THE EXPERT'S VOICE® IN MICROSOFT AZURE

Microsoft Azure

Planning, Deploying, and Managing Your Data Center in the Cloud

BUILD, SCALE, AND STRENGTHEN YOUR DATA CENTER WITH MICROSOFT AZURE

Marshall Copeland, Julian Soh, Anthony Puca, Mike Manning, and David Gollob

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Contents at a Glance

Contents

About the Authors

Marshall Copeland is a cloud solution architect at Microsoft with expertise in cyber security. His work is customer-facing, and in 2008 he began directly supporting US state and local government accounts architecting Microsoft's private cloud. He now focuses on Microsoft Azure Public Cloud, Government Cloud, and Hybrid Cloud for both Windows Server and Linux system workloads. Marshall's career also includes architecture consulting for many Fortune 500 companies supporting technologies such as Active Directory enterprise architecture, systems management, and Cisco network engineering. Marshall is completing his Masters of Science in Information Assurance (MSIA) degree in cyber security from Dakota State University. He has presented at Microsoft TechReady, Microsoft TechEd, and Microsoft Management Summit. Marshall co-wrote *Microsoft Azure: Planning, Deploying, and Managing Your Data Center in the Cloud* and *Microsoft Office 365 Administration Inside Out* first and second editions. When not working, Marshall and his wife enjoy spending time with family and friends in Colorado.

Julian Soh, a principal architect at Microsoft, works with customers to evaluate, understand, plan, and adopt cloud-based technologies, such as Microsoft Azure and Office 365. Prior to joining Microsoft, Julian spent many years in the IT industry, spanning the private, public, education, and defense sectors in both leadership and technical roles. At Microsoft, Julian previously covered productivity technologies, such as SharePoint, Lync (now Skype for Business), Office, and Windows. Julian is also an author for the *Microsoft Office 365 Administration Inside Out* series.

Anthony Puca is a Microsoft datacenter solution specialist. Anthony has been consulting with US state and local government accounts on Microsoft Windows Server, System Center, Private, Public, and Hybrid Cloud Technologies for the last five years. His IT career started 24 years ago as a mainframe librarian for American Express. Anthony has been a consultant for Perot Systems, Avanade, and EMC Corporation with responsibilities for enterprise architecture, system engineering, network engineering, and database administration. In the last eight years, he has presented at Microsoft TechReady, Microsoft TechEd, Microsoft Management Summit, Microsoft Security Summit, VMworld, and various CIO summits across the United States. Anthony co-wrote three MOF whitepapers on change, configuration, and release management. He also authored the SAMS/Pearson book *Microsoft System Center Configuration Manager 2007 R2 Unleashed*, focusing on inventory management, software distribution, and operating system deployments; the O'Reilly book *Microsoft Office 365 Administration Inside Out*, and the Apress book *Microsoft Azure: Planning, Deploying, and Managing Your Data Center in the Cloud*. Anthony received Microsoft's Most Valuable Professional (MVP) seven times, from 2004–2010. These MVP awards were for datacenter monitoring with Microsoft's System Center Operations Manager and Windows Management Instrumentation. Anthony's customer demographics over the last decade include vehicle rental, retail, financial services, food processing, manufacturing, mining, healthcare, government, and energy.

Mike Manning in a Microsoft Certified Master in Exchange 2007 and Exchange 2010 with over four years of Office 365 deployment experience and two years of Microsoft Azure experience. Mike has been working in information technology for over 20 years, and he is very passionate about technology and the Microsoft cloud focus and direction. Mike's other interests outside of information technology include his family, hockey, and baseball.

David Gollob has over 30 years of experience working in database and analytics systems. After receiving his degree in math and computer science at the University of Denver, Dave worked as a principal consultant for numerous Fortune 100 companies, helping them to develop enterprise business solutions, highly scalable OLTP systems, and data warehouse and analytics systems. Dave's vendor tour started with Sybase, where he participated in two patents for his work at TCI Corporation focused on billing and distributed systems design. At Sybase, Dave also spent one-and-a-half years in Switzerland as the principal architect. In 1996, Dave joined Microsoft, where he remains today. Dave's work at Microsoft includes his delivery as both a principal consultant as well as a managing consultant, where he founded the Microsoft Telecom Practice. Dave has presented and participated in numerous industry events, panel discussions, Microsoft technical events, and product review and feedback cycles. Today, Dave travels the western states visiting state and local government customers, evangelizing and assisting with data (big and small) architecture planning, advanced analytics, and solutions design. Dave enjoys his time with his family as well as mountain biking, skiing, hiking, and fishing in Colorado.

About the Technical Reviewer

Thomas LaRock is a head geek at SolarWinds and a Microsoft Certified Master, SQL Server MVP, VMware vExpert, and Microsoft Certified Trainer. He has over 15 years' experience in the IT industry in roles including programmer, developer, analyst, and database administrator.

LaRock has worked in numerous IT roles over the past 15 years with much of his career focused on database administration, leading to his role as technical evangelist for Confio. While at Confio, his research and experience helped to create the initial versions of the software now known as SolarWinds Database Performance Analyzer.

LaRock joined the SolarWinds family through the acquisition of Confio in 2013. His many Microsoft accreditations include SQL Server MVP, MCSM, MCM, MCT, MCITP, MCTS, MCDBA, and MCP—whew!

LaRock is also president of the Professional Association for SQL Server (PASS) and is an avid blogger, author, and technical reviewer for numerous books about SQL Server management. He now focuses his time working with customers to help resolve problems and answer questions regarding database performance tuning and virtualization for SQL Server, Oracle, Sybase, and DB2, making it his mission to give IT and data professionals longer weekends.

Foreword

This team of authors do an excellent job of explaining Microsoft Azure and its many components and features. IT managers, IT architects, project managers, business analysts, and systems administrators can all benefit from the content included in this book. You will enjoy the book's logical flow and layout: it starts at a high level, helping you to understand the landscape, concepts, nomenclature, and moving parts of Azure, and then drills down into the ever-changing core services and features.

This book is like your own personal tour guide to Azure. Build and experiment with your own free Azure subscription as you follow along step by step, experimenting with the services as they are described to you in detail. This book consolidates information that would take you months to pull together and digest from disparate blogs and web sites and will accelerate your learning and help you to avoid pitfalls and blockers that might otherwise slow you down.

As a 10-year Microsoft Valued Professional (MVP) and CEO of a highly decorated Microsoft partner specializing in Azure, I can tell you that this book is a must-read for people involved in the transformation of their IT infrastructures. Knowledge is critical to making educated decisions, and the content in this book will provide you with an Ivy League education in Azure.

One of the other key differentiators in this book is its inclusion of government challenges, compliance requirements, and Azure-specific solutions. Those involved in governmental decision making or influence positions will find the information in this book particularly beneficial.

Open your mind as you pick up this book: it will help you understand multiple Azure features, scenarios, and services. It covers everything from Azure web applications to networking, VMs running in IaaS, Azure identity management, high availability, disaster recovery, migration options, and monitoring and reporting. This book is jam-packed with everything you need to know about Azure. Have fun on your journey!

—Rory McCaw, CEO, Infront Consulting Group, September 2015

Acknowledgments

I want to thank my wife, Angela Copeland, for putting up with all the late nights I spent working on this project in my "spare time." Thank you to my family—Bonnie, Anita, Andy, and Joe—and to Mark and Carla Hilley and Matthew and Elizabeth Jacobs for your support. A big thank you to the Apress team for all of their hard work and long hours. A special thank you to Gwenan Spearing for guiding us from idea to publication. Thank you Melissa Maldonado for keeping us on track and to Gay Schwartz and Thomas LaRock for excellent feedback and great insight to help make this a much better book.

I could not have completed a single page of this book without the support of Keith Olinger, my manager and a great person who supported me with many insightful conversations. Thank you to my fellow authors, Julian Soh, Anthony Puca, Mike Manning, and David Gollob. I am lucky to call you friends, and I could not have completed this book without your skill and dedication.

To Mark Russinovich, thank you for being a friend and for suggesting Microsoft Azure as a topic. I have great appreciation and respect for the amazing work completed by the Microsoft Azure Engineering team.

Thank you to an amazing and supportive account team: Tori Locke, Dean Iacovelli, Steve Finney, Able Cruz, Mark Wernet, Chris Wilch, Steve Kirchoff, Ben Callahan, David Stewart, Brent McCarthy, Tara Larson, and Steven Fiore.

—Marshall Copeland

Undertaking the writing of a book is a demanding but rewarding experience that extends far beyond an author's personal time. It requires the understanding and support of the important people in the author's life. As such, I would like to extend my heartfelt gratitude for the support of my wife Priscilla and daughters Jasmine and Makayla. The times they put up with my absence from family activities in order to complete this book represent a big sacrifice on their part. I would like to thank my dad, Soh Kim Wat, and my mom, Betty, for providing me the opportunity through education to be successful in my chosen career. I am also very grateful to have had the opportunity to continue to work with my co-authors Marshall Copeland, Anthony Puca, Michael Manning, and David Gollob. I am humbled by your professionalism and very thankful for your friendship and partnership. You are truly the best in the industry.

Last but not least, I want to extend my appreciation to the great folks at Microsoft for supporting and helping us with this project, especially Michael Donlan, Tori Locke, John Bunn, Javier Vasquez, Keith Olinger, Dean Iacovelli, Kelly Cooper, Peter Zalkind, Darren Carlsen, Steve Read, Jeff Langford, Scott Wold, Mark Ghazai, David Zarling, Tom Moen, and the extended Microsoft Azure team, Office 365 team, and Account Teams. Without your support and input, this project would not have been successful.

—Julian Soh

Writing a book requires a lot more time and effort than you might imagine. Although it's fairly easy to write about what you know, it's quite difficult to cover a topic like Azure that is so large and so broad. We frequently found ourselves thinking that we could write an entire book on what we cover in any single chapter. That level of effort to stay in lockstep with the Microsoft Azure Engineering Team and share what is available today and right around the corner was a large task. I would like to thank my beautiful wife Laura for her patience and for starting many dinners alone throughout my third book project. The compounding of life, work, and loved ones made the little free time I had that much more valuable.

Special thanks to the other authors: Marshall Copeland, Mike Manning, Julian Soh, and David Gollob. Without them, this book would not have been completed. Each one of them stepped up at various times to make sure we stayed on track and kept moving forward. Their unique insights into the various aspects of Microsoft Azure solutions provides an eloquent summary of some very complex technologies. I don't think anyone has ever said it, so thank you to Marshall for all the "Chapter Status?" e-mails to the team.

Working at Microsoft has exposed me to a large array of clients, the huge pool of challenges they face in their day-to-day business, and some of the brightest and most passionate IT professionals I have ever met. Thank you to Keith Olinger and his Datacenter Specialist team, a talented pool of individuals who continuously keep me and each other on our toes. Thank you to my Account Teams: Mark Starr, Nathan Beckham, Jed Zercher, Will Fahim, Elisa Yaros, Adam Loughran, Todd Strong, Bobby Bliven, and Nicole Deprey, and their manager, Kelly Cooper. This group keeps the customers' business needs and challenges in the foreground and reminds me of the value these things provide to the customers and public. Finally, a big thank you to Scott Wold for always being a resource I can count on to help me or our customers. Your assistance with many Azure-related items was very appreciated.

—Anthony Puca

When I first started working on this book, I didn't realize the time commitment I was taking on. A book project is equally challenging and rewarding. Anyone who has worked with the Microsoft Cloud technologies has seen the pace of change that is happening. The time and effort required to keep up with these rapid changes while continuing to meet regular work and family commitments can sometimes be overwhelming.

With that in mind, I would like to thank my wife, Arlene, and my children, Kevin and Nicole, for their understanding and support while I took time away from them to work on this book. Without their patience and support, I would not have been able to complete this project.

I would also like to thank my manager, Stanley Lum, for supporting me as I continued to meet my work commitments while working on this book. Finally, I would like to thank Anthony Puca, David Gollob, Julian Soh, and Marshall Copeland, my co-authors, for their efforts in writing, proofreading, fact-checking, and keeping us on track to complete this project.

—Mike Manning

I want to acknowledge and thank my authoring peers and friends Marshal Copeland, Anthony Puca, Julian Soh, and Mike Manning for inviting me to participate in writing this book. This is my first book, and I could not have asked for a better team to indoctrinate me and show me the ropes. Thanks to my good friend Mike Wilmot for his inspiration and critical thinking around machine-learning topics and business model strategies. I am humbled by the brilliant team of data scientists and engineers who design, develop, and continuously advance Azure machine learning. These people are tireless and incredibly passionate, truly representing the new Microsoft. If it wasn't for this team, led by Vice President Joseph Sirosh, we wouldn't have this game-changing platform. I want to thank my manager, Keith Bauer, for his unwavering support and for being an amazing sounding board. I want to thank and express deep gratitude to my brothers Steve and Ken, who always push the limits and challenge me to do the same. And, of course, thanks to my wife and kids for putting up with my late nights while I worked on this book.

—David Gollob

Introduction

Think about the first time you heard the term *cloud computing* a few years ago (or longer). There are accounts and reports as far back as 2006 of the term being used to describe some of the larger virtualization initiatives for companies like Google, Amazon, and Microsoft. If you search for more tangible evidence, you can find a report dated 1996 from the offices of Compaq Computer, where a group of technology executives who were intrigued by the future of Internet business published a report titled "Cloud Computing." Fast-forward 20 years into the future to learn about cloud computing services.

The discussions in this book should help you understand the need to improve your organization's maturity to support a formal cloud strategy that includes broad deployment options to support applications, infrastructure, and networking extensions. In addition to using cloud computing as another business-support initiative, corporations need to create new policies in support of cloud computing's greater security compliance to more easily enable line-of-business applications.

Thought leaders in many companies read the industry researcher reports from Gartner, Forrester, IDC, and others that show the growth from traditional datacenters to include cloud computing. They present different statistics and timelines, but they all agree that the IT industry and businesses are migrating to the cloud. Workloads drive business; and enterprise customers that review IT spending are realizing the technology efficiencies and automation of cloud-enablement.

Decision makers including CIOs, CTOs, and IT managers are using cloud-based IT to become agile and efficient in responding to business requests made by the CEOs and CFOs. Azure is a global cloud service; it is engineered to build on current IT skill sets using ITIL best practices in support of SMBs and enterprises with traditional constraints that prevent IT from achieving better alignment to the business. Cloud computing enables any size IT department to quickly respond with solutions for business to reach consumers with products and services in a global market.

What This Book Covers

This book provides deep insight into cloud services offered today by Microsoft Azure. It should help IT administrators, IT architects, business decision makers (BDMs), and small and large business leadership teams to quickly evaluate the cloud services available in Azure to improve their IT agility. In these chapters, you discover how this public cloud provider uses *commodity computing* to allow your business to extend into these readily available services.

This book is different than many books on cloud computing in that it follows two main themes: typical business problems that many companies face and that have cloud solutions, and step-by-step examples that help IT and technical team members to evaluate Azure services quickly. A few other publications provide insight into specific Azure topics, but this book provides a well-rounded understanding of a broad array of Azure cloud services to support you as you connect the dots to achieve IT agility.

Each section presents several key topics. These topics help you fully understand the Microsoft Azure services discussed and how to implement the features. This book is designed to assist you by using the following methods:

- Using a conversational style that helps to raise questions about features and answer those questions, including focused, step-by-step exercises to help you achieve deeper understanding
- Providing information with detailed explanations to help fill knowledge gaps as you continue to expand your learning about cloud computing
- Creating a foundation around cloud services that helps you move traditional IT to a cloud computing approach that provide solutions to "what if" scenarios

How to Use This Book

Although the book and the exercises in each chapter can be used independently, you are not required to read from beginning to end. The four parts group topics in a way that can make learning easier, but the exercises in the individual chapters stand as independent guides for you to follow.

The chapters of the book are organized into four sections. Part 1 is useful for anyone new to the Azure Cloud Services platform and is necessary reading if you want an overview of Azure's capabilities. The chapters are as follows:

1. "Microsoft Azure and Cloud Computing": Business discussions specific to growth today and tomorrow
2. "Overview of Microsoft Azure Services": A high-level look at Azure services and their value to both businesses and IT
3. "Azure Real-World Scenarios": How large and small businesses use Azure to solve problems for their companies and IT
4. "Planning Your Azure Deployment": Considerations for extending the traditional datacenter model to a cloud platform

Part 2 is a fast-moving section that provides a fast ramp-up for IT pros:

5. "Getting Started with Azure Web Apps": Easily building web sites while using features like auto-scaling (up and down)
6. "Getting Started with Azure Virtual Machines": Templates to use, including Linux, Windows, Oracle, SQL, MySQL, and your own customized versions
7. "Understanding Azure Storage and Databases": BLOB storage, how to create storage services, and how to secure access to these services

Part 3 bridges the gap between traditional datacenters and cloud services. You learn about the networking extensions needed to securely communicate with cloud properties:

8. "Extending Your Network with Azure": Virtual private networks that extend networks securely into Azure
9. "Identity Management with Azure Active Directory": How Azure Active Directory creates accounts, providing access for cloud services

10. "Extending Azure Active Directory": Controlling authentication from on-premises while allowing single sign-on for more than 2,500 cloud apps such as Salesforce, Google Apps, WebEx, and Twitter, and customizing your own applications
11. "Clusters, Regional VNets, High Availability, and Disaster Recovery": Features you can use to create solutions that are highly available while using Azure Site Recovery to back up VMware
12. "Migrating Your Virtual Machines to Azure": Using PowerShell to copy your VMs to Azure, convert VMDK to VHD, and create templates from your customized images
13. "Monitoring and Reporting": Azure services that provide real-time monitors for applications, services, and VMs with enterprise reporting features

Part 4 covers Azure services that may seem futuristic but give today's businesses analytic insight via the first cloud-based machine learning service. You develop the agility to use cloud-enabled Hadoop, to securely manage mobile devices while supporting partner collaboration through documents without the loss of intellectual property, and more:

14. "Microsoft Azure Machine Learning": Predictive cloud-based analytics using the R development language, Python, and drag-and-drop capabilities
15. "Data Management and BI with HDInsight": Hadoop services in Azure to scale in the support of volume, velocity, and verity of data
16. "Working with Intune and RMS": Azure services that support managing Apple, Android, and Microsoft mobile devices and tablets and use digital certificates to protect documents

Hardware and Software Requirements

The requirements to connect and use all Microsoft Azure cloud services from the Azure Portal are very broad, to better support the diversity of companies, IT administrators, network administrators, and developers. The Azure Portal can be accessed and managed through many supported browsers, including these:

- Safari (version 7 or the latest for best security)
- Chrome (latest version for best security)
- Firefox (latest version for best security)
- Edge (Windows 10 with the latest security updates)
- Internet Explorer (Version 11 or higher with the latest security updates)

The Azure Portal runs well on modern hardware for most PCs, Macs, and tablet devices. Although mobile phones and their browsers may connect, they currently are not supported by Microsoft Premier Services. The minimum PC hardware recommendations are as follows:

- Processor, 1GHz or faster
- 2GB RAM (4GB or more recommended for PC)
- 64GB hard disk (or higher for PC)
- Network connection (wired or wireless)

To complete some of the more advanced exercises, you are required to use a Microsoft Windows operating system (OS) that supports PowerShell 5.0 (or higher). PowerShell 5.0 is included in Windows 10 and can be installed as a free upgrade from Windows 8.1. An additional free Azure PowerShell module is required to complete all the advanced exercises.

Note You can download and install Azure PowerShell using the Microsoft Web Platform Installer at `http://go.microsoft.com/fwlink/p/?linkid=320376&clcid=0x409`.

This book does not provide in-depth exercises that require Visual Studio Online, Visual Studio 2013, or Visual Studio 2015 for development. We encourage you to sign up for a free trial subscription or use your MSDN subscription for development and search Apress.com for Microsoft Azure development titles. The Azure APIs support a large number of development languages, including Java, Ruby, .NET, PHP, Node.js, and Python, just to name a few.

Who This Book Is For

The book's intended audience includes IT professionals such as IT administrators, IT architects, IT support staff, and business systems integration team members as well as TCP/IP networking professionals. The chapters are written to help novice IT admins ramp up, with feature discussions and expert guidance using specific exercises. The content supports an audience that includes business administrators or developers interested in enabling IT agility by extending your on-premises datacenter into cloud services. Our intended readers are interested in gaining deeper insight to add greater levels of service availability and investigate disaster recovery (DR) solutions for VMware and Hyper-V virtual environments, including enterprise DR for physical servers that need to support business continuity.

This book is also intended for business personnel responsible for IT budget planning and IT executives investigating ways to lower operating costs such as life-cycle hardware replacement, increasing datacenter power and cooling costs, and recurring costs for datacenter security audits. In addition, it's for anyone interested in Azure cloud computing—it is a great reference if you require more detail before you invest and begin integrating your business using Azure cloud services.

PART I

Introducing Microsoft Azure

CHAPTER 1

Microsoft Azure and Cloud Computing

What Is Microsoft Azure?

Microsoft Azure is an overarching brand name for Microsoft's cloud-computing services. It covers a broad, and still growing, range of services that often form the foundational elements of cloud computing.

If you are reading this book, chances are that you are an information technology (IT) professional and have some basic knowledge of Azure. This book was written for the IT professional interested in using cloud-computing services. Some of the topics that may interest you include lowering operating costs, increasing agility, developing better disaster recovery (DR) strategies, accessing unlimited storage, and foregoing responsibility for future hardware refreshes.

Although Azure is considered a fairly new cloud service, it has grown by leaps and bounds in terms of capabilities and offerings during its brief history. Azure is also so diverse that it is not uncommon for IT professionals to be familiar with only a specific subset of Azure services.

Note Azure may seem to have a short history, but it should not be mistaken for a new or immature technology. Azure is based on mature Microsoft technologies such as Windows Server Hyper-V, Active Directory services, SQL Server, System Center, and so on.

The Azure/Office 365 Connection

Azure was introduced as Windows Azure in 2008. Prior to 2008, Microsoft primarily focused on another cloud service that was well known as Business Productivity Online Standard Suite (BPOS). BPOS consisted of Exchange 2007, Microsoft Office SharePoint Server 2007, Office Communications Online, and Microsoft Office Live Meeting. In 2011, Microsoft rebranded BPOS to Office 365. Office 365 is a software as a service (SaaS) offering that provides customers with access to Microsoft's top productivity tools without having to implement and maintain significant on-premises infrastructure. Office 365 delivers Exchange Online to provide turnkey e-mail services, SharePoint Online to provide collaboration capabilities, Lync Online for instant messaging (IM) and virtual meeting spaces, and Office Pro Plus for productivity tools for desktop and mobile users.

In order to provide SaaS capabilities for customers, Microsoft had to build datacenters to host the BPOS and then Office 365 productivity suite offerings. The datacenter infrastructure is provided and managed by a special team within Microsoft known as *Global Foundation Services (GFS)*. As a result, customers now have the option to use Microsoft's productivity and collaboration tools without the added complexity of managing them.

Other core benefits of Office 365 are its scalability, high availability, and associated service-level agreement (SLA). Providing these requires more datacenters, geo-redundancy (redundant services in different geographic regions), and a highly trained operational workforce. The investment made by Microsoft in GFS is beyond the means of many organizations. As a result, even small businesses can now enjoy enterprise-level SLAs and performance.

Anyone who has installed and configured Exchange, SharePoint, or Lync on-premises knows there are myriad required dependent technologies. Active Directory services for identity management is one such technology. To ensure that the services are performing well, monitoring tools such as System Center Operations Manager are required. To provide Office 365 subscribers with unlimited OneDrive for business storage space, a vast and comprehensive storage solution had to be adopted by GFS. Remember too that these services and benefits need to be cost competitive, so economies of scale and efficiency of operations are important topics that Microsoft and GFS continuously need to manage.

It is well known that the birth of cloud computing resulted from the realization that it is possible to monetize excess computing capabilities. What differentiates Azure is that it was built specifically to provide cloud services. It is not the result of excess computing capabilities that were designed for other purposes. It was designed from the ground up to support Office 365. Because other non-Office 365 services can take advantage of foundational services, such as Active Directory, Azure makes acquiring these services possible.

■ **Note** The scalability, elasticity, and reliability of Office 365 SaaS is highly dependent on the Azure infrastructure.

IaaS, PaaS, and SaaS

We have identified Microsoft Office 365 as a SaaS. Other types of cloud services are classified as *infrastructure as a service (IaaS)* or *platform as a service (PaaS)*.

Because Azure provides computing power for Office 365 foundational services, such as Active Directory, it is easy to identify the IaaS nature of Azure. In fact, Azure is most recognized for its IaaS offering. Examples of Azure IaaS offerings include Azure virtual machines and virtual networks, Azure storage solutions, and Azure recovery services. However, Azure is most often mistaken to be only an IaaS, when in fact it has a large portfolio of PaaS offerings. Examples of its PaaS offerings include Azure SQL Database, Azure websites, Azure Content Delivery Network (CDN), Azure BizTalk Services, and Azure Mobile Services.

As you can see, the Azure portfolio of services is much more significant than better-known Office 365 SaaS offering. Subsequent chapters cover key Azure services. For now, the important takeaway is that, as far as cloud computing goes, Microsoft has demonstrated that it is betting its future as a cloud-computing services provider. No other technology company has the *combination* of mature technologies, infrastructure, and financial commitment to package a complete SaaS, IaaS, and PaaS offering. In fact, with the changing of the guard in Microsoft's corner office, CEO Satya Nadella has made cloud computing part of the company's mission—mobile first, cloud first. It also helps that Mr. Nadella was the executive responsible for inventing and developing the Azure business.

When Microsoft reported its earnings for the quarter ending September 2014, cloud-computing services grew by 128% over the previous year, and they contributed to the bulk of the company's $14.93 billion in revenue.

These developments are important if you are shopping for an IT partner to provide cloud-computing services, because you are handing off a very important piece of your IT operations. Knowing that a company has built its comprehensive cloud-computing services from the ground up and that it has a strong financial portfolio, has leadership committed to the service, and is an industry leader should buoy the confidence of any CIO making this decision.

Security, Compliance, and Privacy

As a service offering, Azure is a follow-up act to Microsoft Office 365. This is important because Microsoft implemented many industry-required security standards and regulatory compliance requirements when building the Office 365 business. Furthermore, through Office 365 operations, Microsoft has built a cloud-specific, service-oriented organization to address operational requirements including sales and licensing, incident management, and customer support.

For Office 365, Microsoft introduced the concept of a *Trust Center*. A Trust Center is Microsoft's one-stop shop on the Web for all things related to security, compliance, certifications, SLA metrics, and privacy. It is basically everything a customer needs in order to trust a service. Therefore, like Office 365, there is a Trust Center for the Azure cloud service, known simply as the *Microsoft Azure Trust Center* (`http://azure.microsoft.com/en-us/support/trust-center`). Figure 1-1 shows the Microsoft Azure Trust Center.

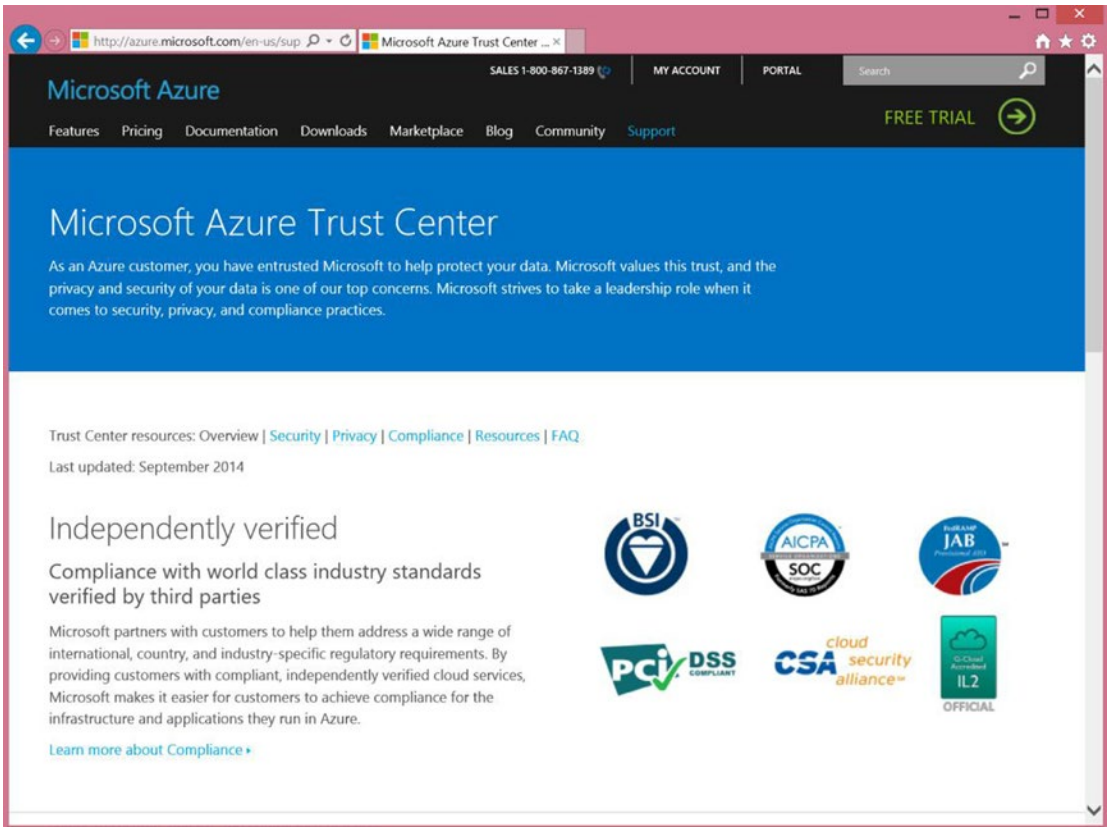

Figure 1-1. *Microsoft Azure Trust Center*