Microsoft

Forecast: Improved economy in the cloud

An introduction to cloud computing in government

A Microsoft U.S. government white paper
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Introduction

From sea to shining sea, America is a land bursting with server farms—the very thing that makes cloud computing possible. The resources you need are probably growing in someone else's farm—and they'll share with you. The integration of software and assets you own with software and services in the cloud gives government new choices for balancing system management, cost, and security while helping to improve citizen services.

Just as cable companies offer consumers a range of services—basic cable packages, premium channels, and pay-per-view—cloud computing brings to government flexible choices about computing resources. Cloud computing sounds more amorphous than it is. In fact, the idea behind the cloud is pretty simple: It's a network of computing resources that are located just about anywhere and that can be shared.

What's in the cloud? Much of what's on your desktop or in your data center right now. For example, e-mail in the cloud is affordable for budget-strapped local governments that need to upgrade legacy systems and expand services. Even missions beyond the clouds are in the cloud. NASA uses the expansive storage capacity of the cloud to host their unique (and large) datasets, making them available to any citizen or researcher with a Web browser.

Federal, state, and local governments can use the cloud to deliver better services, even as they work with fewer resources. By sharing IT services in the cloud, your organization can concentrate on mission-critical needs while achieving savings through economies of scale and standardization.

As you plan your long-term data center strategy, your organization needs to understand the opportunities in the cloud.

> "If in our lives we can go online and provision e-mail within a matter of minutes, or a small business can get online and run its entire financial system in a matter of minutes, why must the government spend billions and billions of dollars on information that may not be sensitive in nature?"
>
> Vivek Kundra
> U. S.Federal Chief Information Officer
> September 2009

Cloud terminology

Services include software and hardware, from e-mail to entire IT platforms, which are *hosted* in the cloud, meaning that someone else makes them available to you *on demand*—that is,when you need them.

Service capacity is controlled in the cloud and is *dynamic* or *elastic*: Computing resources are allocated and deallocated as demand changes.

Cloud compliance

The National Institute of Standards and Technology (NIST) is currently refining its cloud definition.[i] Cloud services comply with relevant statutes, such as the Health Insurance Portability and Accountability Act of 1996 (HIPAA), the Sarbanes-Oxley Act of 2002 (SOX), and the Federal Information Security Management Act of 2002 (FISMA).

Getting cloud confident

Why all the hype around cloud computing? Three words: cheaper, faster, greener. Without any infrastructure investments, you can get powerful software and massive computing resources quickly—with lower up-front costs and fewer management headaches down the road. The pay-as-you-go benefits are so compelling that the federal budget submitted to Congress in February 2010 commits to the use of cloud computing technologies and to a reduction in the number and cost of federal data centers. It's time for all levels of government to understand these benefits and the new choices now offered to IT.

The hype surrounding cloud computing is recent, but the services in the cloud are not particularly new. Windows Live™ Hotmail®, one of the most popular messaging services worldwide, launched in 1996 and now serves 400 million accounts. People have been meeting in the cloud for at least 10 years using hosted conference services, like Microsoft Office Live Meeting, which hosts 5 billion conference minutes a year.

What's new are the growing number of services and alternative payment models that promise appealing cost savings, security, and flexibility. Cloud options range from everyday services, like e-mail, calendaring, and collaboration tools, to infrastructure services that free IT operations from mundane tasks and help reduce capital expenditures. System administrators can bring new services and computing capacity online quickly, managing costs as operational expenses. By allowing IT to respond quickly to changes, cloud computing helps administrators manage risks, peak demand, and long-term planning needs.

With cloud computing as part of your IT strategy, you can increase your data capacity without compromising security or requiring your agency to make heavy infrastructure investments—all while helping to lower your total cost of ownership. The trick is to find the right balance of on-premise and cloud services for your organization.

Eye in the sky

For government, cloud computing translates into choices. Programs like Ohio's Buckeye Traffic Web site for travelers come online for less IT overhead (the cost of support and servers plus the buildings to house them).

Defining the cloud

Clouds in nature may appear loosely defined, but at NIST, cloud computing means the following:

- On-demand service. You can get what you need when you need it.
- Broad network access. The cloud brings network-based access to, and management of, software and services—meaning access is anywhere, anytime.
- Resource pooling. A large pool of users shares location-independent resources and costs in an environmentally sustainable way.
- Flexible resource allocation. As demands fluctuate, cloud services can scale rapidly. You don't have to worry about bringing new servers online or reallocating resources.
- Measured service. Usage is metered—often per user or per hour. This means you pay only for what you use. Service levels are contractually defined.

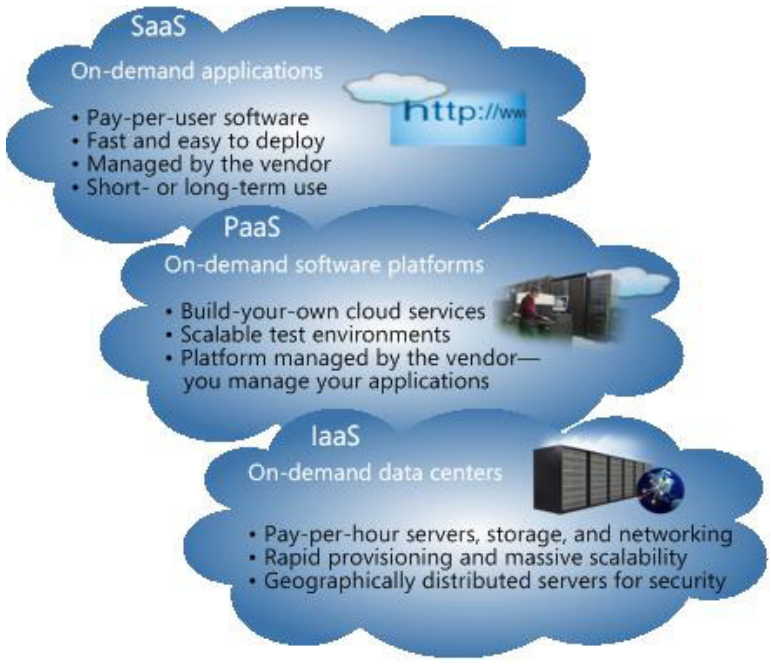
Which cloud is right for you?

The choice to move to the cloud is not an all-or-nothing proposition. With different types of cloud offerings, you have flexible options about which services to obtain in the cloud and which to keep on site. Your priorities and security requirements determine the level of cloud capabilities to explore.

If you look closely at the cloud, you'll see three distinct sets of offerings:

- The applications people use everyday are *Software as a Service* (SaaS).
- The operating environment in which applications run is called *Platform as a Service* (PaaS).
- Data centers offer *Infrastructure as a Service* (IaaS).

Outsourcing some capabilities to the cloud makes the most of what's on site by freeing time, budget, and people. For example, with SaaS, you can add services, like e-mail, affordably. With PaaS, you can deliver services broadly without having to manage the infrastructure. With IaaS, you get pay-as-you-go data center capacity for adding CPUs, storage, networking, or Web hosting.



The three general types of cloud services: SaaS, PaaS, and IaaS

Cloud reality check

With cloud computing comes hype. What can you expect?

- "It's cheaper." The truth is, you need to balance the up-front savings with ongoing subscription costs to determine actual savings. The pay-as-you-go approach lets you balance your IT budget with operational expense spending instead of capital expenses. So you *can* expect to reduce costs associated with server hardware, support and deployment, and power consumption.
- "It's faster." Data-intensive computing in the cloud can be six times faster than in isolated data centers.[ii] You can deploy applications more quickly, too, compared to traditional means. And it's certainly fast to procure on-demand services—just see Apps.gov for an example.
- "It's greener." In 2006, the Department of Energy estimated that U.S. data centers consumed about 1.5 percent of all U.S. electricity use, and current projections show worldwide carbon emissions from data centers will quadruple by 2020.[iii] Consolidating and sharing resources can curb the waste of data center sprawl and reduce greenhouse gas emissions. So yes, the cloud truly has a green lining.

Anytime, anywhere apps: SaaS

The cloud hosts the applications you use every day for office productivity, contact management, payment processing, and more. In the current and future economy, SaaS makes sense. It can lower expenses associated with software acquisitions in the near term. Longer term, it helps organizations with limited IT resources to deploy and maintain needed software in a timely manner—while, at the same time, reducing energy consumption and expense.

Software and services on demand debuted in fourth place in the NASCIO 2010 list of top 10 policy and technology priorities for state CIOs—and it wasn't even on the list a year earlier.[iv] SaaS makes use of a cloud computing infrastructure to deliver one application to many users, regardless of their location, rather than the traditional model of one application per desktop.

A growing number of government groups are turning to SaaS for their desktop applications. For example, Klamath County, Oregon, uses an e-mail solution hosted in the cloud. Without the cost savings of the subscription service, the organization could not have afforded to upgrade its straining legacy system—or to improve system performance. [v]

Private enterprises take advantage of SaaS affordability to deploy business systems quickly and with greater security than they could provide themselves. Even in a downward economy, spending on SaaS in the private sector rose 18 percent in 2009, according to a Gartner report that cited office suites and digital content creation as the most popular type of application, followed by customer relationship management (CRM) and enterprise resource planning (ERP).[vi] As SaaS offerings become even more widespread, government too can find ways to benefits from SaaS investments.

Who uses SaaS?

- The City of Carlsbad, California, looked to the cloud for mobile e-mail, online collaboration tools, and Web conferencing, delivered as part of an integrated package of hosted services.[vii]
- To improve collaboration between regions and across business units, Coca-Cola Enterprises adopted a hosted worldwide intranet with messaging and collaboration tools, including e-mail, calendaring, and conferencing, which are accessible to all employees from any device.[viii]
- Pharmaceutical giant GlaxoSmithKline exchanged its communication and collaboration tools for easier-to-use online services from Microsoft that enabled them to reduce IT operational costs by roughly 30 percent.[ix]

SaaS planning tips

- Compare the up-front cost savings to long-term subscription usage, because fees don't necessarily decline over time.
- Look for the ability to customize or configure the application for your environment. Not all SaaS providers allow configuration.
- Make sure an SaaS solution has all the features you want. Some hosted versions are not identical to their desktop counterparts.
- Can you share? Pueblo County, Colorado, hosts its county assessor and treasurer software services so that they can be used by six other counties.[x]
- Don't focus solely on costs—look for ways to improve your business. For example, can on-demand resources free your time to offer more mission-critical services to workers or citizens, reduce time spent on more mundane IT chores, or get features into use more quickly?
- Realize that applications have been running in the cloud for years, but a variety of approaches exist. Look for service-oriented architectures (SOA), Web services standards, and Web application frameworks—they're easier to integrate.
- Make sure you own your data. Your service agreement with a provider should explicitly specify that the client owns the data—without a time limit. You don't want to get locked in should you need to switch providers.

Considering SaaS

Consider SaaS for the following government needs:

- E-mail and instant messaging
- Desktop productivity, such as document creation and sharing
- Collaboration and presence
- Payment processing
- Identity and relationship management
- Citizen services delivered through the Web, also known as *e-government* projects

Cloudsourcing checklist

Gartner uses the term *cloudsourcing* to refer to the way that organizations will provision services. Whether you want office productivity software offered as a hosted service or a cloud-based messaging infrastructure, you must cloudsource carefully.

- ✓ **Know** your security and compliance needs. Can the provider meet them? Transparency, compliance controls, certifications, and auditability are some of the key criteria to evaluate.
- ✓ **Compare** vendor offerings—not just for features and costs but also for uptime, security, and flexibility.
- ✓ **Ask** whether service levels are negotiable. And what happens if the vendor falls short—are there meaningful penalties?

Platforms in the cloud: PaaS

The scalable architecture of the cloud is transforming how public and private sector groups think about customer service. Size—of your service, budget, or staff—does not limit IT when the platform for custom services is as readily available and broadly deployable as the Web. Cloud platforms free you to focus on the services you can offer without worrying about or managing the infrastructure needed for those services.

PaaS is the operating environment of the cloud with the tools you need on demand to create and host online services, software, Web sites, and mobile applications. With PaaS, you can concentrate on delivering applications rather than on the underlying infrastructure, which a service provider maintains and updates in its data centers. You can also use PaaS to create *multi-tenant* applications—that is, services accessed by many users simultaneously. For example, the U.S. Environmental Protection Agency (EPA) provides its public EnviroMapper environmental data as a service to citizens and government alike, using a mapping platform in the cloud.[xi]

With PaaS, you can develop new applications or services in the cloud that do not depend on a specific platform to run, and you can make them widely available to users through the Internet. PaaS delivers cloud-based application development tools in addition to services for testing, deploying, collaborating on, hosting, and maintaining applications. The accessibility of PaaS offerings enables any programmer to create enterprise-scale systems that integrate with other Web services and databases—an aspect of cloud computing that fosters economic opportunities for small businesses and empowers small agencies and local governments to think big.

The open architecture of PaaS can support integration with legacy applications and interoperability with on-site systems—important considerations, because government operates in a mixed IT world. Interoperability gives you the flexibility to take advantage of cloud benefits while retaining data and applications on site as needed.

Who uses PaaS?

- The City of Edmonton, Alberta, Canada, made access to public data easy for citizens and developers with its Open Data Catalogue. Created in a cloud-based software development environment, it makes data accessible in a programmatic manner with open, industry-standard protocols and application programming interfaces (APIs).[xii]
- For application testing, the U.S. Department of Defense (DoD) emulates field conditions using a cloud platform they lease only as long as needed.[xiii]
- The Office of Naval Research is testing a cloud-based platform for mobile geocasting, a way of broadcasting locations in real time by capturing GPS data from a cell phone. The data is transcoded in real time and displayed as animation over a map to show routes and motion as they occur.[xiv]
- Local governments in India can provide needed e-government applications without additional IT resources using a hosted data center. The provider, Microsoft partner Persistent Systems, delivers these high-availability services in the cloud using a Windows® Azure™ data center.[xv]

PaaS planning tips

- Implement a secure development life cycle methodology for your applications that are hosted in the cloud, and evaluate the cloud provider's compliance against a similar process.
- Plan to scale your service. The multi-tenant architecture of PaaS offerings often comes with concurrency management, scalability, failover, and security so that you can think big when testing and developing software.
- Don't get overwhelmed by the proliferation of protocols and Web services available to PaaS developers. But do consider how you can integrate Web services and databases to create new services.
- Look for providers that help you develop more custom Web apps faster. For example, some PaaS environments help geographically dispersed teams collaborate and share code or include services for creating data models and policies visually.
- Follow the example of other agencies that are integrating Web services and open datasets within PaaS environments. Create cool mashups with datasets in the cloud, such as those available from NASA or from the Microsoft Open Government Data Initiative (OGDI), a set of software assets designed to help agencies bring useful data to the public.
- Remember that you can lease capacity as needed and use PaaS to test and debug high-memory or compute-intensive features in the cloud whether or not you deploy your services in the cloud.
- Compare how well vendor tools enable portability across clouds. Do they support application interactions and provide resources and policies for service interoperability? Some providers may not allow you to take your application and put it on another platform.

Considering PaaS

Consider PaaS for the following government needs:

- Collaborative software development projects that involve multiple agencies
- Applications that can be shared by many users simultaneously
- Creating government-only social networks or cross-agency communities
- Porting on-premise line-of-business applications to the cloud
- Deploying Web services quickly
- Creating mashups of public data to meet federal mandates for transparency

Data centers on demand: IaaS

How many data centers does it take to run a government? Now that the cloud offers storage, networks, and servers as a service, technology is no longer bound by the traditional on-site IT department. On-demand data centers put virtually unlimited computing power into the hands of even the smallest government entities to meet spikes in demand. The catch: In the IaaS world, you will have that much more infrastructure to manage.

On-demand data centers—also known as IaaS—provide compute power, memory, and storage, typically priced per hour, based on resource consumption. Some call IaaS *bare metal on demand*. You pay only for what you use, and the service provides all the capacity you need, but you're responsible 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—which means you can get IT resources that otherwise might not be available.

For example, you might host a Web site in the cloud, as the General Services Administration (GSA) did with USA.gov to cut infrastructure costs.[xvi] Or test compute-intensive applications, like the DoD did when it needed to get new features into the field quickly.[xvii] With IaaS, savings come from hardware and infrastructure costs but not necessarily from staffing, because you are still responsible for system management, patch management, failover and backup, redundancy, and other system management tasks. Depending on the service, an IaaS provider typically handles load balancing, monitoring, and scaling automatically, and you manage your cloud deployments.

In the private sector, this use of cloud computing is rapidly gaining ground, particularly among small businesses.

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 in 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 planning tips

- 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 together with a 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. You need to know what you're getting.
- 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 (SLAs) to 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 XML (eXtensible Markup Language), REST (Representative State Transfer), SOAP (Simple Object Access Protocol), and FTP (File Transfer Protocol).
- Plan an exit strategy. If you choose to change providers, make sure you know how to get applications from the cloud.[xviii]

Considering IaaS

Consider IaaS for the following government needs:

- Hosting public-facing citizen services and Web sites.
- 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.[xviii] 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.

Security in the cloud

Many government agencies are entrusted with confidential information and private data. Cloud computing may seem risky because you cannot secure its perimeter—where are a cloud's boundaries? In addition, government agencies must comply with regulatory statutes, such as HIPAA, SOX, and FISMA. Yet, your organization can move forward even as security standards are being defined.

NIST likens the adoption of cloud computing to wireless technology. Agencies learned how to protect their wireless data as they moved forward—and they will do the same with cloud computing.[xix] In building its cloud platform, NASA found that cloud computing was as secure as other forms of data sharing and storage currently in use by the federal government. By consolidating information and computers onto one platform, the cloud decreases the surface area vulnerable to a cyber attack and reduces the number of systems that would otherwise need to be maintained and monitored independently, making it easier to keep all the computers on a network up-to-date.[xx]

Many analysts agree that government oversight organizations must set the framework of standards that help agencies weigh the risks and benefits of public cloud scenarios.[xxi] Today, a team at NIST is working to do that at the federal level.[xxii] In the technology ecosystem, however, systems evolve faster than standards, and the security standards that would provide consistency across cloud vendors do not exist yet.

The bottom line? Federal, state, and local agencies vary in their security and regulatory compliance needs, and you know your needs best. You must look carefully at how well cloud providers protect key functions and sensitive data.

Security checklist

- ✓ Integration. Look for integration points with security and identity management technologies you already have, such as Active Directory®, and controls for role-based access and entity-level applications.
- ✓ Privacy. Make sure a cloud service includes data encryption, effective data anonymization, and mobile location privacy. In federal agencies, your contract with the service provider should include provisions for complying with the Privacy Act of 1974.[xxiii]
- ✓ Access. When you place your resources in a shared cloud infrastructure, the provider must have a means of preventing inadvertent access. What is the provider's policy if protected data is released accidentally?
- ✓ Jurisdiction. The location of a cloud provider's operations can affect the privacy laws that apply to the data it hosts. Does your data need to reside within your legal jurisdiction? Federal records management and disposal laws may limit the ability of agencies to store official records in the cloud.

Your own private cloud

Agencies with sensitive information and workloads would probably never want all of their data in a public cloud. Private clouds offer the scalability and shared resources of cloud computing on your terms—and on your turf, if you can afford it. To achieve true cloud scalability in a private cloud, you must forecast demand to support the requisite degree of excess capacity and invest accordingly.

Some agencies have the need and the budget to do so. Within the DoD, for example, groups can obtain access to the private cloud created by the Defense Information Service Agency. Called Rapid Access Computing Environment (RACE), it enables DoD users to quickly set up operating environments within a secured cloud. The Department of Homeland Security is also building a cloud platform able to serve up enterprise e-mail and other services to its workers.[xxiv] Michigan and Utah have plans to turn their states' IT departments into private clouds so that they can provide more resources to local governments, schools, and agencies.[xxv]

When should you avoid the cloud?

In the following cases:

- A regulatory or security issue prevents you from hosting even encrypted data in a public cloud.
- An application requires greater reliability or speed than the Internet.
- You want control over your assets, including physical possession of the hardware your data resides on. A private cloud offers one solution if you still want to take advantage of cloud benefits .

Who's in your cloud?

In the cloud, you share computing power with others. Just who that is depends on the cloud's deployment model. The right model for you is the one that meets your data classification, security, privacy, and business requirements.

Public cloud

A cloud infrastructure shared by the general public or industry, typically owned and managed by an organization that sells cloud services.

Community cloud

A cloud infrastructure shared exclusively by certain groups, such as civil agencies or others with like missions, and managed by the group or a third party. It can be hosted on or off premises.

Private cloud

Cloud resources confined inside a firewall with private control over the cloud infrastructure. Some private enterprises run their data centers as a private cloud. In 2009, NASA and the DoD brought theirs online.[xxvi]

Hybrid cloud

An approach that uses a public cloud for some services, such as general business needs, but uses a private data center for others, such as storage of sensitive data that must comply with federal mandates.

Government cloud?

Although you may have heard the term, there is no specific certification that designates a "government cloud" today.

Stepping into the clouds

As popular cloud computing services outperform internal infrastructure—with 99.9 percent uptime or better in many cases—the road to the cloud looks good. Between the flexibility of the cloud and the power of on-premise software, your group can map a cloud strategy that works.

Step 1: Justify cloud services

- Start by discovering how much cloud computing is already taking place in your organization or other agencies, and consider how your existing applications could take advantage of the cloud.
- Evaluate a Web service or hosted application in a test or development environment. Did the service save you time or money? Use any savings to justify future endeavors.

Step 2: Budget for the cloud

- Consider how the cloud gives you a predictable budget and plan for IT resources. Offloading some IT functions to the cloud can free up funds for new projects—launch a call center, develop services for children and families, or add business functions.
- Talk to peers and find ways to share networks, PCs, and even e-mail services. Cloud hosting could help you share common services, such as state child support systems or municipal traffic information, and even generate revenue from your shared services.
- Know when to make your move. Some cloud strategies, like PaaS, pay off over time, so factor in how long it might take to recoup your investment, and set expectations accordingly.

Step 3: Integrate cloud services

- Look for ways to integrate on-premise applications and databases with cloud technologies to offer more or faster services. But make sure your data is secured in transit, not just at the ends.
- Think big—especially if you're a small agency. Cloud services are massively scalable. Who else might benefit? Keep other agencies in the loop.

Storm clouds

Expect the cloud to not only drive technology change but also to change processes, people, and business management procedures. All these factors need to be aligned as you plan any cloud implementation.

And keep an eye on the press as you go forward. The public perception of risk may raise concerns with your stakeholders.

Looking ahead to a world of IT choices

The cloud is a bridge from the desktop to a world of devices, from 9-to-5 government offices to government services anywhere and anytime. As much excitement as there is in cloud computing, it is just one piece of a technology landscape that spans from the on-premise data center to the cloud and reaches people through the PC, Web, and phone.

Shared services can transform government. In fact, they already do. At the 2010 World Economic Forum Annual Meeting, leaders from industry, government, and civil society looked at ways that cloud computing could be applied to economic development, education, and healthcare delivery. Cloud computing makes it possible for governments to do more, as the seven Colorado counties did when they shared hosted software or as Ohio did with the Buckeye Traffic Web site. The economies of cloud computing make it a powerful technology for positive change, but the cloud alone is not enough.

At Microsoft, we see government using a blend of hosted and on-premise products and solutions that are deeply integrated. Today, your application can run solely on premises, or it might store data or code in the cloud, or it can make use of other cloud infrastructure services. That's why our approach to cloud computing for government relies on a platform that gives you the power of choice to deploy services in the cloud or through on-premise servers—or to combine them in any way that works best for your organization and constituents.

Cloud benefits for government

How can the cloud help you transform government? Consider the following:

- Citizen services. Drive innovation with data services in the cloud that citizens can reuse. Offer your own data mashups on a portal.
- Infrastructure. Get all the IT resources you need, only when you need them, managed securely and predictably. And pay only for what you use. Any budget-constrained government has to like that.
- Applications and content. Rather than waiting in the software procurement line, get hosted software, datasets, and services so fast you'll have plenty of time to work on your mission.
- Policies and regulations. Proceed carefully, but note how cloud computing can help you meet compliance requirements.
- Creative IT. Free IT workers from a keep-the-lights-on approach to foster some creative IT problem-solving.

Cloud technology from Microsoft

Government IT is not one-size-fits-all—and neither is the cloud. That's why our approach to cloud computing is based on providing you with choices and flexibility. Government IT will continue to run applications within its own environment while adding new applications and services that run in the cloud. Our focus is on making solutions for the real world of hybrid IT environments by providing cost-effective software and services that support your efforts to boost economic growth, create opportunities, and address societal challenges. And our extensive community of partners is available to work with you to deliver innovative solutions on premises or in the cloud.

Software and services from Microsoft

- Microsoft Business Productivity Online Suite delivers a suite of services, also available as stand-alone software, for hosted communication and collaboration. Microsoft Exchange Online delivers your e-mail with protection, plus calendar and contacts. Microsoft SharePoint® Online creates a highly secure, central location for collaboration, content, and workflow. Microsoft Office Communications Online provides real-time person-to-person communication, through text, voice, and video. Microsoft Office Live Meeting delivers hosted Web conferencing.
- For agencies that require a secure, isolated hosted environment, our enhanced Business Productivity Online Suite meets International Traffic in Arms Regulations (ITAR), with fingerprint access control and data access limited to U.S. citizen personnel who have cleared background checks.
- Microsoft Exchange Hosted Services offers online tools to help your organization protect itself from spam and malware, satisfy retention requirements for e-discovery and compliance, encrypt data to preserve confidentiality, and more. Microsoft Forefront® Online Protection for Exchange helps protect e-mail from spam, viruses, phishing scams, and e-mail policy violations.
- Microsoft Dynamics® CRM Online streamlines customer relationship management, delivering results through your browser and within your everyday productivity applications.
- Office Web Apps (coming soon) let you access documents from virtually anywhere, providing online access to your work and a core set of Microsoft Office functionality over the Web.

Microsoft in the cloud

As one of the largest hosted services providers in the world, Microsoft offers a solid track record as an online solution provider. Long established in the cloud, Microsoft continues to invest heavily—U.S.$9.5 billion per year—in research and development to help drive the technology further.

Compliance

Recognizing that data in many forms is one of government's most prized assets, Microsoft has invested more than U.S.$2 billion in new data centers around the world. These centers today meet or exceed U.S. federal government and international security body standards. Microsoft online services and data centers adhere to stringent HIPAA, SOX, and FISMA requirements, and we expect to attain FISMA accreditation and certification by the third quarter of 2010. The data centers are also SAS 70 and ISO 27001 certified, and they are audited by independent, third-party security organizations.

Uptime

Microsoft guarantees 99.9 percent uptime at its data centers, which are outfitted to operate during power outages and after natural disasters. Microsoft replicates data from its primary data centers to secondary data centers for redundancy, without storing any data offsite.

Platform and infrastructure services from Microsoft

- Azure Services Platform supports applications, data, and infrastructure in the cloud, giving you the flexibility to run applications—or just store code or data—in the cloud, on premises, or with a combination of both. Azure Services Platform is an on-demand operating environment for hosting, managing, and creating application services in the cloud, making it the choice of many Microsoft partners who are using it to build their own public and private cloud services and data centers.

  Featuring Windows Azure for running Windows applications and storing their data in the cloud, Azure Services Platform also includes Microsoft SQL Azure Database, a cloud-based relational database service built on Microsoft SQL Server® that offers highly available, scalable, multi-tenant database services. Software developers can use Windows Azure Tools for Microsoft Visual Studio® to create, configure, build, debug, and run Web applications and services on Windows Azure. Windows Azure platform AppFabric, formerly known as .NET Services, makes it simpler for them to connect cloud services and on-premise applications.

  For more information, see our Windows Azure platform white papers.

- Microsoft Codename "Dallas" makes it easy to find, purchase, and manage premium data subscriptions in the Windows Azure platform, and you can consume the data from any platform, application, or business workflow.
- Dynamic Data Center Toolkit for Enterprise is a free, partner-extensible toolkit that provides a framework for creating virtualized IT infrastructures. IT teams can use the toolkit with Windows Server® 2008 R2 Hyper-V™ and Microsoft System Center Virtual Machine Manager 2008, along with partner extensions, to plan, operate, and deliver the foundation for a private cloud.
- System Center Online Desktop Manager lets you easily secure, update, monitor, configure, and troubleshoot PCs from a single Web-based console—without the overhead associated with installing and maintaining an on-premise management infrastructure.

Data with or without borders

If your data needs to stay within the U.S. borders, Microsoft can guarantee it with multiple data centers across the United States that provide reliability and failover for government customers.

In addition, our data centers preserve the chain of custody for documents. When moving documents between on-premise and cloud services, documents retain the format and fidelity needed to create a reasonable facsimile for investigations or Freedom of Information Act (FOIA) requests.

How green is our cloud?

Microsoft data centers are designed to reduce total energy consumption by 25–40 percent compared to traditional facilities.

Who's who in our cloud?

Millions use Microsoft-hosted services, including the City of Carlsbad, Klamath County, Coca-Cola Enterprises, Eddie Bauer, Energizer Holdings, GlaxoSmithKline, and Ingersoll Rand.

Calculate cloud cost savings

Get a customized estimate of the potential cost savings your organization might achieve by building on the Windows Azure platform. Try our Total Cost of Ownership Calculator.

Microsoft resources	Description
In the cloud	Microsoft cloud services offer you the power of choice. You can run some applications on premises, use hosted services managed by Microsoft or our partners, or use a flexible combination of both. Hosted solutions provide familiar features and experience in the cloud for users of Windows and Microsoft Office.
For government transparency	The Open Government Data Initiative is a cloud-based collection of software assets that enables publicly available government data to be easily accessible. Get more resources that support government's use of technology at www.microsoftgovready.com.
Microsoft Public Sector Idea Bank	You can participate in a community of developers and other professionals to influence the development of future solutions at the Microsoft Public Sector Idea Bank, which highlights on-demand solutions powered by Microsoft Dynamics CRM.
For interoperability	Government operates in a mixed IT world that requires integration and interoperability among agencies and their IT environments. Microsoft offers a multifaceted approach to achieving interoperability and is committed to solving real-world interoperability challenges with our customers through innovative products, community engagement, technology access, and support for technology standards.
About open source	Open source software is part of many data centers today, and Microsoft provides many resources for open source developers, including Port 25, an open source community, and CodePlex, project hosting for open source software.
About infrastructure	IT departments are challenged more than ever to meet competing resource demands in new ways. Virtualization can help agencies control costs, improve manageability, drive agility, and improve availability. Data center sustainability is another approach to lowering costs and reducing environmental impact.
To save energy	Green IT solutions promote long-term sustainability and can offer significant savings through a combination of energy conservation, improved workflow, and streamlined deployment.

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