4x300 Max IOPS
Load balancing		
1,745.42 USD/MONTH (ESTIMATED)	23.81 USD/MONTH (ESTIMATED)	98.95 USD/MONTH (ESTIMATED)
A3 Basic	A4 Basic	D2S_V3 Standard
4 vCPUs	8 vCPUs	2 vCPUs

Figure 3-23. *Pick A1 Basic*

4. Keep all the defaults on the Settings blade and click OK on the Summary blade. See Figure 3-24.



Create virtual machine

1 Basics
Done ✓

2 Size
Done ✓

3 Settings
Configure optional features

4 Summary
Visual Studio Community 2017...

Settings

High availability

* Availability set
None

Storage

Use managed disks
No [✓ Yes]

Network

* Virtual network
(new) demorg-vnet

* Subnet
default (10.0.0.0/24)

* Public IP address
(new) demoserver-ip

* Network security group (firewall)
(new) demoserver-nsg

Extensions

Extensions
No extensions

Auto-shutdown

Enable auto-shutdown
[✓ Off] On

Monitoring

Boot diagnostics
Disabled [✓ Enabled]

Guest OS diagnostics
[✓ Disabled] Enabled

* Diagnostics storage account
(new) demorgdiag179

OK

Figure 3-24. *Keep the settings defaults*

5. The deployment will take about 15–20 minutes to complete. You will receive a notification when it finishes. See Figures 3-25 and 3-26.

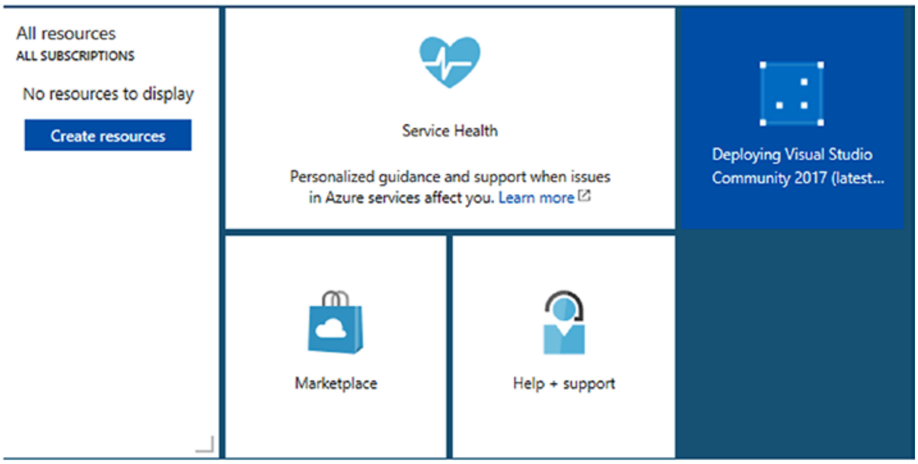
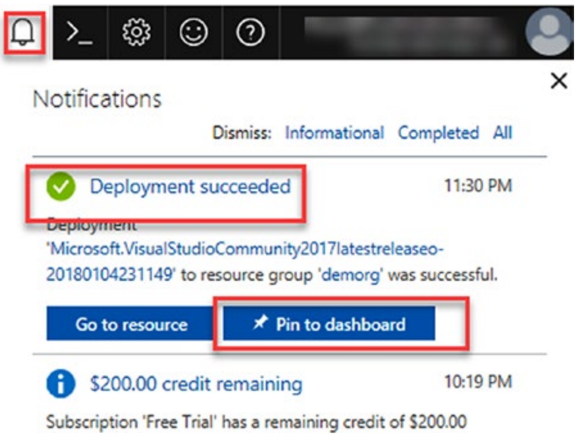

All resources
ALL SUBSCRIPTIONS
No resources to display
Create resources
Service Health
Personalized guidance and support when issues in Azure services affect you. Learn more
Deploying Visual Studio Community 2017 (latest...
Marketplace
Help + support

Figure 3-25. *Deploying Visual Studio VM*



Deployment succeeded 11:30 PM
Deployment 'Microsoft.VisualStudioCommunity2017latestreleaseo-20180104231149' to resource group 'demorg' was successful.

$200.00 credit remaining 10:19 PM
Subscription 'Free Trial' has a remaining credit of $200.00

Figure 3-26. *Notification that deployment succeeded*

6. While this is deploying, let's look at a few resources. Open a new tab in your browser and navigate to the Azure site and the regions map at `http://azure.microsoft.com/regions`. Azure has 50 regions available in 140 countries. You can visit the Azure regions page to see a map of all the regions and decide on the best location to deploy to. Azure offers scale needed to bring applications closer to users around the globe, providing data residency and resiliency options for end customers. See Figure 3-27.

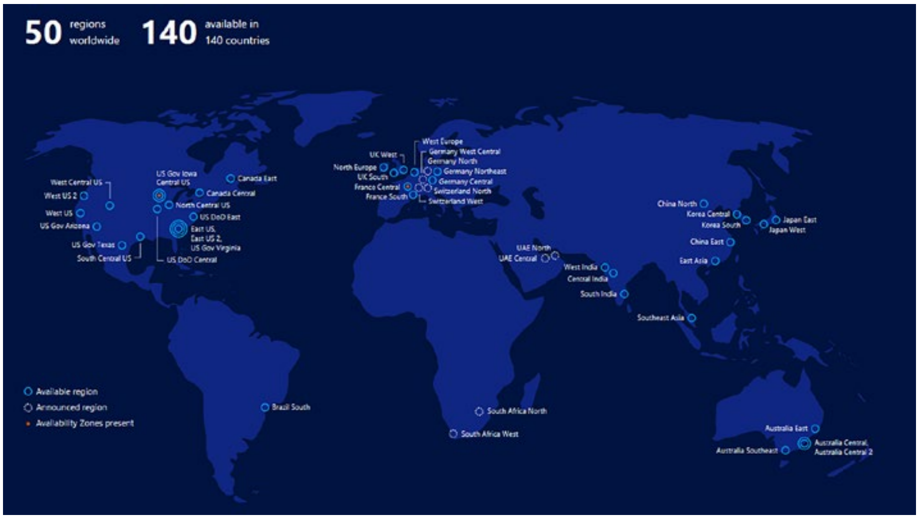
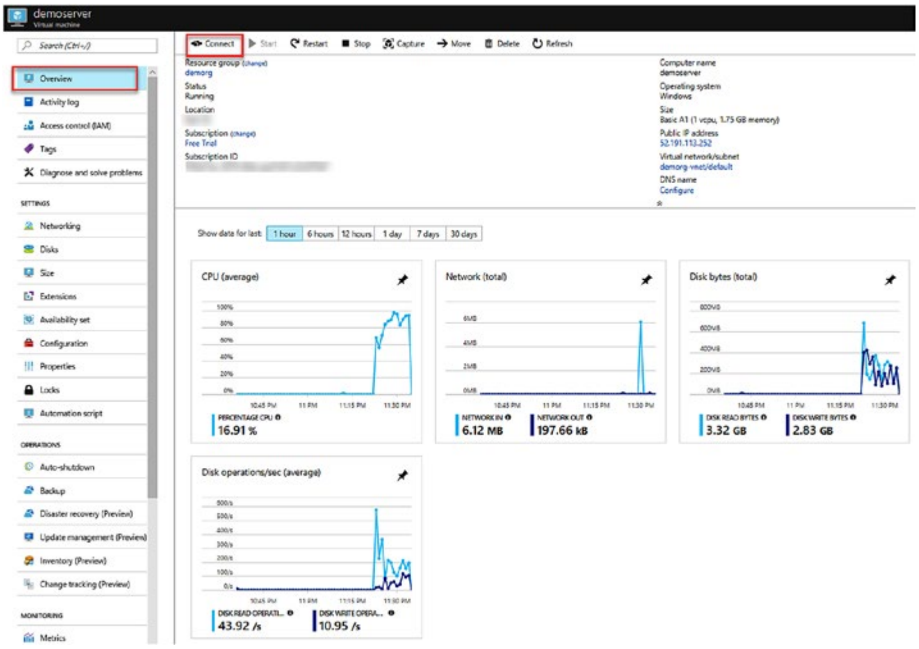


Figure 3-27. *Azure regions map*

7. As for VM sizes, you should choose the right VM for your workload, based on the number of cores, the memory, disk drive size, and price. Azure will give you recommendations based on popular sizes, but you can also click View all to see more options.

8. Once the deployment completes, you can pin it, so that it appears on your dashboard, or you can get to it from the Virtual Machines list on the left pane, or you can search for it using the search bar.

9. On the details page, you can monitor and manage this virtual machine. You can look at the CPU, disk, and network usage; go to the activity log; and diagnose problems. You can add additional disks or change this virtual machine size even after it's been created. Because this is a Windows virtual machine, click connect, download a RDP file that you can then open, and we're now going to remote desktop into this virtual machine running in Azure. See Figure 3-28.



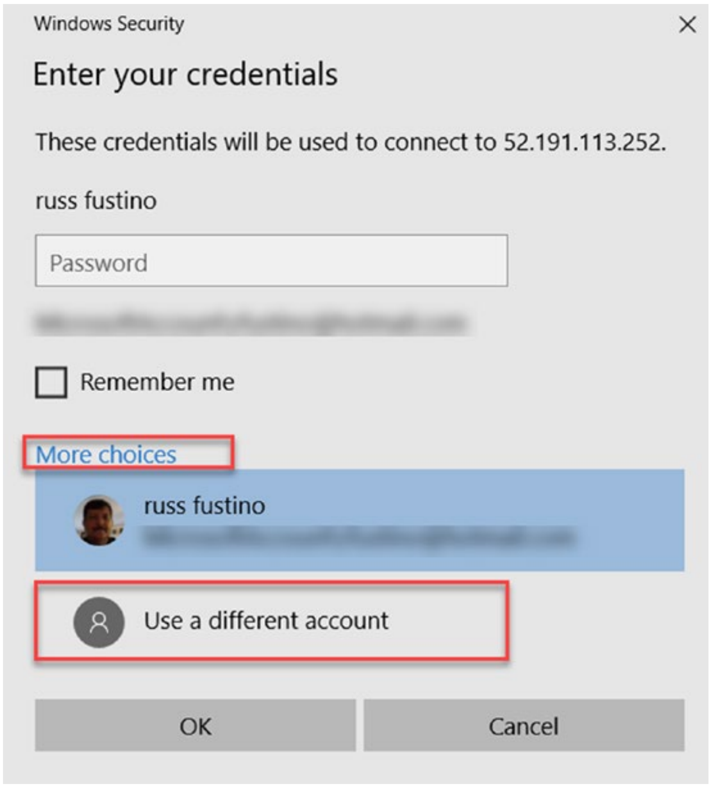
Resource group (change)
demorg
Status
Running
Location
[redacted]
Subscription (change)
Free Trial
Subscription ID
[redacted]

Computer name
demoserver
Operating system
Windows
Size
Basic A1 (1 vcpu, 1.75 GB memory)
Public IP address
52.191.113.252
Virtual network/subnet
demorg-vnet/default
DNS name
Configure

PERCENTAGE CPU 16.91 %
NETWORK IN 6.12 MB
NETWORK OUT 197.66 kB
DISK READ BYTES 3.32 GB
DISK WRITE BYTES 2.83 GB
DISK READ OPERATI... 43.92 /s
DISK WRITE OPERA... 10.95 /s

Figure 3-28. *Virtual Machine Overview. Click Connect to download an RDP file.*

10. When prompted for credentials, click More choices, to enter the demouser credentials we set up. See Figures 3-29 and 3-30.



Windows Security

Enter your credentials

These credentials will be used to connect to 52.191.113.252.

russ fustino

Password

Remember me

More choices

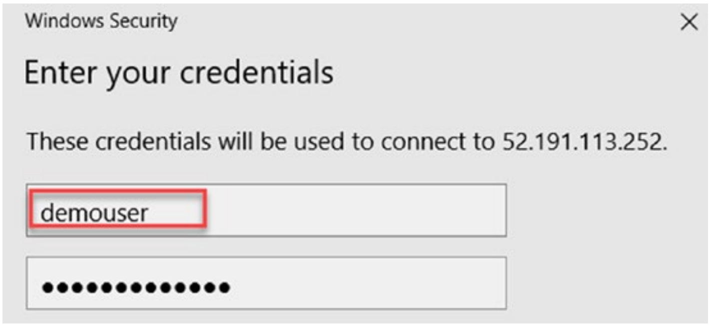
russ fustino

Use a different account

OK

Cancel

Figure 3-29. *Click More choices and use a different account when prompted for credentials*



Windows Security

Enter your credentials

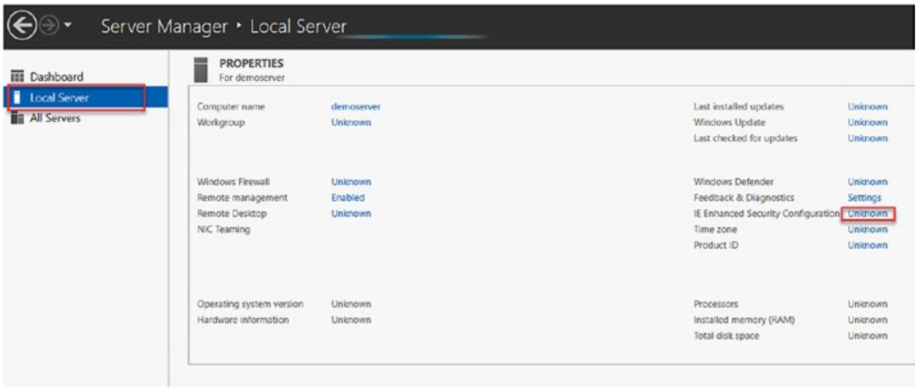
These credentials will be used to connect to 52.191.113.252.

demouser

●●●●●●●●●●●●●

Figure 3-30. *Enter "demouser" and "Demo@pass123" for the password*

11. We now have a new machine! When the Server Manager comes up, select Local Server and the IE Enhanced Security Configuration link. See Figure 3-31.



Server Manager ‣ Local Server

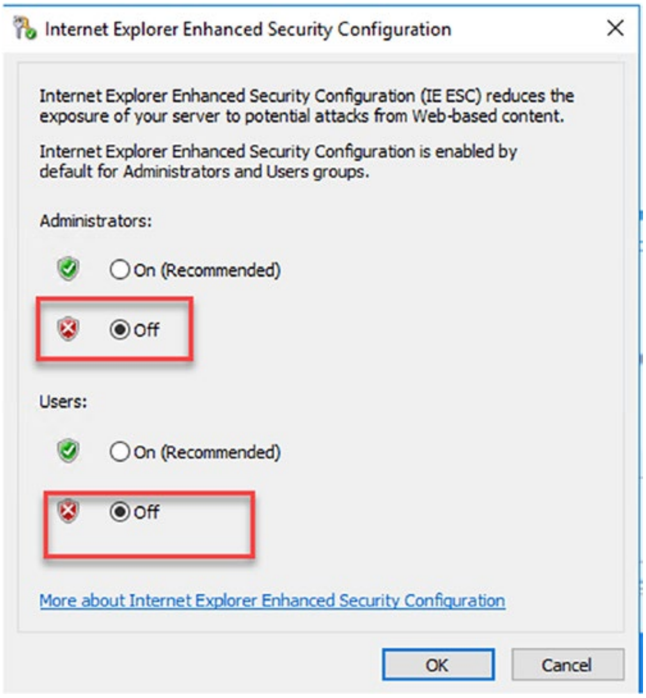
Dashboard
Local Server
All Servers

PROPERTIES
For demoserver

Computer name	demoserver	Last installed updates	Unknown
Workgroup	Unknown	Windows Update	Unknown
		Last checked for updates	Unknown
Windows Firewall	Unknown	Windows Defender	Unknown
Remote management	Enabled	Feedback & Diagnostics	Settings
Remote Desktop	Unknown	IE Enhanced Security Configuration	Unknown
NIC Teaming		Time zone	Unknown
		Product ID	Unknown
Operating system version	Unknown	Processors	Unknown
Hardware information	Unknown	Installed memory (RAM)	Unknown
		Total disk space	Unknown

Figure 3-31. *In Server Manager, click Local Server and IE Enhanced Security Configuration*

12. Set the Internet Explorer Enhanced Security Configuration to off (Figure 3-32), or you will be nagged every time you navigate to a site not already on the list. Of course, this all depends on your security needs.


Internet Explorer Enhanced Security Configuration

Internet Explorer Enhanced Security Configuration (IE ESC) reduces the exposure of your server to potential attacks from Web-based content.

Internet Explorer Enhanced Security Configuration is enabled by default for Administrators and Users groups.

Administrators:

On (Recommended) [✓ Off]

Users:

On (Recommended) [✓ Off]

More about Internet Explorer Enhanced Security Configuration

Figure 3-32. *Set the enhanced security configuration to off*

Creating virtual machines in the Azure portal is very easy, and in just a few minutes, we were able to create resources in the cloud, including an install of Visual Studio!

One note about Xamarin and Azure VMs: At the moment, it is very difficult to use this combination. First, on a Windows Server VM, you cannot create a UWP app on that platform in Visual Studio. You can create a Windows 10 VM but requires an MSDN subscription to do this, as you cannot create a Windows 10 VM with the free 30-day trial subscription. Even if you have an Azure Windows 10 VM with which you can create UWP apps, the emulators do not run in the VM, and there goes Android and iOS dev. You could look into Genymotion for the Android emulator, however, and that may work. iOS must connect on your network to a Mac, and the VM is not on your network; it is on Azure's. So, at this point, I recommend using VS on the metal for Xamarin development and not in an Azure VM.

When we created our virtual machine, I mentioned something called resource groups. I want to give you more context about that in the next section.

Deployment Models and Resource Groups

If you click the More services button again and go through the types of resources you can manage in the portal, you'll see that there are two kinds of virtual machines. One says "Virtual Machines," and the other says "Classic." Here is why:

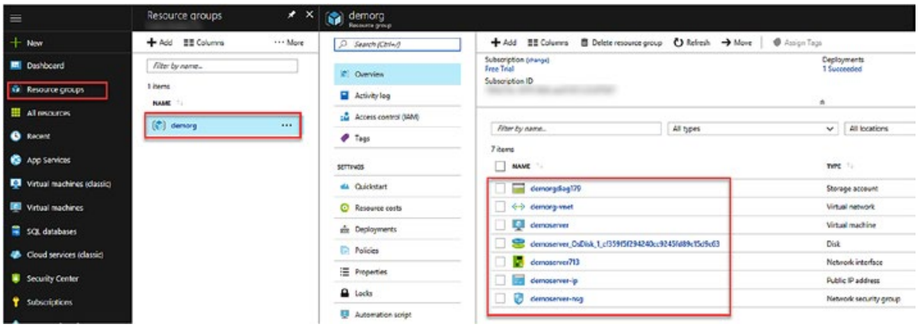
Azure has two deployment models. The classic deployment model is the original model from the first days of Azure. This model is centered on the individual service, and every API call is made to make a single operation on a single resource, for example, create a web site, stop a web site.

This model works well. But, as cloud solutions are becoming more complex and composed of multiple services, it is becoming difficult to deploy a solution by configuring each service independently.

The more recent deployment model, which is now the standard model in the Azure portal, is called ARM, which stands for *Azure Resource Management*. This model looks at the world through resource groups that let you group multiple resources and create or manage them together. As an example, if I look at my virtual machines, I can click on one of them and see whether my VM belongs to a resource group. Drilling into that resource group shows me that it includes a bunch of resources: the virtual machine, the network interface, the public IP address, and storage. All those items were created as a single operation when I created the virtual machine. And, if I ever want to remove my virtual machine, I can simply remove this resource group, and all my related resources will be deleted as well.

I can also see the cost of each of the resources in this group, but, more important, I can get the code or template that can be used to re-create this resource group. Resource groups can be represented using a template, which is a JSON file that defines all the resources and their relationships. Then I can use this template to deploy this entire resource group together, instead of creating each resource individually. I can also get the code required to deploy this template via different programming languages, or through the Azure scripting tools.

This gives you an idea of why you're seeing two types of virtual machines and other services in the full services list, and why we are always associating resources to resource groups. See Figure 3-33.



NAME	TYPE
demorgdiag179	Storage account
demorg-vnet	Virtual network
demoserver	Virtual machine
demoserver_OsDisk_1_cf3595f294240cc9245fd89c15d5c63	Disk
demoserver713	Network interface
demoserver-ip	Public IP address
demoserver-nsg	Network security group

Figure 3-33. *Select Resource groups and drill in your resource group to see all of the components associated with it*

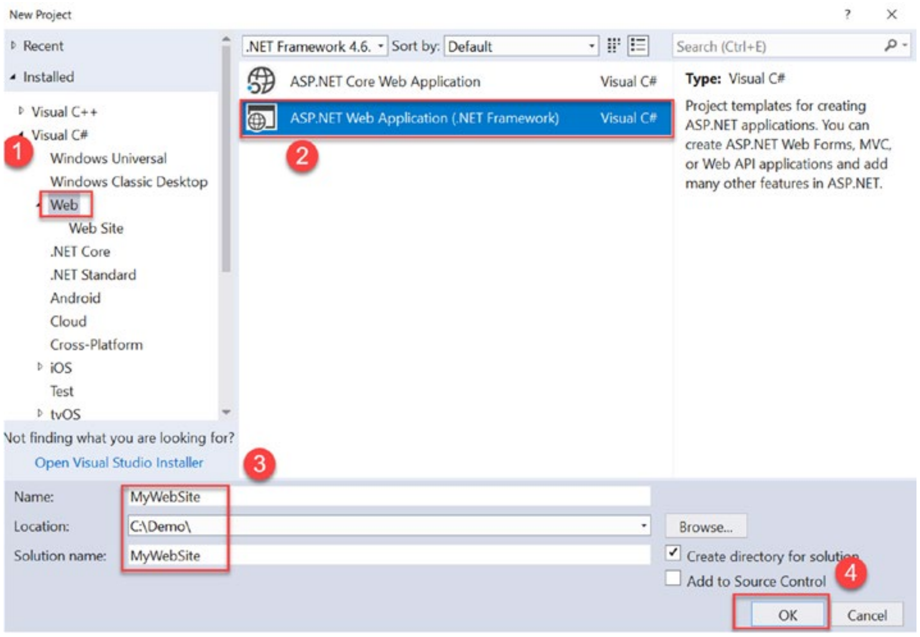
So, we've created a virtual machine and connected to it through the portal. Now, we will create and deploy a web application, but instead of doing it from the portal, we will do this from the Visual Studio IDE on your machine.

Web App ASP.NET

Azure App Service Web Apps (or just Web Apps) provides a highly scalable, self-patching web hosting service for hosting web applications, REST APIs, and mobile back ends. You can develop in your favorite language, be it .NET, Node.js, .NET Core, Ruby, Java, Python, or PHP. Applications run and scale with ease. Azure has SDKs in many languages and extensions to popular IDEs, such as Visual Studio and Eclipse. Why Web Apps? We can use a web app to provide access to an SQL database in the cloud, for example. We will create a web application and deploy it to Azure from Visual Studio.

1. Bring up Visual Studio 2017 on your machine (not in the VM we just created).

2. Create an ASP.NET MVC app. Go to File ➤ New Project ➤ Visual C# ➤ Web ➤ ASP.NET Web Application. See Figure 3-34.



Type: Visual C#

Project templates for creating ASP.NET applications. You can create ASP.NET Web Forms, MVC, or Web API applications and add many other features in ASP.NET.

Name: MyWebSite

Location: C:\Demo\

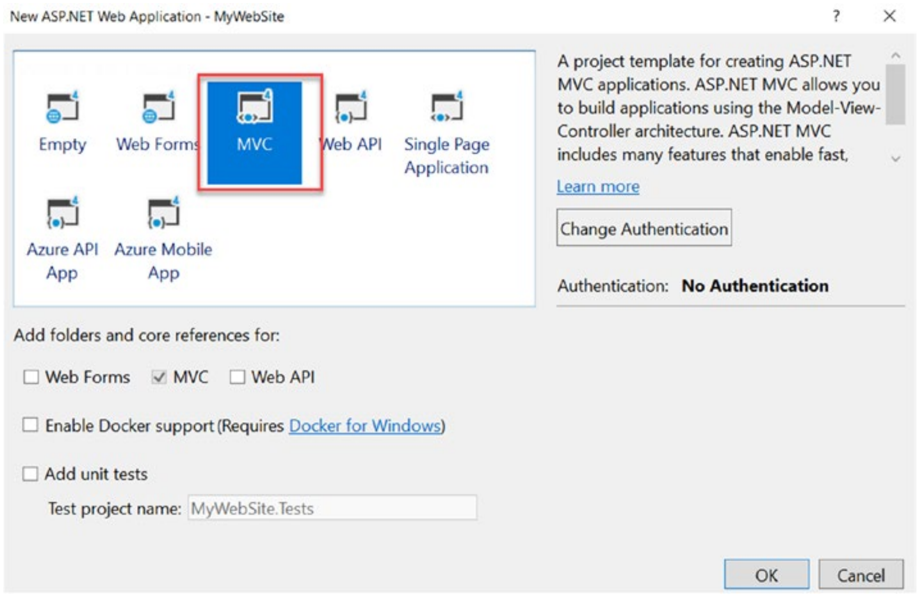
Solution name: MyWebSite

☑ Create directory for solution

☐ Add to Source Control

Figure 3-34. *Creating a new Web project in Visual Studio on your machine*

3. Select MVC and click OK. See Figure 3-35.


New ASP.NET Web Application - MyWebSite

A project template for creating ASP.NET MVC applications. ASP.NET MVC allows you to build applications using the Model-View-Controller architecture. ASP.NET MVC includes many features that enable fast,

Learn more

Change Authentication

Authentication: **No Authentication**

Add folders and core references for:

☐ Web Forms ☑ MVC ☐ Web API

☐ Enable Docker support (Requires Docker for Windows)

☐ Add unit tests

Test project name: MyWebSite.Tests

Figure 3-35. *Select MVC*

4. Left-click project and select Build. See Figure 3-36.

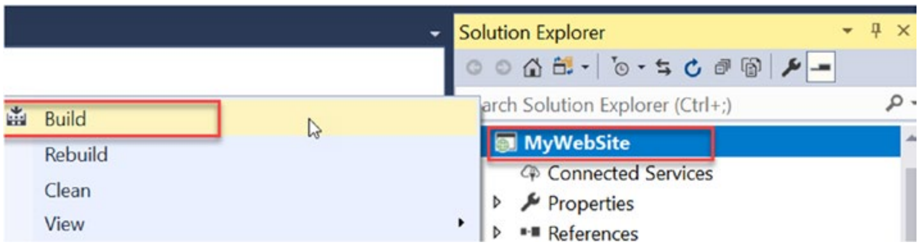


Figure 3-36. *Build the project*

5. In the upper-right corner of the Visual Studio IDE, you may have to sign in to your Azure account, in order to publish to the Azure account associated with it. See Figure 3-37.

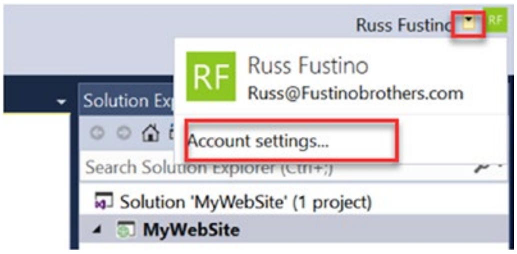


Figure 3-37. *Select Account settings and log in to the same account as with Azure*

6. Right-click the web app in Solution Explorer click Publish, and choose Azure App Service, which is the service that hosts web applications, mobile back ends, and web APIs in Azure. See Figure 3-38.

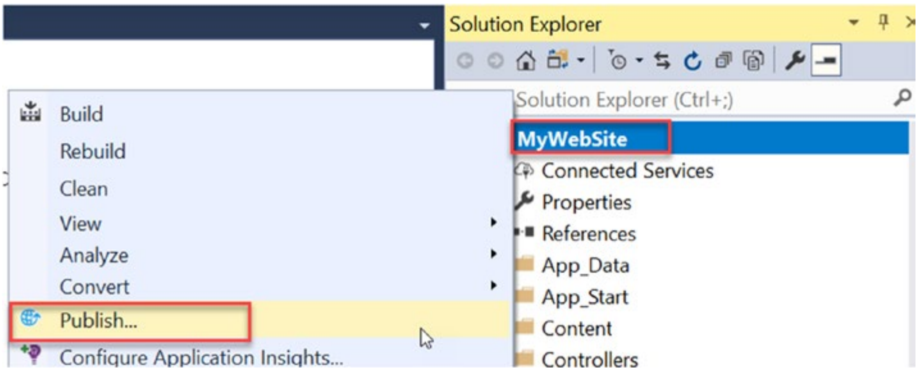
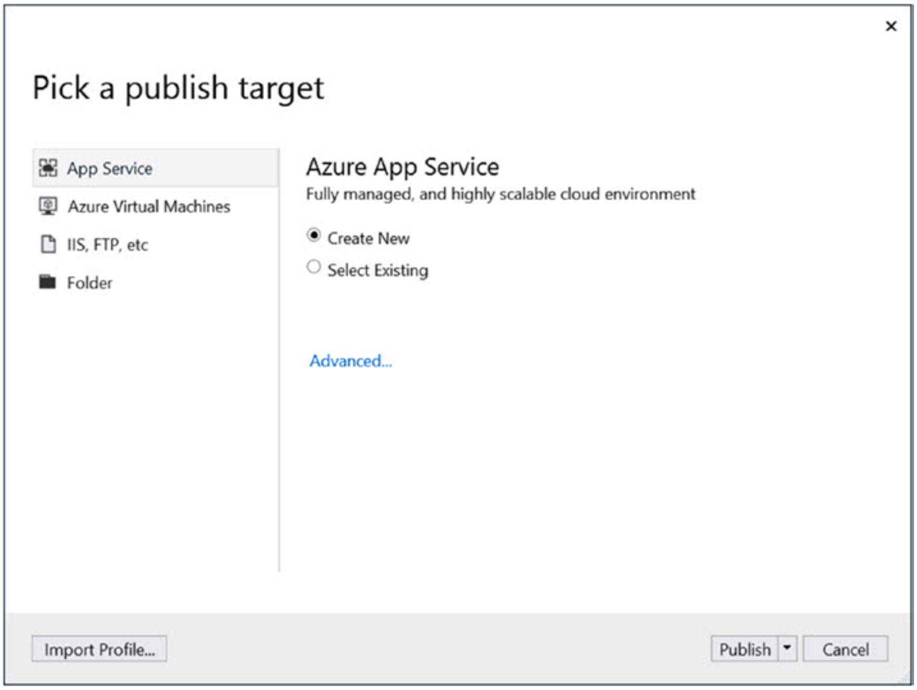


Figure 3-38. *Select Publish*

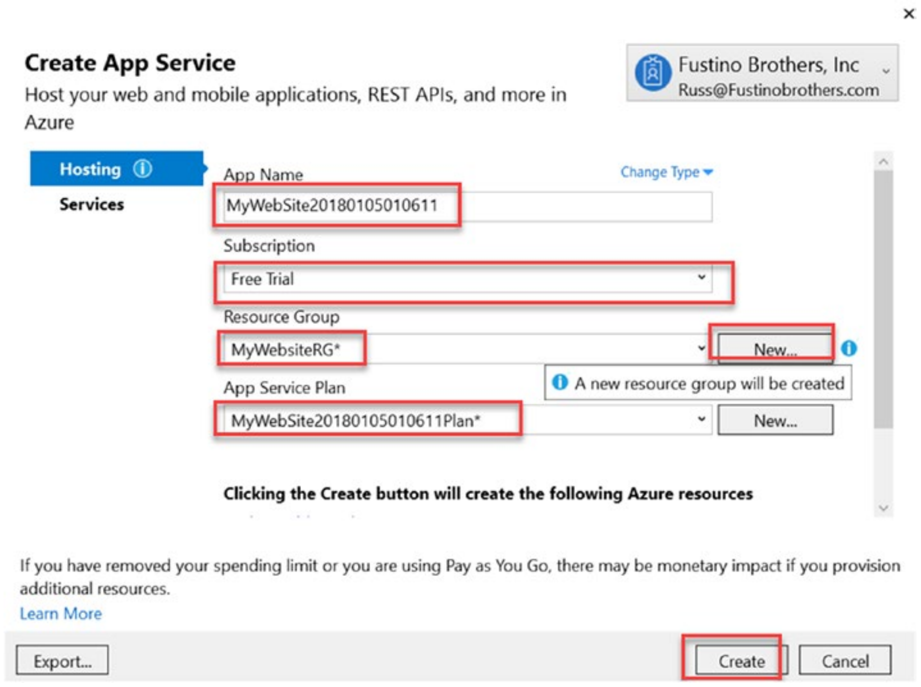
7. Here, we can choose one of our existing apps or create a new one. We will create a new web app, give it a name, and create a resource group (which is the container of multiple apps used by my application. Everything we create for this app will be associated with this new group). Finally, click Create. See Figures 3-39 and 3-40.


Pick a publish target

Azure App Service
Fully managed, and highly scalable cloud environment

(● Create New) ○ Select Existing

Figure 3-39. *Select Azure App Service, Create New, and Publish*



Create App Service

Host your web and mobile applications, REST APIs, and more in Azure

Fustino Brothers, Inc
Russ@Fustinobrothers.com

App Name: MyWebSite20180105010611

Subscription: Free Trial

Resource Group: MyWebsiteRG*

A new resource group will be created

App Service Plan: MyWebSite20180105010611Plan*

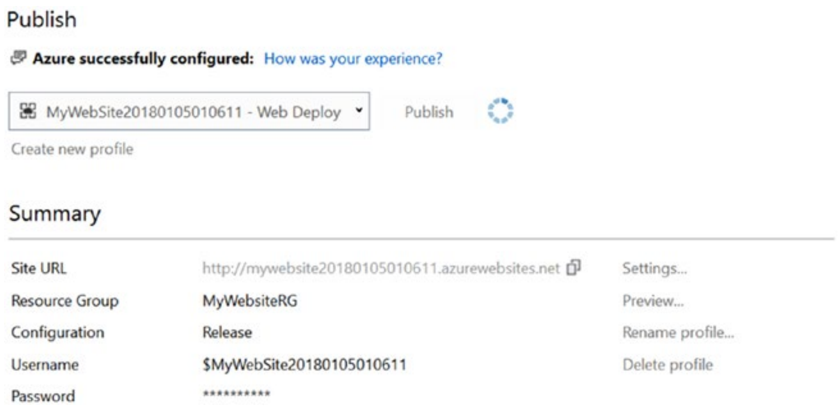
Clicking the Create button will create the following Azure resources

If you have removed your spending limit or you are using Pay as You Go, there may be monetary impact if you provision additional resources.

Learn More

Figure 3-40. *Provide App Name, select Subscription, create new Resource Group (MyWebsiteRG), and keep the App Service Plan default*

Visual Studio is now working with the Azure resource management APIs to create a new web app and will then automatically deploy our web app. See Figures 3-41 and 3-42.


Publish

Azure successfully configured: How was your experience?

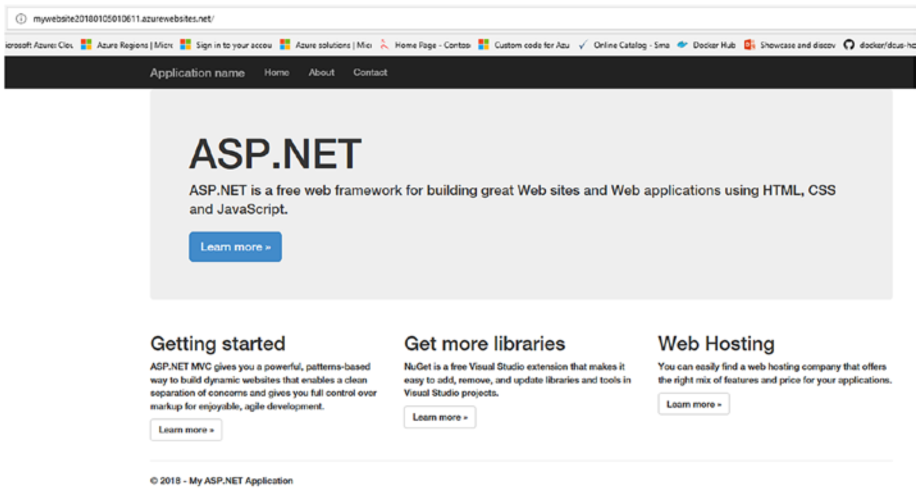
MyWebSite20180105010611 - Web Deploy | Publish

Create new profile

Summary

Site URL	http://mywebsite20180105010611.azurewebsites.net	Settings...
Resource Group	MyWebsiteRG	Preview...
Configuration	Release	Rename profile...
Username	$MyWebSite20180105010611	Delete profile
Password	**********	

Figure 3-41. *Azure is successfully configured*


mywebsite20180105010611.azurewebsites.net/

ASP.NET

ASP.NET is a free web framework for building great Web sites and Web applications using HTML, CSS and JavaScript.

Learn more »

Getting started

ASP.NET MVC gives you a powerful, patterns-based way to build dynamic websites that enables a clean separation of concerns and gives you full control over markup for enjoyable, agile development.

Learn more »

Get more libraries

NuGet is a free Visual Studio extension that makes it easy to add, remove, and update libraries and tools in Visual Studio projects.

Learn more »

Web Hosting

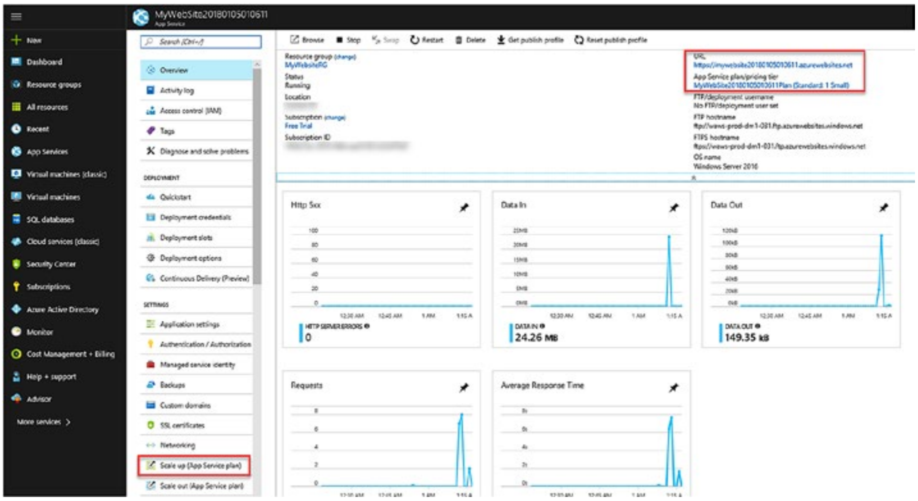
You can easily find a web hosting company that offers the right mix of features and price for your applications.

Learn more »

© 2018 - My ASP.NET Application

Figure 3-42. *Azure web site is running*

Let's switch over to the Azure portal and see what was created. In the portal, click App services. Another thing we can see here is that the web site is associated with an App Service plan, which is basically the pricing tier, or the features we are paying for. We can see that we are now using the Standard tier, but if we scroll down and click Scale up, we can see the full range of pricing tiers. For example, if we don't require strong compute power but need to associate a custom domain to our web site, we would choose the Standard S1 tier. We could also go with higher tiers, and then our resources are dedicated to us and can be shared among several web sites. We can add backup, SSL, and can load balance across regions and more. For now, let's stay with the free tier. See Figures 3-43 and 3-44.

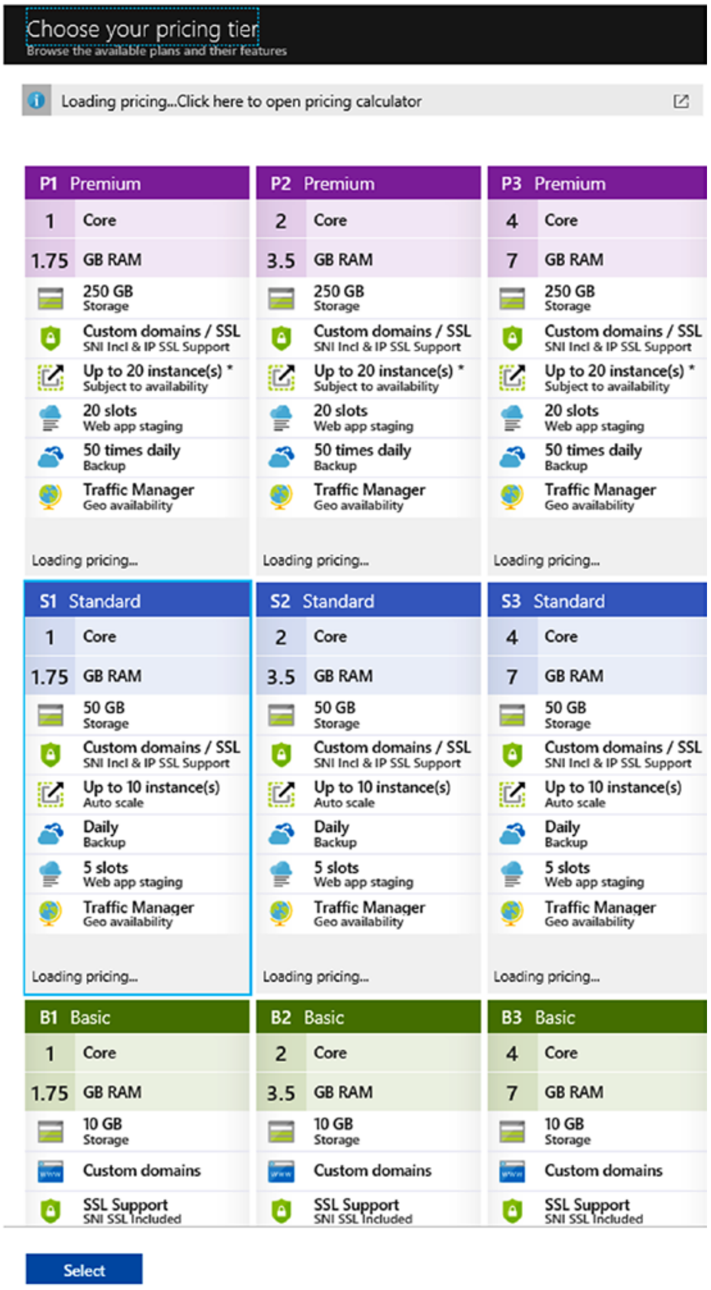


Resource group (change)
MyWebsiteRG
Status
Running
Location
[redacted]
Subscription (change)
Free Trial
Subscription ID
[redacted]

URL
https://mywebsite20180105010611.azurewebsites.net
App Service plan/pricing tier
MyWebSite20180105010611Plan (Standard: 1 Small)
FTP/deployment username
No FTP/deployment user set
FTP hostname
ftp://waws-prod-dm1-031.ftp.azurewebsites.windows.net
FTPS hostname
ftps://waws-prod-dm1-031.ftp.azurewebsites.windows.net
OS name
Windows Server 2016

HTTP SERVER ERRORS 0
DATA IN 24.26 MB
DATA OUT 149.35 kB

Figure 3-43. See associated service plan and click Scale up to see options



Choose your pricing tier
Browse the available plans and their features

Loading pricing...Click here to open pricing calculator

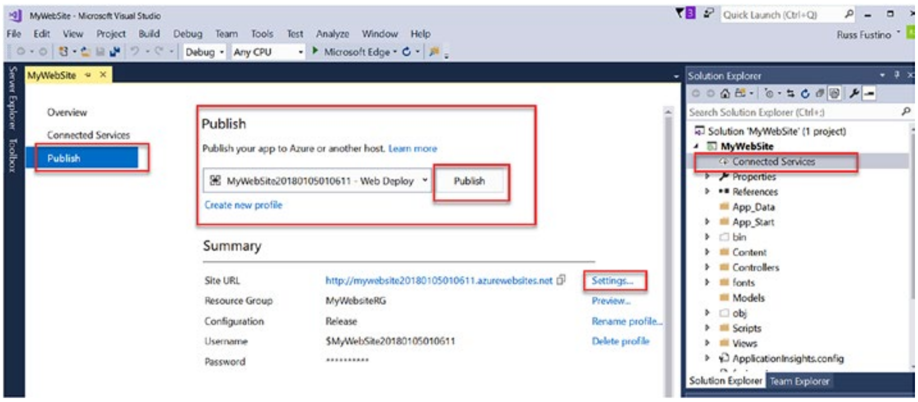
P1 Premium	P2 Premium	P3 Premium
1 Core	2 Core	4 Core
1.75 GB RAM	3.5 GB RAM	7 GB RAM
250 GB Storage	250 GB Storage	250 GB Storage
Custom domains / SSL SNI Incl & IP SSL Support	Custom domains / SSL SNI Incl & IP SSL Support	Custom domains / SSL SNI Incl & IP SSL Support
Up to 20 instance(s) * Subject to availability	Up to 20 instance(s) * Subject to availability	Up to 20 instance(s) * Subject to availability
20 slots Web app staging	20 slots Web app staging	20 slots Web app staging
50 times daily Backup	50 times daily Backup	50 times daily Backup
Traffic Manager Geo availability	Traffic Manager Geo availability	Traffic Manager Geo availability
Loading pricing...	Loading pricing...	Loading pricing...

S1 Standard	S2 Standard	S3 Standard
1 Core	2 Core	4 Core
1.75 GB RAM	3.5 GB RAM	7 GB RAM
50 GB Storage	50 GB Storage	50 GB Storage
Custom domains / SSL SNI Incl & IP SSL Support	Custom domains / SSL SNI Incl & IP SSL Support	Custom domains / SSL SNI Incl & IP SSL Support
Up to 10 instance(s) Auto scale	Up to 10 instance(s) Auto scale	Up to 10 instance(s) Auto scale
Daily Backup	Daily Backup	Daily Backup
5 slots Web app staging	5 slots Web app staging	5 slots Web app staging
Traffic Manager Geo availability	Traffic Manager Geo availability	Traffic Manager Geo availability
Loading pricing...	Loading pricing...	Loading pricing...

B1 Basic	B2 Basic	B3 Basic
1 Core	2 Core	4 Core
1.75 GB RAM	3.5 GB RAM	7 GB RAM
10 GB Storage	10 GB Storage	10 GB Storage
Custom domains	Custom domains	Custom domains
SSL Support SNI SSL Included	SSL Support SNI SSL Included	SSL Support SNI SSL Included

Figure 3-44. *Service plan tiers*

Visual Studio has added a deployment profile file to my project, with information about the app service I am deploying my web app to, so the next time, I'd like to push those changes to Azure. All I must do is hit Publish again. Visual Studio has all the information it requires to deploy it. Click Connected Services under Solution Explorer and click the Publish tab, as shown in Figure 3-45.



Publish

Publish your app to Azure or another host. Learn more

MyWebSite20180105010611 - Web Deploy | Publish

Create new profile

Summary

Site URL	http://mywebsite20180105010611.azurewebsites.net	Settings...
Resource Group	MyWebsiteRG	Preview...
Configuration	Release	Rename profile...
Username	$MyWebSite20180105010611	Delete profile
Password	**********	

Figure 3-45. *Connected Services are retained*

So, we saw how to create a virtual machine through the portal, and how to create and deploy a web site using Visual Studio. Now, I'd like to show you how you can script it.

Azure CLI

The Azure command-line interface (CLI) has two scripting options. If you're a Windows user and are familiar with PowerShell, Azure has PowerShell cmdlets that let you leverage the rich capabilities that PowerShell provides. If you feel more comfortable in the command line, or are using a Mac or Linux, you can use the cross platform command-line tools to do the same things. Behind the scenes, both Azure PowerShell and the Azure command-line interface interact with the same set of APIs, so the capabilities are very similar. It is a matter of personal choice.

Before I discuss the CLI tools, I am going to show you how to install them on your own machine.

1. Go to `azure.microsoft.com` and, at the bottom of the page, click Downloads. Scroll down to see the CLI tools. See Figures 3-46 and 3-47.

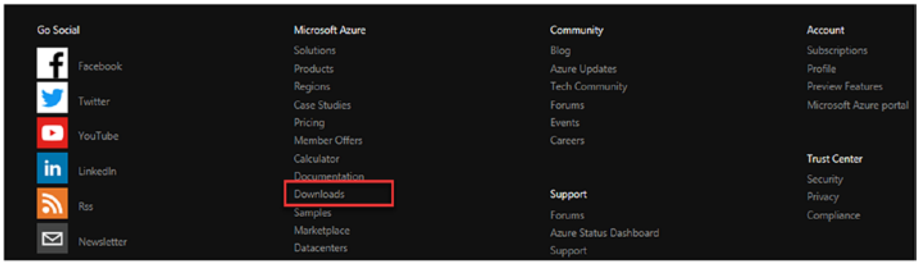


Figure 3-46. *Select Downloads at the bottom of the `azure.microsoft.com` page*

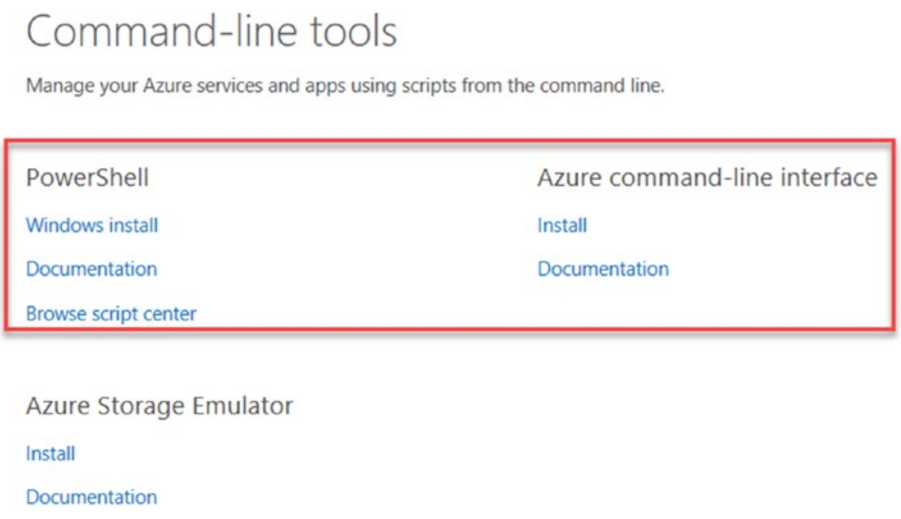


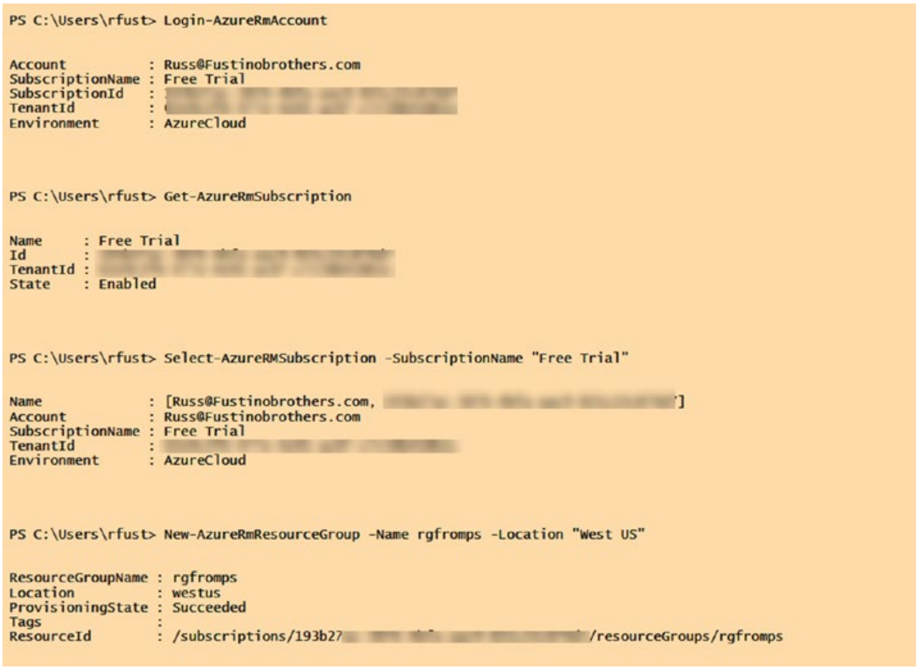
Figure 3-47. *Select PowerShell and command-line installs*

2. Open PowerShell and note a few things we can do with the Azure PowerShell tools, as follows:

PowerShell

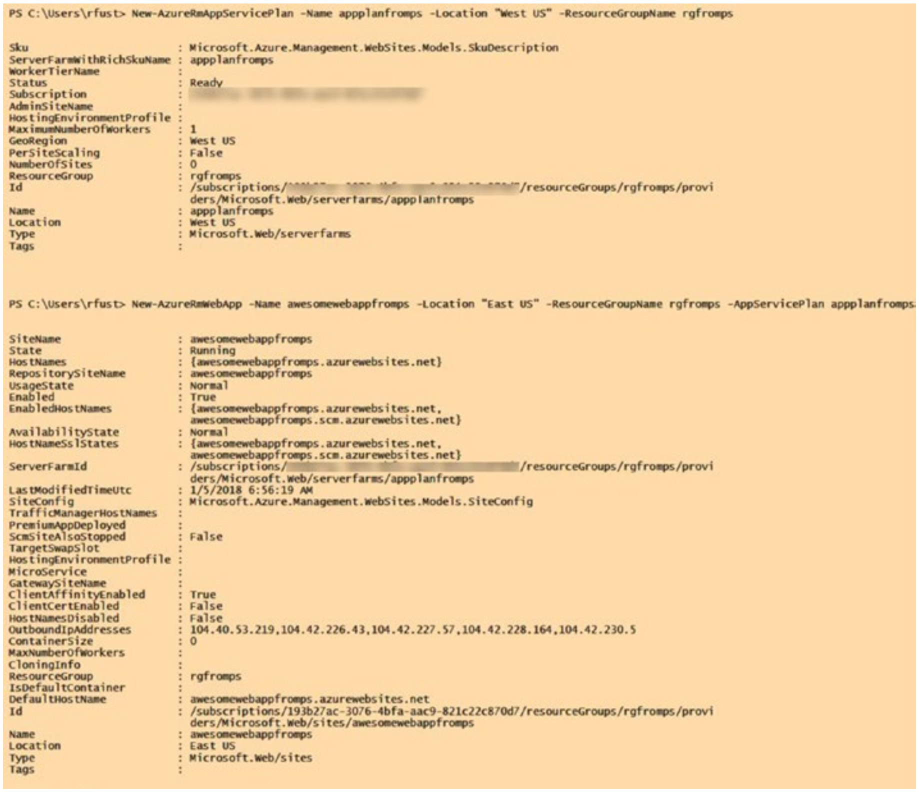
```
Login-AzureRmAccount
Get-AzureRmSubscription
Select-AzureRMSubscription -SubscriptionName "subname"
New-AzureRmResourceGroup -Name rgfromps -Location "West US"
New-AzureRmAppServicePlan -Name appplanfromps -Location
"West US" -ResourceGroupName rgfromps
New-AzureRmWebApp -Name awesomewebappfromps -Location
"East US" -ResourceGroupName rgfromps -AppServicePlan
appplanfromps
```

3. Within a few seconds, we were able to create a new web app running on Azure. See Figures 3-48 and 3-49.



```
PS C:\Users\rfust> Login-AzureRmAccount

Account          : Russ@Fustinobrothers.com
SubscriptionName : Free Trial
SubscriptionId   : [redacted]
TenantId         :
Environment      : AzureCloud


PS C:\Users\rfust> Get-AzureRmSubscription

Name     : Free Trial
Id       : [redacted]
TenantId :
State    : Enabled


PS C:\Users\rfust> Select-AzureRMSubscription -SubscriptionName "Free Trial"

Name             : [Russ@Fustinobrothers.com, [redacted]]
Account          : Russ@Fustinobrothers.com
SubscriptionName : Free Trial
TenantId         : [redacted]
Environment      : AzureCloud


PS C:\Users\rfust> New-AzureRmResourceGroup -Name rgfromps -Location "West US"

ResourceGroupName : rgfromps
Location          : westus
ProvisioningState : Succeeded
Tags              :
ResourceId        : /subscriptions/193b27[redacted]/resourceGroups/rgfromps
```

Figure 3-48. *PowerShell commands*



```
PS C:\Users\rfust> New-AzureRmAppServicePlan -Name appplanfromps -Location "West US" -ResourceGroupName rgfromps


Sku                       : Microsoft.Azure.Management.WebSites.Models.SkuDescription
ServerFarmWithRichSkuName : appplanfromps
WorkerTierName            :
Status                    : Ready
Subscription              : [redacted]
AdminSiteName             :
HostingEnvironmentProfile :
MaximumNumberOfWorkers    : 1
GeoRegion                 : West US
PerSiteScaling            : False
NumberOfSites             : 0
ResourceGroup             : rgfromps
Id                        : /subscriptions/[redacted]/resourceGroups/rgfromps/provi
                            ders/Microsoft.Web/serverfarms/appplanfromps
Name                      : appplanfromps
Location                  : West US
Type                      : Microsoft.Web/serverfarms
Tags                      :



PS C:\Users\rfust> New-AzureRmWebApp -Name awesomewebappfromps -Location "East US" -ResourceGroupName rgfromps -AppServicePlan appplanfromps


SiteName                  : awesomewebappfromps
State                     : Running
HostNames                 : {awesomewebappfromps.azurewebsites.net}
RepositorySiteName        : awesomewebappfromps
UsageState                : Normal
Enabled                   : True
EnabledHostNames          : {awesomewebappfromps.azurewebsites.net,
                            awesomewebappfromps.scm.azurewebsites.net}
AvailabilityState         : Normal
HostNameSslStates         : {awesomewebappfromps.azurewebsites.net,
                            awesomewebappfromps.scm.azurewebsites.net}
ServerFarmId              : /subscriptions/[redacted]/resourceGroups/rgfromps/provi
                            ders/Microsoft.Web/serverfarms/appplanfromps
LastModifiedTimeUtc       : 1/5/2018 6:56:19 AM
SiteConfig                : Microsoft.Azure.Management.WebSites.Models.SiteConfig
TrafficManagerHostNames   :
PremiumAppDeployed        :
ScmSiteAlsoStopped        : False
TargetSwapSlot            :
HostingEnvironmentProfile :
MicroService              :
GatewaySiteName           :
ClientAffinityEnabled     : True
ClientCertEnabled         : False
HostNamesDisabled         : False
OutboundIpAddresses       : 104.40.53.219,104.42.226.43,104.42.227.57,104.42.228.164,104.42.230.5
ContainerSize             : 0
MaxNumberOfWorkers        :
CloningInfo               :
ResourceGroup             : rgfromps
IsDefaultContainer        :
DefaultHostName           : awesomewebappfromps.azurewebsites.net
Id                        : /subscriptions/193b27ac-3076-4bfa-aac9-821c22c870d7/resourceGroups/rgfromps/provi
                            ders/Microsoft.Web/sites/awesomewebappfromps
Name                      : awesomewebappfromps
Location                  : East US
Type                      : Microsoft.Web/sites
Tags                      :
```

Figure 3-49. *PowerShell commands*

4. Now switch back to the portal and search for that web app. In Figure 3-50, you can see that it is associated with the plan and resource group we just created.

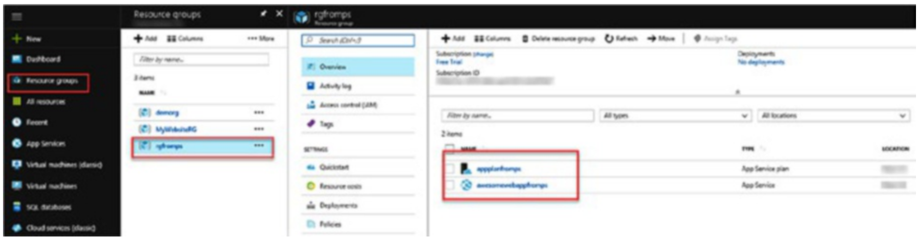


Figure 3-50. *Web app and service plan created with PowerShell*

5. Deploy a web app from GitHub, not from Visual Studio. To do that, you will need a repository on GitHub that has a web application that you can deploy. Luckily, Azure has a code samples gallery that is all based on GitHub. Go to `azure.microsoft.com`, and from the Resources menu, select Samples, to get to the samples gallery. Here, search for HTML and find the HTML sample for Azure App Service sample. See Figures 3-51 and 3-52.

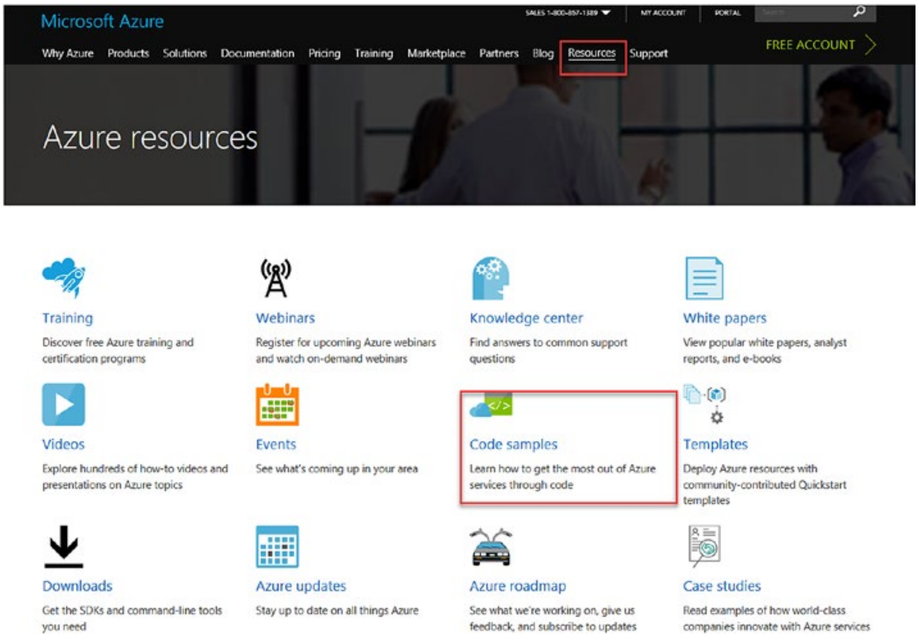
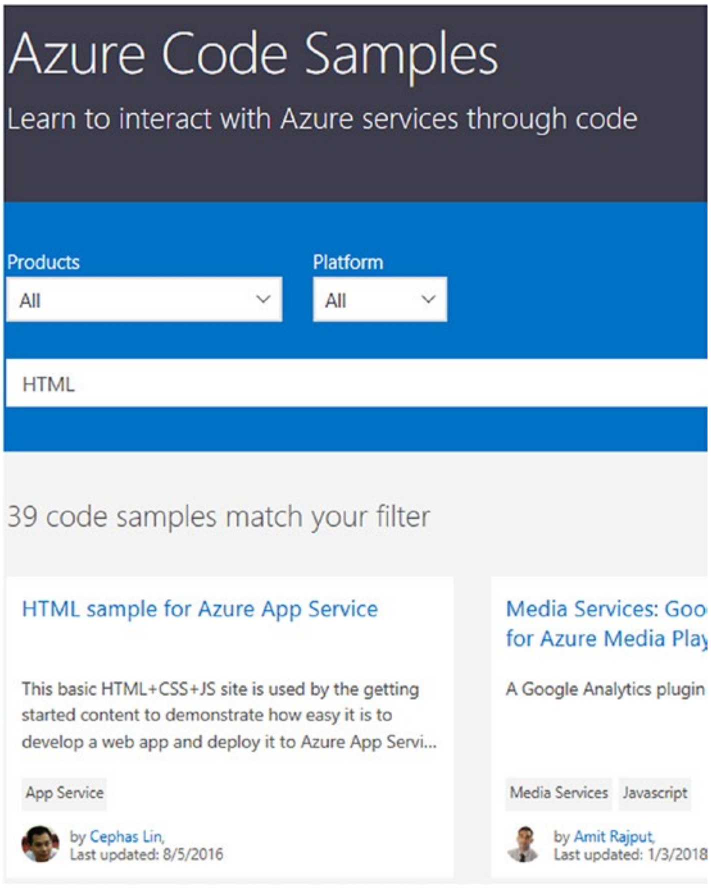

Microsoft Azure
SALES 1-800-867-1389
MY ACCOUNT
PORTAL
Why Azure
Products
Solutions
Documentation
Pricing
Training
Marketplace
Partners
Blog
Resources
Support
FREE ACCOUNT
Azure resources
Training
Discover free Azure training and certification programs
Webinars
Register for upcoming Azure webinars and watch on-demand webinars
Knowledge center
Find answers to common support questions
White papers
View popular white papers, analyst reports, and e-books
Videos
Explore hundreds of how-to videos and presentations on Azure topics
Events
See what's coming up in your area
Code samples
Learn how to get the most out of Azure services through code
Templates
Deploy Azure resources with community-contributed Quickstart templates
Downloads
Get the SDKs and command-line tools you need
Azure updates
Stay up to date on all things Azure
Azure roadmap
See what we're working on, give us feedback, and subscribe to updates
Case studies
Read examples of how world-class companies innovate with Azure services

Figure 3-51. *Go to the Resources menu and select Code samples*


Azure Code Samples

Learn to interact with Azure services through code

Products: All

Platform: All

HTML

39 code samples match your filter

HTML sample for Azure App Service

This basic HTML+CSS+JS site is used by the getting started content to demonstrate how easy it is to develop a web app and deploy it to Azure App Servi...

App Service

by Cephas Lin, Last updated: 8/5/2016

Media Services: Goo for Azure Media Play

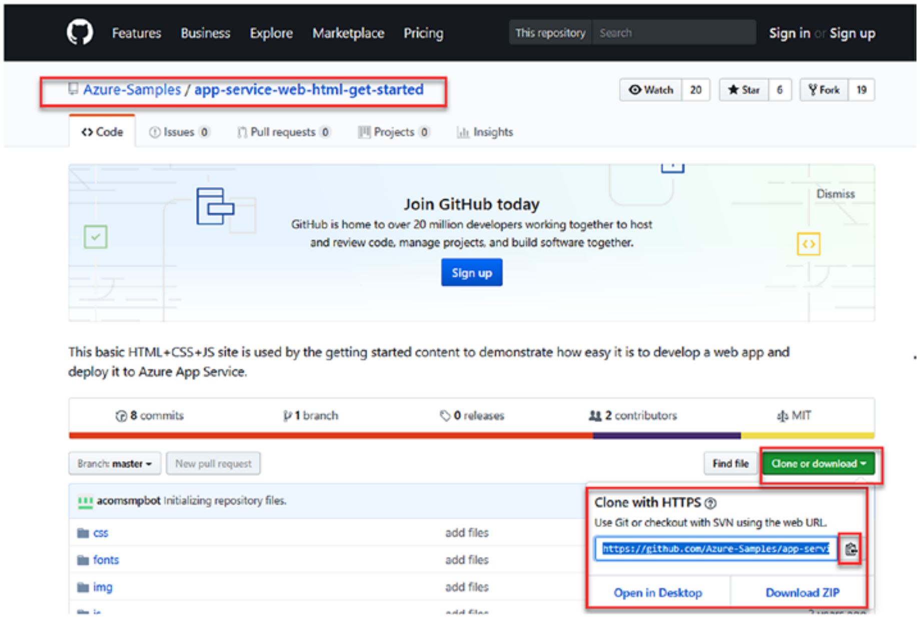
A Google Analytics plugin

Media Services Javascript

by Amit Rajput, Last updated: 1/3/2018

Figure 3-52. *Select HTML sample for Azure App Service*

6. Browse GitHub and grab the clone URL, as shown in Figure 3-53.



Join GitHub today

GitHub is home to over 20 million developers working together to host and review code, manage projects, and build software together.

This basic HTML+CSS+JS site is used by the getting started content to demonstrate how easy it is to develop a web app and deploy it to Azure App Service.

acomsmpbot Initializing repository files.

Clone with HTTPS

Use Git or checkout with SVN using the web URL.

https://github.com/Azure-Samples/app-servi

Figure 3-53. *Copy the clone URL*

7. Now, go back to the portal and, on the MVC demo web app, select Deployment options, then External Repository, and paste that URL. When you click Deployment options again, you will see that the portal has already deployed that app to your web site. See Figures 3-54, 3-55, and 3-56.

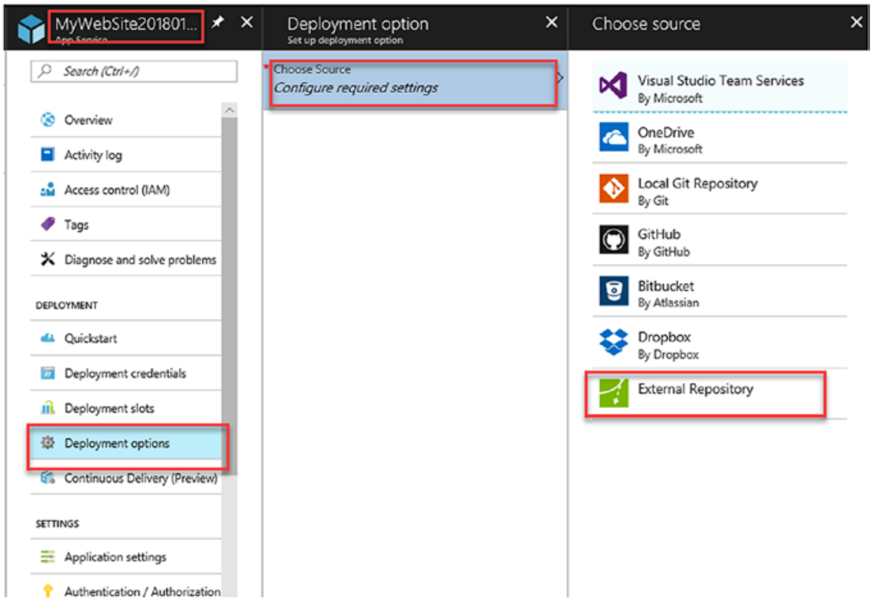
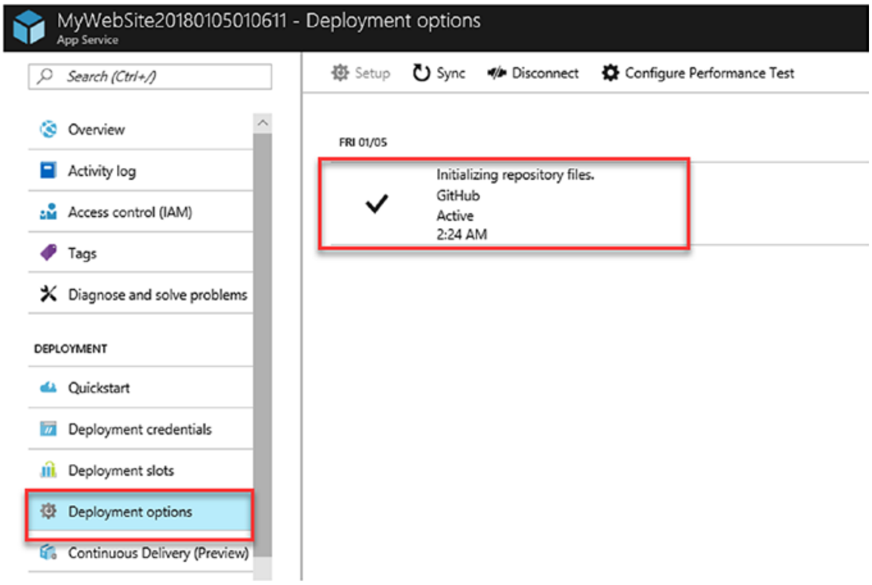
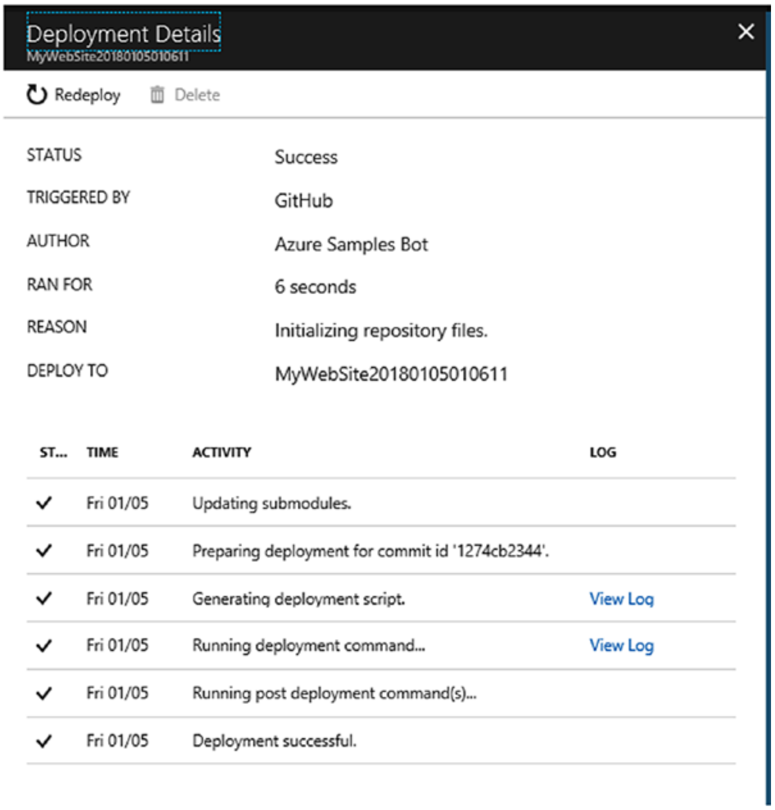


Figure 3-54. *Deployment options for the MVC web site. Select External Repository and paste in the clone URL*



Initializing repository files.
GitHub
Active
2:24 AM

Figure 3-55. *The portal has deployed the app to the site*



STATUS	Success
TRIGGERED BY	GitHub
AUTHOR	Azure Samples Bot
RAN FOR	6 seconds
REASON	Initializing repository files.
DEPLOY TO	MyWebSite20180105010611

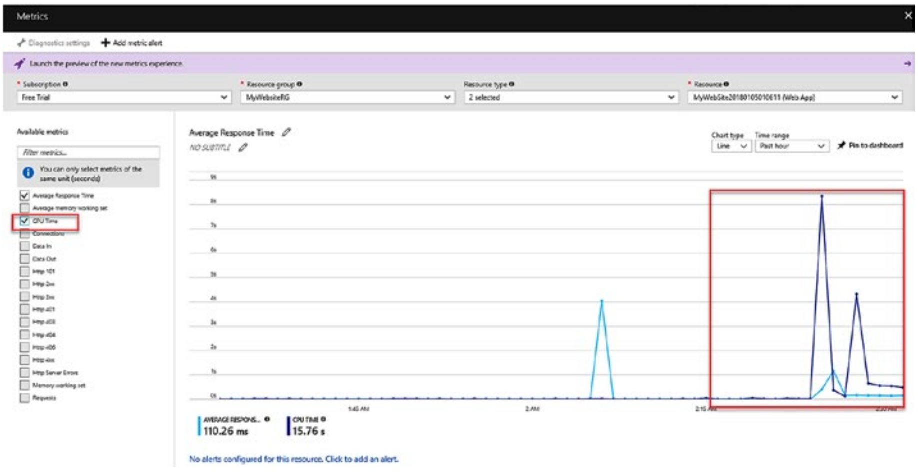
ST...	TIME	ACTIVITY	LOG
✓	Fri 01/05	Updating submodules.	
✓	Fri 01/05	Preparing deployment for commit id '1274cb2344'.	
✓	Fri 01/05	Generating deployment script.	View Log
✓	Fri 01/05	Running deployment command...	View Log
✓	Fri 01/05	Running post deployment command(s)...	
✓	Fri 01/05	Deployment successful.	

Figure 3-56. *Deployment details*

> There are a few more things you can do with your web apps through the portal. You can set up backups, scale them up, scale them out, configure a custom domain name, set up SSL, set SSL up for security scanning, and even visit a live console and explore your application in production—all within that rich Azure portal.

On the web site blade, and, if you are a DevOps person and want to keep an eye on the site's metrics, you can consult the chart in Figure 3-57.

8. Click and add more metrics that you are interested in, such as the number of 200 requests, 404s, and more. You can even take this chart and pin it to your main dashboard and make it your personal DevOps dashboard, with all the information you require on your running services. In fact, you can click Edit dashboard and customize this dashboard the way you want.


Subscription: Free Trial
Resource group: MyWebsiteRG
Resource type: 2 selected
Resource: MyWebSite20180105010611 (Web App)

Average Response Time
Chart type: Line
Time range: Past hour

Available metrics:
- [✓] Average Response Time
- [ ] Average memory working set
- [✓] CPU Time
- [ ] Connections
- [ ] Data In
- [ ] Data Out
- [ ] Http 101
- [ ] Http 2xx
- [ ] Http 3xx
- [ ] Http 401
- [ ] Http 403
- [ ] Http 404
- [ ] Http 406
- [ ] Http 4xx
- [ ] Http Server Errors
- [ ] Memory working set
- [ ] Requests

You can only select metrics of the same unit (seconds)

AVERAGE RESPONS... 110.26 ms
CPU TIME 15.76 s

No alerts configured for this resource. Click to add an alert.

Figure 3-57. *Click any chart and add metrics, by clicking items on the left. Here CPU Time has been added.*

So, we've created a VM and some web apps. Now we need a database.

SQL Database

There are two ways you can run SQL databases on Azure. You can install SQL Server on a VM and get full control over the configuration of the database. In fact, SQL Server running on a VM is one of the most popular things people do on Azure.

Another way is to use the Azure SQL Database service, which lets you create your database in seconds, without having to take care of any infrastructure or manage software updates.

Creating Your Database

To create an SQL database in Azure, we can take the same approaches we've seen before. We can create it from the portal or enlist the Azure CLI or PowerShell to do it. We will use the portal.

1. Click New, and from the database category, choose SQL Database. See Figure 3-58.

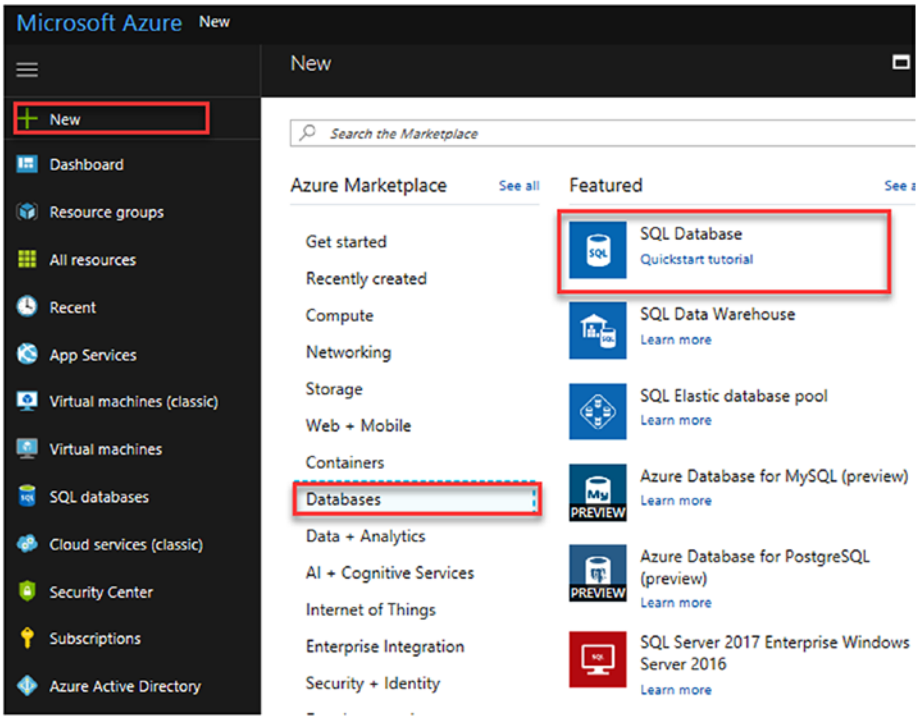
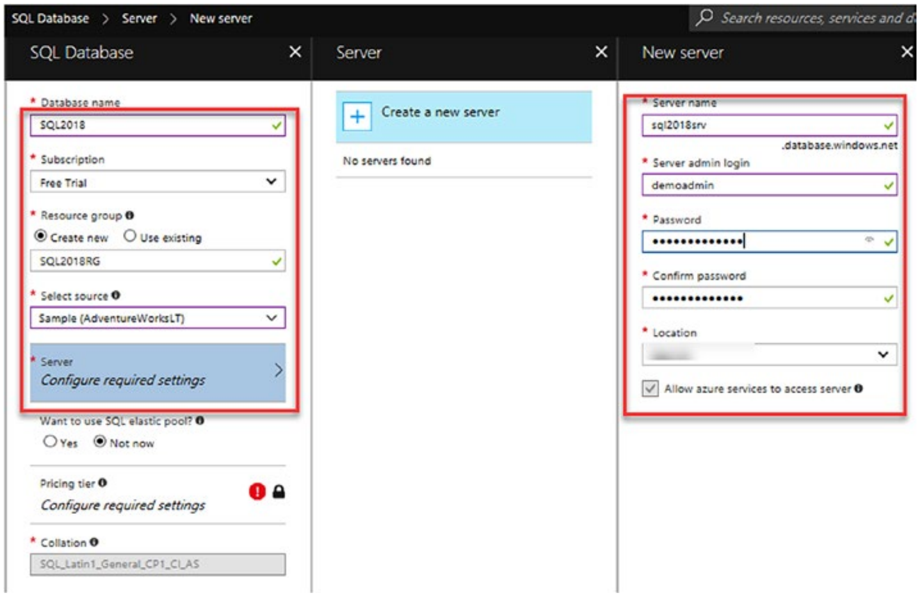


Figure 3-58. *Click +New ➤ Databases and select SQL Database*

2. Give it a name (SQL2018) and create a new resource group. We can create our database as a new empty database, seed it with sample data, or create it from a backup that may have been created earlier. Here we are selecting the source as a Sample AdventureWorks database. This could also be the easiest way to move your databases to the cloud. Just upload a backup and create a database from it. We can create a new database server (that can hold multiple database instances) and choose a location with credentials. See Figure 3-59. For the credentials, use the following:

```
demoadmin, Demo@pass123
```



SQL Database > Server > New server

Search resources, services and d

SQL Database

* Database name: SQL2018

* Subscription: Free Trial

* Resource group: [✓ Create new] Use existing

SQL2018RG

* Select source: Sample (AdventureWorksLT)

* Server: Configure required settings

Want to use SQL elastic pool? Yes [✓ Not now]

Pricing tier: Configure required settings

* Collation: SQL_Latin1_General_CP1_CI_AS

Server

Create a new server

No servers found

New server

* Server name: sql2018srv .database.windows.net

* Server admin login: demoadmin

* Password: •••••••••••••

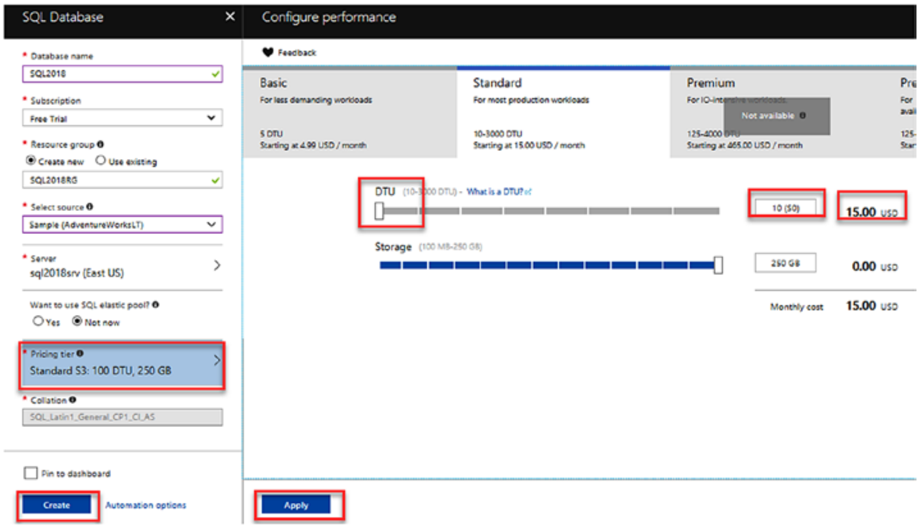
* Confirm password: •••••••••••••

* Location:

☑ Allow azure services to access server

Figure 3-59. *Enter database name, select subscription, select sample date, create a new resource group called SQL2018RG, configure server with name sql2018srv, and provide credentials*

3. Choose a pricing tier. As you can see, you can play around with SQL databases for as little as $5 per month, at the lowest performance tier. SQL databases use DTUs—data transaction units—as a performance measurement. So, as you check out the different pricing tiers, this is the number you should pay the most attention to. As your solution grows, you can scale your database and change your pricing tier at any point, without any downtime. See Figure 3-60.


SQL Database

* Database name: SQL2018

* Subscription: Free Trial

* Resource group: [✓ Create new] Use existing — SQL2018RG

* Select source: Sample (AdventureWorksLT)

* Server: sql2018srv (East US)

Want to use SQL elastic pool? Yes [✓ Not now]

* Pricing tier: Standard S3: 100 DTU, 250 GB

* Collation: SQL_Latin1_General_CP1_CI_AS

Pin to dashboard

Configure performance

Basic	Standard	Premium
For less demanding workloads	For most production workloads	For IO-intensive workloads.
5 DTU	10-3000 DTU	125-4000 DTU
Starting at 4.99 USD / month	Starting at 15.00 USD / month	Starting at 465.00 USD / month

DTU (10-3000 DTU) — 10 (S0) — 15.00 USD

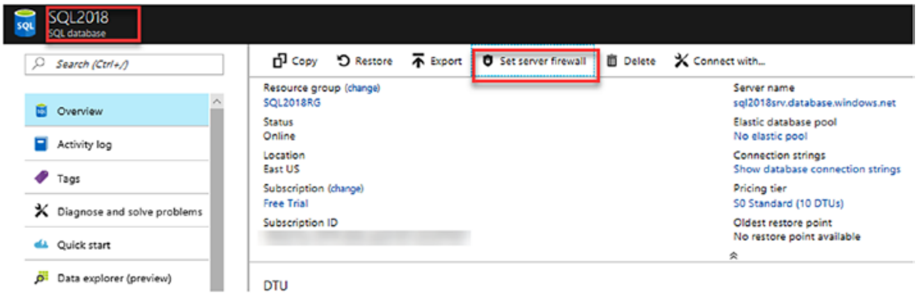
Storage (100 MB-250 GB) — 250 GB — 0.00 USD

Monthly cost 15.00 USD

Figure 3-60. *Under Pricing Tier, slide DTU all the way to the left, and you will see the current cost. Here it is $15.00 per month for 250GB of storage. Click Create and Apply.*

4. Provisioning a database can take a few minutes, and you can check the notification area in the portal to get the latest update. Once the database is provisioned, you can start monitoring it. You can set up geo-replication, scale it up to a different tier, based on your performance needs, configure security, and more.

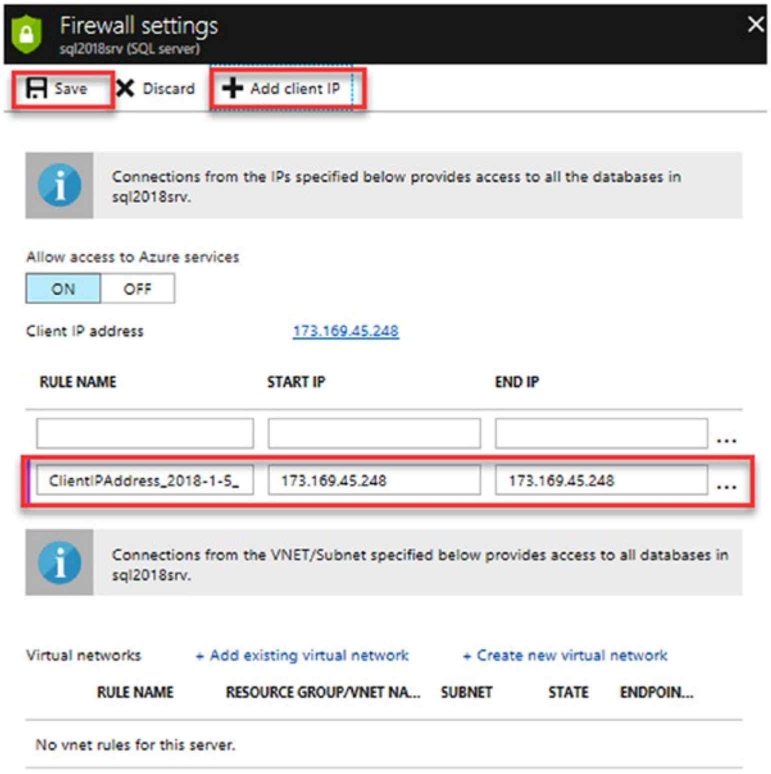
5. Open SQL2018 after it deploys. To access it on the server we just created for the database, add white list IP addresses by clicking Set server firewall rules. Add client IP and save. This will allow access to your IP or IP addresses range. Click save. Now you can connect through a client library or SDK or a management tool. Azure SQL Database allows you to connect to it from a variety of programing languages, such as .NET, Java, PHP, Python, and more. See Figures 3-61 and 3-62.



Resource group (change)
SQL2018RG
Status
Online
Location
East US
Subscription (change)
Free Trial
Subscription ID
[redacted]

Server name
sql2018srv.database.windows.net
Elastic database pool
No elastic pool
Connection strings
Show database connection strings
Pricing tier
S0 Standard (10 DTUs)
Oldest restore point
No restore point available

Figure 3-61. *Select Set server firewall*



Connections from the IPs specified below provides access to all the databases in sql2018srv.

Allow access to Azure services [✓ ON] OFF

Client IP address 173.169.45.248

RULE NAME	START IP	END IP
ClientIPAddress_2018-1-5_	173.169.45.248	173.169.45.248

Connections from the VNET/Subnet specified below provides access to all databases in sql2018srv.

Virtual networks + Add existing virtual network + Create new virtual network

RULE NAME	RESOURCE GROUP/VNET NA...	SUBNET	STATE	ENDPOIN...
No vnet rules for this server.				

Figure 3-62. *Click Add client IP, then Save*

Let's connect to this database, to see the sample data that was populated into the database, and run queries against it.

Using Visual Studio to Verify Your Database

After you have created a database, the next thing you will want to do is see the sample data that you seeded it with. In the following steps, we will bring up Server Explorer and connect to the Azure database and then view the data using the SQL Server Object Explorer.

1. Open Visual Studio, navigate to Server Explorer, and connect to Microsoft Azure Subscription. See Figure 3-63.

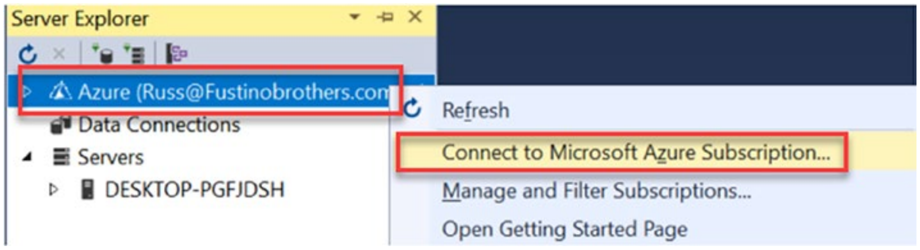

Server Explorer
Azure (Russ@Fustinobrothers.com
Data Connections
Servers
DESKTOP-PGFJDSH
Refresh
Connect to Microsoft Azure Subscription...
Manage and Filter Subscriptions...
Open Getting Started Page

***Figure 3-63.** From Server Explorer, right-click Azure and select Connect to Microsoft Azure Subscription*

2. Expand the database and right-click and select Open in SQL Server Object Explorer. See Figure 3-64.

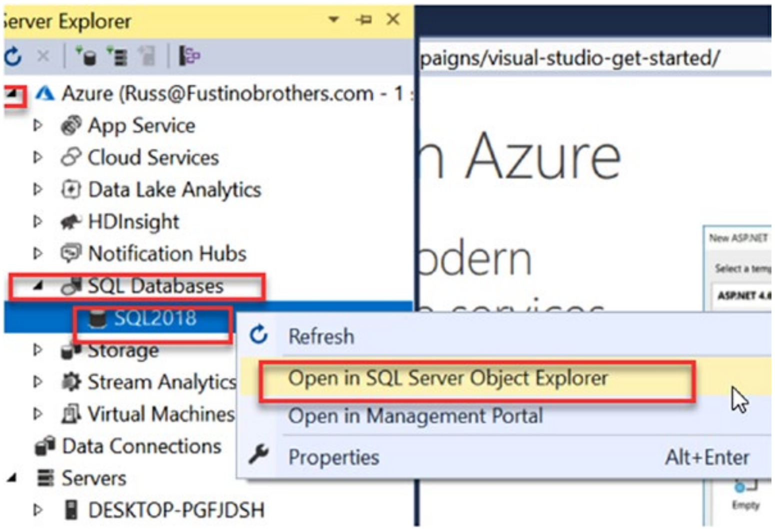


***Figure 3-64.** From Server Explorer, expand SQL Databases, Right click on SQL2018 and select Open in SQL Server Object Explorer*

3. Query the existing table by right-clicking the database table and selecting View Data. See Figures 3-65 and 3-66.

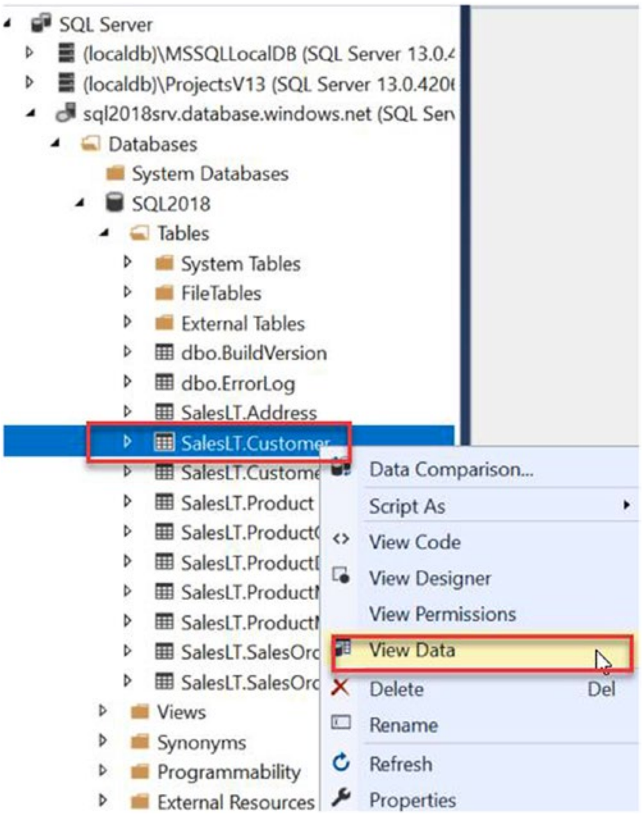
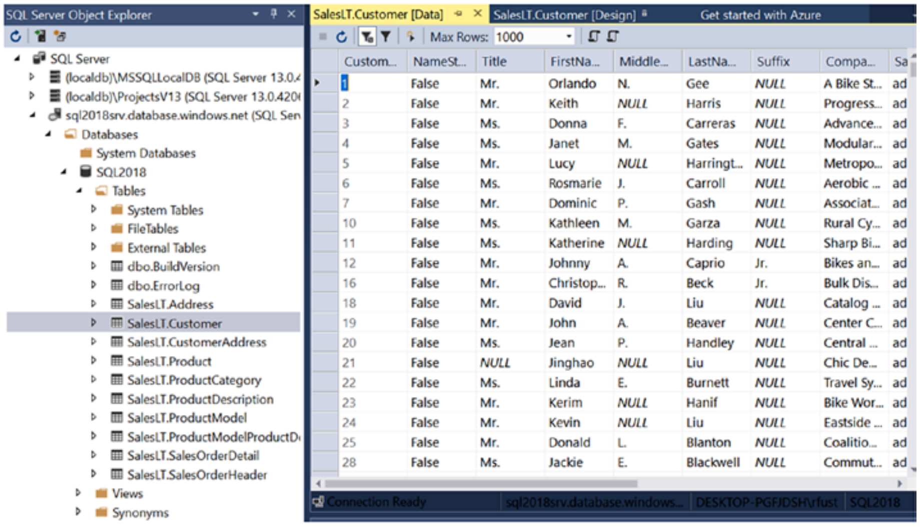


Figure 3-65. *Right-click a table and select View Data*



Custom...	NameSt...	Title	FirstNa...	Middle...	LastNa...	Suffix	Compa...	Sa
1	False	Mr.	Orlando	N.	Gee	NULL	A Bike St...	ad
2	False	Mr.	Keith	NULL	Harris	NULL	Progress...	ad
3	False	Ms.	Donna	F.	Carreras	NULL	Advance...	ad
4	False	Ms.	Janet	M.	Gates	NULL	Modular...	ad
5	False	Mr.	Lucy	NULL	Harringt...	NULL	Metropo...	ad
6	False	Ms.	Rosmarie	J.	Carroll	NULL	Aerobic ...	ad
7	False	Mr.	Dominic	P.	Gash	NULL	Associat...	ad
10	False	Ms.	Kathleen	M.	Garza	NULL	Rural Cy...	ad
11	False	Ms.	Katherine	NULL	Harding	NULL	Sharp Bi...	ad
12	False	Mr.	Johnny	A.	Caprio	Jr.	Bikes an...	ad
16	False	Mr.	Christop...	R.	Beck	Jr.	Bulk Dis...	ad
18	False	Mr.	David	J.	Liu	NULL	Catalog ...	ad
19	False	Mr.	John	A.	Beaver	NULL	Center C...	ad
20	False	Ms.	Jean	P.	Handley	NULL	Central ...	ad
21	False	NULL	Jinghao	NULL	Liu	NULL	Chic De...	ad
22	False	Ms.	Linda	E.	Burnett	NULL	Travel Sy...	ad
23	False	Mr.	Kerim	NULL	Hanif	NULL	Bike Wor...	ad
24	False	Mr.	Kevin	NULL	Liu	NULL	Eastside ...	ad
25	False	Mr.	Donald	L.	Blanton	NULL	Coalitio...	ad
28	False	Ms.	Jackie	E.	Blackwell	NULL	Commut...	ad

Figure 3-66. *Rows for the table are retrieved and displayed*

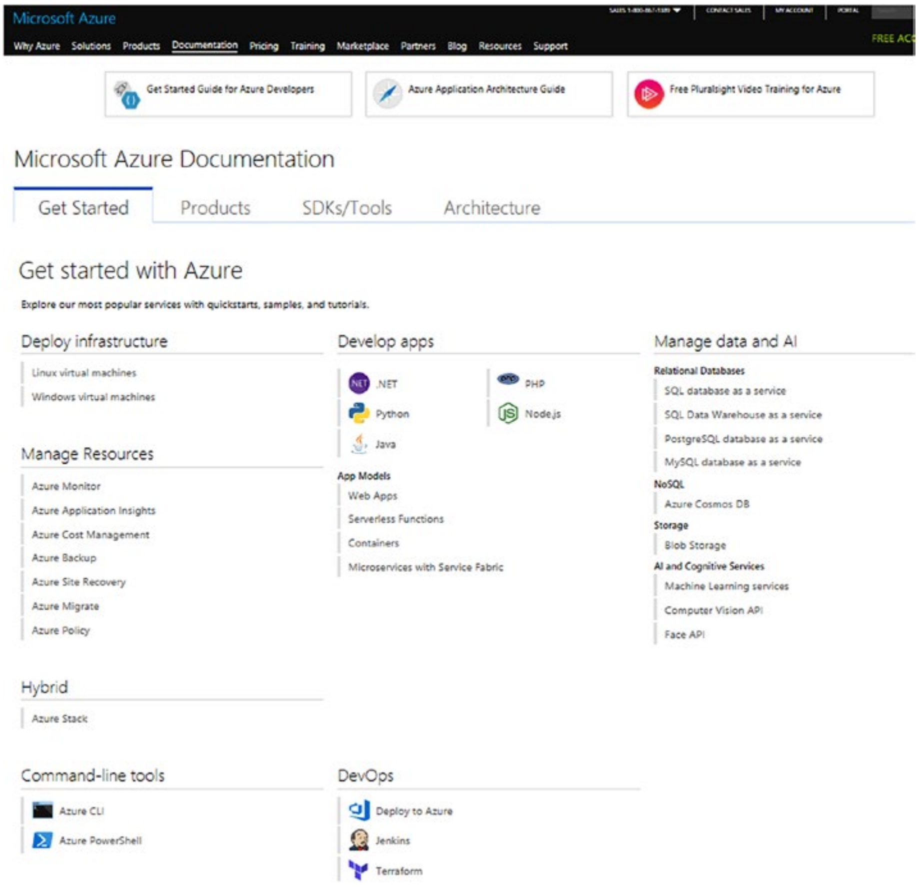
Building Solutions

Awesome! So, we've created a virtual machine, deployed web apps, and created an SQL database in Azure. This should allow us to start building solutions today, using your free trial accounts.

Documentation

To learn more about the different Azure services, there is a huge documentation section available from `azure.microsoft.com`.

1. If you click on the Documentation link at the top menu bar, you can browse through all the services and dive into their documentation. You can also get high-level white papers for developers and IT operators that provide a good technical overview of the platform and services and when to choose which service, based on the scenario you're building. See Figure 3-67.



Microsoft Azure Documentation

Get Started | Products | SDKs/Tools | Architecture

Get started with Azure

Explore our most popular services with quickstarts, samples, and tutorials.

Deploy infrastructure
- Linux virtual machines
- Windows virtual machines

Manage Resources
- Azure Monitor
- Azure Application Insights
- Azure Cost Management
- Azure Backup
- Azure Site Recovery
- Azure Migrate
- Azure Policy

Hybrid
- Azure Stack

Command-line tools
- Azure CLI
- Azure PowerShell

Develop apps
- .NET
- Python
- Java
- PHP
- Node.js

App Models
- Web Apps
- Serverless Functions
- Containers
- Microservices with Service Fabric

DevOps
- Deploy to Azure
- Jenkins
- Terraform

Manage data and AI

Relational Databases
- SQL database as a service
- SQL Data Warehouse as a service
- PostgreSQL database as a service
- MySQL database as a service

NoSQL
- Azure Cosmos DB

Storage
- Blob Storage

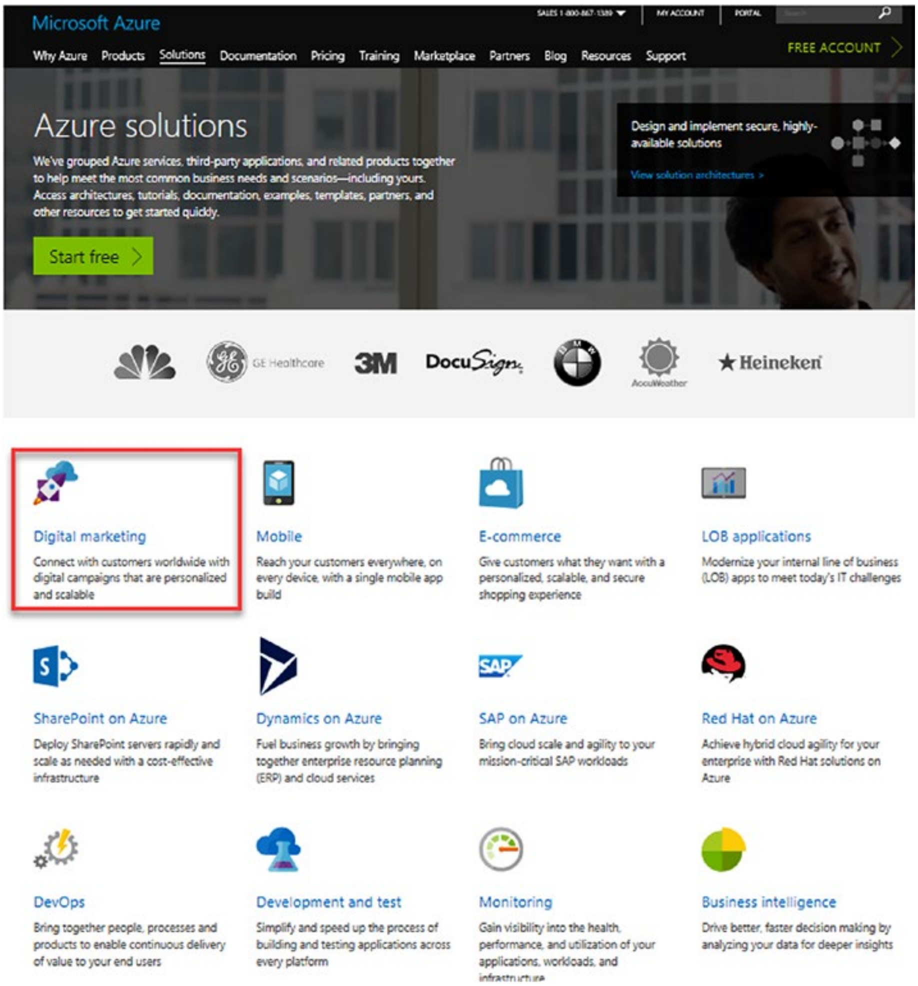
AI and Cognitive Services
- Machine Learning services
- Computer Vision API
- Face API

Figure 3-67. *Select documentation from Microsoft Azure*

Solutions

In many cases, your solutions are going to be composed of multiple services. For example, if you're building a digital marketing web site, you might start with a web site and scale it to different parts of the world, using Traffic Manager, move your content to a CDN, and service media with Media Services. If you visit the Solutions area on Microsoft Azure, you'll find the information you need to do that.

1. Navigate to `https://azure.microsoft.com/en-us/solutions/`. Here are some of the types of solutions customers are building on Azure today. Click Digital Marketing, for example, and you can see some key benefits, learn about the core Azure services that can help you, and, if you scroll down to the bottom, you'll see some architectures for common scenarios. See Figures 3-68 and 3-69.



Azure solutions

We've grouped Azure services, third-party applications, and related products together to help meet the most common business needs and scenarios—including yours. Access architectures, tutorials, documentation, examples, templates, partners, and other resources to get started quickly.

Design and implement secure, highly-available solutions

Digital marketing
Connect with customers worldwide with digital campaigns that are personalized and scalable

Mobile
Reach your customers everywhere, on every device, with a single mobile app build

E-commerce
Give customers what they want with a personalized, scalable, and secure shopping experience

LOB applications
Modernize your internal line of business (LOB) apps to meet today's IT challenges

SharePoint on Azure
Deploy SharePoint servers rapidly and scale as needed with a cost-effective infrastructure

Dynamics on Azure
Fuel business growth by bringing together enterprise resource planning (ERP) and cloud services

SAP on Azure
Bring cloud scale and agility to your mission-critical SAP workloads

Red Hat on Azure
Achieve hybrid cloud agility for your enterprise with Red Hat solutions on Azure

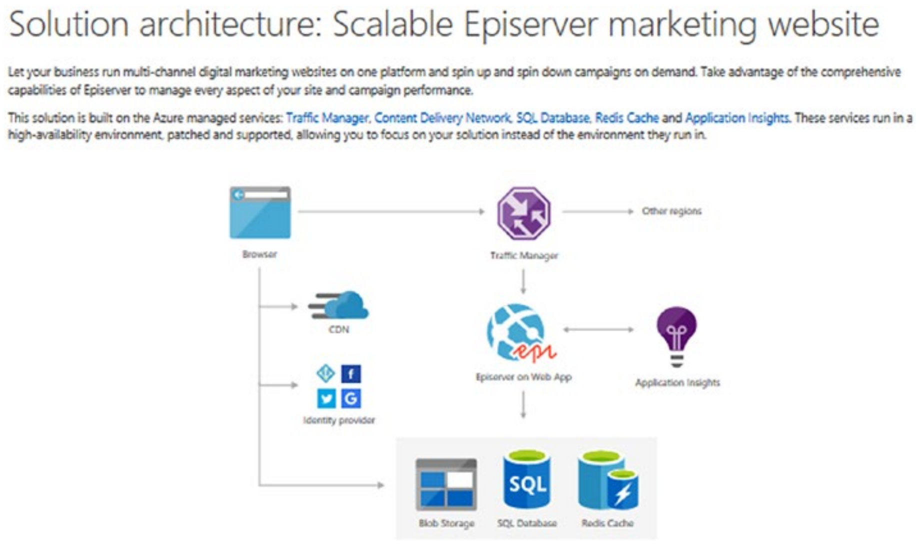
DevOps
Bring together people, processes and products to enable continuous delivery of value to your end users

Development and test
Simplify and speed up the process of building and testing applications across every platform

Monitoring
Gain visibility into the health, performance, and utilization of your applications, workloads, and infrastructure

Business intelligence
Drive better, faster decision making by analyzing your data for deeper insights

Figure 3-68. *Azure solutions at* `https://azure.microsoft.com/en-us/solutions/`



Solution architecture: Scalable Episerver marketing website

Let your business run multi-channel digital marketing websites on one platform and spin up and spin down campaigns on demand. Take advantage of the comprehensive capabilities of Episerver to manage every aspect of your site and campaign performance.

This solution is built on the Azure managed services: Traffic Manager, Content Delivery Network, SQL Database, Redis Cache and Application Insights. These services run in a high-availability environment, patched and supported, allowing you to focus on your solution instead of the environment they run in.

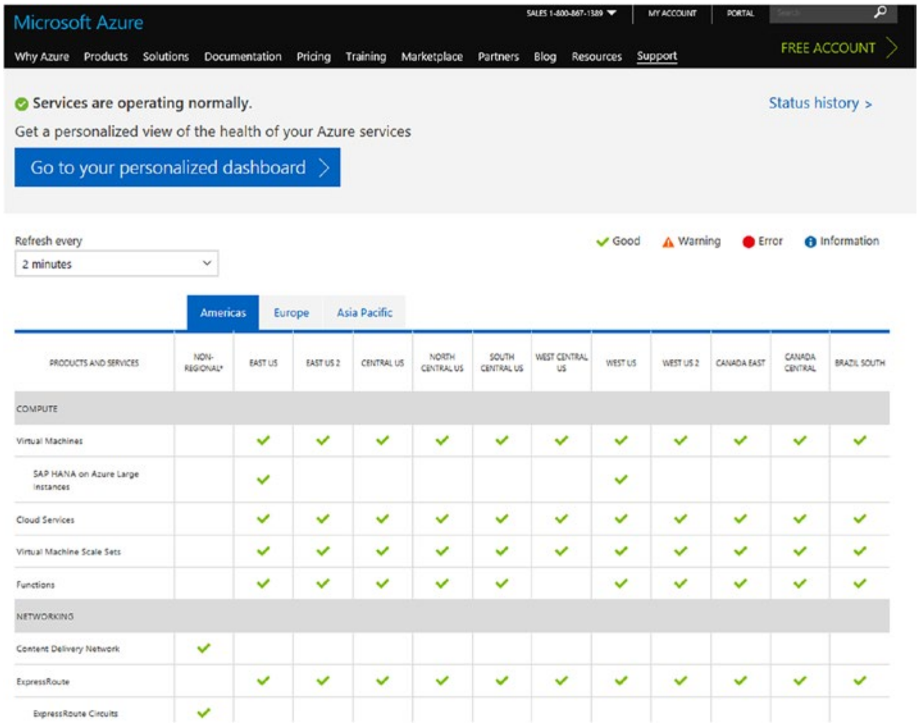
Figure 3-69. *One of the solution diagrams for digital marketing*

2. For example, if I am interested in building a web site using the Umbraco content management system, I can get an architecture diagram that shows me all the services I need to use and how they should be composed together. I can also see related documentation to help me get started.

Status

If you're starting to think about production services on Azure, another useful page is the Status page, easily found on the footer under Support, that shows you the health of the platform and if there's any known issues for services or regions.

1. Navigate to `https://azure.microsoft.com/en-us/status/`. We all know that every software has bugs, and hardware might fail, so if you're seeing something weird, I suggest going to this page and detecting if there is anything going on. See Figure 3-70.



Services are operating normally.

Get a personalized view of the health of your Azure services

Refresh every: 2 minutes

✓ Good ▲ Warning ● Error ● Information

PRODUCTS AND SERVICES	NON-REGIONAL*	EAST US	EAST US 2	CENTRAL US	NORTH CENTRAL US	SOUTH CENTRAL US	WEST CENTRAL US	WEST US	WEST US 2	CANADA EAST	CANADA CENTRAL	BRAZIL SOUTH
COMPUTE												
Virtual Machines		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
SAP HANA on Azure Large Instances		✓						✓				
Cloud Services		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Virtual Machine Scale Sets		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Functions		✓	✓	✓	✓	✓		✓	✓	✓	✓	✓
NETWORKING												
Content Delivery Network	✓											
ExpressRoute		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
ExpressRoute Circuits	✓											

***Figure 3-70.** Check status at `https://azure.microsoft.com/en-us/status/`.*

Support

What about support? As you're going through the phases of testing out the technology all the way to running production workloads in the cloud, you might want to consider getting some level of support. It is nice to know that there are options, depending on your needs and budget. Let's compare some.

1. On Microsoft Azure, click Support and then Compare Support Plans. The free support you're getting as part of the free trial account covers billing and subscription-related issues. The developer support plan is great if you're playing around with the technology and require technical assistance. The standard and professional support plans are best suited for production workloads. They have faster response times and better product coverage. See Figures 3-71 and 3-72.

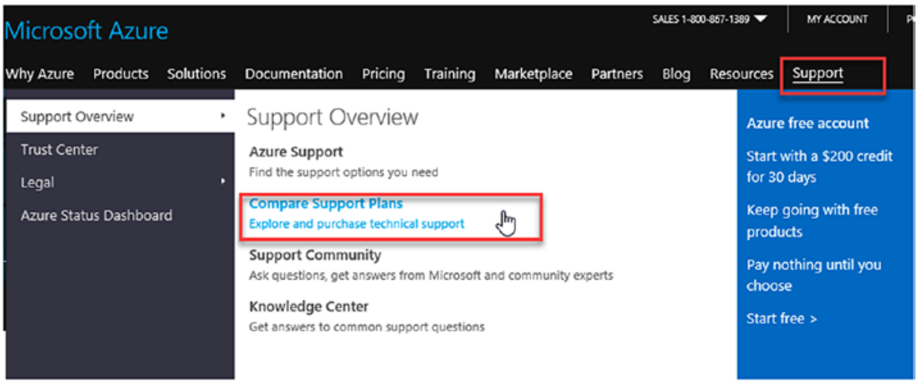
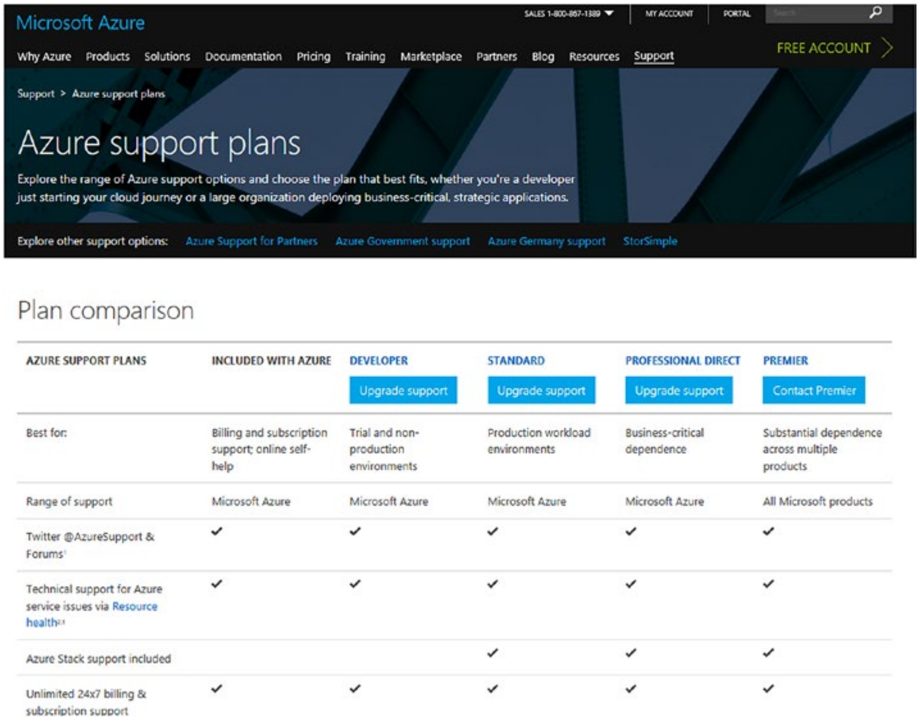


Figure 3-71. *On Microsoft Azure, click Support and then Compare Support Plans*



Azure support plans

Explore the range of Azure support options and choose the plan that best fits, whether you're a developer just starting your cloud journey or a large organization deploying business-critical, strategic applications.

Explore other support options: Azure Support for Partners Azure Government support Azure Germany support StorSimple

Plan comparison

AZURE SUPPORT PLANS	INCLUDED WITH AZURE	DEVELOPER	STANDARD	PROFESSIONAL DIRECT	PREMIER
		Upgrade support	Upgrade support	Upgrade support	Contact Premier
Best for:	Billing and subscription support; online self-help	Trial and non-production environments	Production workload environments	Business-critical dependence	Substantial dependence across multiple products
Range of support	Microsoft Azure	Microsoft Azure	Microsoft Azure	Microsoft Azure	All Microsoft products
Twitter @AzureSupport & Forums[1]	✓	✓	✓	✓	✓
Technical support for Azure service issues via Resource health[2,3]	✓	✓	✓	✓	✓
Azure Stack support included			✓	✓	✓
Unlimited 24x7 billing & subscription support	✓	✓	✓	✓	✓

Figure 3-72. *View your support options*

2. To open a support request, you simply go to the Azure portal and start the process. See Figures 3-73 and 3-74.

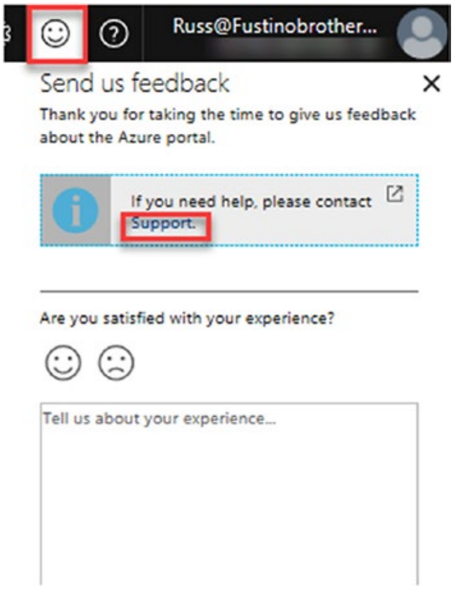

Russ@Fustinobrother...
Send us feedback
Thank you for taking the time to give us feedback about the Azure portal.
If you need help, please contact Support.
Are you satisfied with your experience?
Tell us about your experience...

Figure 3-73. *Click the smiley face and then Support*

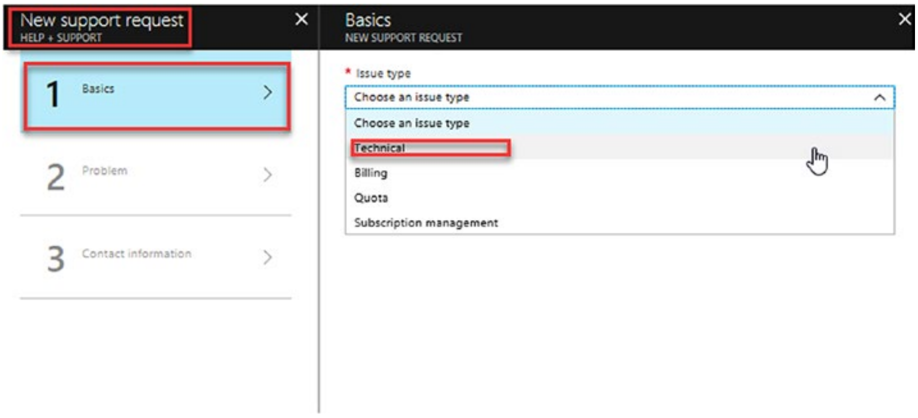


Figure 3-74. *Fill out a new support request*

Delete Resources

When learning Azure, it is a good idea to delete resources you created in the learning process. By doing so, you will extend the Azure credits. You have used a couple of dollars' worth in this chapter, if you completed it in a few hours. These resources will not be required for the remainder of the book.

1. Delete the resources created in this chapter, by clicking Resource groups, then pressing the delete button for each of them. The resources should be related to demorg, MyWebsiteRG, rgfromps, and, the latest, SQL2018RG. See Figures 3-75 and 3-76.

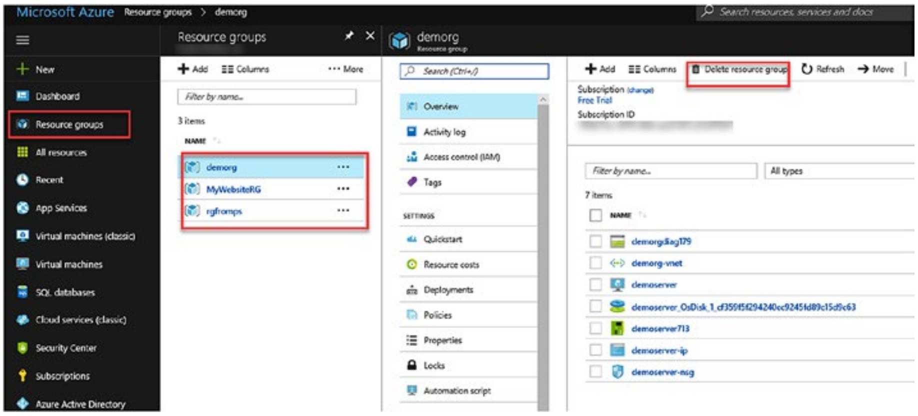


Figure 3-75. *Delete resources related to demorg, MyWebsiteRG, and rgfromps*

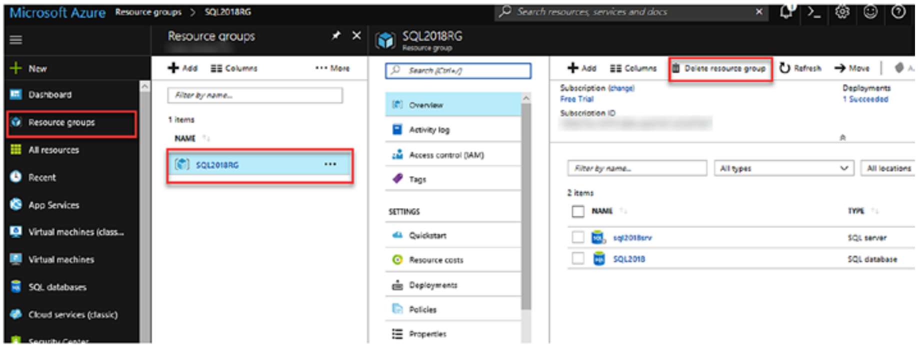


Figure 3-76. Delete resources related to SQL2018RG

Summary

In this chapter, you took the first steps in working with Azure. I discussed free trial accounts and what you can do with them to explore the platform. We used the Azure portal to create and manage resources. We created virtual machines, web apps, and an SQL database and discussed basic concepts, such as resource groups, DTUs, and more. Then we deployed a web app from Visual Studio and saw the tools and the integration we have for Azure inside the IDE. We used scripting tools, such as the Azure CLI and Azure PowerShell, to automate tasks, such as creating a new web app, so we could deploy into it from GitHub. I also discussed growing your solutions and how to find useful resources on `azure.microsoft.com` related to support, architectures, and more and how to delete learning resources.

CHAPTER 4

Building an Azure Service Using Quickstart

In building a typical app, you need data. Then, you usually have to serve that data up in a web service, so it can be consumed by any client application. Finally, in the client app itself, you must download that data, possibly update it, and send it back. What I have just described are the basic steps in the Quickstart Azure Mobile App.

This chapter is divided into six parts, each of which represents a main task in creating an Azure service, beginning with Quickstart. You will use the Azure portal to create a mobile app, using Xamarin Forms Quickstart, and Quickstart will create a database for the app. Quickstart also allows you to create an app service, using the Table API. Finally, Quickstart generates a sample Xamarin Forms application to consume the data. Quickstart creates one table, which represents a "to do item" list. The Xamarin Forms app created will display and update the "to do item" table.

This is great! However, realistically, the next thing you will have to do is add your own tables to your own application. I will cover how to do this in this chapter as well. You will then modify the Table API service app and, in Chapter 5, create two additional tables for a different app to consume. This first table is for questions, with a list of possible answers for each question,

R. Fustino, *Azure and Xamarin Forms*, https://doi.org/10.1007/978-1-4842-3561-4_4

and is called Questions. This is analogous to a multiple-choice question on an exam. The user will respond to those questions by selecting an answer, and that response will be stored in the second table, called Responses. The data that gets generated for the Questions table will be accomplished in this chapter. The data that gets generated for the Responses table will be generated in Chapter 5. In other words, this chapter will focus primarily on the app service, and the next chapter will focus primarily on the client.

The result will be to consume the Questions table in a client app that serves as a polling service to the user community. The Xamarin client app will display the question and ask the user to select a desired answer from a list and then store the response. It is kind of like a voting system in which each user of the app will be responding to a question. For example, to a question such as “What is your favorite book in the list?”, the user would select from the list the book he or she likes best. This will be referred to as a polling app. As part of this process, you will have to seed the data for the questions and a list of possible answers to select from. Finally, we will verify that seeded data generated in this chapter is stored in the “to do item” table from Quickstart as well as the customized Questions table.

Note Run the code in this chapter from your laptop/PC and *not* an Azure virtual machine.

Time Estimate
60 Minutes

Part 1: Create a Mobile App in the Azure Portal

Time Estimate

10 Minutes

Let's get started. In this part, we will begin the process of creating a mobile app in the Azure portal. We must do this first, because Quickstart becomes available on one of the blades, once the mobile app is deployed. We will then cover the first step in Quickstart for mobile app Xamarin Forms, which is used to create the database. We will then perform a second step in Quickstart, which is to download the code required for the API service.

1. From `http://portal.azure.com`, click New, then Web + Mobile. Next, select Mobile App. See Figure 4-1.

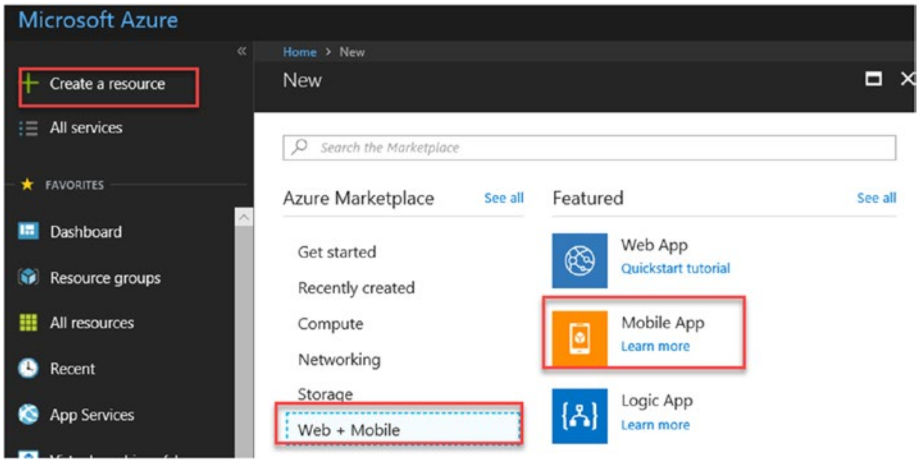
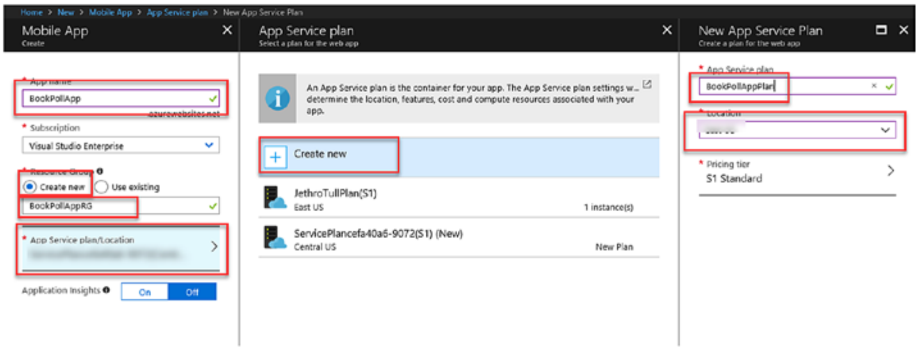


Figure 4-1. *From the Azure portal, click New, Web + Mobile, and select Mobile App*

2. Create a new mobile app with a unique app name like BookPollApp and a new resource group called BookPollAppRG. Select or create an app service plan in a location close to you. (use this same location for all future resources). Click OK and then Create new, as shown in Figure 4-2. It will take about a minute to create the new mobile app.


Home > New > Mobile App > App Service plan > New App Service Plan
Mobile App
Create
App Service plan
Select a plan for the web app
New App Service Plan
Create a plan for the web app
Create new

Mobile App

- App name: BookPollApp .azurewebsites.net
- Subscription: Visual Studio Enterprise
- Resource Group: [✓ Create new] Use existing
- BookPollAppRG
- App Service plan/Location
- Application Insights: On [✓ Off]

App Service plan

An App Service plan is the container for your app. The App Service plan settings w... determine the location, features, cost and compute resources associated with your app.

- JethroTullPlan(S1) East US 1 instance(s)
- ServicePlancefa40a6-9072(S1) (New) Central US New Plan

New App Service Plan

- App Service plan: BookPollAppPlan
- Location
- Pricing tier: S1 Standard

Figure 4-2. *Create a new mobile app with a unique app name similar to BookPollApp and a new resource group called BookPollAppRG*

3. Once notified, the app is created, and if it does not open automatically, open the service manually. On the App Service blade, select Quickstart and Xamarin.Forms, as shown in Figure 4-3.

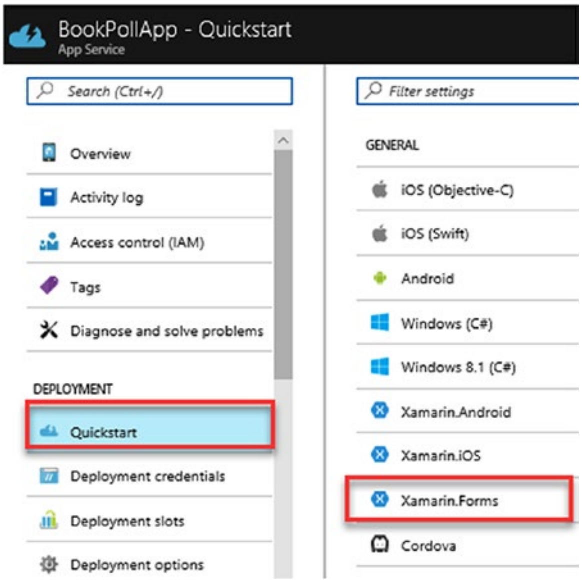


Figure 4-3. *Select Quickstart and Xamarin.Forms*

4. You will see that there are three steps:

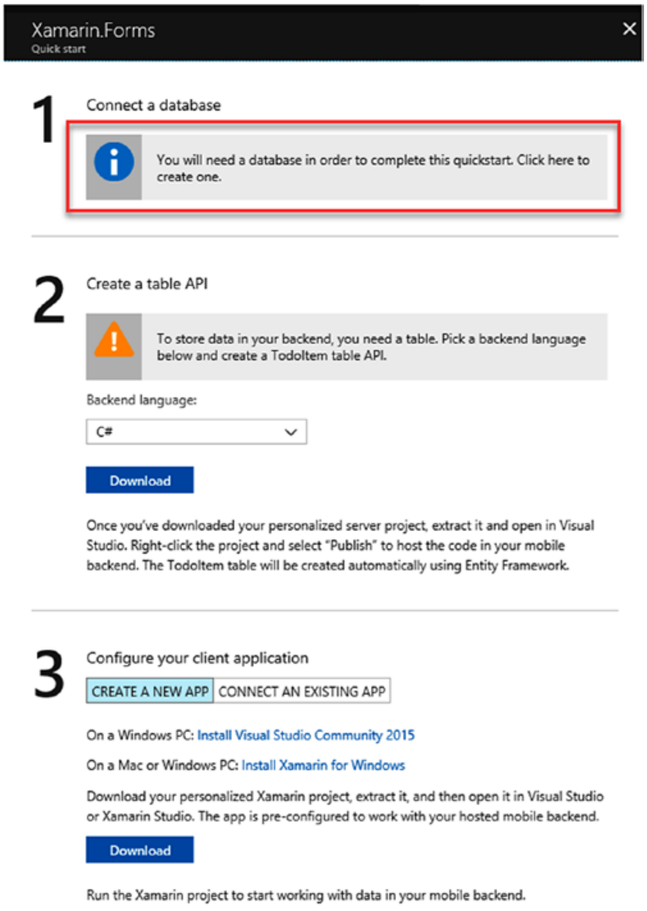
    a. Connect a Database

    b. Create a Table API

    c. Configure Your Client Application (Xamarin Forms)

    Execute one step at a time and wait for the deployments for each step to finish before proceeding to the next step. The app we are writing will be a polling service with questions provided in the app service (step 2) and selected answers provided in the app client (covered in Chapter 5). We will look at the Quickstart app generated for the client application, which displays a “to do list” in Step 3.

5. Click the information box to connect a database, as the first step in the Quickstart wizard. See Figure 4-4.



Xamarin.Forms
Quick start

1 Connect a database

You will need a database in order to complete this quickstart. Click here to create one.

2 Create a table API

To store data in your backend, you need a table. Pick a backend language below and create a TodoItem table API.

Backend language: C#

Download

Once you've downloaded your personalized server project, extract it and open in Visual Studio. Right-click the project and select "Publish" to host the code in your mobile backend. The TodoItem table will be created automatically using Entity Framework.

3 Configure your client application

CREATE A NEW APP | CONNECT AN EXISTING APP

On a Windows PC: Install Visual Studio Community 2015

On a Mac or Windows PC: Install Xamarin for Windows

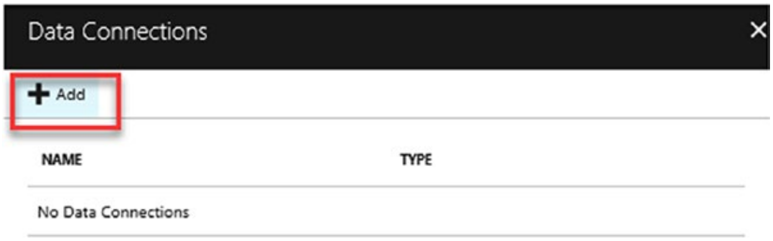
Download your personalized Xamarin project, extract it, and then open it in Visual Studio or Xamarin Studio. The app is pre-configured to work with your hosted mobile backend.

Download

Run the Xamarin project to start working with data in your mobile backend.

Figure 4-4. *Select Connect a database*

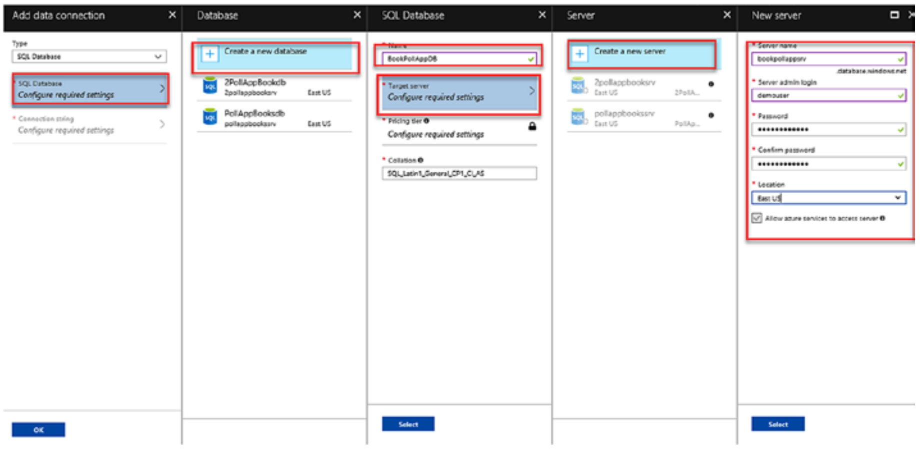
6. Click +Add to add a connection. See Figure 4-5.



NAME	TYPE
No Data Connections	

Figure 4-5. *Add a data connection*

7. Click SQL Database *Configure required settings* ➤ + Create a new database, give it a unique name like BookPollAppDB, and click Target server *Configure required settings*. Give the server a unique name, such as bookpollappsrv, and type "demouser" as the server admin login, "Demo@pass123" (case sensitive) as the password, and then the desired location, as in Figure 4-6. Accept the default pricing tier of Standard s0: 10 DTU, 250GB, then click Select.



Type: SQL Database
SQL Database: Configure required settings
Connection string: Configure required settings

2PollAppBookdb — 2pollappbooksrv — East US
PollAppBooksdb — pollappbooksrv — East US

Name: BookPollAppDB
Target server: Configure required settings
Pricing tier: Configure required settings
Collation: SQL_Latin1_General_CP1_CI_AS

2pollappbooksrv — East US — 2PollA...
pollappbooksrv — East US — PollAp...

Server name: bookpollappsrv .database.windows.net
Server admin login: demouser
Password: ••••••••••••
Confirm password: ••••••••••••
Location: East US
☑ Allow azure services to access server

Figure 4-6. *Create a new database and new server with the properties illustrated here*

8. Click *MS_TableConnectionString*, as in Figure 4-7, and accept the default name. Click OK to start the database deployment.

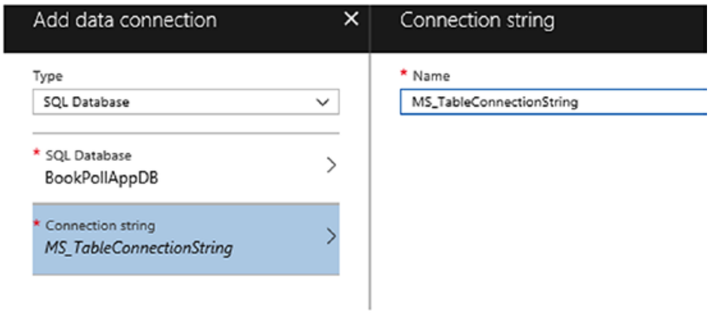

Add data connection
Connection string
Type
SQL Database
* SQL Database
BookPollAppDB
* Connection string
MS_TableConnectionString
* Name
MS_TableConnectionString

Figure 4-7. *Accept the default connection string name*

9. The deployment will take three or four minutes. Once created, proceed to step 2 of Quickstart from the portal, but only after the data connection is created. (It is important that you wait, or it may not work.) Once you see the green check mark in step 1, proceed to step 2. Time for a coffee. See Figure 4-8.

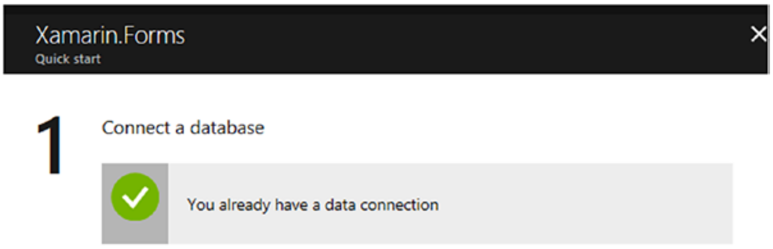
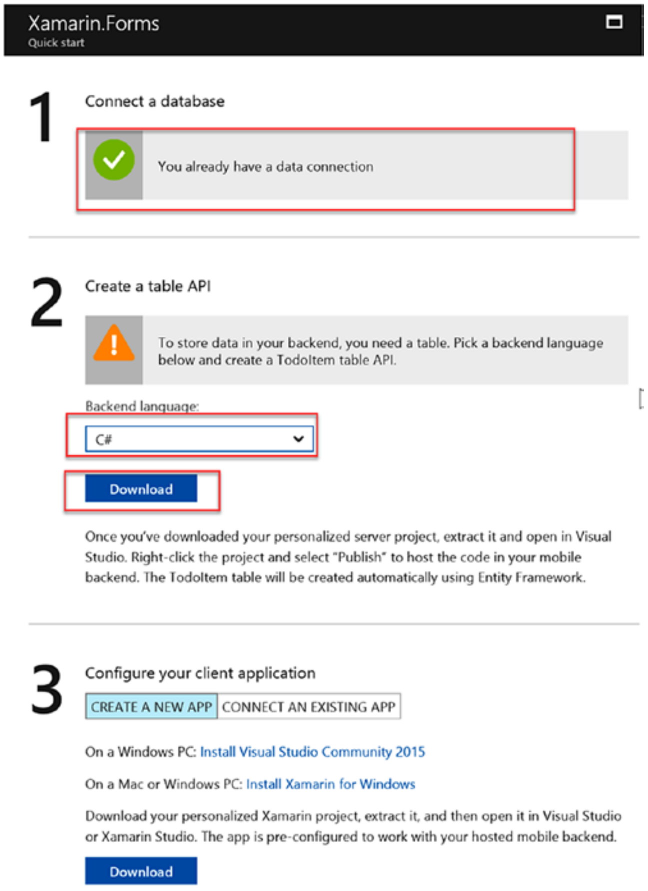

Xamarin.Forms
Quick start
1
Connect a database
You already have a data connection

Figure 4-8. *Wait until you see the green check mark in step 1 before proceeding to step 2*

10. Now that you have successfully created a database, click C# from the drop-down menu and then click Download. Download to a folder close to your root drive, such as `C:\apressbook`. See Figure 4-9.



You already have a data connection

To store data in your backend, you need a table. Pick a backend language below and create a TodoItem table API.

Backend language: C#

Once you've downloaded your personalized server project, extract it and open in Visual Studio. Right-click the project and select "Publish" to host the code in your mobile backend. The TodoItem table will be created automatically using Entity Framework.

On a Windows PC: Install Visual Studio Community 2015

On a Mac or Windows PC: Install Xamarin for Windows

Download your personalized Xamarin project, extract it, and then open it in Visual Studio or Xamarin Studio. The app is pre-configured to work with your hosted mobile backend.

Figure 4-9. *Select C# from the drop-down menu and then click Download*

Do not close the portal window with Quickstart showing. We will return to it in about 20 minutes, to complete step 3. If you try to perform step 3 now, it will fail for the rest of this chapter. Be patient; trust me here.

Part 2: Modify the Service App

Time Estimate

5 Minutes

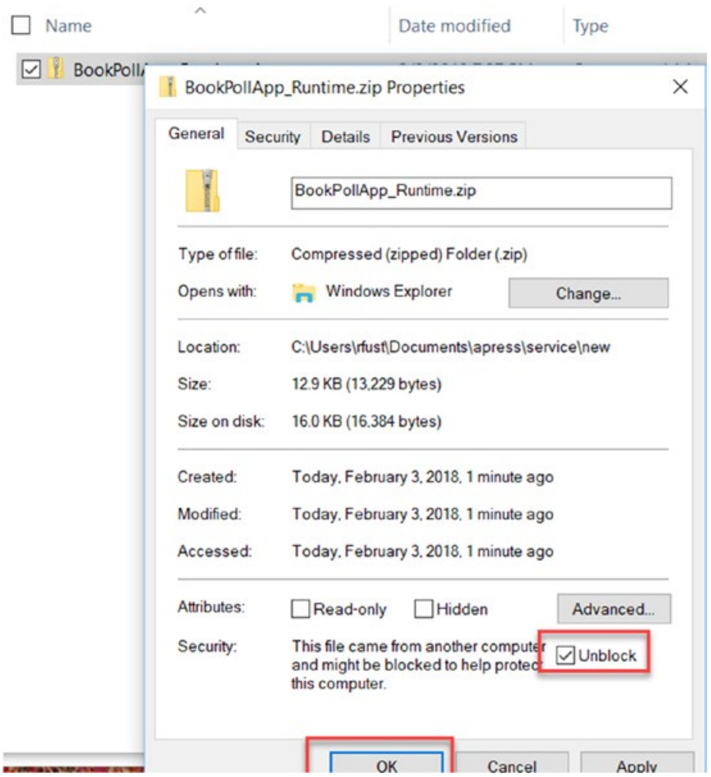
We have accomplished quite a bit already with steps 1 and 2 of Quickstart completed. We created a database and generated the code required to serve it up in an API service. In theory, all we have to do is compile and publish the app service and then perform step 3 to download the Xamarin Forms app. HOWEVER, WE ARE NOT GOING TO DO THIS YET. The reason? I want to show you how to work with your own Xamarin Forms application, not just the app generated from Quickstart. In other words, Quickstart is great for creating a new application (we are going to do that in due time in this chapter), but we are going to kill two birds with one stone and also cover how to modify the API service to provide data for an existing app, by generating a couple of new tables before we publish this service. Those two additional tables will be used in the app in Chapter 5. In this part, you will modify the Table API Service app generated with Quickstart, to add those two new tables.

Caution Do not publish this until all the modifications have been made and you are directed to do so toward the end of this chapter.

Note The completed solution is provided at `https://github.com/Apress/azure-and-xamarin-forms` however the Chapter 4 solution is for reference only. The Quickstart created solution places the correct end point in the code as well as the configuration settings. So, the provided solution will not run and publish successfully, as is.

---

1. Once downloaded, in File Explorer, right-click the zip, select properties, check unblock, and click OK. Extract the files. See Figure 4-10.



BookPollApp_Runtime.zip

Type of file: Compressed (zipped) Folder (.zip)
Opens with: Windows Explorer

Location: C:\Users\rfust\Documents\apress\service\new
Size: 12.9 KB (13,229 bytes)
Size on disk: 16.0 KB (16,384 bytes)

Created: Today, February 3, 2018, 1 minute ago
Modified: Today, February 3, 2018, 1 minute ago
Accessed: Today, February 3, 2018, 1 minute ago

Attributes: ☐ Read-only ☐ Hidden
Security: This file came from another computer and might be blocked to help protect this computer. ☑ Unblock

Figure 4-10. *Check Unblock and click OK*

2. Open the solution in Visual Studio, right-click the solution, select Restore NuGet Packages, and then rebuild the solution. See Figure 4-11.

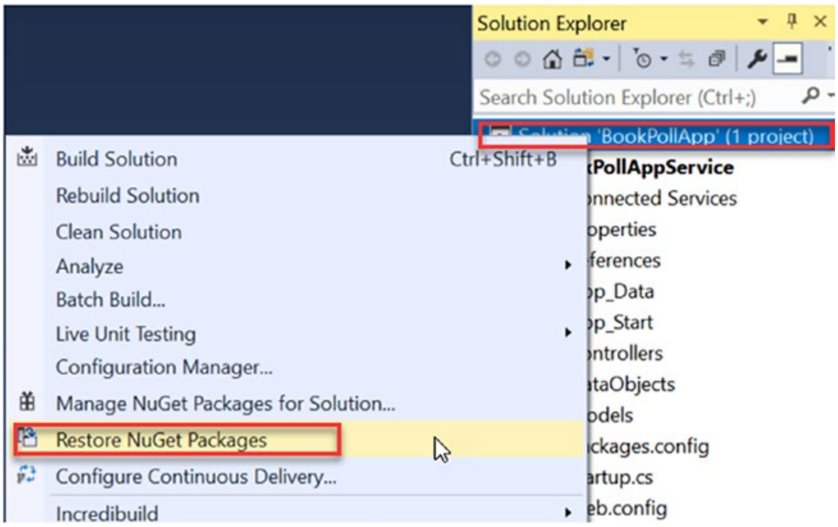


Figure 4-11. *Right-click the solution and select Restore NuGet Packages*

3. Open the BookPollAppService solution.

4. Right-click the solution and select Manage NuGet Packages, then browse to add the package for System.ComponentModel.Annotations. See Figure 4-12.

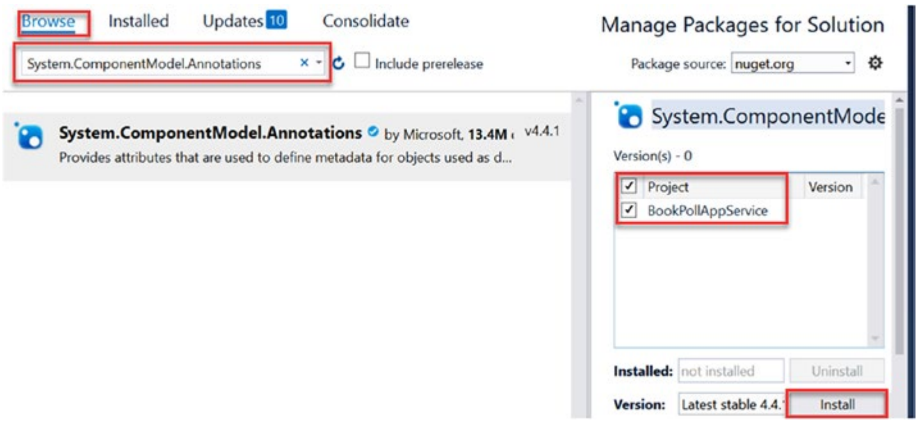

Browse
Installed
Updates 10
Consolidate
Manage Packages for Solution
System.ComponentModel.Annotations
Include prerelease
Package source: nuget.org
System.ComponentModel.Annotations by Microsoft, 13.4M v4.4.1
Provides attributes that are used to define metadata for objects used as d...
System.ComponentMode
Version(s) - 0
Project
Version
BookPollAppService
Installed: not installed
Uninstall
Version: Latest stable 4.4.1
Install

Figure 4-12. *Browse for System.ComponentModel.Annotations and install*

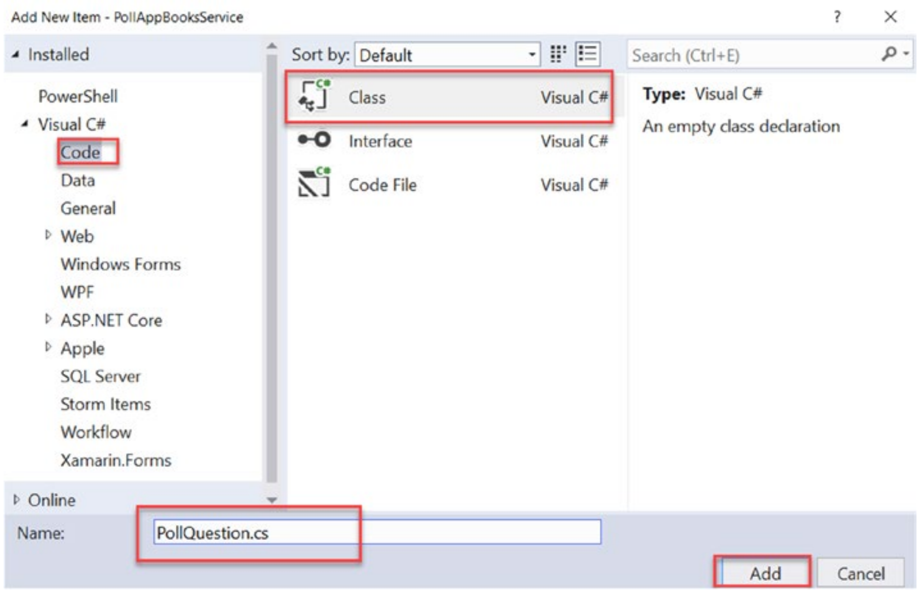
The plumbing is done, with the code and NuGet packages installed. Now, let's get down to adding two new tables to the Service API in the next part.

Part 3: Add the Question and Response DTOs and End Points

Time Estimate
5 Minutes

In this part, we will prepare the app to seed the Questions table with data the first time we access it. This will require that you create a class to represent this, both in our database and over the wire, when talking to a client. You will add a class named `PollQuestion` to provide this support. You will also need to add a new `TableController`, to expose this table over the network. You want to store this object in a table named `"questions"`. The JSON format will match the data transformation object (DTO) . The JSON parser will automatically lowercase the property names.

1. Add a class to the `DataObjects` folder called `PollQuestion`. See Figure 4-13.



Type: Visual C#

An empty class declaration

Name: PollQuestion.cs

Figure 4-13. *Add a class and name it `PollQuestion.cs` in the `DataObjects` folder*

2. Add the following `using` statements:

```
using Microsoft.Azure.Mobile.Server;
using System.ComponentModel.DataAnnotations.Schema;
```

3. Derive the class from `EntityData` and add code for Text and Answers. The highlighted text represents code changes.

```
namespace BookPollAppService.DataObjects
{
    [Table("questions")]
    public class PollQuestion : EntityData
    {
        public string Text { get; set; }
        public string Answers { get; set; }
    }

}
```

4. Add a class to the `DataObjects` folder called `PollResponse`.

5. Add the `using` statements:

```
using System.ComponentModel.DataAnnotations.Schema;
using Microsoft.Azure.Mobile.Server;
using Newtonsoft.Json;
```

6. Add a class to the `DataObjects` folder called `PollResponse`. Add the following code:

```
namespace BookPollAppService.DataObjects
{
    [Table("responses")]
    public class PollResponse : EntityData
    {
        [JsonProperty("questionId")]
        public string QuestionId { get; set; }

        public string Name { get; set; }
        [JsonProperty("answer")]
        public int AnswerIndex { get; set; }
    }

}
```

7. Save all.

We have now completed the DTOs thatdefine our new tables. Let's now expose the data, through functions on retrieving and updating the tables, by creating the controllers.

Part 4: Add Controllers

Time Estimate

20 Minutes

In this part, you will wire up controllers to expose a table over the wire. The question table controller should expose only the GET options (all or by ID). We will not allow this table to be updated in the client Xamarin Forms app.

Using a database initializer function, we will seed this table with data, by creating a set of poll questions and inserting them into it.

1. **Try** { Right-click the `Controllers` folder and select Add ➤ Controller, then select Azure Mobile Apps Table Controller. See Figures 4-14 and 4-15.

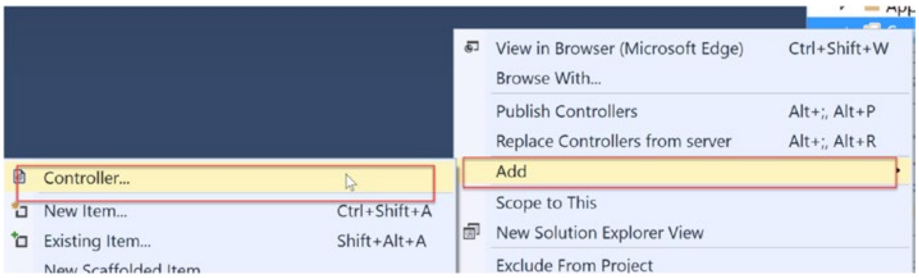
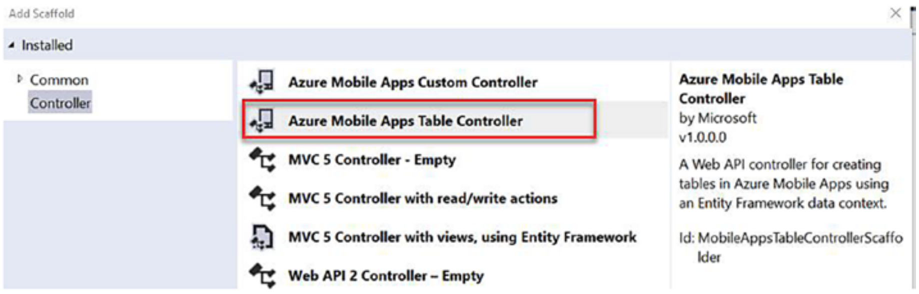

Controller...
New Item... Ctrl+Shift+A
Existing Item... Shift+Alt+A
New Scaffolded Item
View in Browser (Microsoft Edge) Ctrl+Shift+W
Browse With...
Publish Controllers Alt+;, Alt+P
Replace Controllers from server Alt+;, Alt+R
Add
Scope to This
New Solution Explorer View
Exclude From Project

***Figure 4-14.** Right-click the `Controllers` folder and select Add Controller*

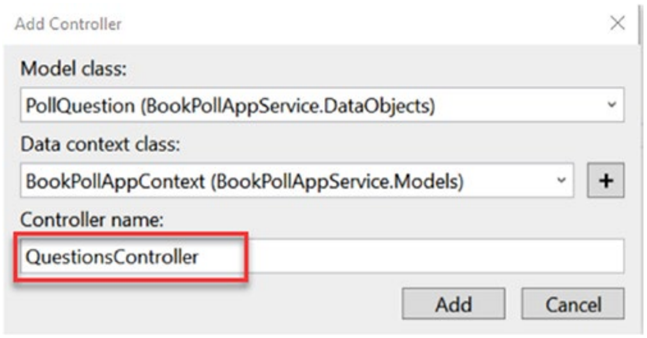

Add Scaffold
Installed
Common
Controller
Azure Mobile Apps Custom Controller
Azure Mobile Apps Table Controller
MVC 5 Controller - Empty
MVC 5 Controller with read/write actions
MVC 5 Controller with views, using Entity Framework
Web API 2 Controller – Empty

Azure Mobile Apps Table Controller
by Microsoft
v1.0.0.0
A Web API controller for creating tables in Azure Mobile Apps using an Entity Framework data context.
Id: MobileAppsTableControllerScaffolder

***Figure 4-15.** Select Azure Mobile Apps Table Controller*

2. Try: { Select PollQuestion from the Model class drop-down menu and BookPollAppService for the Data context class. Rename the default controller to QuestionsController. You will also have to add a controller for PollResponse, using a controller. Revise the default name to ResponsesController.

3. Try: { Select PollQuestion from the Model class drop-down menu, BookPollAppContext from the Data context class drop-down, and rename PollQuestionController QuetionsController (See possible error in step 5 below). See Figure 4-16.


Add Controller

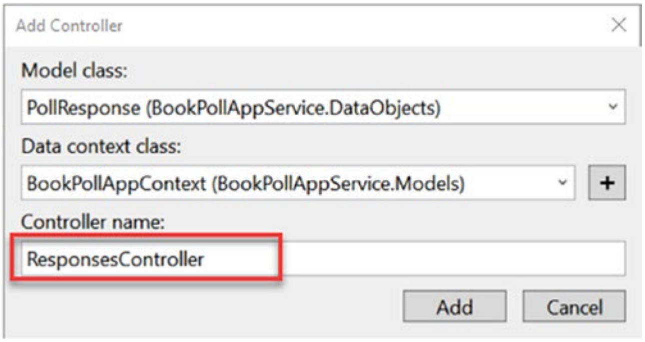
Model class: PollQuestion (BookPollAppService.DataObjects)

Data context class: BookPollAppContext (BookPollAppService.Models)

Controller name: QuestionsController

Figure 4-16. *Controller renamed QuestionsController*

4. Try: { PollResponse from the Model class drop-down, insert BookPollAppContext as the Data context class, and change the name of the Controller from PollResponseController to ResonsesController (See possible error in step 5 below). See Figure 4-17.



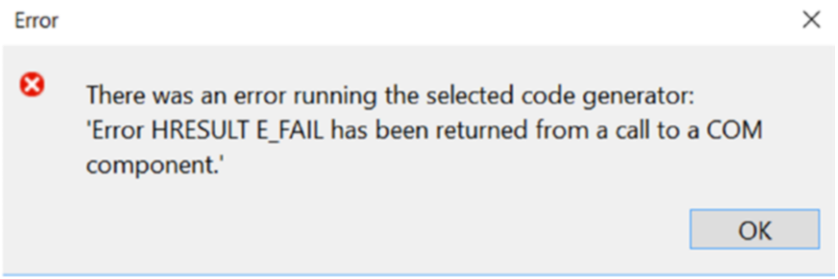
Model class: PollResponse (BookPollAppService.DataObjects)

Data context class: BookPollAppContext (BookPollAppService.Models)

Controller name: ResponsesController

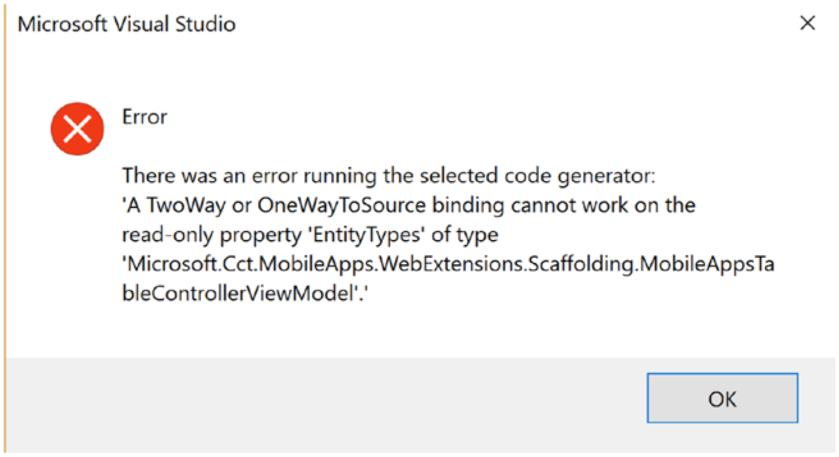
Figure 4-17. *Controller renamed ResponsesController*

5. Catch: { If you get either of the following errors related to scaffolding, resulting from a known bug in VS 2017 at the time of writing, see the workarounds that follow. (See Figures 4-18 and 4-19.) If the bug is fixed by the time you read this, simply follow workaround #1 at step 6 and let Visual Studio add the controllers instead of adding them manually. You will still have to make the code modifications documented in workaround #1, after adding your Questions and Responses controllers.



There was an error running the selected code generator: 'Error HRESULT E_FAIL has been returned from a call to a COM component.'

Figure 4-18. *COM component error*



Error

There was an error running the selected code generator:
'A TwoWay or OneWayToSource binding cannot work on the read-only property 'EntityTypes' of type 'Microsoft.Cct.MobileApps.WebExtensions.Scaffolding.MobileAppsTableControllerViewModel'.'

Figure 4-19. *Scaffolding error*

}

6. **Catch** {There are two workarounds.}

7. Workaround #1 is quicker, unless you already have VS 2015 installed, as VS 2015 can take a couple of hours to install. Workaround #1 is to add the classes and code modifications manually in step 6. Workaround #2 starts at step 13 and is about reverting to VS 2015 and installing the Azure SDK for VS 2015, to create the table controllers. Once added successfully, return to using VS 2017. If you use workaround #2, you will still have to make the code modifications in steps 7 through 12. Details on each workaround follow.

8. Workaround #1

   Add an existing file from the book assets folder called `QuestionsController.cs` to the `Controllers` folder in the project solution, only if you received one of the preceding errors. See Figure 4-20.

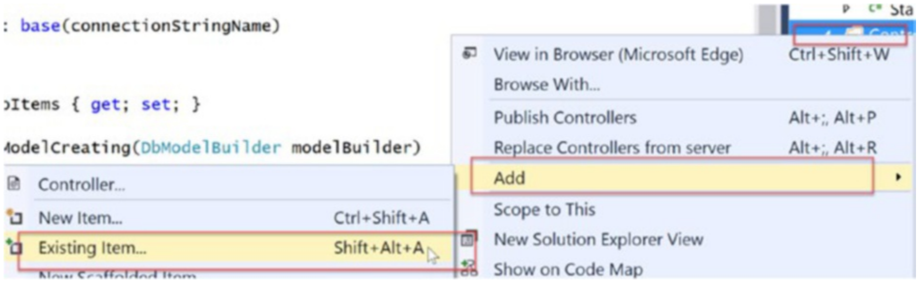

: base(connectionStringName)
Items { get; set; }
ModelCreating(DbModelBuilder modelBuilder)
Controller...
New Item... Ctrl+Shift+A
Existing Item... Shift+Alt+A
View in Browser (Microsoft Edge) Ctrl+Shift+W
Browse With...
Publish Controllers Alt+;, Alt+P
Replace Controllers from server Alt+;, Alt+R
Add
Scope to This
New Solution Explorer View
Show on Code Map

Figure 4-20. *Add `QuestionsController.cs` to the `Controllers` folder*

9. You may have to change the namespace of your project name, and you should remove or comment any "non-GET" methods, as the question data will be read-only. So, comment out or delete the tasks for `PATCH`, `POST`, and `DELETE` questions.

10. The code final code should look like the following (resolve the `using` statements):

```
using System.Linq;
using System.Threading.Tasks;
using System.Web.Http;
using System.Web.Http.Controllers;
using System.Web.Http.OData;
using Microsoft.Azure.Mobile.Server;
using BookPollAppService.DataObjects;
using BookPollAppService.Models;

namespace BookPollAppService.Controllers
{
    public class QuestionsController :
    TableController<PollQuestion>
    {
        protected override void Initialize(HttpController
        Context controllerContext)
        {
            base.Initialize(controllerContext);
            BookPollAppContext context = new
            BookPollAppContext();
            DomainManager = new EntityDomainManager<
            PollQuestion>(context, Request);
        }

        // GET tables/PollQuestion
        public IQueryable<PollQuestion>
        GetAllPollQuestion()
        {
            return Query();
        }

        // GET tables/PollQuestion/48D68C86-6EA6-4C25-
        AA33-223FC9A27959
        public SingleResult<PollQuestion>
        GetPollQuestion(string id)
        {
            return Lookup(id);
        }
    }
}
```

11. Add an existing file for the student materials to the `Controllers` folder, called `ResponsesController.cs`. You may have to change the namespace to your project name.

12. We can customize it with ASP.NET attributes. For example, we can rename the methods to match what they do.

    - Rename the `PostPollResponse` method to `InsertPollResponse`. Because we no longer have the word "Post" on the method, the controller will not associate this to an `HTTP POST` request. To correct this, add an `[HttpPost]` attribute to the method.
    - Rename the `PatchPollResponse` method to `UpdatePollResponse` and add an `[HttpPatch]` attribute to the method, to ensure that it responds to an `HTTP PATCH` request.

```
using System.Linq;
using System.Threading.Tasks;
using System.Web.Http;
using System.Web.Http.Controllers;
using System.Web.Http.OData;
using Microsoft.Azure.Mobile.Server;
using BookPollAppService.DataObjects;
using BookPollAppService.Models;

namespace BookPollAppService.Controllers
{
    public class ResponsesController :
    TableController<PollResponse>
    {
        protected override void Initialize(Http
        ControllerContext controllerContext)
        {
```

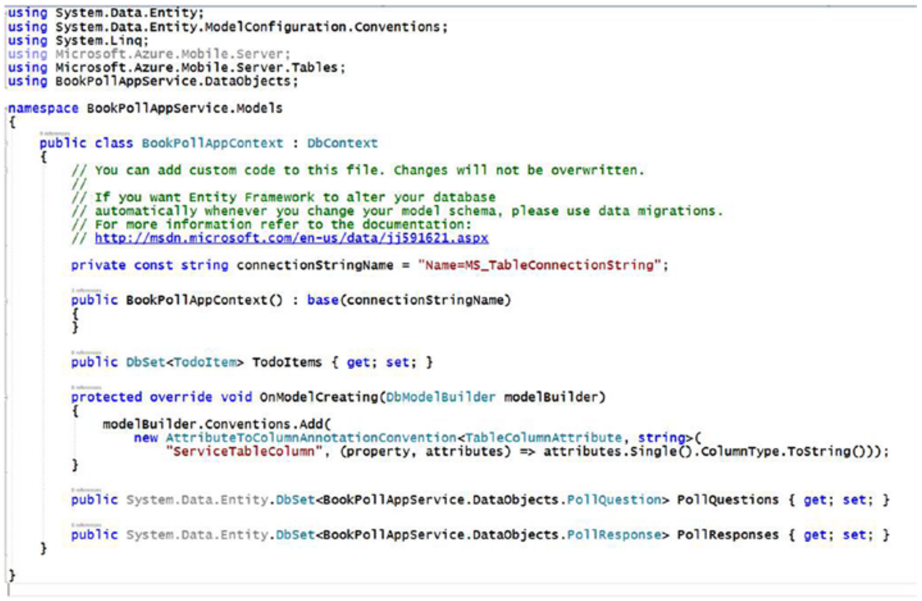
```
    base.Initialize(controllerContext);
    BookPollAppContext context = new
    BookPollAppContext();
    DomainManager = new EntityDomainManager
    <PollResponse>(context, Request);
}

// GET tables/PollResponse
public IQueryable<PollResponse>
GetAllPollResponse()
{
    return Query();
}

// GET tables/PollResponse/48D68C86-6EA6-
4C25-AA33-223FC9A27959
public SingleResult<PollResponse>
GetPollResponse(string id)
{
    return Lookup(id);
}

// PATCH tables/PollResponse/48D68C86-6EA6-
4C25-AA33-223FC9A27959
[HttpPatch]
public Task<PollResponse>
UpdatePollResponse(string id,
Delta<PollResponse> patch)
{
     return UpdateAsync(id, patch);
}
```

```
                // POST tables/PollResponse
                [HttpPost]
                public async Task<IHttpActionResult>
                InsertPollResponse(PollResponse item)
                {
                    PollResponse current = await
                    InsertAsync(item);
                    return CreatedAtRoute("Tables", new {
                    id = current.Id }, current);
                }

                // DELETE tables/PollResponse/48D68C86-
                6EA6-4C25-AA33-223FC9A27959
                public Task DeletePollResponse(string id)
                {
                     return DeleteAsync(id);
                }
            }
        }
```

13. Open `BookPollAppContext.cs` in the `Models` folder, if you manually added the preceding controllers, and add these two lines after the `OnModelCreating` method. Also, replace the `BookPollAppService` namespace and lines below with the name of your project, if different, and do the same for any `using` statements. These lines may be there already, if you successfully added a controller through the Visual Studio Add Controller.

```
public System.Data.Entity.DbSet<BookPollAppService.
DataObjects.PollQuestion> PollQuestions { get; set; }

public System.Data.Entity.DbSet<BookPollAppService.
DataObjects.PollResponse> PollResponses { get; set; }
```

14. For `BookPollAppContext.cs`, the code should look like that shown in Figure 4-21. This completes the controller updates!



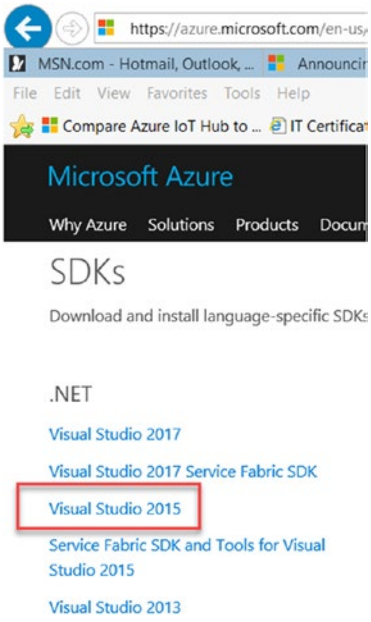
```
using System.Data.Entity;
using System.Data.Entity.ModelConfiguration.Conventions;
using System.Linq;
using Microsoft.Azure.Mobile.Server;
using Microsoft.Azure.Mobile.Server.Tables;
using BookPollAppService.DataObjects;

namespace BookPollAppService.Models
{
    public class BookPollAppContext : DbContext
    {
        // You can add custom code to this file. Changes will not be overwritten.
        //
        // If you want Entity Framework to alter your database
        // automatically whenever you change your model schema, please use data migrations.
        // For more information refer to the documentation:
        // http://msdn.microsoft.com/en-us/data/jj591621.aspx

        private const string connectionStringName = "Name=MS_TableConnectionString";

        public BookPollAppContext() : base(connectionStringName)
        {
        }

        public DbSet<TodoItem> TodoItems { get; set; }

        protected override void OnModelCreating(DbModelBuilder modelBuilder)
        {
            modelBuilder.Conventions.Add(
                new AttributeToColumnAnnotationConvention<TableColumnAttribute, string>(
                    "ServiceTableColumn", (property, attributes) => attributes.Single().ColumnType.ToString()));
        }

        public System.Data.Entity.DbSet<BookPollAppService.DataObjects.PollQuestion> PollQuestions { get; set; }

        public System.Data.Entity.DbSet<BookPollAppService.DataObjects.PollResponse> PollResponses { get; set; }
    }

}
```

Figure 4-21. *The completed code for `BookPollAppContext.cs`*

15. Workaround # 2

    Download and install VS 2015 at `www.visualstudio.com/vs/older-downloads/`. You can add controllers in VS 2015 and go back to a prior version on the Azure SDK for 2.9.6 and Azure Mobile apps SDK version 2.0.40201. You may have to uninstall the Azure Mobile Apps SDK first, if newer. This is a bug with the version of the Azure Mobile Apps SDK installers included with VS 2017. The templates themselves shouldn't have changed, so the specific workaround is to download the Azure 2.9.6 SDK from `www.microsoft.com/en-us/download/details.aspx?id=54289` and select the AzureMobileAppsSdkV2.0.msi installer (version 2.0.40201). This will install the scaffolded controllers to the folder indicated in the error message. Also, you may have to install the Azure SDK for VS 2015, which can be accessed at `https://azure.microsoft.com/en-us/downloads/`, as shown in Figures 4-22 and 4-23.

    Repeat steps 1–11, to create the controllers, with the only difference being that you will not have to add the `PollQuestionController` and `PollResponseController` classes in step 6 from existing files, as these will have been generated. Modify generated code as in steps 1–11.


https://azure.microsoft.com/en-us
MSN.com - Hotmail, Outlook, ...
Announcir
File Edit View Favorites Tools Help
Compare Azure IoT Hub to ...
IT Certifica
Microsoft Azure
Why Azure Solutions Products Docum

SDKs

Download and install language-specific SDKs

.NET

Visual Studio 2017

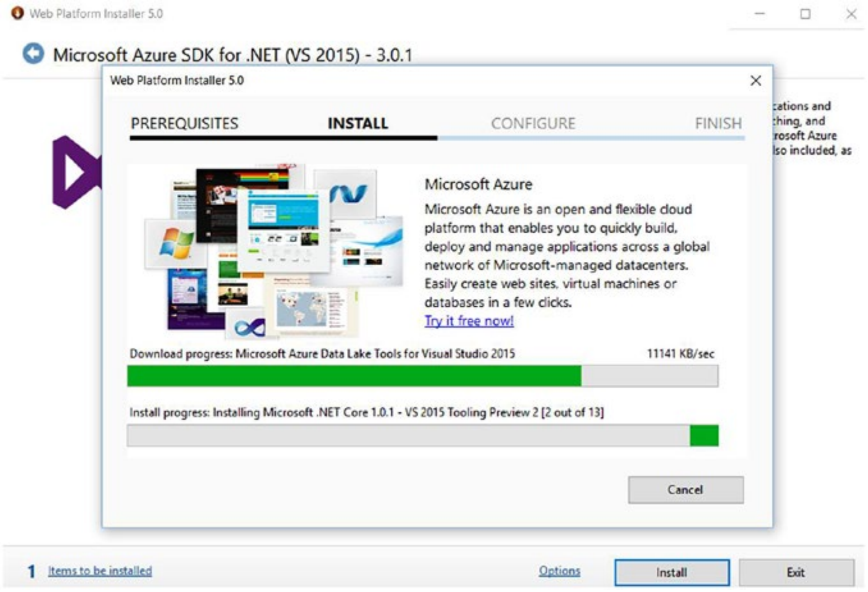
Visual Studio 2017 Service Fabric SDK

Visual Studio 2015

Service Fabric SDK and Tools for Visual Studio 2015

Visual Studio 2013

Figure 4-22. *Download the Azure SDK for VS 2015*


Web Platform Installer 5.0
Microsoft Azure SDK for .NET (VS 2015) - 3.0.1
Web Platform Installer 5.0
PREREQUISITES
INSTALL
CONFIGURE
FINISH
Cancel
1 Items to be installed
Options
Install
Exit

Microsoft Azure

Microsoft Azure is an open and flexible cloud platform that enables you to quickly build, deploy and manage applications across a global network of Microsoft-managed datacenters. Easily create web sites, virtual machines or databases in a few clicks.

Try it free now!

Download progress: Microsoft Azure Data Lake Tools for Visual Studio 2015 11141 KB/sec

Install progress: Installing Microsoft .NET Core 1.0.1 - VS 2015 Tooling Preview 2 [2 out of 13]

Figure 4-23. *Install the Azure SDK for VS 2015*

We are almost at the finish line! The only thing left in building our API service is to prepopulate our tables with some data. This is referred to as "seeding the data."

Part 5: Seed the Data and Force Entity Framework to Re-create Our Tables and Publish

Time Estimate

10 Minutes

When you ship an application, it is often required that you ship it with data that is prepopulated in the database that is used for the app. In our case, Quickstart has to populate a few items in the "to do list" table. This way, when you open the app, you will see some sample data. And in our new tables that we added in the preceding parts, we must populate the Questions table with some questions and some answers to select from, as this is required to make the app work. In this part, you will seed data for the database, and we will publish the app service.

1. For one-time initialization, open the `Startup.MobileApp.cs` file in the `App_Start` folder in Solution Explorer.

2. At about line 52, the `BookPollAppInitializer :CreateDatabaseIfNotExists<BookPollAppService>` database initializer class directs Entity Framework to create the database tables required to run the service, if no tables exist in the database. This initializer only runs once. If we later add/change/delete a DTO, the service will throw an exception indicating that the schema is out of date and does not match the model.

Note To re-create tables when a schema changes, you have to change the database initializer class to `DropCreateDatabaseIfModelChanges<BookPollAppService>`, which instructs Entity Framework to drop all the tables and re-create them if the model (BookPollAppService) or any DTOs in the model change. Recall that when we add a new Table Controller, a `DbSet` property is created in the BookPollAppService to represent the table. The system identifies this using reflection and recognizes that the database schema is different. It will then re-create all the tables, using the current model; however, we will lose all our data. `DropCreateDatabaseAlways` will always drop the tables and create. Data must be migrated in these scenarios.

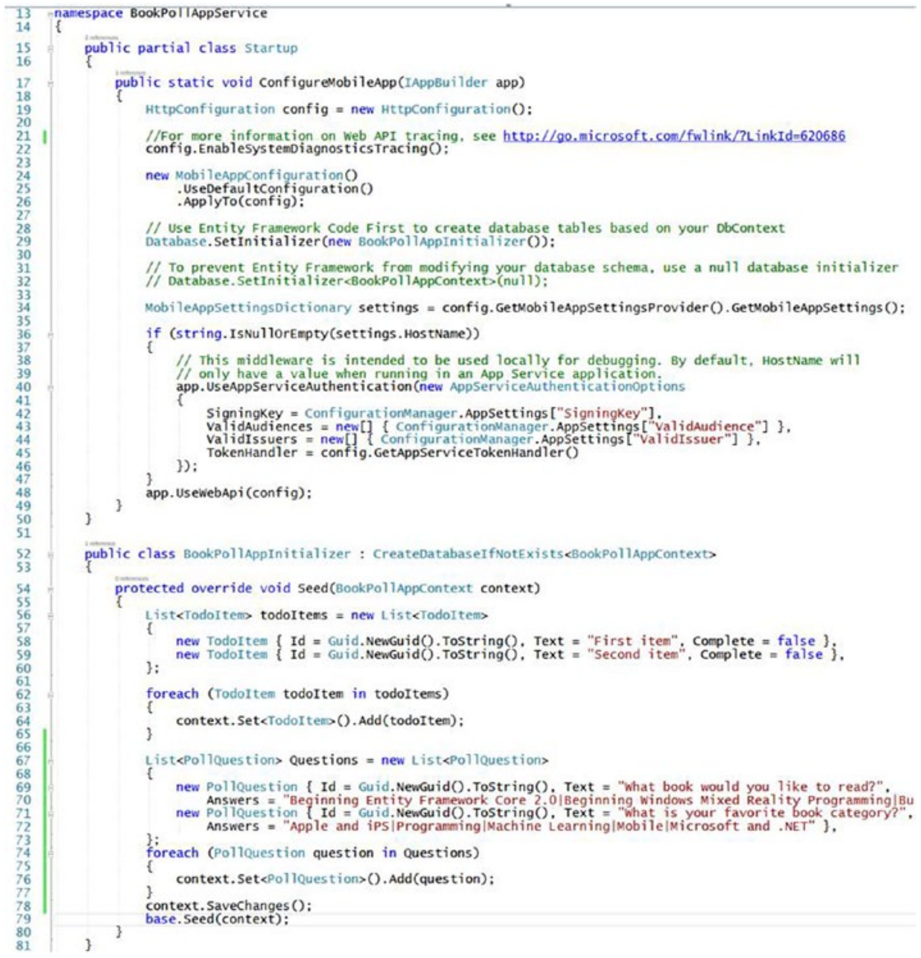
3. Keep `CreateDatabaseIfNotExists` on first run, then if you do subsequent runs, you can change to either `DropCreateDatabaseIfModelChanges` or `DropCreateDatabaseAlways`.

4. Replace the protected override void Seed method code with the following, which seeds data for the `TodoItem` list as well as PollQuestions (the source for `Startup.MobileApp.cs` is in the `Assets` folder, if you wish to copy the seed override method):

```
public class BookPollAppInitializer :
CreateDatabaseIfNotExists <BookPollAppContext>
{
    protected override void Seed(BookPollAppContext
    context)
    {
```

```
List<TodoItem> todoItems = new
List<TodoItem>
{
    new TodoItem { Id = Guid.NewGuid().
    ToString(), Text = "First item",
    Complete = false },
    new TodoItem { Id = Guid.NewGuid().
    ToString(), Text = "Second item",
    Complete = false },
};

foreach (TodoItem todoItem in todoItems)
{
    context.Set<TodoItem>().Add(todoItem);
}
List<PollQuestion> Questions = new
List<PollQuestion>
{
    new PollQuestion { Id = Guid.NewGuid().
    ToString(), Text = "What book would you
    like to read?",
        Answers = "Beginning Entity
        Framework Core 2.0|Beginning
        Windows Mixed Reality
        Programming|Business in Real-Time,
        Using Azure IoT|Cyber Security on
        Azure|Angular 5 and .NET Core 2" },
    new PollQuestion { Id = Guid.NewGuid().
    ToString(), Text = "What is your
    favorite book category?",
                Answers = "Apple and iPS|Programming|
                Machine Learning|Mobile|Microsoft
                and .NET" },
            };
            foreach (PollQuestion question in Questions)
            {
                context.Set<PollQuestion>().
                Add(question);
            }
             context.SaveChanges();
            base.Seed(context);
        }
    }
```

5. Your code should look like that shown in Figure 4-24.



```
namespace BookPollAppService
{
    public partial class Startup
    {
        public static void ConfigureMobileApp(IAppBuilder app)
        {
            HttpConfiguration config = new HttpConfiguration();

            //For more information on Web API tracing, see http://go.microsoft.com/fwlink/?LinkId=620686
            config.EnableSystemDiagnosticsTracing();

            new MobileAppConfiguration()
                .UseDefaultConfiguration()
                .ApplyTo(config);

            // Use Entity Framework Code First to create database tables based on your DbContext
            Database.SetInitializer(new BookPollAppInitializer());

            // To prevent Entity Framework from modifying your database schema, use a null database initializer
            // Database.SetInitializer<BookPollAppContext>(null);

            MobileAppSettingsDictionary settings = config.GetMobileAppSettingsProvider().GetMobileAppSettings();

            if (string.IsNullOrEmpty(settings.HostName))
            {
                // This middleware is intended to be used locally for debugging. By default, HostName will
                // only have a value when running in an App Service application.
                app.UseAppServiceAuthentication(new AppServiceAuthenticationOptions
                {
                    SigningKey = ConfigurationManager.AppSettings["SigningKey"],
                    ValidAudiences = new[] { ConfigurationManager.AppSettings["ValidAudience"] },
                    ValidIssuers = new[] { ConfigurationManager.AppSettings["ValidIssuer"] },
                    TokenHandler = config.GetAppServiceTokenHandler()
                });
            }
            app.UseWebApi(config);
        }
    }

    public class BookPollAppInitializer : CreateDatabaseIfNotExists<BookPollAppContext>
    {
        protected override void Seed(BookPollAppContext context)
        {
            List<TodoItem> todoItems = new List<TodoItem>
            {
                new TodoItem { Id = Guid.NewGuid().ToString(), Text = "First item", Complete = false },
                new TodoItem { Id = Guid.NewGuid().ToString(), Text = "Second item", Complete = false },
            };

            foreach (TodoItem todoItem in todoItems)
            {
                context.Set<TodoItem>().Add(todoItem);
            }

            List<PollQuestion> Questions = new List<PollQuestion>
            {
                new PollQuestion { Id = Guid.NewGuid().ToString(), Text = "What book would you like to read?",
                    Answers = "Beginning Entity Framework Core 2.0|Beginning Windows Mixed Reality Programming|Bu
                new PollQuestion { Id = Guid.NewGuid().ToString(), Text = "What is your favorite book category?",
                    Answers = "Apple and iPS|Programming|Machine Learning|Mobile|Microsoft and .NET" },
            };
            foreach (PollQuestion question in Questions)
            {
                context.Set<PollQuestion>().Add(question);
            }
            context.SaveChanges();
            base.Seed(context);
        }
    }
```

Figure 4-24. *The completed* `Startup.MobileApp.cs` *file in the* `App_Start` *folder*

6. Build the app. Drum roll please! Right-click the solution, and now you can publish the app. See Figure 4-25.

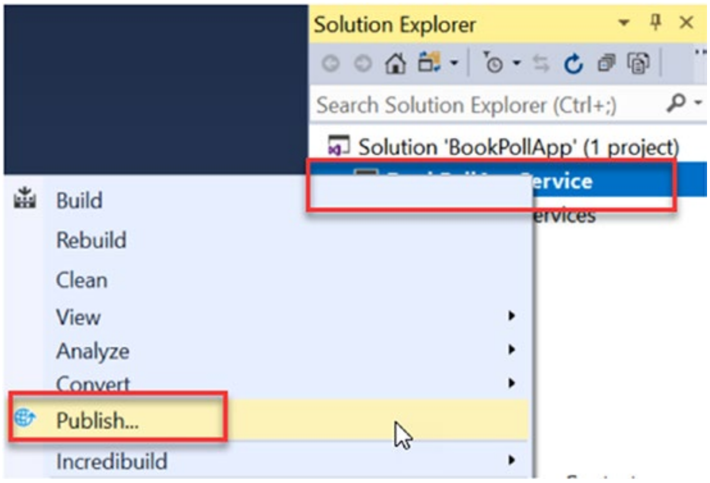


Figure 4-25. *Select the project, right-click, and select Publish… .*

7. Select Azure App Service, then Select Existing. See Figure 4-26.

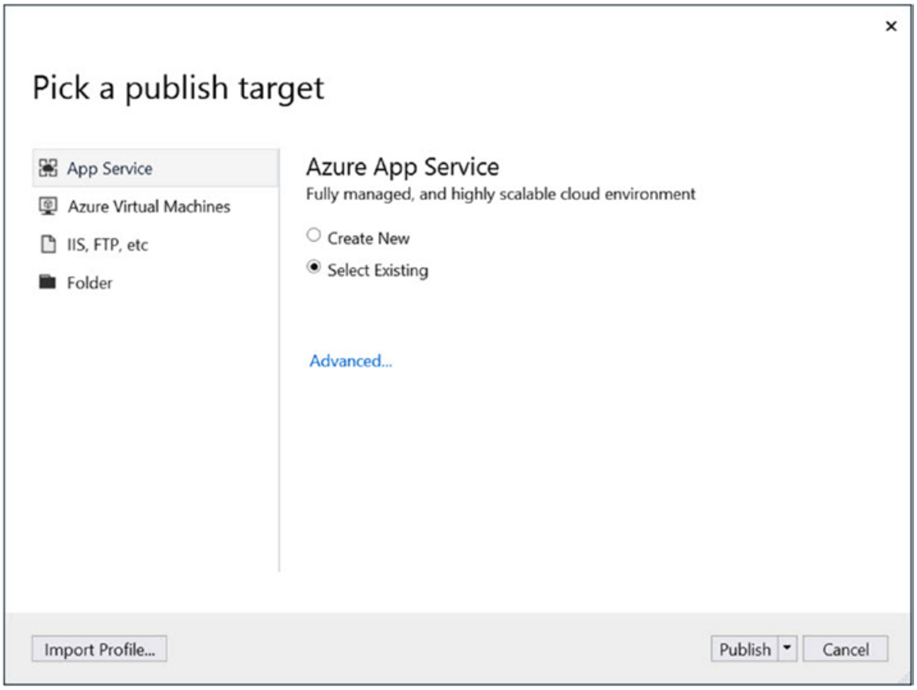
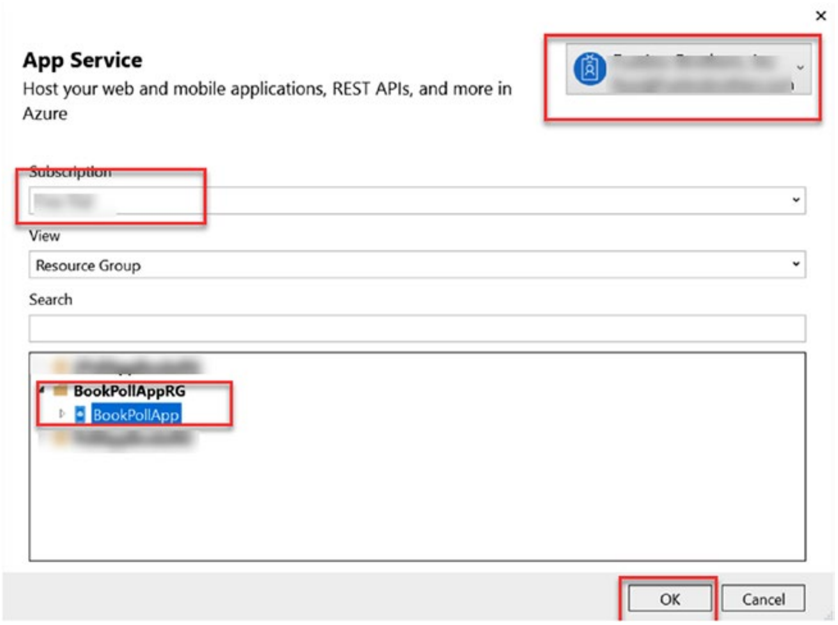


Figure 4-26. *Select the Azure App Service, then Select Existing, and click Publish… .*

8. Verify your credentials in the upper-right corner. Select your subscription and, under Resource Group, BookPollAppRG, then select your app service, BookPollApp. See Figure 4-27.


App Service

Host your web and mobile applications, REST APIs, and more in Azure

Subscription

View: Resource Group

Search

BookPollAppRG

BookPollApp

Figure 4-27. *Select your subscription and resource group from the drop-downs and select the app service you created in Quickstart under Resource Group*

9. The deployment should take a minute or two. Once deployed, you should see your browser pop up, with the service running as shown in Figure 4-28.

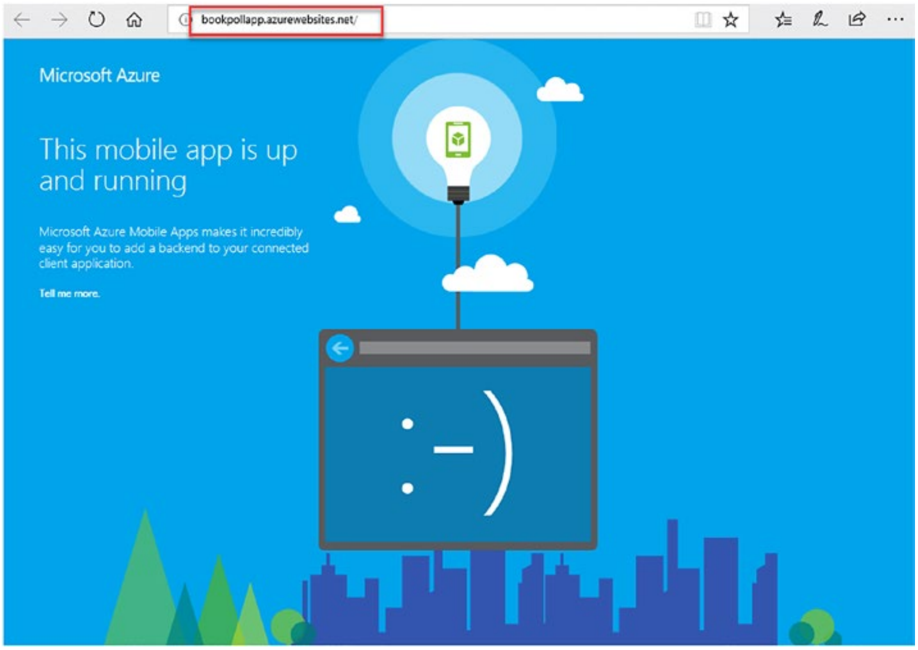
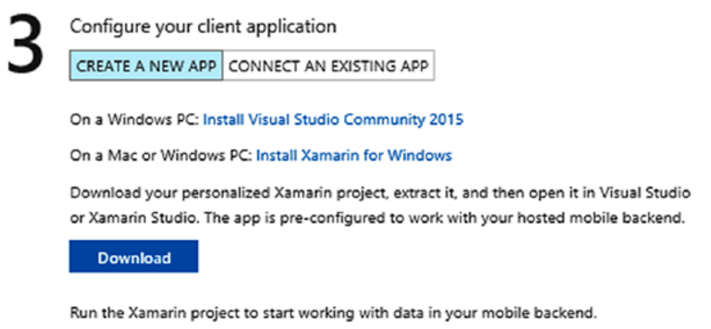

bookpollapp.azurewebsites.net/
Microsoft Azure
This mobile app is up and running
Microsoft Azure Mobile Apps makes it incredibly easy for you to add a backend to your connected client application.
Tell me more.

Figure 4-28. *Your web service should pop up in your browser, indicating that the mobile app is up and running!*

10. Now go back to the portal quick start and complete step 3, the final step, but only after you see that the web service is running. Click to download the Xamarin Forms client application for CREATE A NEW APP. See Figure 4-29. We will be connecting to an existing app in Chapter 5.


3 Configure your client application

On a Windows PC: Install Visual Studio Community 2015

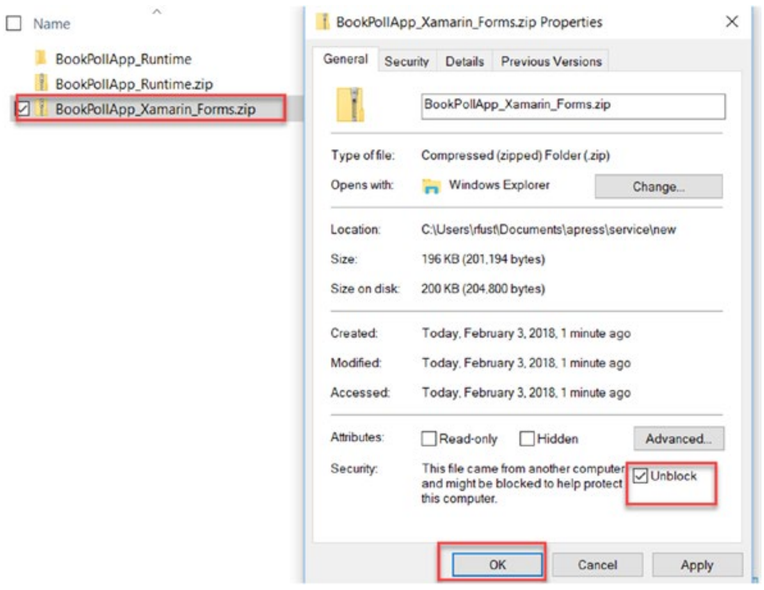
On a Mac or Windows PC: Install Xamarin for Windows

Download your personalized Xamarin project, extract it, and then open it in Visual Studio or Xamarin Studio. The app is pre-configured to work with your hosted mobile backend.

Run the Xamarin project to start working with data in your mobile backend.

Figure 4-29. *Click the Download button to get your Xamarin Forms app, which is wired to your service and data*

Before you unzip, right-click the downloaded file and bring up the properties to unblock. Check Unblock and click OK. If you do not do this, you may encounter strange errors when running your app in Visual Studio. See Figure 4-30.



BookPollApp_Runtime
BookPollApp_Runtime.zip
BookPollApp_Xamarin_Forms.zip

BookPollApp_Xamarin_Forms.zip Properties

BookPollApp_Xamarin_Forms.zip

Type of file: Compressed (zipped) Folder (.zip)
Opens with: Windows Explorer

Location: C:\Users\rfust\Documents\apress\service\new
Size: 196 KB (201,194 bytes)
Size on disk: 200 KB (204,800 bytes)

Created: Today, February 3, 2018, 1 minute ago
Modified: Today, February 3, 2018, 1 minute ago
Accessed: Today, February 3, 2018, 1 minute ago

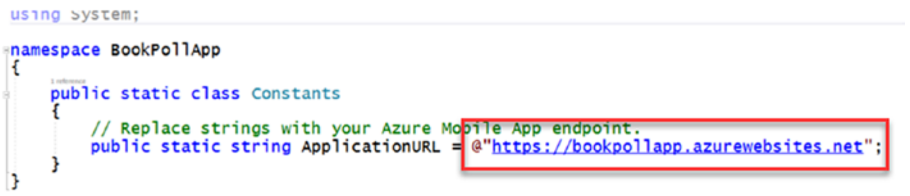
Attributes: ☐ Read-only ☐ Hidden

Security: This file came from another computer and might be blocked to help protect this computer. ☑ Unblock

Figure 4-30. *Right-click the downloaded zip and select properties. Check Unblock and click OK.*

11. Right-click the solution and Restore NuGet Packages.

12. In the BookPollApp, open `Constants.cs` and verify that the application URL is set to what you created in Quickstart. See Figure 4-31.



```
using System;

namespace BookPollApp
{
    public static class Constants
    {
        // Replace strings with your Azure Mobile App endpoint.
        public static string ApplicationURL = @"https://bookpollapp.azurewebsites.net";
    }
}
```

Figure 4-31. *Verify application URL in* `Constants.cs`

13. Right-click the UWP project and set as startup. See Figure 4-32.

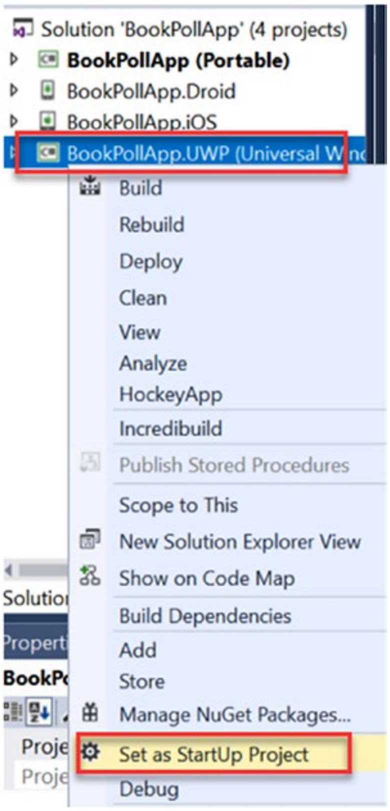


Figure 4-32. *Right-click the UWP project and select Set as StartUp Project*

14. Rebuild the portable project and the UWP projects and any other platforms you wish to test.

15. **You need to run the app to populate the database tables.** For UWP, run the app on Local Machine ×86 or ×64 **(not ARM).** See Figure 4-33.

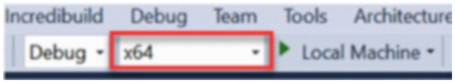


Figure 4-33. *Select ×64 or ×86 and then click Local Machine*

16. After the app starts, give it 5–10 seconds the first time, you should see a couple of "to do" items float into the list that were populated in the service app on our database. See Figure 4-34.

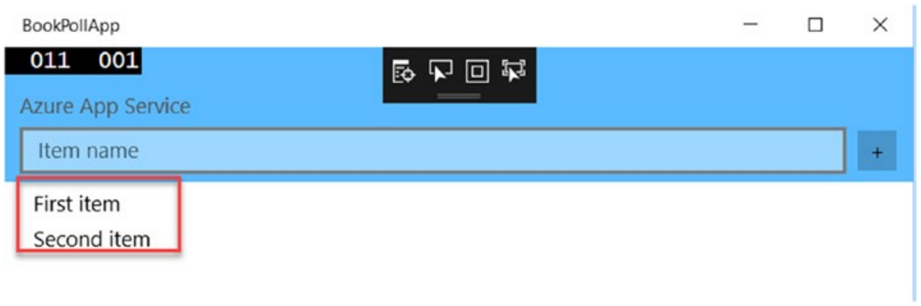


Figure 4-34. *See the "to-do list" items for the first and second items*

17. Go ahead and add a third entry. It will be stored in your Azure Database. See Figures 4-35 and 4-36.

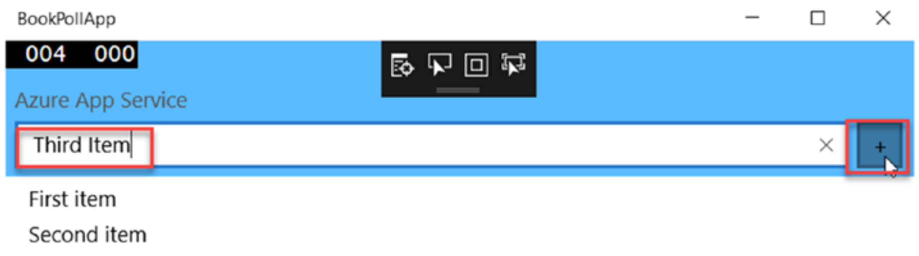
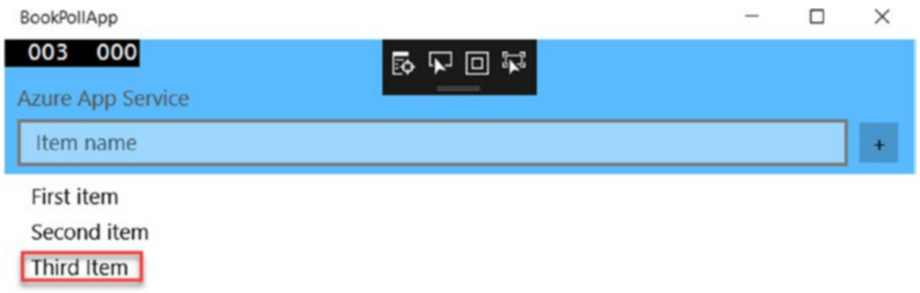


Figure 4-35. *Add a third item to the list by typing a value and clicking +*



First item
Second item
Third Item

Figure 4-36. *You will see the third item added to the list*

Wow! That completes building your customized tables for an existing app and the table for the new app from Quickstart. We now have a working API that serves up data that our client apps can use. Are you feeling tingly yet? But wait…is the data really in the database? We know it is for the `TodoItem` table, because the preceding app shows it, but what about the Questions table? We need to verify this.

Part 6: Verify the Database

Time Estimate

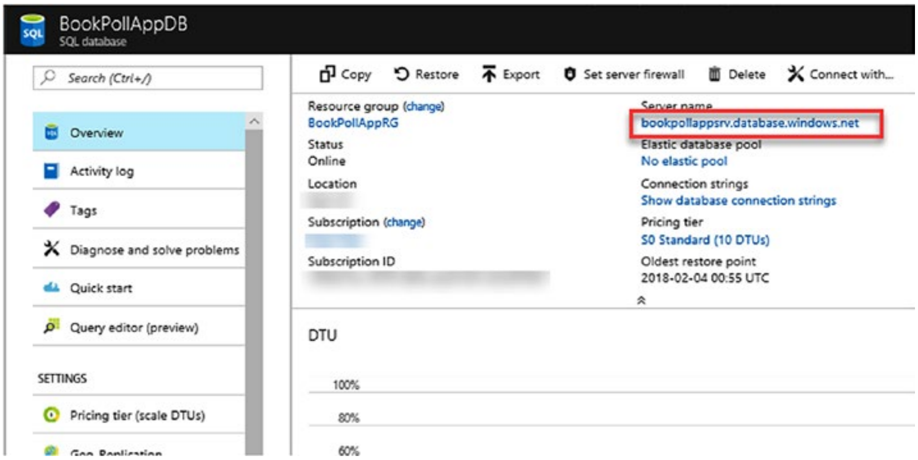
10 Minutes

In this final part of the chapter, we will look at how to verify that the data has been seeded successfully in our application database. This is useful to do at this point, because in the next chapter, we must know if this part has been done correctly, or we will have data problems that are not in the app but in the database. So, we must eliminate that possibility. Let's accomplish this task and get started using SQL Server Management Studio.

Note You must run the Xamarin Forms app in Part 5, to see the data in Part 6. It does not seed tables in the database until used in the Xamarin Forms client app.

---

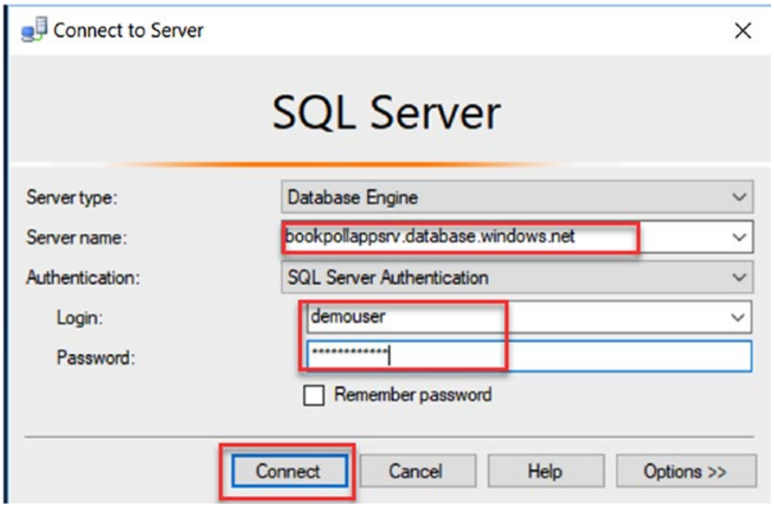
1. Go back to the portal and click Resource group on the left dashboard panel. Select BookPollAppRG, then select the SQL database, BookPollAppdb.
2. Copy the Database URL. See Figure 4-37.



Resource group (change)
BookPollAppRG
Status
Online
Location
Subscription (change)
Subscription ID
Server name
bookpollappsrv.database.windows.net
Elastic database pool
No elastic pool
Connection strings
Show database connection strings
Pricing tier
S0 Standard (10 DTUs)
Oldest restore point
2018-02-04 00:55 UTC

Figure 4-37. *Copy the server name URL for your database in the portal*

3. Start up SQL Server Management Studio, paste in the URL for the server name, and enter the login user and password that you set up for the database. Click Connect. See Figure 4-38.


Connect to Server

SQL Server

Server type: Database Engine

Server name: bookpollappsrv.database.windows.net

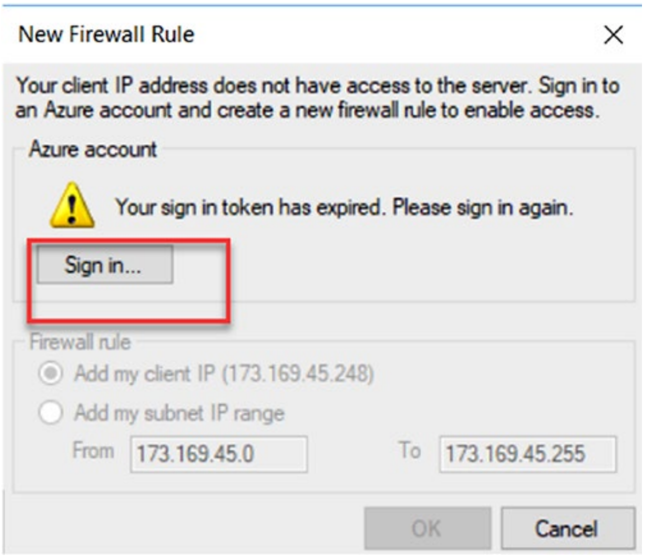
Authentication: SQL Server Authentication

Login: demouser

Password: ************

Figure 4-38. *Paste in the URL, enter the credentials you set up, and click Connect*

4. If you get prompted, sign in and create a new firewall rule. See Figures 4-39 and 4-40.


New Firewall Rule

Your client IP address does not have access to the server. Sign in to an Azure account and create a new firewall rule to enable access.

Azure account

Your sign in token has expired. Please sign in again.

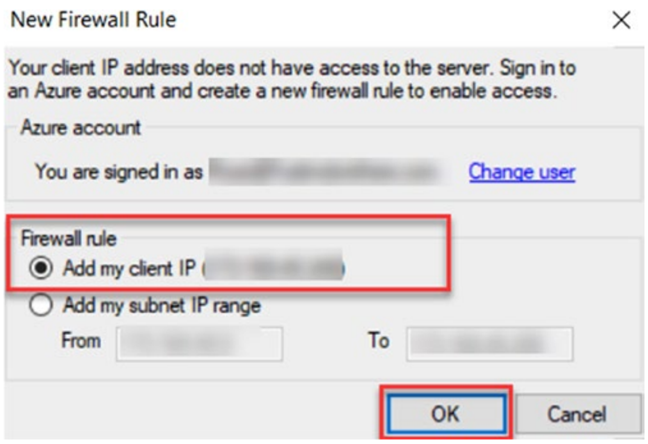
Firewall rule

Add my client IP (173.169.45.248)

Add my subnet IP range

From 173.169.45.0 To 173.169.45.255

Figure 4-39. *Click Sign in and enter your credentials for the portal*



New Firewall Rule

Your client IP address does not have access to the server. Sign in to an Azure account and create a new firewall rule to enable access.

Azure account

You are signed in as [redacted] Change user

Firewall rule

● Add my client IP ([redacted])

○ Add my subnet IP range

From [redacted] To [redacted]

Figure 4-40. *Add my client IP and click OK*

5. Expand BookPollAppDB and Tables, right-click `dbo.TodoItems`, and click Select Top 1000 Rows. See Figure 4-41.

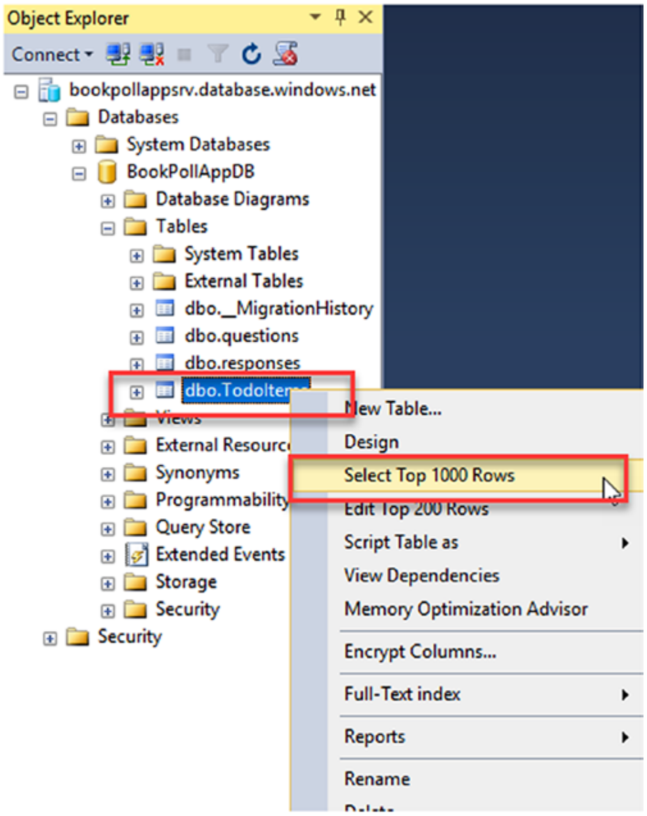
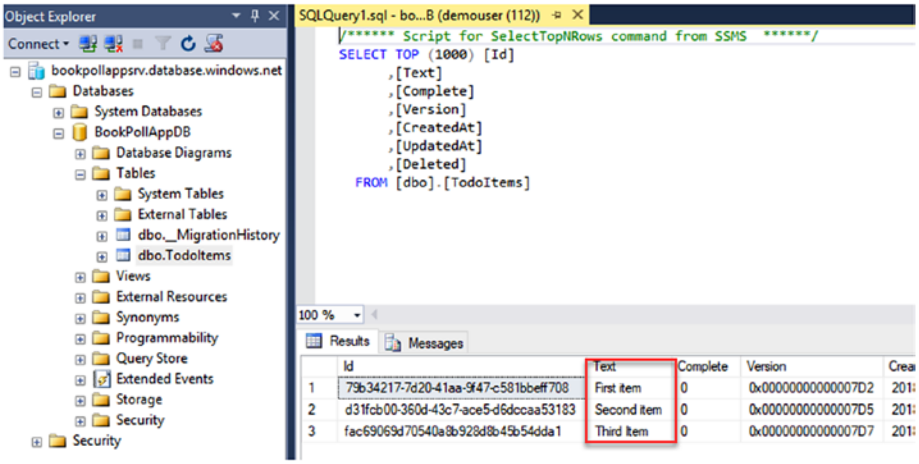


Figure 4-41. *Right-click* `dbo.TodoItems` *then click Select Top 1000 Rows*

6. You should see all three rows, including the one we added. See Figure 4-42.



```
/****** Script for SelectTopNRows command from SSMS  ******/
SELECT TOP (1000) [Id]
      ,[Text]
      ,[Complete]
      ,[Version]
      ,[CreatedAt]
      ,[UpdatedAt]
      ,[Deleted]
  FROM [dbo].[TodoItems]
```

	Id	Text	Complete	Version	Crea
1	79b34217-7d20-41aa-9f47-c581bbeff708	First item	0	0x00000000000007D2	201
2	d31fcb00-360d-43c7-ace5-d6dccaa53183	Second item	0	0x00000000000007D5	201
3	fac69069d70540a8b928d8b45b54dda1	Third Item	0	0x00000000000007D7	201

Figure 4-42. *All three items are shown*

7. Do the same for `dbo.questions`: click Select Top 1000 Rows. See Figure 4-43.

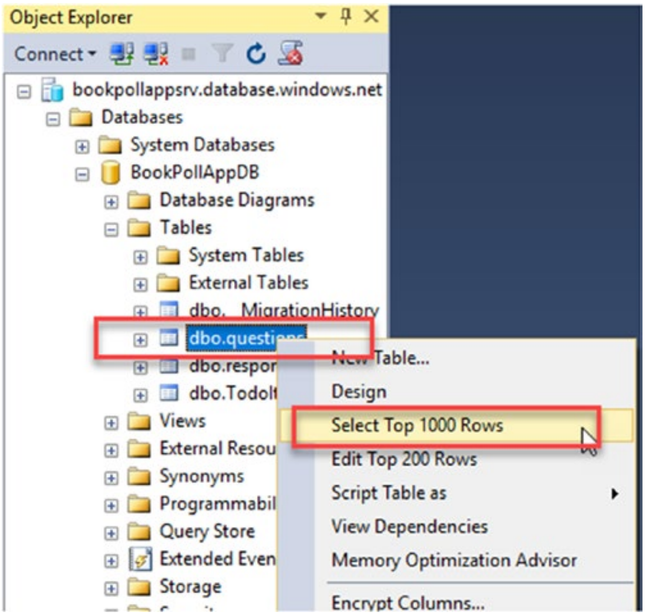
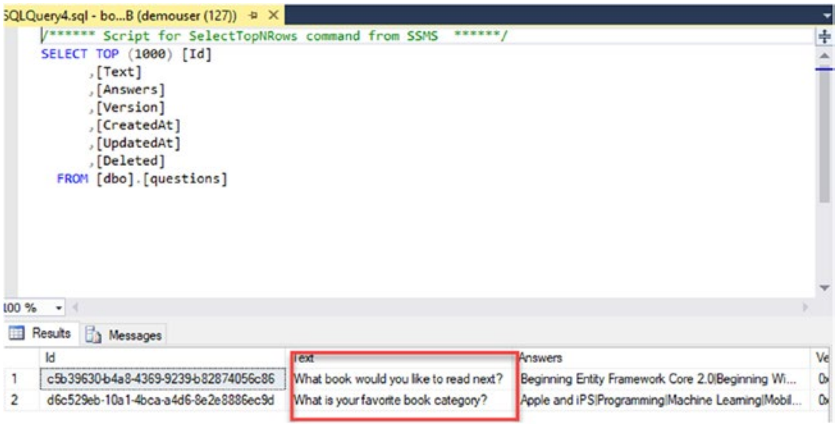


Figure 4-43. *Select rows for the* `dbo.questions` *table*

8. You should see the two questions we added. See Figure 4-44.



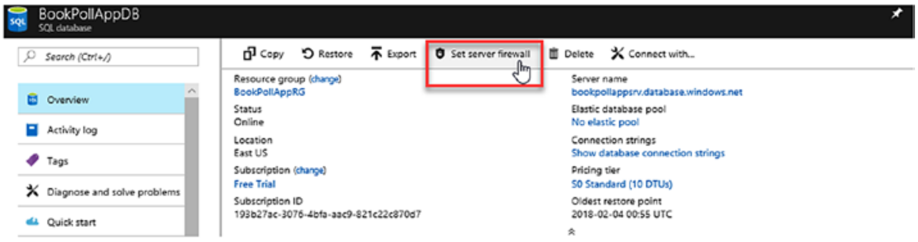
```
/****** Script for SelectTopNRows command from SSMS  ******/
SELECT TOP (1000) [Id]
      ,[Text]
      ,[Answers]
      ,[Version]
      ,[CreatedAt]
      ,[UpdatedAt]
      ,[Deleted]
  FROM [dbo].[questions]
```

	Id	Text	Answers	Ve
1	c5b39630-b4a8-4369-9239-b82874056c86	What book would you like to read next?	Beginning Entity Framework Core 2.0|Beginning Wi...	0x
2	d6c529eb-10a1-4bca-a4d6-8e2e8886ec9d	What is your favorite book category?	Apple and iPS|Programming|Machine Learning|Mobil...	0x

Figure 4-44. *Two questions should be displayed*

9. The Responses table will be empty. We will be populating that in Chapter 5.

10. You can also set up the firewall rules on the server. Navigate to the portal and open the database blade. Click Set server firewall. See Figure 4-45.

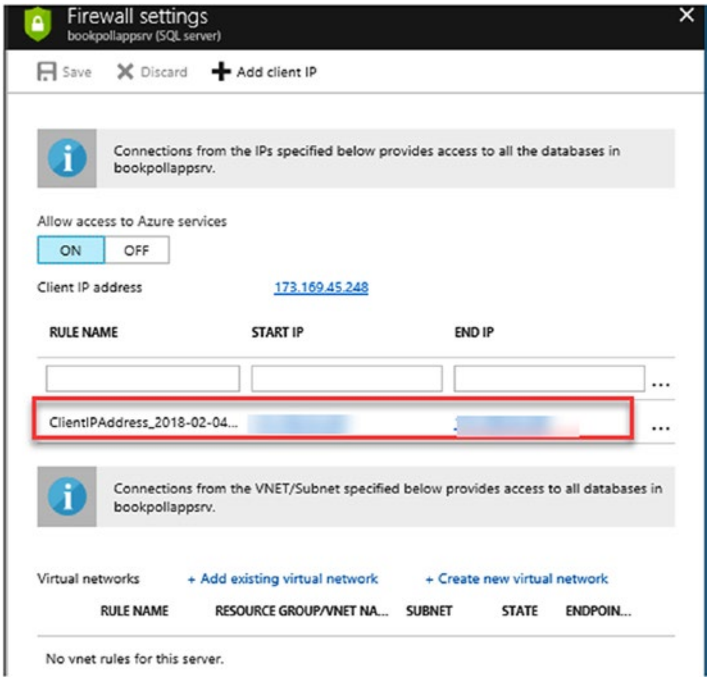


Resource group (change)
BookPollAppRG
Status
Online
Location
East US
Subscription (change)
Free Trial
Subscription ID
193b27ac-3076-4bfa-aac9-821c22c870d7

Server name
bookpollappsrv.database.windows.net
Elastic database pool
No elastic pool
Connection strings
Show database connection strings
Pricing tier
S0 Standard (10 DTUs)
Oldest restore point
2018-02-04 00:55 UTC

Figure 4-45. *You can set the server firewall on the portal as well*

11. You should see the firewall rule that we just set up from SQL Server Management Studio. See Figure 4-46.


Firewall settings
bookpollappsrv (SQL server)

Save | Discard | Add client IP

Connections from the IPs specified below provides access to all the databases in bookpollappsrv.

Allow access to Azure services: [✓ ON] OFF

Client IP address: 173.169.45.248

RULE NAME	START IP	END IP
ClientIPAddress_2018-02-04...		

Connections from the VNET/Subnet specified below provides access to all databases in bookpollappsrv.

Virtual networks: + Add existing virtual network | + Create new virtual network

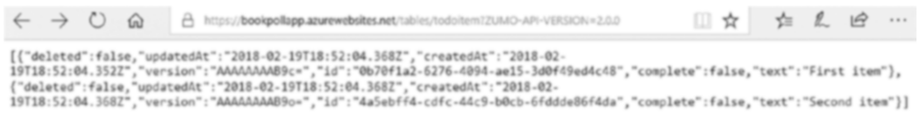
RULE NAME	RESOURCE GROUP/VNET NA...	SUBNET	STATE	ENDPOIN...

No vnet rules for this server.

Figure 4-46. *The client IP we set up via SQL Server Management Studio*

12. Click on the + Add client IP to set up another one if you like. Click Save. Congratulations! You just built a service that can be consumed by any client. We will populate the Responses table and use the Questions table in the next chapter.

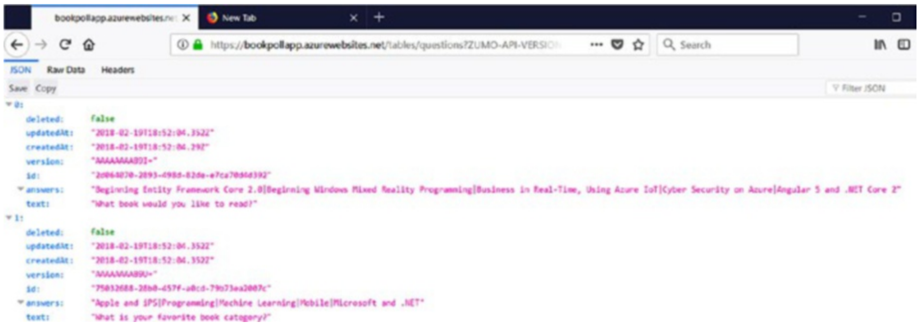
13. Type in the URLS to display the data in any current browser (except Internet Explorer, which will prompt you to download the results, which you can view with Notepad). Figure 4-47 shows the query for `todoitem` from the Edge browser. If you receive a message that resources have been moved or renamed, double-check the controller step 2 in Part 4, and make sure that you changed the name of the default controller from PollQuestionController to QuestionsController and did the same for responses.


https://bookpollapp.azurewebsites.net/tables/todoitem?ZUMO-API-VERSION=2.0.0

```
[{"deleted":false,"updatedAt":"2018-02-19T18:52:04.368Z","createdAt":"2018-02-
19T18:52:04.352Z","version":"AAAAAAAAB9c=","id":"0b70f1a2-6276-4094-ae15-3d0f49ed4c48","complete":false,"text":"First item"},
{"deleted":false,"updatedAt":"2018-02-19T18:52:04.368Z","createdAt":"2018-02-
19T18:52:04.368Z","version":"AAAAAAAAB9o=","id":"4a5ebff4-cdfc-44c9-b0cb-6fddde86f4da","complete":false,"text":"Second item"}]
```

Figure 4-47. *The results for a query in a browser. This one is from Edge.*

From Firefox, query the Questions table, and it should appear nicely formatted, as in Figure 4-48. Enter the following URL: `https://bookpollapp.azurewebsites.net/tables/questions?ZUMO-API-VERSION=2.0.0`.


bookpollapp.azurewebsites.ne
New Tab
https://bookpollapp.azurewebsites.net/tables/questions?ZUMO-API-VERSIO
Search
JSON
Raw Data
Headers
Save
Copy
Filter JSON

```
▼ 0:
    deleted:      false
    updatedAt:    "2018-02-19T18:52:04.352Z"
    createdAt:    "2018-02-19T18:52:04.29Z"
    version:      "AAAAAAAAB0I="
    id:           "2d064070-2893-4988-82de-e7ca70d4d392"
  ▼ answers:      "Beginning Entity Framework Core 2.0|Beginning Windows Mixed Reality Programming|Business in Real-Time, Using Azure IoT|Cyber Security on Azure|Angular 5 and .NET Core 2"
    text:         "What book would you like to read?"
▼ 1:
    deleted:      false
    updatedAt:    "2018-02-19T18:52:04.352Z"
    createdAt:    "2018-02-19T18:52:04.352Z"
    version:      "AAAAAAAAB9U="
    id:           "75032688-28b0-457f-a0cd-79b73ea2007c"
  ▼ answers:      "Apple and iPS|Programming|Machine Learning|Mobile|Microsoft and .NET"
    text:         "What is your favorite book category?"
```

Figure 4-48. *The results for a query in a browser. These are from Firefox.*

14. Do not delete any resources from this chapter until you have completed Chapter 5.

Caution Do not delete any resources from this chapter until you have completed Chapter 5.

Summary

In this chapter, you used the Azure portal to create a mobile app and Xamarin Forms' Quickstart to create a database for the app. Quickstart also created an app service using the Table API. You modified the Table API Service app and created two additional tables for questions and responses, which will be used in another Xamarin Forms app in Chapter 5. You have also seeded some data. You downloaded the sample Quickstart Xamarin Forms solution and ran it. You updated the "to do item" list and verified the database contents with SQL Server Management Studio and set up a server firewall rule.

In the next chapter, let's look at taking an existing Xamarin Forms app and integrating Azure, so we can consume the Questions table data that we exposed in our API app service. We will be populating the Responses table data in Chapter 5 from that same existing app. For the rest of the book, it is all about the client app!

CHAPTER 5

Building a Xamarin Forms Azure Client

When we used Quickstart in Chapter 4, we generated a new app that utilized Azure services. Now that you are liking Azure and, I hope, have seen the light, you may have an existing app that you would like to modify to use Azure. I have several apps that I have written for which I wish I had started using Azure from the get-go. This chapter will help you make modifications to an existing app and take advantage of the benefits that Azure has to offer. Something else that is often an afterthought is to make your app available and fully operational in an offline manner. The app we will be modifying in this chapter is fully functional from a local perspective, and we want to move the data for a local store to the cloud as well as synchronize it when offline. These are all common tasks many existing apps require today that cause headaches for developers.

In this chapter, you will modify an existing Xamarin Forms application to add support for utilizing an Azure mobile service. You can use any mix of the platform projects, depending on your development environment (Mac or Windows). You will customize data transfer objects (DTOs) and database query logic, as well as add offline caching support and synchronization.

R. Fustino, *Azure and Xamarin Forms*, https://doi.org/10.1007/978-1-4842-3561-4_5

Note Run this project from your laptop/PC **and not an Azure Virtual Machine**. Chapter 4 must be completed, as it creates a service that will be consumed in Chapter 5. It creates an end point similar to `http://bookpollapp.azurewebsites.net`. Completed code for Chapter 4 is in this book's assets folder. The source code and assets for this book can be downloaded from `https://github.com/Apress/azure-and-xamarin-forms`.

The provided chapter 4 solution does not run and publish as is, It needs the Quickstart generated endpioint and Qucikstart generated configuration in Web.config as well as appropriate NuGet packages.

You must publish the app service in Chapter 4, exposing the end point similar to above.

We will not be using the Xamarin Client App created using Quickstart in Chapter 4. Instead, we will be using a starter project for Chapter 5. This chapter will provide knowledge on modifying an existing Xamarin Forms Client to "Azure-ize" it.

Time Estimate
65 Minutes

Part 1: Open an Existing Xamarin Forms Application

Time Estimate

5 Minutes

I have provided a fully functional app that works well with local data. The problem is that to make the app useful, the data really should be in the cloud, so the data is sharable among several users. Perhaps you have developed a prototype that runs local data and need to do that same thing. This is a very common problem in the developer community, for sure. The app provides questions with a list of choices for responses. Think of it as an app that facilitates polling or voting responses. In this part, you will be modifying an existing solution. You will open the starter solution, build it, run the project, and review the output.

1. Copy the Starter app from the book assets folder to a folder close to the root, such as `C:\Apressbooks`. From File Explorer, set properties to unblock and then unzip. With Visual Studio, open the Starter BookPollClientApp project.

2. As with any Xamarin Forms sample you download, always restore NuGet packages first. Right-click the solution and select Restore NuGet Packages. See Figure 5-1.

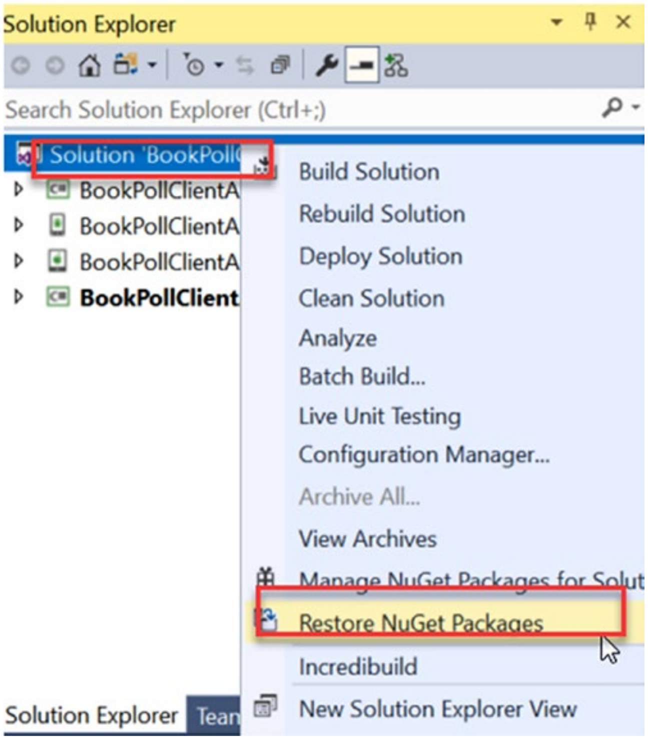


Figure 5-1. *Right click on the solution and Select Restore NuGet Packages*

3. Set the UWP project to the startup project. The next step is to build. Right-click the Portable project and select Build. See Figure 5-2.

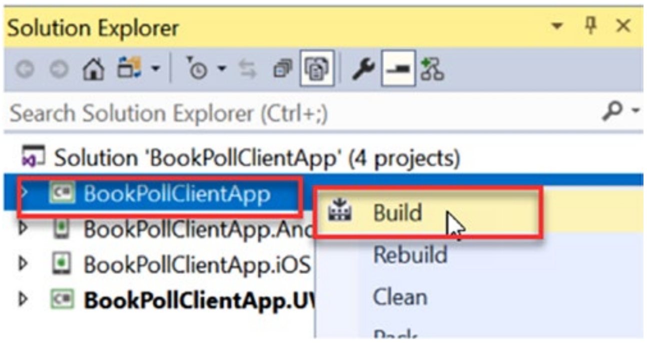
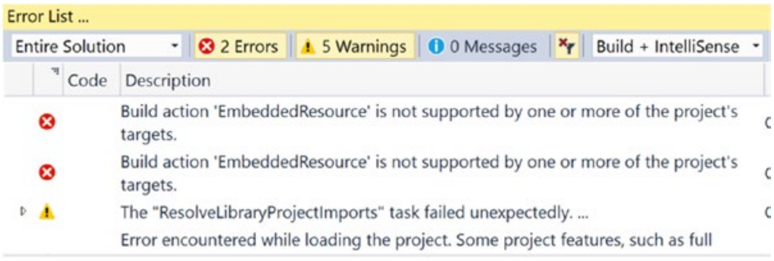


Figure 5-2. *Right-click the Portable and UWP projects and select Build*

4. If you see errors in the Portable project related to EmbeddedResources, or other extraneous errors, do the following:

   - Right-click the project in the solution.
   - Unload the project.
   - Reload the project.
   - Build the project.

   This is another common problem on downloaded Xamarin samples. Sometimes you may also have to clean the solution (by right-clicking the solution), then delete the `obj` and `bin` folders by clicking the Show All Files button for each project. See Figures 5-3 through 5-6.


Error List ...

Entire Solution | 2 Errors | 5 Warnings | 0 Messages | Build + IntelliSense

	Code	Description
⊗		Build action 'EmbeddedResource' is not supported by one or more of the project's targets.
⊗		Build action 'EmbeddedResource' is not supported by one or more of the project's targets.
⚠		The "ResolveLibraryProjectImports" task failed unexpectedly. ...
		Error encountered while loading the project. Some project features, such as full

Figure 5-3. *An EmbeddedResource error is not really an error*

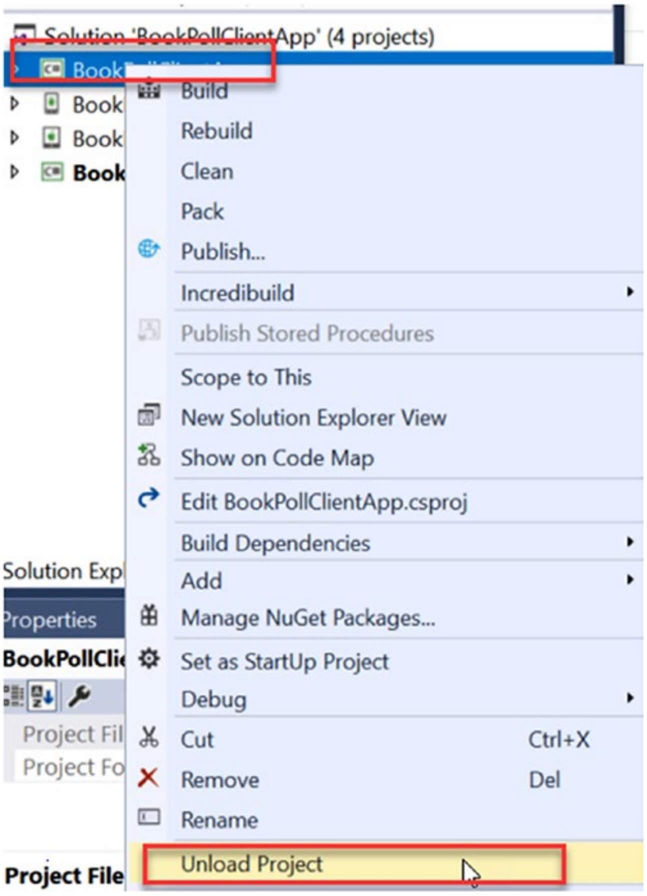


Figure 5-4. *To get rid of the preceding error, select Unload Project*

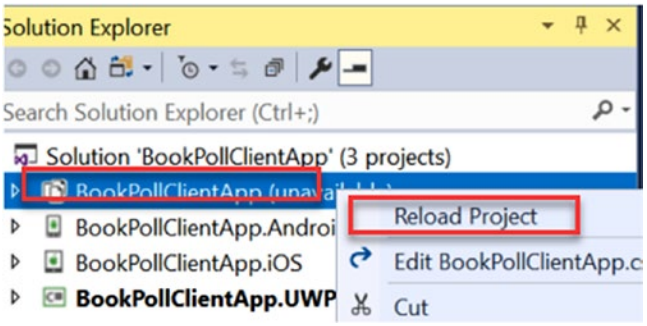


Figure 5-5. *By selecting Reload Project, the project should rebuild*

To resolve extraneous errors, sometimes you must clean project and delete the `bin` and `obj` folders. To see them, click the Show All Files button in Solution Explorer.

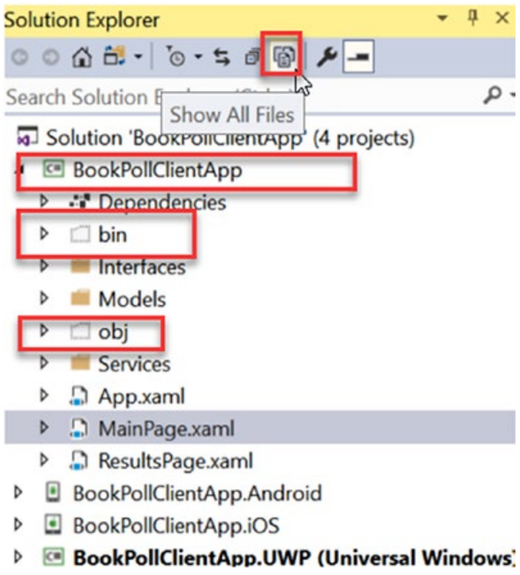


Figure 5-6. *Show All Files button in Solution Explorer*

Now we have a project that builds. Next, let's run it and see the application that currently runs from local data.

Part 2: Add Azure Support to a Xamarin Forms Application

Time Estimate

15 Minutes

Where do I start? The first thing will be to simply run the app and see it execute in its current local data state. We will review the structure of the app, so that you become a little more familiar with it. Then we will look at adding the appropriate NuGet packages that are required to access Azure Services. We will add the appropriate Azure initialization calls and create a PollQuestion interface. In this part, you will add Azure support to an existing application.

1. Continue with the same project.
2. Set your preferred platform-specific project as the startup project. Any of them will work.
3. Run the application to see it work. See Figure 5-7.

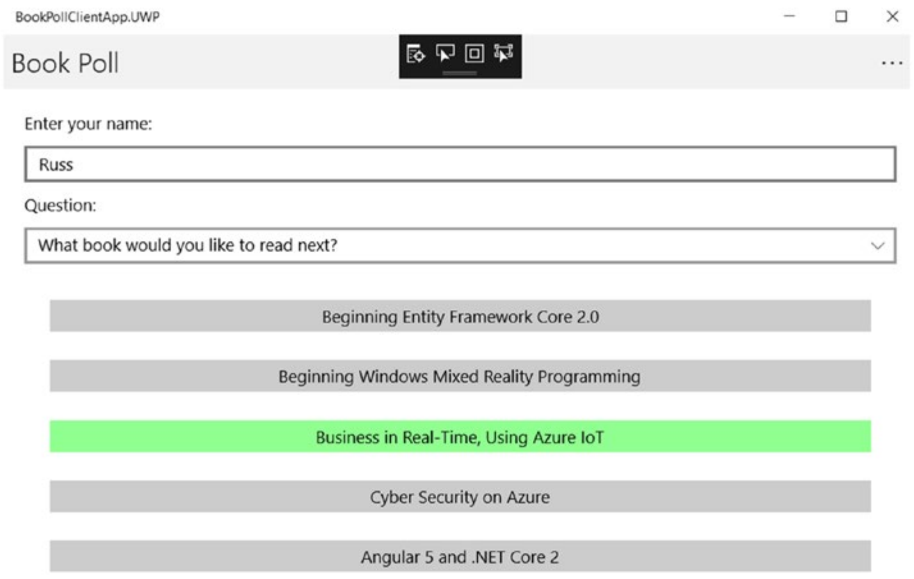

BookPollClientApp.UWP
Book Poll
Enter your name:
Russ
Question:
What book would you like to read next?
Beginning Entity Framework Core 2.0
Beginning Windows Mixed Reality Programming
Business in Real-Time, Using Azure IoT
Cyber Security on Azure
Angular 5 and .NET Core 2

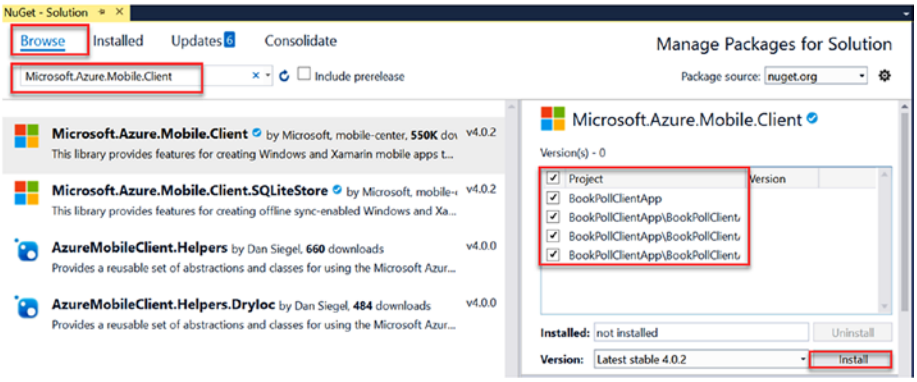
Figure 5-7. *Running the starter app should look like this*

4. Expand the solution—it contains several projects, as listed in Table 5-1.

Table 5-1. *Solution Project Layout*

Project	Description
BookPollClientApp	This is the core Xamarin.Forms view shared assembly. It contains the page definitions (one for the main page and one for a results page), the models, and the code that will interact with the service. Currently, it has a mocked-out implementation that does everything with hard-coded local data. You will be using the IPollQuestionService interface, which you will implement to connect to Azure Service.
BookPollClientApp.Android	The Xamarin.Android platform-specific (head) project
BookPollClientApp.iOS	The Xamarin.iOS platform-specific (head) project. You will require a Mac host to run this application.
BookPollClientApp.UWP	The Windows UWP platform-specific (head) project. You will require Visual Studio for Windows to run this project. It will be disabled on macOS.

5. We need the Azure client libraries in our projects and to add NuGet references. This will allow us to connect to Azure and interact with the exposed table end points. Add the Microsoft.Azure.Mobile.Client NuGet package to all of the projects. Right-click the solution and select Manage NuGet Packages for Solution… . Click the browse tab and search on Microsoft.Azure.Mobile.Client. Check all the projects, as shown in Figure 5-8.



Microsoft.Azure.Mobile.Client

Package source: nuget.org

Microsoft.Azure.Mobile.Client by Microsoft, mobile-center, 550K dov v4.0.2
This library provides features for creating Windows and Xamarin mobile apps t...

Microsoft.Azure.Mobile.Client.SQLiteStore by Microsoft, mobile-(v4.0.2
This library provides features for creating offline sync-enabled Windows and Xa...

AzureMobileClient.Helpers by Dan Siegel, 660 downloads v4.0.0
Provides a reusable set of abstractions and classes for using the Microsoft Azur...

AzureMobileClient.Helpers.Dryloc by Dan Siegel, 484 downloads v4.0.0
Provides a reusable set of abstractions and classes for using the Microsoft Azur...

Microsoft.Azure.Mobile.Client

Version(s) - 0

	Project	Version
✓	BookPollClientApp	
✓	BookPollClientApp\BookPollClient.	
✓	BookPollClientApp\BookPollClient.	
✓	BookPollClientApp\BookPollClient.	

Installed: not installed

Version: Latest stable 4.0.2

Figure 5-8. *Browse for Microsoft.Azure.Mobile.Client and install to all the projects*

6. If you see errors in the Error list after loading the mobile client, click Save All and close and reopen Visual Studio with the project.

7. Next, we must initialize the Azure library. Both Android and iOS must initialize the Azure client library, by adding a line of code into the initialization of the app. This code must be done in the platform-specific projects, as the method isn't available in the shared project. You only have to do this for Android and iOS—and only if you plan to run these platforms.

8. For Android, open the `MainActivity.cs` file in the Xamarin.Android project. Because this is a Xamarin. Forms app, the main Activity only launches once per app-launch, and we can do our initialization here.

9. Add a call to `Microsoft.WindowsAzure.MobileServices.CurrentPlatform.Init();` in the `OnCreate` override. You can place it just before the `Forms.Init` call. The following highlighted code is what you must add:

```
protected override void OnCreate(Bundle bundle)
{
    TabLayoutResource = Resource.Layout.Tabbar;
    ToolbarResource = Resource.Layout.Toolbar;

    base.OnCreate(bundle);
    Microsoft.WindowsAzure.MobileServices.
    CurrentPlatform.Init();

    global::Xamarin.Forms.Forms.Init(this, bundle);
    LoadApplication(new App());
}
```

10. For iOS, open the `AppDelegate.cs` file in the Xamarin.iOS project.

11. Add a call to `Microsoft.WindowsAzure.MobileServices.CurrentPlatform.Init ();` in the `FinishedLaunching` override. You can place it just before the `Forms.Init` call.

```
public override bool FinishedLaunching(UIApplication
app, NSDictionary options)
        {
                Microsoft.WindowsAzure.MobileServices.
                CurrentPlatform.Init();
            global::Xamarin.Forms.Forms.Init();
            LoadApplication(new App());

            return base.FinishedLaunching(app,
            options);
        }
```

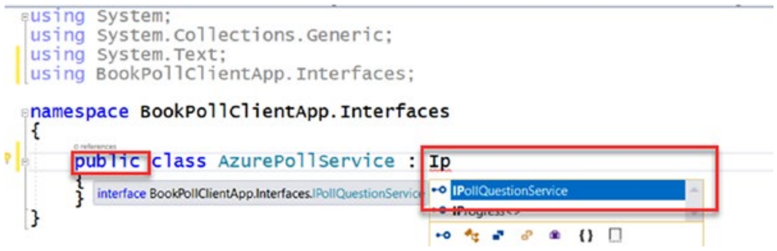
12. Let's create a new service class to interact with Azure. The interface is defined to interact with our poll data service. Currently, it's implemented with a mock class for local testing. Our goal is to eventually replace this with a complete implementation that talks to Azure (or some other online cloud provider). Open the `IPollQuestionService.cs` file in the `Interfaces` folder of the BookPollClientApp project. This is the interface we must implement.

13. Let's start by creating a new class that implements the interface. Add a new class named `AzurePollService.cs` in the `Services` folder.

14. Make the class public, and have it implement `IPollQuestionService`. You can use the built-in IDE support to add each required method stub. We won't actually be providing an implementation yet, but all the methods must be present. Just leave the `throw new NotImplementedException();` in place for now. Add these `using` statements:

    ```
    using BookPollClientApp.Interfaces;
    using Microsoft.WindowsAzure.MobileServices;
    ```

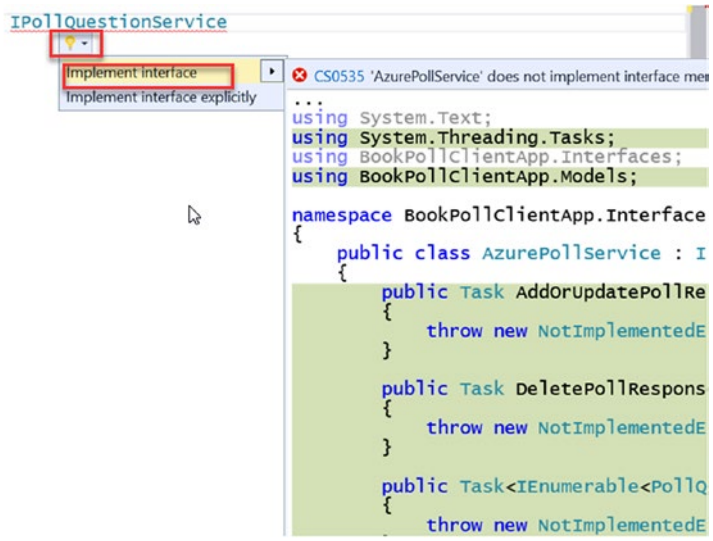
15. Make the class public, and as you type in the interface to inherit, you should see the Intellisense show the IPollQuestionService interface. See Figure 5-9.



```
using System;
using System.Collections.Generic;
using System.Text;
using BookPollClientApp.Interfaces;

namespace BookPollClientApp.Interfaces
{
    0 references
    public class AzurePollService : Ip
    {
    }
}
```

***Figure 5-9.** Select the Intellisense for IPollQuestionService*

16. Hover over the red squiggle on IPollQuestionService and select the Show potential fixes icon. Select Implement interface. See Figure 5-10.



```
IPollQuestionService
```

```
CS0535 'AzurePollService' does not implement interface mem
...
using System.Text;
using System.Threading.Tasks;
using BookPollClientApp.Interfaces;
using BookPollClientApp.Models;

namespace BookPollClientApp.Interface
{
    public class AzurePollService : I
    {
        public Task AddOrUpdatePollRe
        {
            throw new NotImplementedE
        }

        public Task DeletePollRespons
        {
            throw new NotImplementedE
        }

        public Task<IEnumerable<PollQ
        {
            throw new NotImplementedE
```

***Figure 5-10.** Select Implement interface*

17. To interact with Azure Service, you use a `MobileServiceClient` object. We'll create one and place it into our new `AzurePollService` class. Add a new private field of type `MobileServiceClient`. Add a new private method named `Initialize`, create

a mobile service client object, and assign it to your field. You will require the URL of the Azure service to pass into the constructor. We are working with a pre-built service from Chapter 4. The URL to the pre-built server from Chapter 4 is similar to http://bookpollapp.azurewebsites.net.

Add this using statement to AzurePollService.cs and the following code:

```
using Microsoft.WindowsAzure.MobileServices;

public class AzurePollService : IPollQuestionService
    {
        const string AzureUrl = @"http://bookpollapp.
        azurewebsites.net";
        MobileServiceClient client;
        void Initialize()
        {
            client = new MobileServiceClient(AzureUrl);
        }

        public Task AddOrUpdatePollResponseAsync(PollRe
        sponse response)
        {
            throw new NotImplementedException();
        }
...
```

18. Add a check into the Initialize method, to see if the MobileServiceClient has been created (non-null) and, if so, return. We want to be able to call this method multiple times but have the logic executed only once.

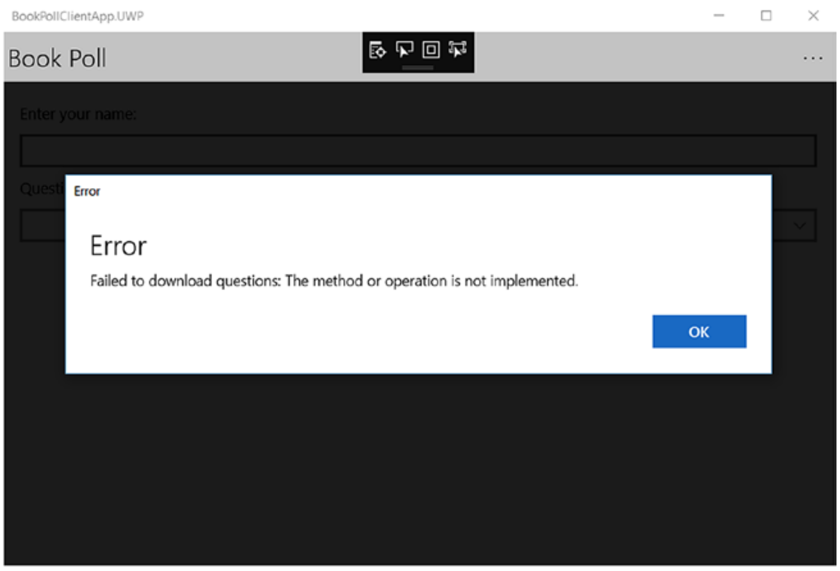
19. Next, add a call to the `Initialize` method into **each** of your implementation methods. We will create it the first time we use the object (as opposed to when it is created).

```
public class AzurePollService :
IPollQuestionService
{
    const string AzureUrl = "http://bookpollapp.
    azurewebsites.net";
    MobileServiceClient client;
    void Initialize()
    {
        if (client != null)
            return;
        client = new MobileServiceClient(AzureUrl);
    }
    public Task AddOrUpdatePollResponseAsync
    (PollResponse response)
    {
        Initialize();
        throw new NotImplementedException();
    }
    public Task DeletePollResponseAsync
    (PollResponse response)
    {
        Initialize();
        throw new NotImplementedException();
    }
...
```

20. Now, let's use our new Azure service and replace the service mock! Open the `MainPage.xaml.cs` file in the Portable project. It allocates an `IPollQuestionService` as a field in the class. Replace the `MockPollQuestionService` instance with a `new AzurePollService` instance.

```
public partial class MainPage : ContentPage
{
    // TODO: replace implementation
    readonly IPollQuestionService service = new
    AzurePollService();
```

21. Run the application. It should now fail and display a message indicating that the called method is not implemented. However, we will have created our Azure connection and are now set up to start implementing data access methods! See Figure 5-11.



Error

Failed to download questions: The method or operation is not implemented.

Figure 5-11. *Run, and an expected error will occur*

Congrats! You have started the journey to add Azure services to your app. Let's proceed to the next step and get the app to be functional again, by customizing the DTOs for the polling service.

Part 3: Customize the DTOs for the Polling Service

Time Estimate

10 Minutes

What we must do is wire the data we created in Chapter 4, now in the cloud, to the app. The plumbing is done thru DTOs, as we saw in Chapter 4 when serving up the data. Here, we will be using the DTOs to consume the data. Also, the data coming across the wire may have slightly different names than we are using in our app. No problem. That's what JSON attributes are for. Just specify the name of the field you are getting from the service in the attribute, and it will map it automatically for you. Phew! No major renaming in my app! In this part, you will customize the DTOs by adding `Json` and `Table` attributes.

There are two classes defined in the app that are used to hold the data that drives the user interface (UI):

> `PollQuestion`: This class holds a single question that includes text and a set of answers delimited by a "|".
>
> `PollResponse`: This class is used to represent the response to a poll question. It includes a property for the responder's name, the question ID being answered, and the index of the answer chosen.

The server end points we will be interacting with have data similar to the preceding data structures; however, when the developers created the service, they deviated slightly from the specification (or maybe we deviated from the specification when creating the client!).

The two classes will require Json.NET attributes, to set the name of the table. Make sure the properties conform to the preceding data structures.

We have to modify the DTO to match the JSON response. If we tried to use the current data structures as DTOs, they would not map much of the API, and, in fact, would actually hit the wrong end point, for example, PollQuestion instead of questions. We could fix this by renaming the class and its properties, but that's undesirable, because it would ripple throughout the application. Instead, let's fix this problem by applying Json.NET attributes to our DTO, to change the serialization format.

1. Open the PollQuestion.cs source file in the Models folder.

   Note that the property names don't match our JSON-expected shape, and the name of the class is being used as the end point name, which doesn't match.

2. Add a [Newtonsoft.Json.JsonObject(Title="questions")] attribute to the class, to fix the end point name. Add the following using statement and code:

```
using Newtonsoft.Json;

namespace BookPollClientApp.Models
{
    [JsonObject(Title = "questions")]
    public class PollQuestion
    {
        public string Id { get; set; }

        public string Text { get; set; }
        public string Answers { get; set; }
        public override string ToString()
        {
            return Text;
        }
    }
}
```

3. Do the same fix for the `PollResponse` object. Recall that the JSON shape

   - Is exposed on an end point named "`responses`".
   - Has the fields "`questionId`", "`name`", and "`answer`".

4. We will want to use the `createdAt` property a bit later, so add a new property to provide access to the field.

```
using Newtonsoft.Json;
using Microsoft.WindowsAzure.MobileServices;
using System;

namespace BookPollClientApp.Models
{
    [JsonObject(Title = "responses")]
    public class PollResponse
    {
        public string Id { get; set; }
        [JsonProperty("questionId")]
        public string PollQuestionId { get; set; }
        public string Name { get; set; }
        [JsonProperty("answer")]
        public int ResponseIndex { get; set; }
```

```
                [UpdatedAt]
                public DateTimeOffset UpdatedAt { get; set; }

            }
        }
```

Looks like our data structures are now intact. But how about the logic methods to work with our data?

Part 4: Fill In the Logic to Query and Update Our Poll Records

Time Estimate

10 Minutes

Data is useless unless we can get at it and pull it into the app. We may want to have methods to pull back all the questions. Perhaps we want to pull back a specific question or perform an update or insert in a record set. In this part, you will provide the logic for database queries. Basically, we want to be able to perform create, read, update, and delete (CRUD) operations, using lists and/or individual records.

Now let's add support to query and update our created tables in the Azure service we created.

- Implement the `GetQuestionsAsync` method, which retrieves all the questions from the questions table.
- Implement the `GetResponseForPollAsync` method, which retrieves a single response record.
- Implement the `GetResponsesForPollAsync` method, which retrieves all response records.

- Implement the `AddOrUpdatePollResponseAsync` method, to add or update the passed record, based on whether it exists in the database.
- Finally, implement the `DeletePollResponseAsync` method, to remove an existing poll response.

1. Let's create a table accessor for the questions table. We have to retrieve an IMobileServiceTable implementation for the questions. Luckily, we already have a DTO defined in the `Models` folder of our data project, which we just updated to support the proper schema.
2. Open `AzurePollService.cs`. In the `Initialize` method of your service, make a call to the mobile service client `GetTable` method using `PollQuestion` as the DTO. This will return `IMobileServiceT able<PollQuestion>`, which you should store in a class field (the chapter names this field `"questionsTable"`).

```
public class AzurePollService : IPollQuestionService
{
    const string AzureUrl = @"http://bookpollapp.
    azurewebsites.net";
    MobileServiceClient client;
    IMobileServiceTable<PollResponse>
    responseTable;
    IMobileServiceTable<PollQuestion>
    questionsTable;
    void Initialize()
    {
        if (client != null)
            return;
        client = new MobileServiceClient(AzureUrl);
        questionsTable = client.
        GetTable<PollQuestion>();
        responseTable = client.
        GetTable<PollResponse>();
    }
```

3. Next, to read all the questions, use the table interface and implement the `GetQuestionsAsync` method for your service. This just returns `Task<IEnumerable<PollQuestion>>`, which matches nicely with one of the retrieval methods discussed in the class.

```
    public Task<IEnumerable<PollQuestion>>
    GetQuestionsAsync()
    {
        Initialize();
        return questionsTable.ReadAsync();
    }
```

4. Run the application and verify that questions show up from Azure. (Do not try to type a name in yet or you will get an error - we will fix this) One method down! See Figure 5-12.

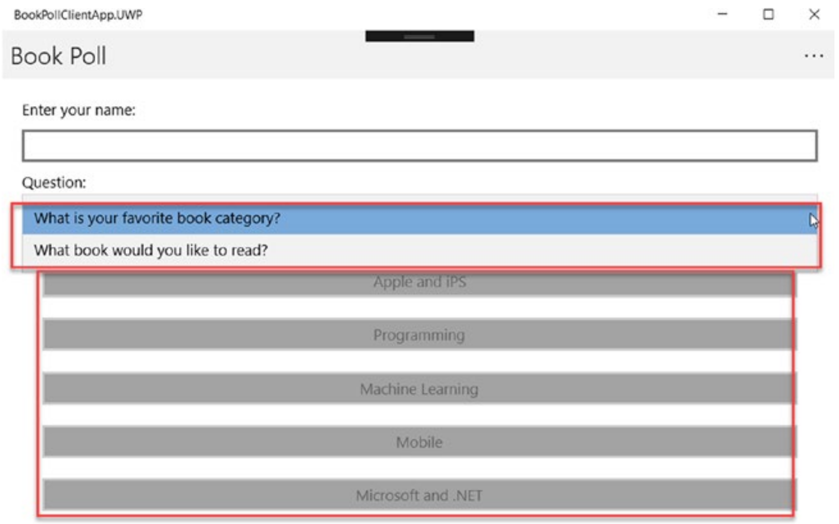


Figure 5-12. *The questions have been populated and connected to Azure*

5. Next, let's work with the responses table. The steps here are pretty much identical to those we performed with questions. Use the table interface to retrieve the top 100 responses, to implement the `GetResponsesForPollAsync` method for your service. Order the data by the `CreatedAt` property in descending order. The method we are modifying here for `GetResponsesForPollAsync` only has one parameter, `questionId` (not to be confused with the method called `GetResponseForPollAsync`, which has two parameters).

    - Order the data by the `CreatedAt` property in descending order.
    - Restrict the query to 100 records with the `Take` method.

- You will need to add a ToEnumerableAsync method to the call.

```
public async Task<IEnumerable<PollResponse>>
GetResponsesForPollAsync(string questionId)
{
    Initialize();
    return await responseTable
      .OrderByDescending(r => r.UpdatedAt)
      .Take(100).ToEnumerableAsync();
}
```

6. Next, implement the GetResponseForPollAsync method, by adding a Where clause to the table. Implement the following code to return the first PollResponse result from the Enumerable collection that matches the questionId and the name parameters. Also, you will have to add a using statement for System.Linq.

```
using System.Linq;

        public async Task<PollResponse>
        GetResponseForPollAsync(string questionId,
        string name)
        {
            Initialize();
            return (await responseTable.Where(r =>
            r.PollQuestionId == questionId &&
            r.Name == name)
        .ToEnumerableAsync()).FirstOrDefault();
}
```

7. Implement the `DeletePollResponseAsync` method, using the table `DeleteAsync` method. This is a straight call. You will have to use `async` and `await` in this method.

```
public async Task DeletePollResponseAsync(PollR
esponse response)
{
 Initialize();
 await responseTable.DeleteAsync(response);
}
```

8. Finally, implement the `AddOrUpdatePollResponseAsync` method. You will either have to call `InsertAsync` or `UpdateAsync`, based on whether the request is in the database. You can tell if the value already exists in the database by looking at the `Id` property. If it's null or empty, it's a new response.

```
public Task AddOrUpdatePollResponseAsync(PollRe
sponse response)
{
    Initialize();
    if (string.IsNullOrEmpty(response.Id))
    {
        return responseTable.
        InsertAsync(response);
    }
    return responseTable.UpdateAsync(response);
}
```

9. Run the app again. We now have a complete implementation, and it should work exactly the way it did with your local mocked service, except now, the data is persisted. If you run this on different devices, you'll see the same data shared across them, because it's stored in the cloud! Click the menu to see your responses or delete them. See Figures 5-13 and 5-14. We have made quite a few changes to the current project and the completed project through Part 4 of Chapter 5 is located in this book's assets folder, in case you have to double-check your work.

Note The source code and assets for this book can be downloaded from `https://github.com/Apress/azure-and-xamarin-forms`

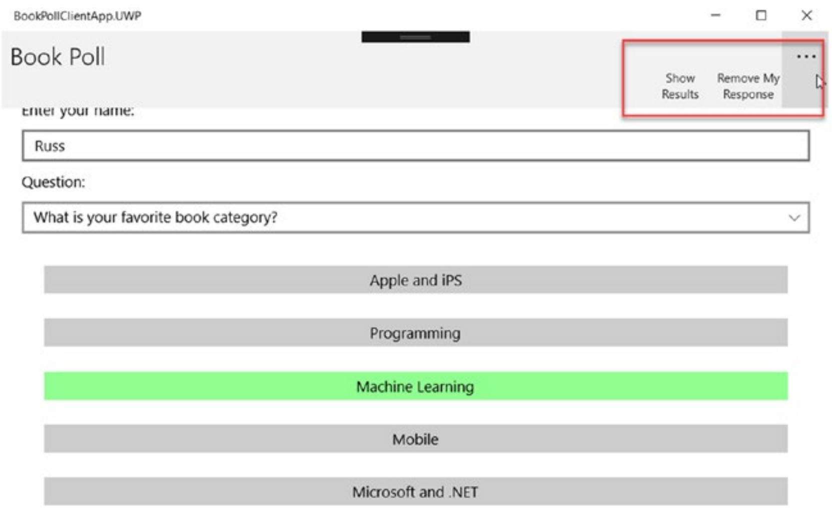
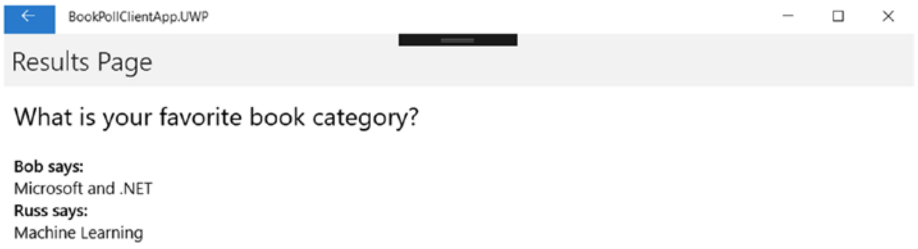


Figure 5-13. *Select the menu choice for Show Results, after clicking on an answer and entering your name*



What is your favorite book category?

Bob says:
Microsoft and .NET
Russ says:
Machine Learning

Figure 5-14. *See the list of poll answers and enter more*

Wow! We now have a functioning app that is using cloud-based data. Congrats! You may want to save this project, so that you can come back to it, if needed, when working on this chapter's next part, on adding offline caching to the app. You are at a good checkpoint.

Part 5: Add Support to Our App for Offline Data Caching

Time Estimate

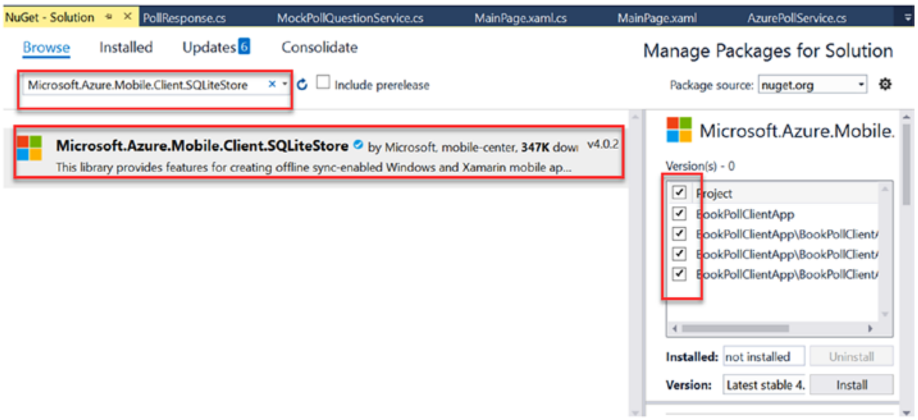
15 Minutes

Many apps today require an offline strategy. For example, say you have an app that works in the field for an electric company, and you need to have it work all the time, even in rural areas where Internet and cellular connectivity is poor. Well, this is a perfect reason to store the updates and retrieve copies of the data locally. Once connectivity is restored, you can update the cloud data. I always thought this was a tough nut to crack, before I learned Azure, but you will be amazed at how simple this is, using SQLite for local storage and Azure services for synchronization. In this part, you will add support for offline caching, using SQLite.

- Add the Microsoft.Azure.Mobile.Client.SQLiteStore NuGet package to all the projects.
- Add the required SQLite PCL initialization code into the iOS head/platform project.

- Create a new MobileServiceSQLiteStore to hold our local data.
- Define our two tables in the SQLite store.
- Initialize `MobileServiceClient.SyncContext` with the SQLite store.
- Change the table definitions to use `IMobileServiceSyncTable`.
- To add support offline caching, we must add a reference to another NuGet package and call an initialize method for our iOS application, as follows:

1. Add a NuGet reference to the Microsoft.Azure.Mobile.Client.SQLiteStore package to each of the platform-specific (head) projects and to your PCL. See Figure 5-15.



Microsoft.Azure.Mobile.Client.SQLiteStore

Microsoft.Azure.Mobile.Client.SQLiteStore by Microsoft, mobile-center, 347K dow v4.0.2
This library provides features for creating offline sync-enabled Windows and Xamarin mobile ap...

Microsoft.Azure.Mobile.

Version(s) - 0

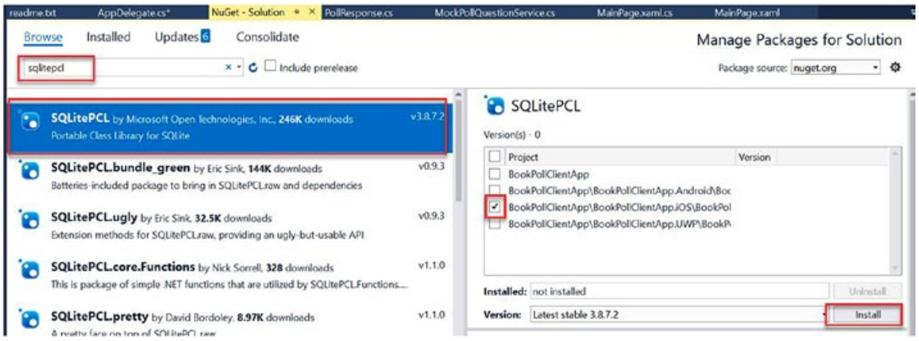
- [✓] Project
- [✓] BookPollClientApp
- [✓] BookPollClientApp\BookPollClient/
- [✓] BookPollClientApp\BookPollClient/
- [✓] BookPollClientApp\BookPollClient/

Installed: not installed

Version: Latest stable 4.

Figure 5-15. *Add the NuGet package for Microsoft.Azure.Mobile.Client.SQLiteStore to all projects.*

2. Next, in the iOS platform-specific project, open `AppDelegate.cs` and add a call to `SQLitePCL.CurrentPlatform.Init ();`, to initialize the SQLite-managed library. This should happen as part of your application initialization, just as when initializing the Azure client library. This is only required for iOS. You may have to add another NuGet package SQLitePCL by Microsoft Open Technologies. See Figure 5-16.



sqlitepcl
Include prerelease
Package source: nuget.org

SQLitePCL by Microsoft Open Technologies, Inc., **246K** downloads v3.8.7.2
Portable Class Library for SQLite

SQLitePCL.bundle_green by Eric Sink, **144K** downloads v0.9.3
Batteries-included package to bring in SQLitePCL.raw and dependencies

SQLitePCL.ugly by Eric Sink, **32.5K** downloads v0.9.3
Extension methods for SQLitePCL.raw, providing an ugly-but-usable API

SQLitePCL.core.Functions by Nick Sorrell, **328** downloads v1.1.0
This is package of simple .NET functions that are utilized by SQLitePCL.Functions....

SQLitePCL.pretty by David Bordoley, **8.97K** downloads v1.1.0
A pretty face on top of SQLitePCL.raw

SQLitePCL

Version(s) - 0

	Project	Version
☐	BookPollClientApp	
☐	BookPollClientApp\BookPollClientApp.Android\Boo	
✓	BookPollClientApp\BookPollClientApp.iOS\BookPol	
☐	BookPollClientApp\BookPollClientApp.UWP\BookP	

Installed: not installed
Version: Latest stable 3.8.7.2

Figure 5-16. *Add NuGet package for SQLitePCL to the iOS project*

```
public override bool FinishedLaunching(UIApplication
app, NSDictionary options)
{
    Microsoft.WindowsAzure.MobileServices.
    CurrentPlatform.Init();
    SQLitePCL.CurrentPlatform.Init();
    global::Xamarin.Forms.Forms.Init();
    LoadApplication(new App());
    return base.FinishedLaunching(app, options);
}
```

3. Next, we have to initialize our local database, so the Azure client can work with a local data source, instead of the remote database.

4. Open your `AzurePollService.cs` service you have been working on.

5. In the `Initialize` method, create a new MobileServiceSQLiteStore and store it in a local field in the method.

6. Next, call a `DefineTable<T>` method on the database store for our two DTOs.

```
using Microsoft.WindowsAzure.MobileServices.
SQLiteStore;

. . .
        void Initialize()
        {
            if (client != null)
                return;
            var store = new
            MobileServiceSQLiteStore("Poll.db");
            store.DefineTable<PollQuestion>();
            store.DefineTable<PollResponse>();

            client = new MobileServiceClient(AzureUrl);
            questionsTable = client.
            GetTable<PollQuestion>();
            responseTable = client.
            GetTable<PollResponse>();
 }
```

7. The location for `poll.db` will be in the appropriate app storage area for the platform. For example, in Windows, you will see it at the following location, after we run the app: `C:\Users\{user}\AppData\Local\Packages\{long guid}\LocalState`.

8. Uninstalling the app in any platform will also uninstall the local database, as it is part of the app deployment.

9. When using SQLite, we must use all data-related methods as `Async` methods, or your app might crash. Next, call the `InitializeAsync` method on the `SyncContext` property of your `MobileServiceClient`.

   - Pass the created store as the first parameter.
   - Pass a new instance of a `MobileServiceSyncHandler` object as the second parameter. This class is what executes the async calls to synchronize the database. We are using the default implementation.

10. Note that this method is asynchronous and returns a `Task`. To make this easier to work with, you can modify the method to be async and return a `Task`, so errors propagate out.

11. Rename the method to `InitializeAsync`, so it is clear that this method is asynchronous. You can use the `Rename` refactoring, to ensure this change goes through the class. Use this `using` statement and the code below.

```
using Microsoft.WindowsAzure.MobileServices.Sync;

        async Task InitializeAsync()
        {
            if (client != null)
                return;
            var store = new
            MobileServiceSQLiteStore("Poll.db");
            store.DefineTable<PollQuestion>();
            store.DefineTable<PollResponse>();

            client = new MobileServiceClient(AzureUrl);

            await client.SyncContext.
            InitializeAsync(store, new
            MobileServiceSyncHandler());
. . .
}
```

12. That last change ripples throughout our class, because we call InitializeAsync from every method. Fix all the methods, using the await keyword on each call to InitializeAsync. You can use the following code as a guide, to apply the keywords into the correct place, if you need some help:

```
public async Task AddOrUpdatePollResponseAsync(
PollResponse response)
{
   await InitializeAsync();
    if (string.IsNullOrEmpty(response.Id))
    {
        await responseTable.
        InsertAsync(response);
    }
    await responseTable.UpdateAsync(response);
}

public async Task<IEnumerable<PollQuestion>>
GetQuestionsAsync()
{
    await InitializeAsync();
    return await questionsTable.ReadAsync();
}
public async Task<PollResponse>
GetResponseForPollAsync(string questionId,
string name)
{
    await InitializeAsync();
    return (await responseTable.Where(r =>
    r.PollQuestionId == questionId && r.Name
    == name)
.ToEnumerableAsync()).FirstOrDefault();
}
public async Task<IEnumerable<PollResponse>>
GetResponsesForPollAsync(string questionId)
{
    await InitializeAsync();
    return await responseTable
      .OrderByDescending(r => r.UpdatedAt)
      .Take(100).ToEnumerableAsync();
}
public async Task DeletePollResponseAsync(PollR
esponse response)
{
    await InitializeAsync();
    await responseTable.DeleteAsync(response);
}
```

13. The final step in switching to our local cache is to use the IMobileServiceSyncTable interface instead of our normal IMobileServiceTable.
14. Change the two fields holding the questions and responses to be IMobileServiceSyncTable.
15. Change the call to `GetTable` on the `MobileServiceClient>` to GetSyncTable.

```
        const string AzureUrl = "http://
        bookpollapp.azurewebsites.net";
MobileServiceClient client;
IMobileServiceSyncTable<PollQuestion>
questionsTable;
IMobileServiceSyncTable<PollResponse>
responseTable;
```

```
async Task InitializeAsync()
{
    if (client != null)
        return;
    var store = new
    MobileServiceSQLiteStore("Poll.db");
    store.DefineTable<PollQuestion>();
    store.DefineTable<PollResponse>();

    client = new MobileServiceClient(AzureUrl);

    await client.SyncContext.
    InitializeAsync(store, new
    MobileServiceSyncHandler());
    questionsTable = client.
    GetSyncTable<PollQuestion>();
    responseTable = client.
    GetSyncTable<PollResponse>();

}
```

16. Run the application to see the results. If you get an error such as “The specified path, file name or both,” close the project, shorten the folder names, reopen, rebuild, and run the application again. You can also simply copy the entire project closer to the root of your drive, as another alternative.

17. We are now using our local cached data—except we have no data! So, the screen will come up without data. The next step is to learn how to synchronize our data to the remote database.

I can see light at the end of the tunnel. Can you? We are building things to a crescendo, to the most exciting part in this chapter: synchronization. It will take your app to a professional level.

Part 6: Synchronizing to the Remote Database

Time Estimate

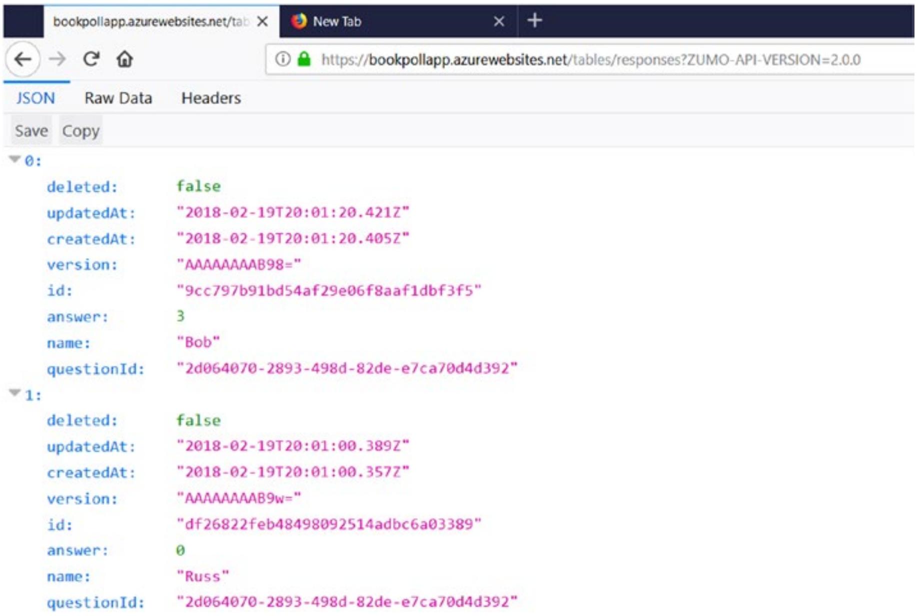
10 Minutes

Not only will you add and learn the code that does the magic on synchronization, you will also learn to use some tools to see what is going across the wire. When I presented this at a recent Azure Developer Event, the crowd went wild! Really. In this part, you will test offline use and synchronization.

- Use Edge, Firefox, or Chrome to query the data. (Internet Explorer will not display but makes available the results via a downloaded file.)
- You can also use Postman to query the data.
- Push any changes to the remote database when the app is launched.
- Pull down the latest questions table when the app is launched.
- Synchronize changes to the responses table each time we change the question or the name.

1. Because you'll now be working offline, it's helpful to be able to look at what's currently on the server. You can do this by hitting the responses table directly with a REST client, such as Postman or Edge, Chrome or Firefox. The end point you want to GET is `https://bookpollapp.azurewebsites.net/tables/responses`, and use the header for `ZUMO-API-VERSION` with the value 2.0.0.

2. Let's use Firefox, as it formats the data that is displayed. As the URL, type `https://bookpollapp.azurewebsites.net/tables/responses?ZUMO-API-VERSION=2.0.0`. See Figure 5-17.


bookpollapp.azurewebsites.net/tab
New Tab
https://bookpollapp.azurewebsites.net/tables/responses?ZUMO-API-VERSION=2.0.0
JSON
Raw Data
Headers
Save
Copy

```
▾ 0:
    deleted:      false
    updatedAt:    "2018-02-19T20:01:20.421Z"
    createdAt:    "2018-02-19T20:01:20.405Z"
    version:      "AAAAAAAAB98="
    id:           "9cc797b91bd54af29e06f8aaf1dbf3f5"
    answer:       3
    name:         "Bob"
    questionId:   "2d064070-2893-498d-82de-e7ca70d4d392"
▾ 1:
    deleted:      false
    updatedAt:    "2018-02-19T20:01:00.389Z"
    createdAt:    "2018-02-19T20:01:00.357Z"
    version:      "AAAAAAAAB9w="
    id:           "df26822feb48498092514adbc6a03389"
    answer:       0
    name:         "Russ"
    questionId:   "2d064070-2893-498d-82de-e7ca70d4d392"
```

Figure 5-17. *Firefox display of table responses*

3. Let's start by synchronizing the questions table. We'll do this as part of our initialization logic in our service code. Locate the `InitializeAsync` method and use the `MobileServiceClient.SyncContext` to push changes to the remote database after we initialize our sync tables. After you've pushed changes that may have been made while offline, go ahead and pull all questions down. Because these don't change frequently, we'll just pull them down once, as part of our initialization code. Because this is part of our initialization code, go ahead and pass in a query name (such as `"allQuestions"`), so we turn on incremental sync. You can use a standard full query. Make sure to catch exceptions. For now, just dump the exception to the debug console, using `Debug.WriteLine`. Run the app and verify that you get questions in the UI now. Use the following `using` statement and code:

```
using System.Diagnostics;

        async Task InitializeAsync()
        {
            if (client != null)
                return;
            var store = new
            MobileServiceSQLiteStore("Poll.db");
            store.DefineTable<PollQuestion>();
            store.DefineTable<PollResponse>();

            client = new MobileServiceClient(AzureUrl);
            await client.SyncContext.
            InitializeAsync(store, new
            MobileServiceSyncHandler());
            questionsTable = client.
            GetSyncTable<PollQuestion>();
            responseTable = client.GetSyncTable<PollRe
            sponse>();
            try
            {
                await client.SyncContext.PushAsync();
                await questionsTable.PullAsync(
                    "allQuestions", questionsTable.
                    CreateQuery());
            }
            catch (Exception ex)
            {
                Debug.WriteLine("Got exception: {0}",
                ex.Message);
            }
    }
```

4. Next, we must write a method to synchronize our response table. Because this table will be changed by our app (and on the server), we will have to synchronize it more often than the questions. Because the app always works with responses only for the current question, we'll use a custom query that only synchronizes for a specific question. Add a new method, `SynchronizeResponsesAsync`, that returns a `Task` and takes a string that is the `questionId` we want to retrieve responses for. Use the `PullAsync` method to retrieve only the

responses for the passed questionId. We can turn on incremental sync by supplying a query name. However, it must be unique for each query, meaning it has to take into account the questionId. The easiest way to do that is to generate a unique string by appending the questionId itself. As with the previous code, make sure to catch exceptions. Just output them to the debug console.

```
async Task SynchronizeResponsesAsync(string
questionId)
{
    try
    {
        await responseTable.
        PullAsync("syncResponses" + questionId,
                                 responseTable.Where(
                                r => r.PollQuestionId
                                == questionId));
    }
    catch (Exception ex)
    {
        // TODO: handle error
        Debug.WriteLine("Got exception: {0}",
        ex.Message);
    }
}
```

5. We will want to perform the response synchronization each time we change a record, so add a call to our new `SynchronizeResponsesAsync` method into your `AddOrUpdatePollResponseAsync` and `DeletePollResponseAsync` methods after you make the change.

```
        public async Task AddOrUpdatePollResponseAsync(
        PollResponse response)
        {
            await InitializeAsync();
            if (string.IsNullOrEmpty(response.Id))
            {
                await responseTable.
                InsertAsync(response);
            }
            await responseTable.UpdateAsync(response);
            await SynchronizeResponsesAsync(response.
            PollQuestionId);
        }

        public async Task DeletePollResponseAsync(PollR
        esponse response)
        {
            await InitializeAsync();
            await responseTable.DeleteAsync(response);
            await SynchronizeResponsesAsync(response.
            PollQuestionId);
 }
```

6. We also want to synchronize to the response table when we change the current question or the name. In both cases, this will call our `GetResponseForPollAsync` method. However, we don't want to refresh against the table every single time because this is called quite often. Instead, let's only refresh if the passed `questionId` parameter changes.

   - Create a private field in the class to hold the last known `questionId` we refreshed our responses for.
   - Check the field against the passed `questionId` parameter. If it's different, then synchronize against the responses table using our method and set the last `questionId` field. Run the application, try adding and deleting a few records, and compare it to the online version through the REST client.

```
string lastQuestionId;
public async Task<PollResponse>
GetResponseForPollAsync(string questionId,
string name)
{
    await InitializeAsync();
    if (lastQuestionId != questionId)
    {
        // Get the latest responses for this
        // question.
        await SynchronizeResponsesAsync
        (questionId);
        lastQuestionId = questionId;
    }
```

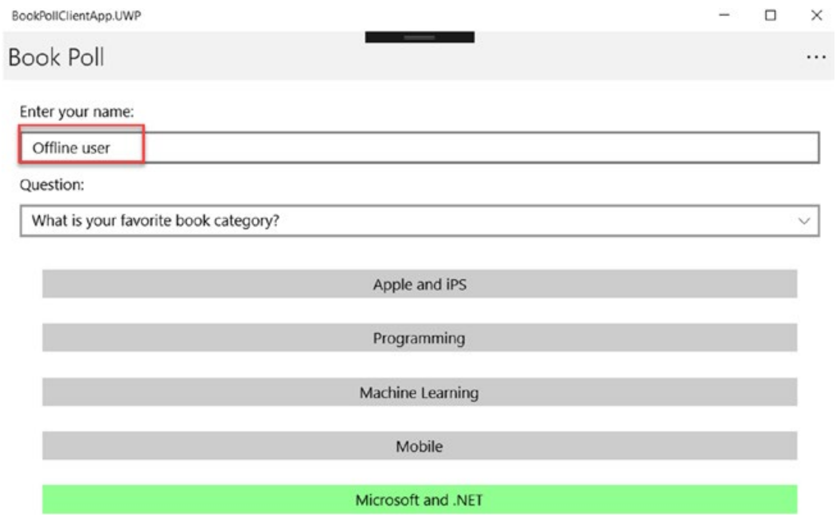
```
        return (await responseTable.Where(r =>
        r.PollQuestionId == questionId && r.Name ==
        name)
    .ToEnumerableAsync()).FirstOrDefault();
    }
```

7. Run the app once, to cache the questions and responses.

8. Next, let's force the app offline and see how it responds. Prior to our changes, it would have simply failed. We have several ways we can test no network. If you are on a physical device, you can switch to Airplane mode. On a simulator, we can simply change the `AzureUrl` value to something we cannot resolve.

9. Change the `AzureUrl` constant string to be invalid. For example, change the `".net"` suffix to `".zzz"` (kind of like it's sawing wood!).

10. Run the application and make some changes offline. See Figure 5-18.


BookPollClientApp.UWP

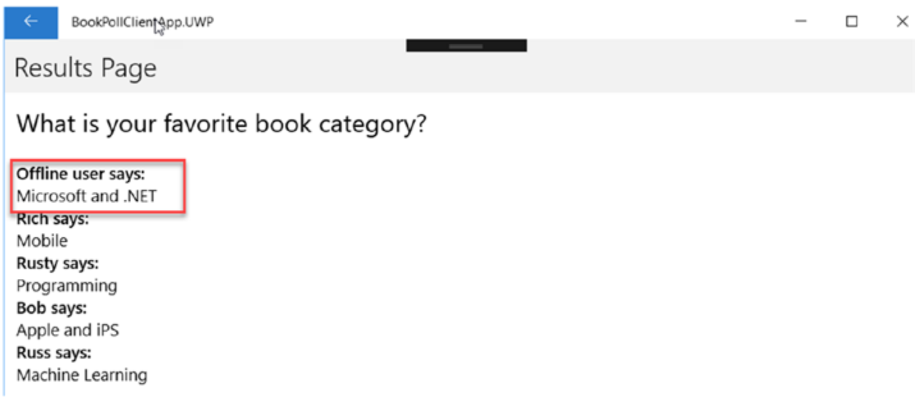
Book Poll

Enter your name: Offline user

Question: What is your favorite book category?

Figure 5-18. *Enter an offline user and select a book*

11. Shut down the app, reset the URL back, and run it again. When it launches, verify that your changes are still in the app, by looking at all responses. They should immediately synchronize back to the server. See Figure 5-19.


BookPollClientApp.UWP

Results Page

What is your favorite book category?

Offline user says:
Microsoft and .NET
Rich says:
Mobile
Rusty says:
Programming
Bob says:
Apple and iPS
Russ says:
Machine Learning

Figure 5-19. *Your offline entry should immediately synchronize back to the server. Cool, huh? It's just that easy to sync.*

Summary

In this chapter, you added support to an existing Xamarin.Forms application to access an Azure mobile service. You finished the Xamarin client application and implemented a complete client to access the Azure Poll service and the main logic for the Xamarin client application. You added full support for locally caching data, using the built-in support. Finally, you completed your offline caching, by synchronizing your local database with the remote database on Azure.

CHAPTER 6

Delete Resources in Your Subscription

In this short chapter, you will delete the resource groups in your subscription, for the resources you created in this book. This will delete all the artifacts created in Azure for this book.

Removing All Artifacts

When I was learning Azure, I was not deleting resources, even though I was really done with them. I also am a pack rat. These are bad things. The good thing to do, after you have read this book, is to delete the resources you created, or you will be racking up unnecessary charges. Soon, your free credit and/or your monthly credit will be used up! Using resource groups, as we have done in this book, makes this task very easy and quick.

Time Estimate

5 Minutes

1. In the Azure Management portal, click Resource groups. See Figure 6-1.

R. Fustino, *Azure and Xamarin Forms*, https://doi.org/10.1007/978-1-4842-3561-4_6

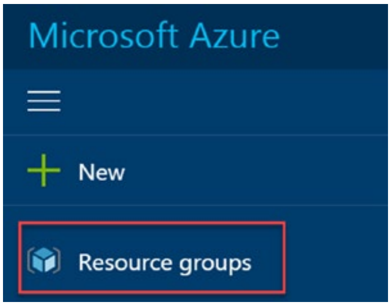
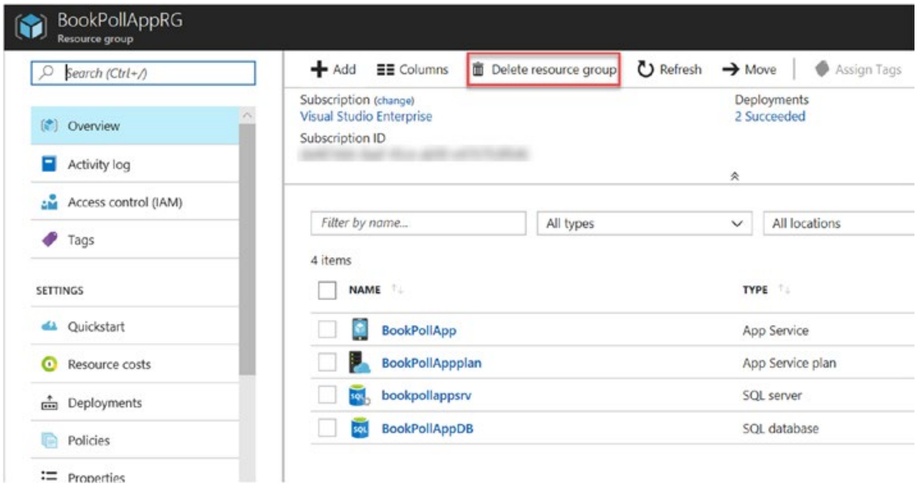


Figure 6-1. *Select Resource groups from your portal dashboard*

2. Click the resource group created in Chapter 4. It should be similar to BookPollAppRG resource group. Then select the Delete resource group action. See Figure 6-2.



Subscription (change)
Visual Studio Enterprise
Subscription ID
[redacted]

Deployments
2 Succeeded

4 items

NAME	TYPE
BookPollApp	App Service
BookPollAppplan	App Service plan
bookpollappsrv	SQL server
BookPollAppDB	SQL database

Figure 6-2. *Click Delete resource group*

3. If you have not already deleted the resources from Chapter 3, do so now as well. Delete the resources created in Chapter 3 by clicking on Resource groups and then pressing the Delete button for each of them. They should be called something similar to demorg, MYWebsiteRG, rgfromps, and SQL2018RG.

4. Click the Delete resource group button to delete the resource group. When prompted, type in the name of the resource group, to confirm. See Figure 6-3.

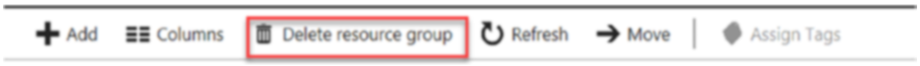


Figure 6-3. *Click Delete resource group for each resource group created in this book*

Summary

In this chapter, you have removed the related resources that were created in previous chapters.

Book Summary

In this book, you learned several important applications and concepts with which to create a working Xamarin Forms app and use Azure, including the following:

Xamarin Forms:

- Navigation
- Layout controls, such as `StackLayout` and `GridLayout`
- Device-dependent logic to adapt to phones and tablets
- File input and output

- Embedded resources by using images
- ListView template page and template customization
- A working Xamarin Forms app and an understanding of the solution structure

Azure:

- Azure portal, resource usage, and billing data
- High-level architecture from end to end, by creating a Virtual Machine, SQL database, ASP.NET web site, and a mobile app
- Deployment from GitHub

Azure and Xamarin Forms:

- Using the Azure Mobile Apps Quickstart template to create a database and create a service app with a Table API and a new sample Xamarin Forms app
- Consuming that service in the client application, by taking an existing app and modifying it to use Azure client services
- Creating offline storage with SQLite and synchronization with an online SQL database
- Using tools to verify database table data.

Note The source code and assets for this book can be downloaded from `https://github.com/Apress/azure-and-xamarin-forms`

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