



# Hybrid Application innovation with Azure and Azure Stack



Version 1.2

3/17/2017

The information herein is for informational purposes only and represents the current view of Microsoft Corporation as of the date of this publication. Because Microsoft must respond to changing market conditions, it should not be interpreted to be a commitment on the part of Microsoft, and Microsoft cannot guarantee the accuracy of any information provided after the date of this presentation. MICROSOFT MAKES NO WARRANTIES, EXPRESS, IMPLIED OR STATUTORY, AS TO THE INFORMATION IN THIS PRESENTATION.

© 2017 Microsoft. All rights reserved. This document is for informational purposes only. Microsoft makes no warranties, express or implied, with respect to the information presented here.

## CONTENTS

Business challenges and the need for a hybrid cloud platform .....	3
Modern Applications with Azure and Azure Stack.....	3
Consistent hybrid application development .....	3
Azure services available on-premises .....	3
Purpose-built systems for operational excellence .....	4
Application Innovation Use Cases .....	4
Distributed Applications .....	4
Application Modernization .....	5
Application Mobility .....	5
How Azure Stack Works .....	5
Developer and IT Professional Experiences .....	5
Unified Application Model .....	6
Service Delivery Framework .....	6
Marketplace Content .....	7
Services .....	7
Cloud Infrastructure .....	7
Infrastructure Operations and Management.....	7
Scale Model .....	8
Delivering Continuous Innovation – Functionality, Roadmap, and Timing .....	8
Types of Updates – Content and System .....	9
GA Functionality .....	9
Azure Stack Post-GA Roadmap .....	10
Delivery.....	10
Availability .....	11
Extending cloud economics to on-premises with Pay-as-you-use pricing .....	11
Integrated Systems .....	11
Azure Services Pricing.....	11

## BUSINESS CHALLENGES AND THE NEED FOR A HYBRID CLOUD PLATFORM

Every company in every industry around the world is being challenged to transform from an organization that uses digital technology, to a digital organization. Application modernization is at the heart of digital transformation, with the opportunity to help companies engage customers, empower employees, optimize operations and transform products. Azure provides a rich platform for developers to build modern applications, and in fact most applications are moving to public cloud quickly. Some applications however face technological and regulatory obstacles; regulation, latency, data sensitivity, and customization needs are primary examples. Azure Stack provides a way to run the same applications in on-premises environments. With a consistent cloud platform, organizations can confidently make technology decisions based on business requirements, rather than business decisions based on technology complications.

## MODERN APPLICATIONS WITH AZURE AND AZURE STACK

Azure Stack is an extension of Azure, bringing the agility and fast-paced innovation of cloud computing to on-premises environments. Organizations can build innovative applications across hybrid cloud environments, balancing the right amount of flexibility and control. Developers can build applications using a consistent set of Azure services and DevOps processes and tools, then collaborate with operations to deploy to the location that best meets the business, technical, and regulatory requirements. Developers can speed up new cloud application development by using pre-built components from the Azure Marketplace, including open source tools and technologies.

## CONSISTENT HYBRID APPLICATION DEVELOPMENT

Maximize developer productivity by empowering them to build and deploy applications the same way, whether they run on Azure or Azure Stack. Implement a common DevOps approach across hybrid cloud environments. With a consistent platform for application development, customers can:

- Go faster by using the same application model, self-service portal, and APIs, as enabled by Azure Resource Manager.
- Improve processes: adopt common DevOps processes and tools across Azure and Azure Stack
- Easily transfer existing skills through consistent experience with Visual Studio
- Adopt modern development practices by investing in a continuous integration/ continuous deployment (CI/CD) pipeline with open source tools (e.g., Jenkins) and Visual Studio Team System (VSTS)
- Rely on powerful automation tools, such as and Azure PowerShell DSC extensions.
- Speed up new cloud application development by using a range of open-source and community-driven software components from the Azure Marketplace in Azure Stack.
- Choose from multiple Linux distributions, Docker-integrated Containers (Linux and Windows Server), and Mesos.
- Use Cloud Foundry consistently across Azure and Azure Stack to rapidly build, deploy, and operate cloud applications that are easily portable across hybrid cloud environments.
- Just like Azure, Azure Stack supports a broad choice of open source application platforms, languages, and frameworks including Java, Python, Node.js, and PHP.

## AZURE SERVICES AVAILABLE ON-PREMISES

Adopt hybrid cloud computing on your terms. Meet business and technical requirements, with the flexibility to choose the right combination of cloud and on-premises deployment models for applications. With Azure Services available on-premises, customers can:

- Use the cloud computing model for Azure IaaS services that go much beyond traditional virtualization. For instance, Virtual Machine Scale Sets enable rapid deployments with scaling for modern workloads (e.g., containerized applications).
- Incorporate Consistent Azure PaaS services that simplify development and enable hybrid deployment choice and portability for cloud applications. Run fully managed PaaS (Azure App Service) and Serverless computing (Azure Functions) in on-premises environments.
- Efficiently deploy and operate Azure IaaS/ PaaS services using the same admin experiences and tools as Azure.
- Build for the future as Microsoft delivers continuous Azure innovation to Azure Stack, including new Azure services, updates to existing services, and additional Azure Marketplace applications.

#### PURPOSE-BUILT SYSTEMS FOR OPERATIONAL EXCELLENCE

Focus on delivering continuous cloud innovation – Azure Services and updates – with purpose-built integrated systems. Reduce risk and complexity across the full lifecycle with simplified management and operations designed for the whole stack. By using a purpose build integrated system, customers can:

- Go from concept to faster with Azure Stack Integrated Systems from HPE, Dell EMC, and Lenovo. The systems include hardware, software, services, and enterprise-grade customer support that work together from the start.
- Consume continuous innovation from Azure, with greater quality and reliability across the full operations lifecycle with pre-validated updates that apply to both the hardware and software.
- Easily integrate Azure Stack with other solutions, such as monitoring and identity services. Use Operations Management Suite (OMS) as your unified management solution for protection and disaster recovery of applications and services running on Azure Stack.
- Start as small as a 4-server system and scale as your environment grows.

#### APPLICATION INNOVATION USE CASES

For companies investing in cloud technologies, particular elements of their portfolio remain problematic for different reasons and motivators. There are cases where a company wants to invest in new, cloud born application tools and techniques, but still have specific on-premises concerns that they don't want to build alternate solutions for. Some companies, mindful of their own roadmap and changing business requirements, want to additional flexibility about where their applications run. Other companies are interested in pushing the "edge of the cloud" as far as they can, to factory floors and remote locations.

Azure Stack extends the benefits of Azure to enable new scenarios. Azure Stack is a solution for Azure customers who, for various reasons, require additional options on how to build their solutions. Generally, these considerations are typically around: Regulations, Data sovereignty, Latency, Performance, Disconnected environments.

As we work with customers on Azure Stack, there are several patterns of innovation that Azure Stack helps address as part of an overall Azure Strategy.

#### DISTRIBUTED APPLICATIONS

Distributed Applications take full advantage of the consistent app platform across both Azure and Azure Stack. Motivation is to address latency, connectivity, or data locality preferences. Typical patterns include a store and forward model processing data locally in Azure Stack and using analytics, aggregating datasets and machine learning in the Azure public cloud.

## APPLICATION MODERNIZATION

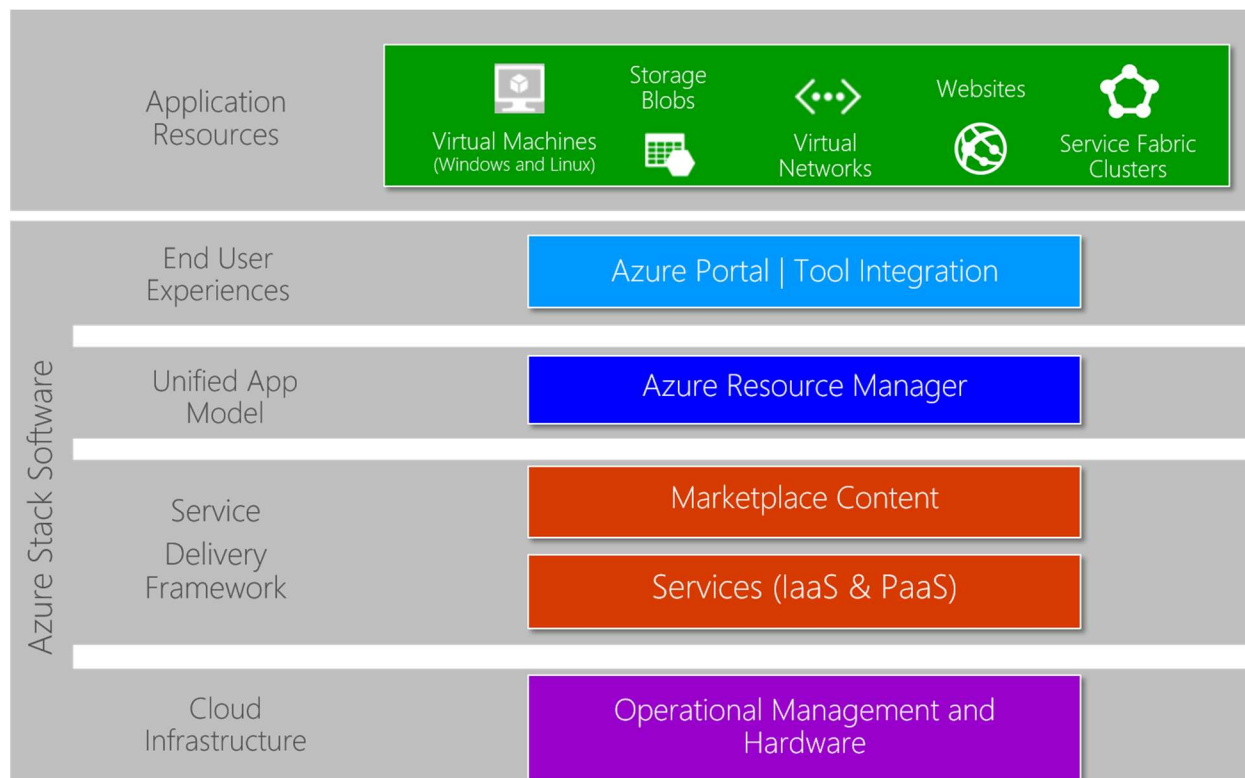
Application Modernization focuses on rethinking legacy systems running on-premises by incorporating cloud functionality. Customers who have systems and that are not yet ready to fully transition to the public cloud gain the most from this scenario.

## APPLICATION MOBILITY

Application Mobility is comprised of scenarios in which customers have already started, or want to start with Azure, but due to business needs, government / industry regulations, or organizational policies now have scenarios that require their application to run where cloud isn't feasible. This allows them bring solutions to markets otherwise inaccessible and to run consistent application patterns as they do in Azure reducing development and operational complexity and cost.

## HOW AZURE STACK WORKS

Since Azure Stack is fundamentally born from Azure, the design challenge was clear. For customers to be successful bringing cloud innovation on-premises, we had to treat Azure as a platform that could be distributed and operated by industry professionals. Fundamentally, the value of a platform is in how it helps save time by providing functionality, while ensuring functionality operates well where ever it's used. The graphic below provides a simplified view of the Azure Stack product architecture.



## DEVELOPER AND IT PROFESSIONAL EXPERIENCES

Developers and IT pros have an experience with Azure Stack that is consistent to that which they experience in Azure. This is fundamentally made possible because the Azure Stack portal environment is the same code as Azure. However, the real innovation of Azure Stack is the implementation of a consistent cloud API as Azure, so there is a consistent experience across clouds. Simply connecting to a portal to choose from preconfigured patterns is not enough; the definition of self-service has evolved to include programmatic access to the cloud API for the creation, deployment and operations of workloads in a cloud.

A consistent API surface area between Azure and Azure Stack is the path to a set of *experiences, tools, application patterns, automation capabilities, deployment and configuration, and operations* that work across clouds.



- **Experiences:** The first engagement with Azure and Azure Stack usually comes through the portal which provides a web-accessible conduit into the system.
- **Tools:** Customers can use the tools they use in Azure and know they will work in Azure Stack. Developers and Application teams can focus on solving business problems, rather than constant tooling and deployment transitions.
- **Application Patterns:** Programmatic and abundant access to resources are changing the way that applications are being designed, developed and operated. You can work with the resources in your application as a group – mixing resources *across* IaaS and PaaS services.
- **Automation Capabilities:** Having a consistent API means that developers and operations teams can invest in automating development, deployment and operational activities knowing that they will not have to be rewritten to be used with a cloud supplier that offers Azure services.
- **Deployment and Configuration:** Deployment and configuration can be simplified by using a single code base for apps and infrastructure.
- **Operations:** Templated deployments work for different environments such as testing, staging and production. Role based access control, usage and audit capabilities are standardized across all cloud resources in the deployment. Updates made to application resources can be performed in an incremental and non-destructive manner.

These are all examples of the breadth of impact enabled by this hybrid cloud platform. In each area, we believe Azure customers should be confident that their investments in people, processes and technologies will be transferable between Azure and Azure Stack.

## UNIFIED APPLICATION MODEL

We believe that cloud is a model and not a place. The key to our Azure cloud model is the **Azure Resource Manager**. In both Azure and Azure Stack the Azure Resource Manager plays two important roles. The first is by providing a single entry point for users and tools to define their resources running in the cloud. The second is focused on enabling teams to create, organize and control their cloud application lifecycle.

## SERVICE DELIVERY FRAMEWORK

A key principle of operating a cloud is constant innovation - new capabilities, new insights and new customer needs are the norm. Microsoft Azure is composed of over fifty services today and has an enormous amount of

content in the Azure Marketplace. As Microsoft continues to innovate and release new Azure content and services, a way to deploy and manage new functionality throughout Azure datacenters was needed. Azure is fundamentally designed to enable the release of innovation on a regular and on-going cadence.

With Azure Stack, the framework we use to install and publish new content and services is the same. The only difference is that we've tuned the requirements for success when operated by customers instead of Microsoft.

---

## MARKETPLACE CONTENT

When running a self-service cloud, curating a differentiated Marketplace for users is a key part of the value to customers. With Azure Stack, cloud operators will be able to create their own custom Marketplace content and add items directly from the Azure Marketplace to make them available to their users. Key Windows and Linux distributions along with other technologies, such as Blockchain, Mesos, and Cloud Foundry can all be made available in an Azure Stack Marketplace.

---

## SERVICES

Azure services power the next generation of cloud applications and are a key component of every Azure Stack deployment. Azure Stack begins with the initial services required for getting started with application innovation initiatives by providing modern compute, storage, networking, and security services, as well as platform services, such as WebApps and Functions. In Azure Stack, there are services that ship in the integrated system and services that can be Optional Services that can be added to an Azure Stack deployment to add new functionality.

When an Azure Stack operator chooses to add a service to their cloud they're growing the capabilities they can offer to their application teams. Microsoft will grow the list of services that can be installed to Azure Stack over time.

It is important to keep in mind that in Azure, running in our datacenters, services take dependencies on other services – they layer on top of each other. Each service in Azure is a candidate for being distributed through Azure Stack and we will listen to customer input and consider technical feasibility in determining the roadmap. For a detailed list of services at GA and in the next investments we're making, see the roadmap section below.

## CLOUD INFRASTRUCTURE

Like Azure, the cloud infrastructure with Azure Stack is a purpose built, preconfigured solution that provides the capacity and lifecycle management for the system. Our design point is to remove the complexity of building a cloud and focus on continuously delivering the services that applications depend on. Unlike Azure, Azure Stack is deployed, operated, and maintained by the customer. Accordingly, we have incorporated a set of principles in Azure Stack infrastructure design that simplify the operations experience so that operators and administrators can focus more on delivering Azure services and updates, rather than on infrastructure set-up and tuning.

---

## INFRASTRUCTURE OPERATIONS AND MANAGEMENT

All the Azure Stack solution components such as machines, software infrastructure, services, and subscriptions exhibit management interfaces that are intuitive to the end customer.

Management Capabilities include:

- **Intuitive experiences:** A portal and command line experience surfaces the common actions an Azure Stack provider or operator needs to take, allowing them to make decisions quickly and intuitively.
- **Monitoring and diagnostics:** Monitoring, notifications and management capabilities that allow the management of infrastructure and service health, performance, and capacity that underlie tenant workloads.
- **Servicing:** Microsoft will provide customers with the ability to update their infrastructure software and firmware while minimizing the impact on business applications, services and workloads.
- **Business continuity:** Azure Backup and Azure Site Recovery will enable Guest / tenant level protection for business applications and services.
- **Security and Privacy:** Azure Stack has a secure by design approach across network, data and management.
- **Hardware lifecycle management:** Azure Stack will have validated workflows experience to enable incremental expansion and replacement of failed components.

---

## SCALE MODEL

Azure Stack will provide scalability in multiple dimensions: This enables choice and flexibility to meet customer requirements and can grow with their needs. The approach to Azure Stack scale is derived from Azure. Customers will scale-out their deployments by adding capacity to a region, adding additional regions, while exposing unified access through ARM and portal.

---

Azure Stack has several entry points for scale and introduces new concepts that should be understood.

- **Cloud:** Azure Resource Manager spans across the entire system and provides a single entry point to the cloud.
- **Regions:** Underneath Azure Resource manager are Regions that represents available capacity. Each region represents a set of physical compute and storage resources that generally share the same location.
- **Scale Units:** A scale unit is a set of servers with identical CPU, Memory, Network, and Storage configuration. Each Scale Unit may have different/new hardware configurations. One or more Scale Units comprise a Region.
- **Servers:** individual nodes that populate a Scale Unit.

Scale for an Azure Stack cloud, then, is the formula of [#Regions] X [# of Scale Units per region] X [#Servers per Scale Unit] The smallest configuration that will be supported would be 1 Region X 1 Scale Unit X Servers, or 4 Servers. The goal is for customers to be able to start small and grow by adding a single server as their application needs dictate.

## DELIVERING CONTINUOUS INNOVATION – FUNCTIONALITY, ROADMAP, AND TIMING

Azure Stack is designed to stay consistent with Azure through continuous innovation. Like Azure, Azure Stack does planning and building at frequent intervals. This means that we prioritize features and functionality based on customer feedback and deliver it as quickly as we can.

At General Availability, Azure Stack extends Azure to provide a hybrid cloud platform for organizations looking to modernize applications. This enables new scenarios, like using PaaS to modernize on-premises applications, or deploying new hybrid applications in the cloud while maintaining the data on-premises, or optimizing on-premises applications to operate without latency but still use the cloud for further processing and analytics.



Beyond GA, Microsoft will continuously deliver additional capabilities in frequent updates. The first round of updates beyond GA are focused on two areas: 1) **enhanced modern application scenarios** and 2) **enhanced system management and scale**. These updates will continue to expand customer choice of IaaS and PaaS technologies when developing applications, as well as improve manageability and grow the footprint of Azure Stack to accommodate growing portfolios of applications.

In addition, we will add new integrated system partners to expand choice for customers.

---

#### TYPES OF UPDATES – CONTENT AND SYSTEM

With Azure Stack, we will deliver updates that 1) add cloud functionality for creating and working with applications, and 2) improve Azure Stack itself.

- **Content, services, and tools updates** - these updates do not have a regular scheduled release pattern, and can come anytime they are ready. They include new Marketplace gallery content, updates to Services as well as new optional Azure Services that can be deployed to Azure Stack. They tend to focus on adding new end-user facing functionality to the Azure Stack deployment.
- **System Updates** - these updates are more structured and regular. They include new and updated Infrastructure Management capabilities, Firmware, Drivers and expanded Scale points. They focus on improving the operational excellence of Azure Stack.

Following GA, we will continue to release both new content and services, as well as system updates. In addition, we will also have monthly security updates.

---

#### GA FUNCTIONALITY

The following table summarizes the details across Azure Stack GA functionality.

Scenarios	<ul style="list-style-type: none"> <li>• Hybrid app modernization for enterprise and dedicated hosting</li> <li>• People and Process Improvement (DevOps)</li> </ul>
Content, services, and tools	<p>Azure Services*:</p> <ul style="list-style-type: none"> <li>• IaaS – Compute, Storage, Network</li> <li>• PaaS – Storage (blobs, tables, queues)</li> <li>• Key Vault</li> <li>• App Service^: Web Apps, Mobile Apps, API Apps</li> <li>• Functions^</li> <li>• MySQL RP^</li> <li>• SQL Server RP^</li> </ul> <p>Azure Marketplace Content - Key IaaS workloads</p> <ul style="list-style-type: none"> <li>• Microsoft SQL</li> <li>• Mesos template</li> <li>• Cloud Foundry template</li> <li>• Blockchain template</li> <li>• More solutions from the Azure Marketplace**</li> </ul> <p>Azure Marketplace Content - Images and extensions</p> <ul style="list-style-type: none"> <li>• LINUX: RedHat, SuSE</li> <li>• Windows Server</li> <li>• Azure Docker Extension</li> <li>• DSC Extension</li> <li>• Chef</li> </ul> <p>Tool support:</p>

	<ul style="list-style-type: none"> <li>• Visual Studio</li> <li>• PowerShell</li> <li>• Azure CLI</li> <li>• Operations Management Suite guest extension</li> </ul>
System Capabilities	<p>Purpose Built Management:</p> <ul style="list-style-type: none"> <li>• Monitoring, diagnostics</li> <li>• Security and privacy</li> <li>• Patching and updating</li> <li>• Field replacement of parts</li> <li>• 3<sup>rd</sup> party management integration</li> </ul> <p>Scale: 4-12 nodes (physical servers); Single Region, Single Scale Unit</p>

\*API version will vary across services, however we will maintain API profiles.

\*\* We expect most single VM solutions with BYOL terms that use available services in Azure Stack to work without changes.

^Optional services

---

## AZURE STACK POST-GA ROADMAP

The following table highlights the investment areas after GA.

	Initial Updates Post GA
Scenarios	<ul style="list-style-type: none"> <li>• Enhanced Hybrid Application Scenarios</li> <li>• Improved Shared Hosting capabilities</li> <li>• Enhanced resiliency and scale capabilities (support for multi-region)</li> </ul>
Content, services, and tools	<ul style="list-style-type: none"> <li>• More Marketplace applications</li> <li>• Existing Azure service refresh</li> <li>• Tool Refresh</li> </ul>
System updates	<ul style="list-style-type: none"> <li>• Infrastructure backup and restore</li> <li>• Improved Management functionality</li> <li>• Continued Security, Firmware, and Driver updates</li> <li>• Performance improvements</li> <li>• Ability to add Regions for geo redundancy</li> </ul>
Investments with timing TBD	<ul style="list-style-type: none"> <li>• Azure Container Service</li> <li>• Azure Service Fabric</li> <li>• Scale expansion for additional scale units in a Region.</li> </ul>

---

## DELIVERY

Azure Stack will be available as:

- **Azure Stack integrated systems**, delivered by our hardware partners, that customers can purchase to modernize their application portfolio across cloud and on-premises environments.
- The **Azure Stack Development Kit** uses similar code as an Azure Stack Integrated system, on a single physical server, so customers can prototype hybrid applications in Azure and validate in Azure Stack when creating applications that are consistent across Azure Clouds. In addition, customers can also use this to familiarize themselves with the purpose built Operational Management capabilities in Azure Stack as well

as prototyping its integration into their environments. At any given time, the ASDK may be available in two builds:

- **“Stable build”** which has undergone more validation over a sustained period.
- **“In-Development build”** which has the very latest features availability for early validation and feedback before they become part of the feature update releases.

The following table is a summary of the availability dates for Azure Stack.

	Availability Date*	Country Availability*
Azure Stack Development Kit	Mid-CY17 for download	Global
Azure Stack integrated systems	Mid-CY17 for ordering from our hardware partners: <ul style="list-style-type: none"><li>• HPE</li><li>• Dell EMC</li><li>• Lenovo</li></ul> Additional systems will come online as follows: <ul style="list-style-type: none"><li>• Cisco – 2017</li></ul>	46 countries*

\* Planned – subject to change. \*\* See availability list below

---

## AVAILABILITY

The following are the countries\* in which Azure Stack will be available initially:

- Americas: Argentina, **Brazil, Canada**, Chile, Colombia, **Mexico**, Peru, **United States**, Uruguay
- EMEA: **Austria, Belgium, Denmark, Finland, France, Germany, Ireland**, Israel, **Italy**, Luxembourg, Monaco, Morocco, **Netherlands, Norway**, Portugal, Russia, **Saudi Arabia, South Africa, Spain, Sweden, Switzerland**, Turkey, United Arab Emirates, **United Kingdom**
- APAC: **Australia, Hong Kong, India**, Indonesia, **Japan, Korea**, Malaysia, **New Zealand**, Philippines, **Singapore, Taiwan**, Thailand, Vietnam

\* Planned – subject to change. (Bolded countries are the ones in which systems will be available from all three partners, Dell EMC, HPE, and Lenovo – other countries have availability from at least one partner)

## EXTENDING CLOUD ECONOMICS TO ON-PREMISES WITH PAY-AS-YOU-USE PRICING

Azure and Azure Stack deliver a truly consistent hybrid cloud platform to help organizations modernize their application portfolio across cloud and on-premises environments. Aligned with the product promise, Azure Stack brings the cloud economic model to on-premises environments with pay-as-you-use pricing.

---

## INTEGRATED SYSTEMS

Azure Stack is delivered as an integrated system, with software pre-installed on hardware. Azure Stack hardware and system support is purchased directly from the hardware partners.

---

## AZURE SERVICES PRICING

As in Azure, there are no upfront licensing fees for services; customers only pay when they use a service. Since customers take on the cost of ownership and operations, Azure Stack prices will be lower than Azure prices in many cases.

Azure Stack services will be metered on the same units as Azure.

Service	Metering Unit
Base VM	Per vCPU/min
Azure Storage (blob, table, or queue storage)	Per GB ( <i>no transaction fee</i> )
Azure App Service	Per vCPU/min
Azure Functions	Per GB-s execution time and Per million executions

For VMs, there is a Base VM charge that applies to all VMs. In addition, guest software must be licensed, and this requirement of course applies to WS too. Customers have the choice of paying the base VM charge and bringing their own WS license, or using SPLA, or renting by the hour, in which case the price they are charged will include both the Base VM charge and the WS rental.

Microsoft software can be licensed directly from Microsoft via EA and CSP.