MANUAL 02-006

CLOUD COMPUTING FOR
U.S. GOVERNMENT PROFESSIONALS

CLOUD BASICS

CHAPTER 6
INFRASTRUCTURE AS A SERVICE

LIGHTEN THE LOAD FOR YOUR OFFICE

On-demand data centers—also known as Infrastructure as a Service (IaaS)—provide computing power, memory, and storage, typically priced per hour, based on resource consumption. You pay only for what you use, and the service provides all the capacity you need. You'll maintain responsibility for monitoring, managing, and patching your on-demand infrastructure.

The biggest advantage of IaaS for government is that it offers a cloud-based data center without requiring you to install new equipment or to wait for the hardware procurement process, giving you access to IT resources that otherwise might not be available.

In the private sector, this use of cloud computing is rapidly gaining ground, particularly among small businesses. In government, the General Services Administration hosts USA.gov in the cloud to cut infrastructure costs.[1]

TIPS TO GET YOU STARTED

- Weigh the impact to your IT organization before adopting IaaS, because you are still responsible for software patches, maintenance, and upgrades. Monitoring and managing applications in a provider's data center, in addition to those you host yourself, can become a burden to staff.
- Create a strong internal team to manage your security and compliance requirements with your chosen cloud provider.
- Make sure you have a thorough understanding of how your current system works before you outsource any of it to the cloud.
- Look for service providers who can meet your redundancy needs for connectivity or storage so that you never lose needed services.
- Negotiate service-level agreements to help ensure you get the level of security and identity management required by your organization.
- Understand that on-demand is not all-or-nothing, and take advantage of pay-per-use pricing in the near term for some of the applications you run in a data center. Use existing dedicated capacity for baseline resources while you assess the impact on your IT staff.
- Look at the access methods for an IaaS offering, and see if existing standards are used. Common protocols include eXtensible Markup Language (XML), Representative State Transfer (REST), Simple Object Access Protocol (SOAP), and File Transfer Protocol (FTP).
- Plan an exit strategy. If you choose to change providers, make sure you know how to get applications from the cloud.[1]

VOCABULARY

VIRTUAL INFRASTRUCTURES

Providers of cloud computing services use *virtualization* to provide the elasticity so often cited as a benefit. Virtualization means to create virtual machines out of physical servers—that is, multiple operating environments within one physical environment. That way, you can squeeze the maximum computing capacity out of your existing resources. Virtualization technology is useful for any IT group interested in cost-effective data consolidation apart from cloud computing. Just be aware that virtual machines need to be managed and maintained, whether they reside on a service provider's infrastructure or within your own data center.

ON-DEMAND COMPLIANCE

Even with federal mandates that embrace cloud computing, you must compare IaaS offerings carefully. You should have a well-functioning compliance program for identities, data, and devices before adopting cloud services. Then, ask prospective service providers whether they can meet your needs for transparency, compliance controls, certifications, and auditability.

IaaS can help agencies with:

- Hosting public-facing citizen services and websites.
- Storage—especially of public data. The public cloud might even be a safer place to store data than your own data center, according to a team of engineers and computer scientists at the University of California.[2] However, data classification is a key requirement for evaluating risk and making informed decisions about the use of cloud computing.
- Testing large-scale applications in a discrete environment before deployment in the field.

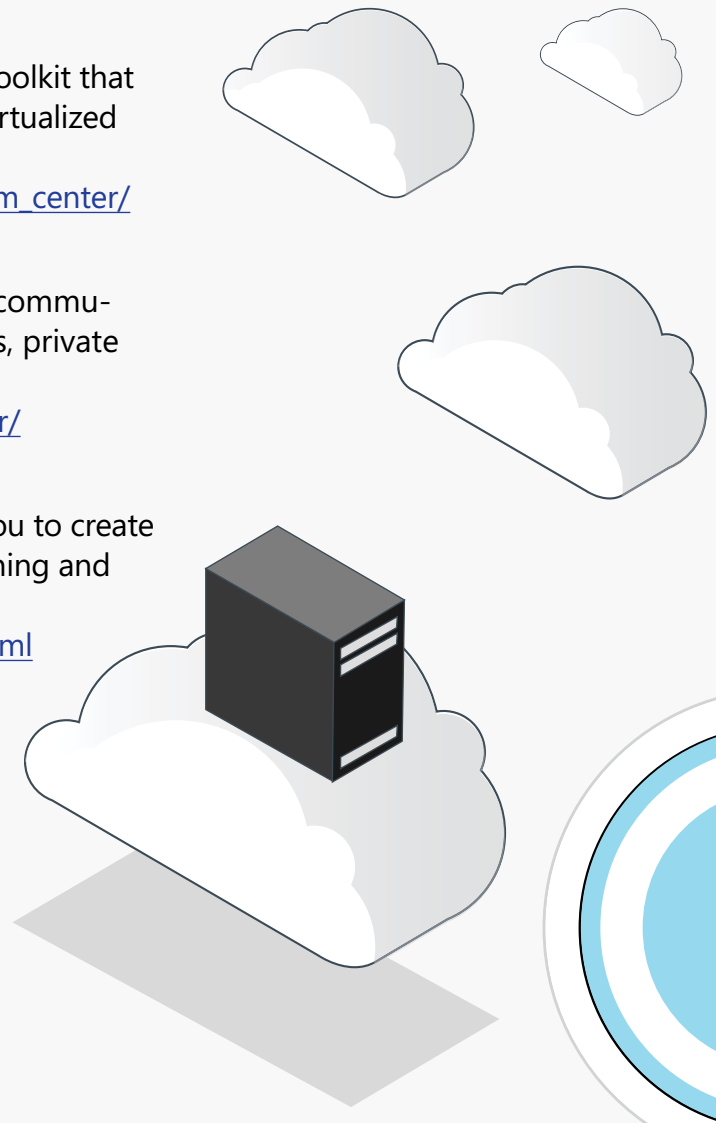
IaaS FROM MICROSOFT

Microsoft offers a variety of online services to address your agency's most pressing needs:

MICROSOFT SYSTEM CENTER has a free, partner-extensible toolkit that allows data centers to dynamically pool, allocate, and manage virtualized resources to enable IaaS.
http://www.microsoft.com/industry/government/products/system_center/default.aspx

WINDOWS SERVER provides an architectural piece allowing communication, collaboration, and management between on-premises, private cloud, and public cloud computing.
http://www.microsoft.com/industry/government/products/server/windows2008.mspx

DYNAMIC DATA CENTER TOOLKIT FOR HOSTERS allows you to create a private or public cloud offering, including services for provisioning and managing different servers and server roles.
http://www.microsoft.com/hosting/dynamicdatacenter/Home.html



LEARN MORE ABOUT IaaS

MICROSOFT GOVERNMENT CLOUD COMPUTING GUIDE
http://www.microsoft.com/govcloud

WHITE PAPER: AN INTRODUCTION TO CLOUD COMPUTING IN GOVERNMENT
http://download.microsoft.com/download/2/0/1/201E54BE-31A8-4B9B-8069-849DCE50C04F/GovernmentCloudComputing.pdf

GSA ADDS UP CLOUD SAVINGS
http://www.gcn.com/Articles/2009/12/14/Numerator-USAGov.aspx

PUBLIC OR PRIVATE, THE CLOUD MAKES ITS BUSINESS CASE
http://www.gcn.com/Articles/2009/12/14/Tech-Trends-Cloud-Computing.aspx

ABOVE THE CLOUDS: A BERKELEY VIEW OF CLOUD COMPUTING
http://www.eecs.berkeley.edu/Pubs/TechRpts/2009/EECS-2009-28.html

TAKING THE FOG OUT OF CLOUD COMPUTING: INFRASTRUCTURE AS A SERVICE
http://www.forrester.com/rb/Research/taking_fog_out_of_cloud_computing_infrastructure-as-a-service/q/id/56547/t/2

DYNAMIC DATA CENTER TOOLKIT FOR HOSTERS
http://www.microsoft.com/hosting/dynamicdatacenter/Home.html

MICROSOFT CLOUD COMPUTING INFRASTRUCTURE
http://www.microsoft.com/virtualization/en/us/private-cloud.aspx

CLOUD BASICS SERIES

ENTERING THE CLOUD
http://www.microsoft.com/industry/government/guides/cloud_computing/1-entering.aspx

GOVERNMENT BENEFITS IN THE CLOUD
http://www.microsoft.com/industry/government/guides/cloud_computing/2-benefits.aspx

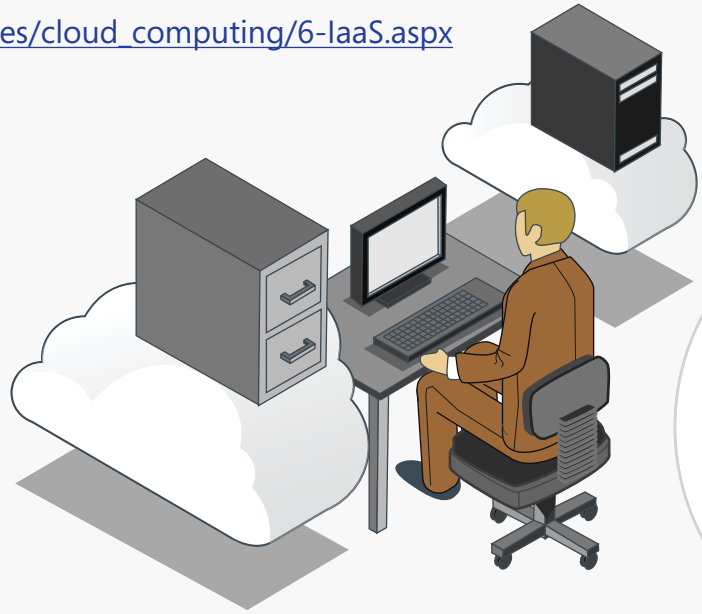
SECURITY IN THE CLOUD
http://www.microsoft.com/industry/government/guides/cloud_computing/3-security.aspx

SaaS
http://www.microsoft.com/industry/government/guides/cloud_computing/4-SaaS.aspx

PaaS
http://www.microsoft.com/industry/government/guides/cloud_computing/5-PaaS.aspx

IaaS
http://www.microsoft.com/industry/government/guides/cloud_computing/6-IaaS.aspx

CLOUD FIRST
http://www.microsoft.com/cloudfirst



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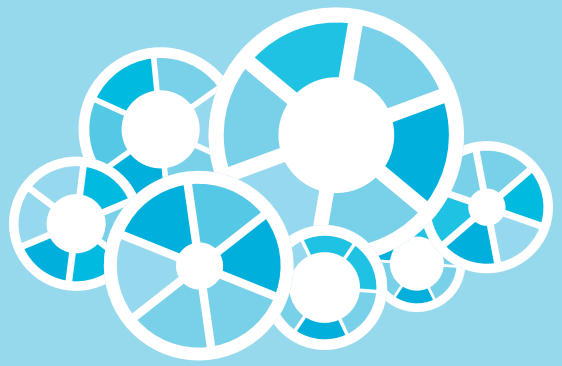
FOOTNOTES

[1] Jackson, Joab. "GSA adds up cloud savings." Government Computer News December 11, 2009.
http://www.gcn.com/Articles/2009/12/14/Numerator-USAGov.aspx

[2] Armbrust, Michael et al. "Above the clouds: A Berkeley view of cloud computing" (Technical Report No. UCB/EECS-2009-28). University of California, Berkeley, 2009.
http://www.eecs.berkeley.edu/Pubs/TechRpts/2009/EECS-2009-28.html



Cloud Power

http://www.microsoft.com/govcloud

Microsoft