

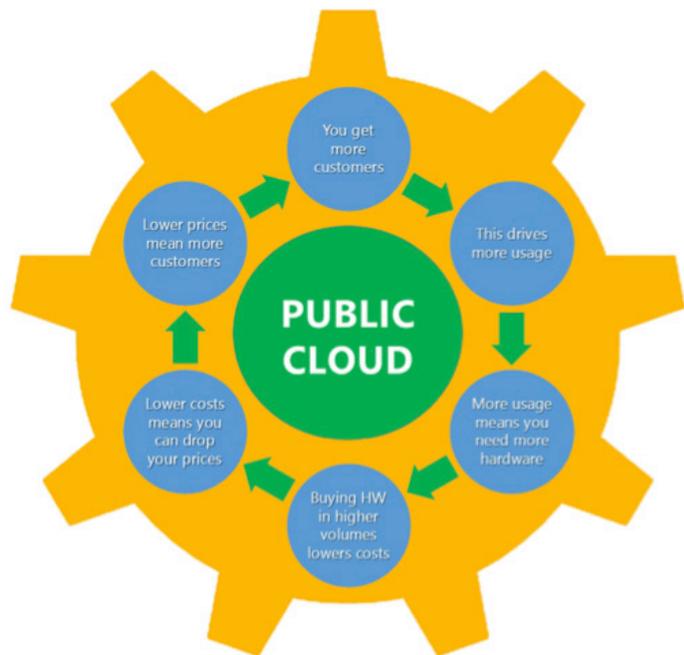
The Virtuous Cycle of the Public Cloud



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Public cloud has burst onto the radar of all CIOs who are planning their future enterprise computing strategies. But while public cloud seems like a straightforward concept, many customers still do not realize a key benefit: A public cloud designed with the right strategy will benefit the largest population possible. The public cloud can become the center of a “virtuous cycle” that can grow to benefit every organization in the world – even those that are not using the public cloud.

The virtuous cycle of a public cloud looks a lot like the image below. As the usage of the public cloud grows, customers need more hardware to meet demand and sustained growth. This need for hardware increases customers’ purchasing power, which allows them to negotiate lower prices as they purchase in bulk. As purchasing power grows and costs drop, companies can pass those savings on to their customers by dropping prices for products or services. The lower prices increases demand and the virtuous cycle continues.



Customers using the public cloud can easily realize the benefits of this virtuous cycle (the lower prices); but what about organizations that are also using private and hosted clouds? How can they benefit?

Organizations with multiple clouds can benefit if the public cloud vendor has, at the core of its strategy, an intention to take everything that it is learning from operating that public cloud and delivering it back for use in datacenters around world.

This is where Microsoft occupies a unique position as the only organization in the world operating a globally available, at-scale public cloud that makes its learning available in datacenters of every customer. The Microsoft perspective is to provide the learnings gleaned from years of global public cloud and cloud services success and make them available to anyone.

Customers can see this experience realized in the innovation Microsoft has incorporated into products like Windows Server, System Center, and the Microsoft Azure Pack. These products are the only cloud offerings in the industry that are consistent across public, hosted and private clouds. This ensures that customers avoid cloud lock-in, are able to maximize workload mobility, and have the flexibility to choose the cloud that best meets their needs.

This means that the Microsoft view of the virtuous cycle is larger and more beneficial than that of other public cloud providers. First, at the center of this virtuous cycle is industry-leading innovation. This means innovation in software, innovation in hardware, and innovation in processes. Microsoft orders and deploys hundreds of thousands of new servers, massively increasing their storage infrastructure every year. Innovation is a requirement simply to manage the demands and costs of procuring, deploying, operating, and retiring hardware at this scale.

Microsoft is addressing this challenge in the most direct and complete way possible: over the last three years, Microsoft has spent more than \$15

billion building datacenters around the world and filling them with the hardware and capacity demanded by customers of Azure and other Microsoft cloud services.

Microsoft keeps its public cloud costs low by managing an efficient supply chain that can scale to this kind of capacity, and, per the cycle, those savings are passed on to our customers. Other criteria are also carefully tracked, including things like the number of days from when an order for hardware is placed to the time the order is delivered to the loading dock (“order-to-dock”), and the number of hours/days it takes for the hardware to move from the loading dock to running customer workloads (“dock-to-live”). Throughout this process, aggressive quarterly targets are set and expert staff works constantly to drive those numbers down.

As you can imagine, after spending billions of dollars on hardware every year, Microsoft is highly incented to find ways to drive hardware costs down. The single best strategy is to use software to do things traditionally handled by hardware. For example, Microsoft Azure is able to deliver globally available, storage at low prices through [software innovations like software defined networking \(SDN\)](#) – all of which is based on low-cost, direct-attached storage. This brings storage economics never before seen in the industry.

One example of this is the most common workload hosted in Microsoft Azure: the “Web” workload. Whether it is Azure acting as the web tier for hybrid application, or the entire workload being hosted in Azure, the web workload is a part of almost every application. This makes it a great target for innovation. Microsoft Azure has pioneered high-density web site hosting with the ability to host 5,000+ web sites on a single Windows Server operating system (OS) instance. This dramatically reduces costs, which in turn reduces customer costs.

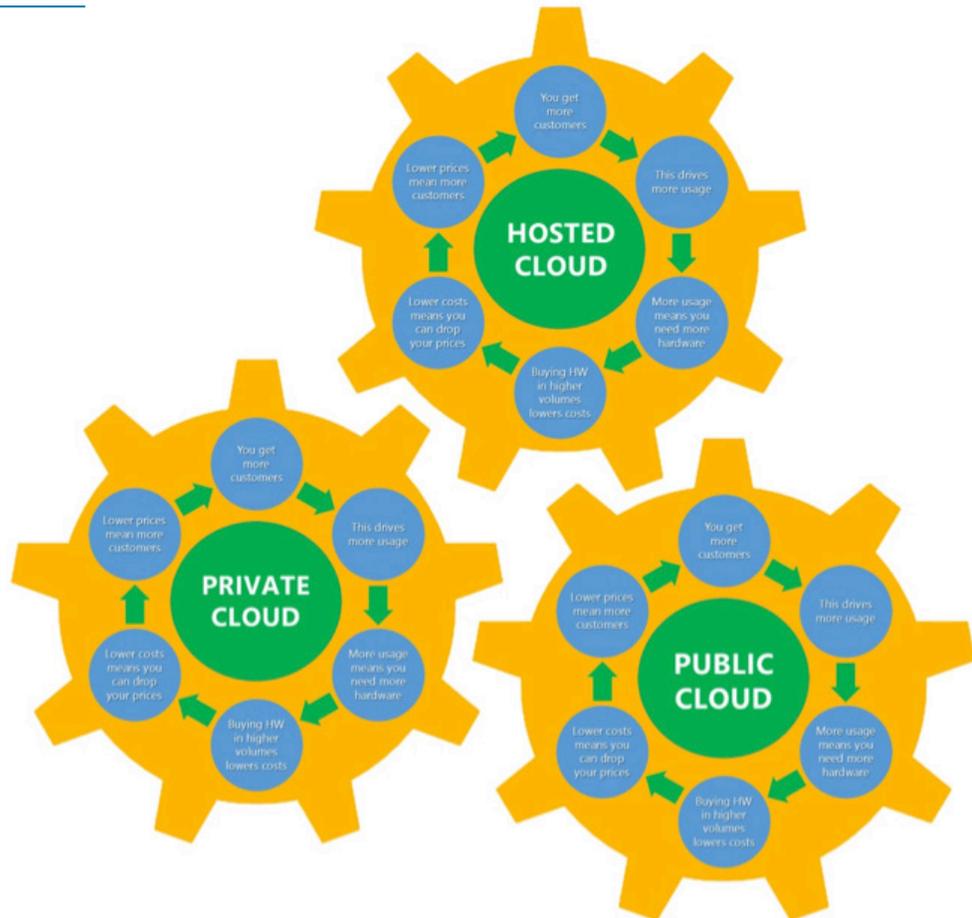
This success indicates that the virtuous cycle of the public cloud can actually be larger, more functional, and significantly more powerful by integrating service providers and hosted clouds.

This expanded virtuous cycle is both practical and more closely aligned with the needs of many customer organizations. All this is made possible by leveraging innovations and experience from Microsoft Azure and making them available to Microsoft enterprise customers through Windows Server and System Center. The list of such innovations is long, but top examples include:

- For highly available, low-cost direct attached storage, Windows Server 2012 introduced a set of capabilities called [Storage Spaces](#). Storage Spaces delivers the value of a SAN on low-cost, direct-attached storage, and it has been widely recognized as one of the most innovative new capabilities in Windows Server. It was [significantly updated](#) again in [Windows Server 2012 R2](#).

- High-density web serving, a key capability of Microsoft Azure, allows more than 5,000 web sites to be hosted on a single Windows Server OS instance. This capability is also available to enterprise datacenter customers through the new [Windows Azure Pack](#) (WAP).
- [Service Bus](#) provides a messaging queue solution in the public cloud that can be used by developers for things like a queuing system across clouds and building loosely coupled applications. Service Bus also ships as a component of the Windows Azure Pack, providing value pioneered in the public cloud for use in private and hosted clouds.

With innovations like these within enterprise customer datacenters as well as public clouds, a new vision of the complete virtuous cycle becomes clear:



Microsoft has not only driven effort into software innovation. Extensive work with hardware purchasing, deployment, and management has driven down costs while at the same time increasing the capacity each core and processor can support.

This work with hardware was highlighted when Microsoft joined the Open Compute Project and contributed the full design of server hardware in Microsoft Azure. The design, called “The Microsoft cloud server specification,” provides the blueprints for the datacenter servers Microsoft has designed to deliver the world’s most diverse portfolio of cloud services at global scale. These servers are optimized for Windows Server software and can efficiently manage the enormous availability, scalability and efficiency requirements of Azure, the global cloud platform.

This design specification offers dramatic improvements over traditional enterprise server designs: up to 40% server cost savings, 15% power efficiency gains, and a 50% reduction in deployment and service times. This server design is also expected to contribute to environmental sustainability by reducing network cabling by 1,100 miles and metal by 10,000 tons.

Microsoft recognizes that the majority of organizations will want to take advantage of [Hybrid Cloud scenarios](#). Every organization is going to take its own unique journey to the cloud and organizations should make decisions about cloud partners that truly enable them with the flexibility to use multiple clouds, while providing constant innovation and operational consistency.