Cloud GIS Reveals the 'Where' in Your Data

Geospatial Visualization and Analysis for Improved Business Outcomes

Featuring research from Gartner

Welcome

Dear Colleague:

Never before have I been so excited about the potential for geographic information system (GIS) technology to positively impact our world. Advances in the past decade, including the widespread embrace of cloud computing, have served to connect billions of people and significantly changed the way business is conducted. Demands have risen for deeper intelligence, as have expectations for it to be delivered in real time, all day, every day. As someone who has witnessed both the power and application of GIS technology to convey information that can literally change lives, I am enthused by the growing adoption of cloud GIS for exposing and analyzing information from the perspective of place to enable better business outcomes.

GIS enables you to identify and see the location of your assets (e.g., personnel, customers, infrastructure) and discover patterns and trends based on their locations. It also enables your enterprise to use, make, and share this knowledge from any device, anywhere. In this report, you will find real-world examples of how organizations like yours are finding success with cloud GIS solutions.

Esri® offers both end-user solutions and developer toolkits that let you create custom mapping applications to meet the specific needs of your business. Esri® technology integrates cloud, server, mobile, and desktop environments, collectively forming a complete enterprise platform. Deployment models for a public, private, or hybrid cloud exist to meet the specific needs and requirements of your organization.

I encourage you to use this report to learn more about the benefits of leveraging cloud GIS technology. We at Esri look forward to helping you realize the power of cloud GIS across your organization.

Warm regards,
Jack Dangermond
President and Founder

Executive Brief

Three Real-World Stories

These stories describe how organizations are benefiting and realizing ROI from cloud GIS.

- *MacKenzie Adopts ArcGIS Online and Opens Up New Lines of Business* describes how a large commercial property management firm discovered new streams of revenue from using a cloud-based solution to identify prime sites for growth.
- *Wall Street Network Extends Offerings with Esri Technology* chronicles the success of a New York City solution provider to deliver user-friendly solutions in reduced time by building on Esri's cloud-based geospatial platform, ArcGIS Online.
- *Born Again: The Antidote for Zombie Stores* shows the success of commercial real estate managers who employed geospatial analysis of locations that helped them capitalize on opportunities and guide their portfolios back to profitability.

ArcGIS Online: The Mapping Platform for Your Organization

We've included a broad overview of our cloud-based platform for making and sharing maps, apps, and other geographic data and content. Whether you are exploring deployment of a public, private, or hybrid cloud, the ArcGIS Online platform offers the flexibility to meet the unique requirements of your organization. You can pilot a test case with a free 30-day trial, then roll out your deployment based on the strategic initiatives of each business unit within the enterprise.

Whitepaper

The Business Case for Cloud discusses the inherent challenges and advantages of private, public, and hybrid cloud deployment models. Adopting any cloud solution requires an understanding of which cloud computing services and models best address the unique needs of an organization.

Analyst Insight

Cloud Computing Positions Itself for Growth, by Gartner analysts Daryl C. Plummer and David Mitchell Smith, discusses their positions on cloud computing with consideration for the business values cloud promises and the practical issues encountered by organizations seeking to leverage the power of cloud technology.

Taking the Next Step

The stories you read in this report will help clarify how cloud-based geospatial technology solutions can make a significant impact on your business processes. We invite you to learn more about our offerings on our website or by contacting our cloud experts.

To learn more about Esri cloud technology and sign up for a free 30-day trial, visit esri.com/agol.

Three Real-World Stories

MacKenzie Adopts ArcGIS Online and Opens Up New Lines of Business

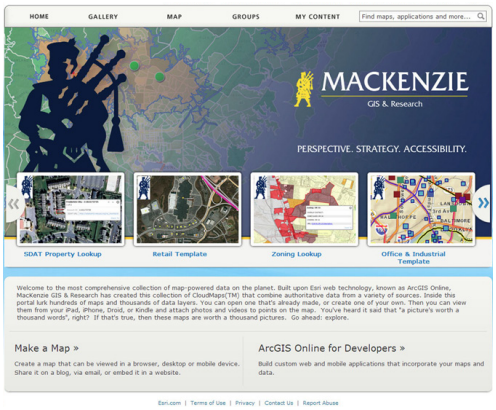
Esri's Cloud-Based Solution Increases Commercial Opportunities and Expands Marketplace

MacKenzie Commercial Real Estate Services, one of the largest commercial real estate firms in the greater Baltimore, Maryland, metropolitan area, is expanding its service model with the help of Esri's ArcGIS Online. Using the cloud-based solution, MacKenzie is able to provide its clients with a new generation of strategic decision-making tools and information services. The new opportunities ArcGIS Online has opened up have prompted MacKenzie to become an Esri partner so it can offer its web-based solutions to a broader range of customers.

ArcGIS Online allows MacKenzie to organize retail partner information based on need and ensure that it can be accessed from anywhere on any device. "I think about the world I was in just 10 years ago—me having to build applications and run analyses for people—and now the technical and operational barriers have been lifted," said Matt Felton, managing director of MacKenzie's GIS & Research group.

MacKenzie's team has created dashboards, known as MapDash, that provide C-level decision makers (CEO, COO, CFO) with a map-based portal for accessing both business data and market intelligence. One of these dashboards, MapDash for Leases, allows owners of multisite businesses to quickly access information about a particular asset. This dashboard makes access to even the largest portfolio intuitive, quick, and easy. Since MacKenzie removed the complexity and hassle of managing books of property information, brokers can now focus on delivering superior client advice services and ensuring that portfolios perform at their highest and best level.

MacKenzie's success in applying geospatial information system (GIS) to business strategy has prompted the MacKenzie Companies to create a new business venture, which was officially launched in January 2013. It extends MacKenzie's GIS capabilities beyond Maryland and into new disciplines such as banking and health care.



ArcGIS Online has opened up new lines of business at MacKenzie.

Source: Esri

"We are pleased to see MacKenzie translate its own business advantage into new opportunity for its clients. ArcGIS Online and the iPad application are moving the discussion from the back office to the field, the very place where you need to make decisions based on a complete, factual understanding of site operations and opportunities," said Simon Thompson, director, commercial solutions, Esri. "As a result, MacKenzie's customers benefit from an accelerated ability to respond to changing consumer behavior and market conditions, which will help them be more successful. This is good for everyone."

Learn more about Esri cloud technology at esri.com/agol.

Wall Street Network Extends Offerings with Esri Technology

ArcGIS Online Quickly Serves Solutions for Provider's Clients

Wall Street Network (WSN), a technology solution provider located in New York City's financial district, has licensed Esri's geospatial information system (GIS) technology to extend its location intelligence solutions to organizations in risk management, marketing, and logistics. WSN plans to incorporate ArcGIS Online to broaden access to the software's easy-to-use analytic tools, which mash up business and spatial data in executive dashboards.

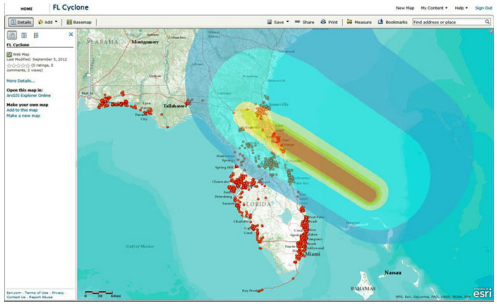
"The robust architecture of the Esri software allows us to build better products quickly, so we can focus on solving business problems and delivering users new perspectives," said Kristina Mazelis, chief operating officer (COO) and chief financial officer (CFO), WSN. "We can remove the complexities of working with spatial data and provide our clients with the extensive discovery, collaboration, and analysis tools they need in their businesses."

ArcGIS Online is a cloud-based platform that offers businesses the ability to create interactive maps and applications that can be shared with knowledge workers anywhere. The collaboration requires no installation or setup. Maps and applications that WSN creates can be quickly embedded in workflows so that content created by one user can easily be shared with others. People inside and outside the organization can view and interact with maps and perform analysis on smartphones, tablets, and notebooks as well as the traditional office desktop.

Using this solution, WSN continues its tradition of quickly creating user-friendly software.

"The first application we created was for insurance, and it was up and running in a matter of weeks," said Mazelis. "We wanted to provide customers with tools to easily view and understand their policies by location to see how they are affected by risks such as hurricanes and tropical cyclones. We needed to do this before hurricane season hit. Selecting Esri ensured we could do just that."

Reduced time to market and improved development agility provide considerable benefit to WSN staff and heavily influenced the choice of GIS platform.



WSN creates location intelligence solutions based on Esri ArcGIS Online.

Source: Esri

"Using ArcGIS Online, WSN can also expect to pass these benefits and ROI [return on investment] on to its clients," said Simon Thompson, global director of commercial solutions at Esri. "They'll enjoy lower entrance and ongoing costs due to cloud and web-based systems. The solution is going to deliver higher and faster returns, because everyone can access it anywhere. That knowledge will be easily absorbed into the company and make a huge difference to the bottom line."

Learn more about Esri cloud technology at esri.com/agol.

"He's already dead, he just doesn't know it yet." That phrase, popularized by horror movies, describes the living dead who naively roam the earth, not realizing that their lives have passed. This phrase has also been applied to retail outlets—stores, restaurants, and service venues—with declining businesses and dwindling operating capital that are limping along with marginal profits.

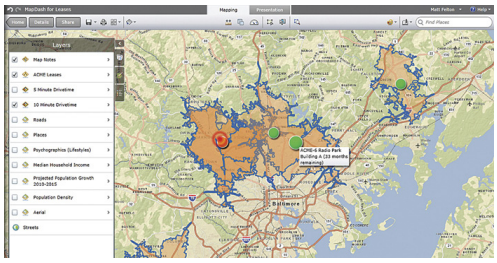
Although these businesses have outlived their usefulness in their current locations, their owners cling to the hope that they will be able to keep the lights on for just one more lease cycle.

"This recession has created zombie stores, stores that appear to be alive but that are really dead," said Ted Hurlbut, a consultant at the retail consulting firm Hurlbut Associates. "In good times, in every chain there are below-average stores that only generate 70 percent or 80 percent of the average store but are still four-wall profitable. In this downturn, with sales in some of these weaker stores off by as much as 10 percent to 20 percent, these stores are now four-wall cash drains."

Finding the Best Use

Geospatial information system (GIS) technology can help retailers fight off the zombie virus. In real estate, it all comes down to one simple question, What is the best use for this land or this building? according to David Beitz, GIS director at EDENS, which is a developer, owner, and operator of community-oriented shopping places in primary markets along the East Coast of the United States.

"If a retail site is barely making it, GIS can be used proactively to spot opportunities that could increase the value of the real estate," Beitz said. "Maybe that tired chain store location would make a great bank branch. Or maybe it could be combined with several other parcels to build an apartment complex. GIS gives us the tools to research locations and find opportunities in order to make smarter real estate decisions."



Customers can see their entire portfolio, not just one lease at a time, allowing them to be proactive in their management strategies. This translates into healthier retail stores.

Source: Esri

Matt Felton, GIS director at MacKenzie Commercial Real Estate Services, agrees: "With GIS, we can help owners of vacant stores with [information on] current, up-to-date market reach, customer profiles, and market potential for zombie sites. Most of these zombie stores are in markets that have dramatically changed quicker than the owners can adapt. Often, these types of stores have outlived their nature in a given market and should instead turn into something new, or they have been completely out-positioned so that no other retailers will want to show interest in the site."

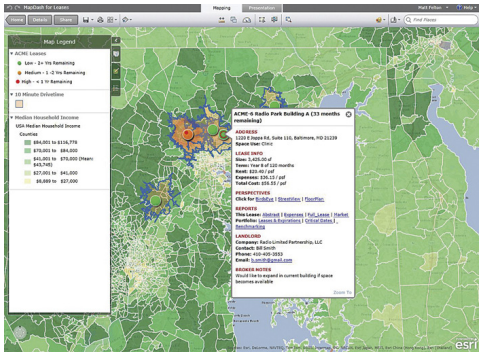
Connecting People to Real Places
As a shopping center company, EDENS uses GIS in the leasing process to first identify potential retailers for a site, then uses the technology to communicate to the retailer why EDENS leasing and development staff think a site is good for it. "Studies show that the more time customers spend at a shopping center, the more money they spend," said Beitz. "Great shopping places provide a variety of activities for people in the community to connect through shopping, services, entertainment, and restaurants."

For example, when EDENS has a retail space or outparcel *(a small lot at the outer edge of a shopping center, reserved for later sale)* that—if developed as a restaurant—would complement one of their shopping centers, staff look at a number of questions:

- What other restaurants are nearby?
- Who is not in this market but is successfully operating in other similar markets?
- How do the demographics of their target site line up with the potential restaurant's other locations?
- Where are the schools nearby that help determine commuting patterns?

GIS helps EDENS to understand and communicate the answers to these questions, determining if additional retail square footage might be profitable for landlord and tenant. In addition to maps and demographics, EDENS has also been using Esri Tapestry™ Segmentation data to better understand its markets. Tapestry classifies US residential neighborhoods into 65 unique market segments based on socioeconomic and demographic characteristics. By understanding lifestyles, life stages, likes, and wants of people, it is easier to understand what may interest people living in specific neighborhoods.

"Above and beyond demographics, the Tapestry data profiles the households and gives us a deeper view of the consumers in the market," said Beitz. "I think the key here is to add retail space only if it accomplishes the larger goal of creating a dynamic shopping place where people want to spend time. If you only look at retail square footage per capita, then you will see that lots of areas are overretailed. The problem is that often the retailer has not adapted to the changing composition of the market. Tapestry gives us the consumer understanding of the business equation to better capitalize on opportunities in the market."



MapDash helps organizations that hold between 10 and 40 leases in a region access all related information, identify property location, and know when leases on those properties should be renewed.

Source: Esri

Secure Access to Information Anywhere
MacKenzie brokers and retail partners can present retail centers in the most positive light using an online dashboard created by Felton. MapDash, built on ArcGIS Online for organizations, a cloud-based solution from Esri, provides designated staff with secure access to information from anywhere.

When an anchor store leaves a mall, customer counts and sales often decline. This triggers the material adverse change clause in most leases and affects the rates other tenants pay. To counter this situation, Felton and his team use MapDash to define the current customer dynamics in trade areas and quantify the market opportunity, depth of demand, and spending capability of consumers in the area. With this information, MacKenzie staff can match opportunities with tenant prospects.

"I think about the world I was in just 10 years ago—me having to build applications and run analyses for people—and now the barriers have been lifted," said Felton. "Today, I can focus on the content, the business use, and not worry about the infrastructure."

From Reactive to Proactive

MapDash helps the brokers communicate lease information to their customers. The dashboard helps organizations that hold between 10 and 40 leases in a region access all related information, identify where properties are located, and know when leases on those properties should be renewed.

Red flashing dots on the dashboard map signify stores that require attention relating to a time-sensitive issue such as a lease option. Clicking these dots provides both street and bird's-eye views of the retail location, along with reports that summarize the pertinent information about the lease such as length of lease, price per square foot, and length of time at the site. This gives decision makers a better understanding of the terms of all leases, turning the often reactive lease renewal process into a proactive strategy for optimizing the company's portfolio.

"MapDash allows our customers to see their entire portfolio, not just one lease at a time," said Felton. "Accessing information in this manner is better and faster and keeps our clients more informed. This gives them more leverage in the process, and this translates into healthier retail stores."

Opportunity in a Sea of Change

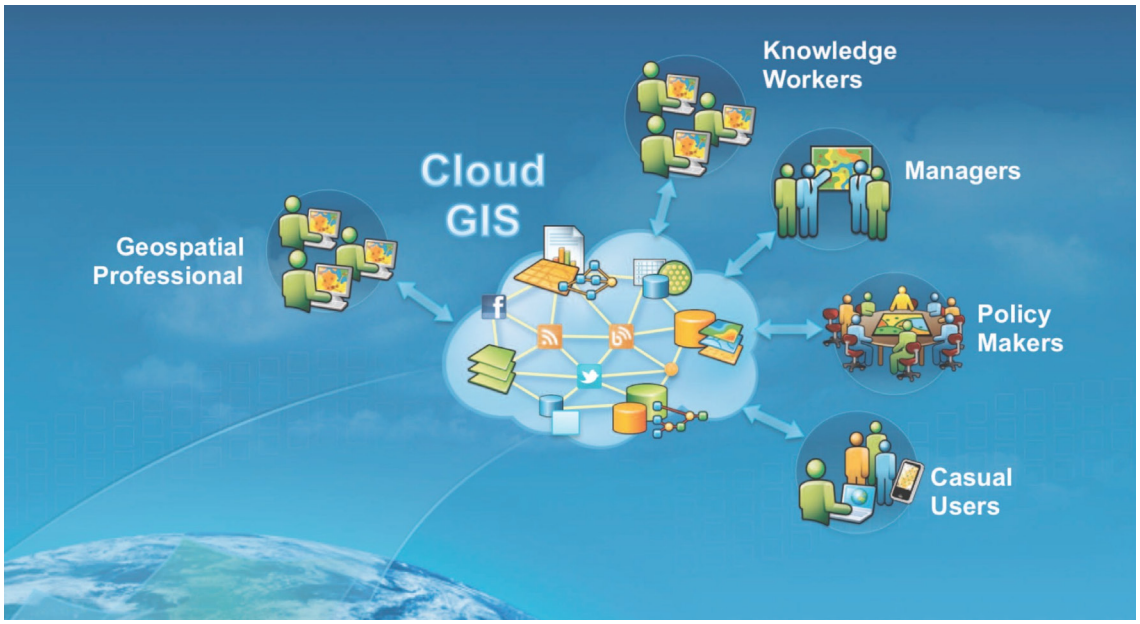
Today's retailers have a tremendous opportunity to leverage their retail locations to gain significant competitive advantages. GIS technology and data help retailers gain a comprehensive understanding of daily store operations and the customer. These retailers can more quickly identify key trends, make decisions, and respond to changing consumer behavior. This is a key competitive advantage. Being agile and responsive is the key to maintaining a viable and growing business in a dramatically evolving economic landscape.

Learn more about Esri cloud technology at esri.com/agol.

Source: Esri

ArcGIS℠ Online
The Mapping Platform for Your Organization

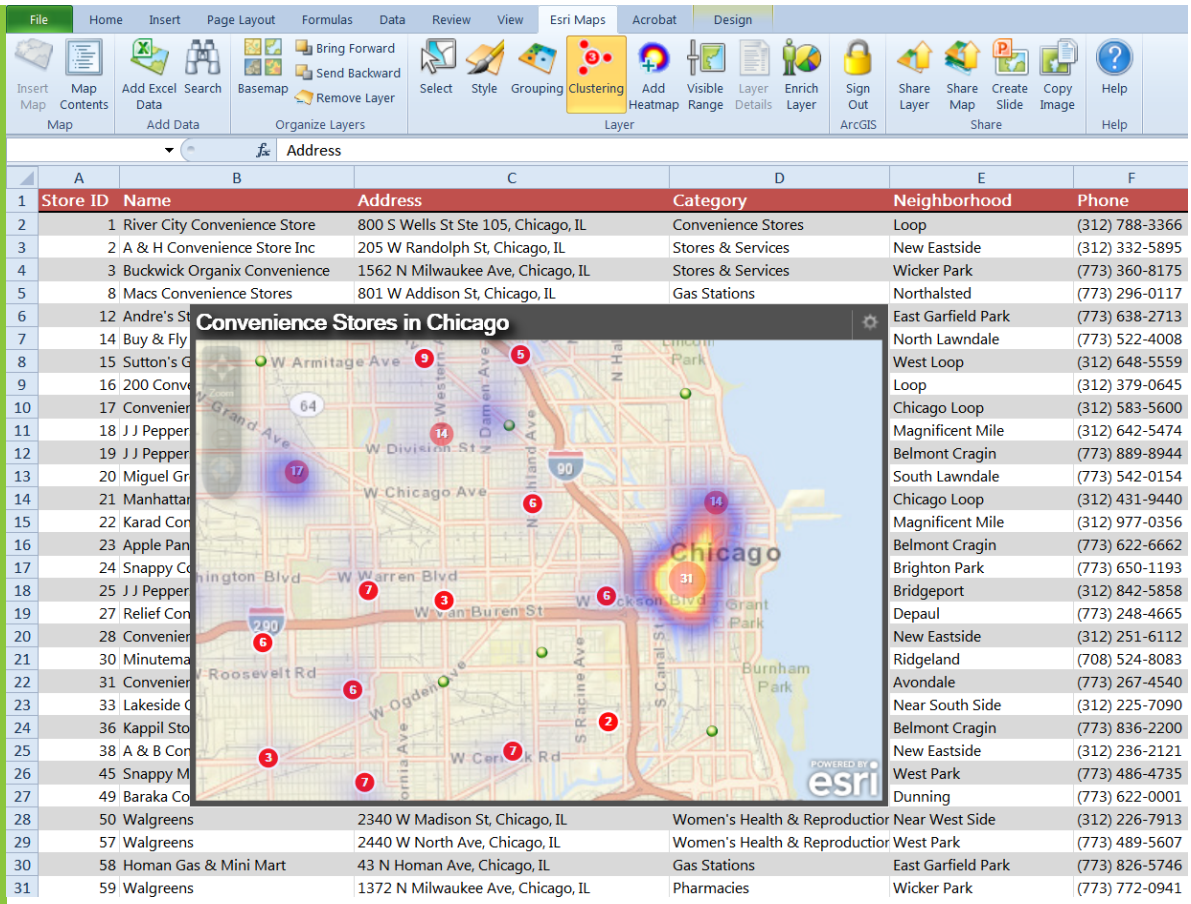
ArcGIS Online is a collaborative, cloud-based platform for making and sharing maps, applications, and other geographic data and content.



Through ArcGISOnline, organizations get access to Esri's secure cloud, where users can manage, create, store, and access hosted web services. And because ArcGIS Online is part of the ArcGIS® platform, it's completely integrated with ArcGIS for Desktop and ArcGIS for Server and thus extends the work of GIS professionals to the entire organization.

Create Web Maps

ArcGIS Online includes everything you need to make web maps. Through the built-in map viewer, you can access a gallery of basemaps to get you started and tools for adding your own data or layers. You can easily add shapefiles, spreadsheet data, KML files, OGC WMS services, and GPS files and quickly create mashups with data and maps shared by others.



	A	B	C	D	E	F
1	Store ID	Name	Address	Category	Neighborhood	Phone
2	1	River City Convenience Store	800 S Wells St Ste 105, Chicago, IL	Convenience Stores	Loop	(312) 788-3366
3	2	A & H Convenience Store Inc	205 W Randolph St, Chicago, IL	Stores & Services	New Eastside	(312) 332-5895
4	3	Buckwick Organix Convenience	1562 N Milwaukee Ave, Chicago, IL	Stores & Services	Wicker Park	(773) 360-8175
5	8	Macs Convenience Stores	801 W Addison St, Chicago, IL	Gas Stations	Northalsted	(773) 296-0117
6	12	Andre's St			East Garfield Park	(773) 638-2713
7	14	Buy & Fly			North Lawndale	(773) 522-4008
8	15	Sutton's G			West Loop	(312) 648-5559
9	16	200 Conve			Loop	(312) 379-0645
10	17	Convenier			Chicago Loop	(312) 583-5600
11	18	J J Pepper			Magnificent Mile	(312) 642-5474
12	19	J J Pepper			Belmont Cragin	(773) 889-8944
13	20	Miguel Gr			South Lawndale	(773) 542-0154
14	21	Manhattar			Chicago Loop	(312) 431-9440
15	22	Karad Con			Magnificent Mile	(312) 977-0356
16	23	Apple Pan			Belmont Cragin	(773) 622-6662
17	24	Snappy Co			Brighton Park	(773) 650-1193
18	25	J J Pepper			Bridgeport	(312) 842-5858
19	27	Relief Con			Depaul	(773) 248-4665
20	28	Convenier			New Eastside	(312) 251-6112
21	30	Minutema			Ridgeland	(708) 524-8083
22	31	Convenier			Avondale	(773) 267-4540
23	33	Lakeside C			Near South Side	(312) 225-7090
24	36	Kappil Sto			Belmont Cragin	(773) 836-2200
25	38	A & B Con			New Eastside	(312) 236-2121
26	45	Snappy M			West Park	(773) 486-4735
27	49	Baraka Co			Dunning	(773) 622-0001
28	50	Walgreens	2340 W Madison St, Chicago, IL	Women's Health & Reproductior	Near West Side	(312) 226-7913
29	57	Walgreens	2440 W North Ave, Chicago, IL	Women's Health & Reproductior	West Park	(773) 489-5607
30	58	Homan Gas & Mini Mart	43 N Homan Ave, Chicago, IL	Gas Stations	East Garfield Park	(773) 826-5746
31	59	Walgreens	1372 N Milwaukee Ave, Chicago, IL	Pharmacies	Wicker Park	(773) 772-0941

Make Maps with Your Excel Data

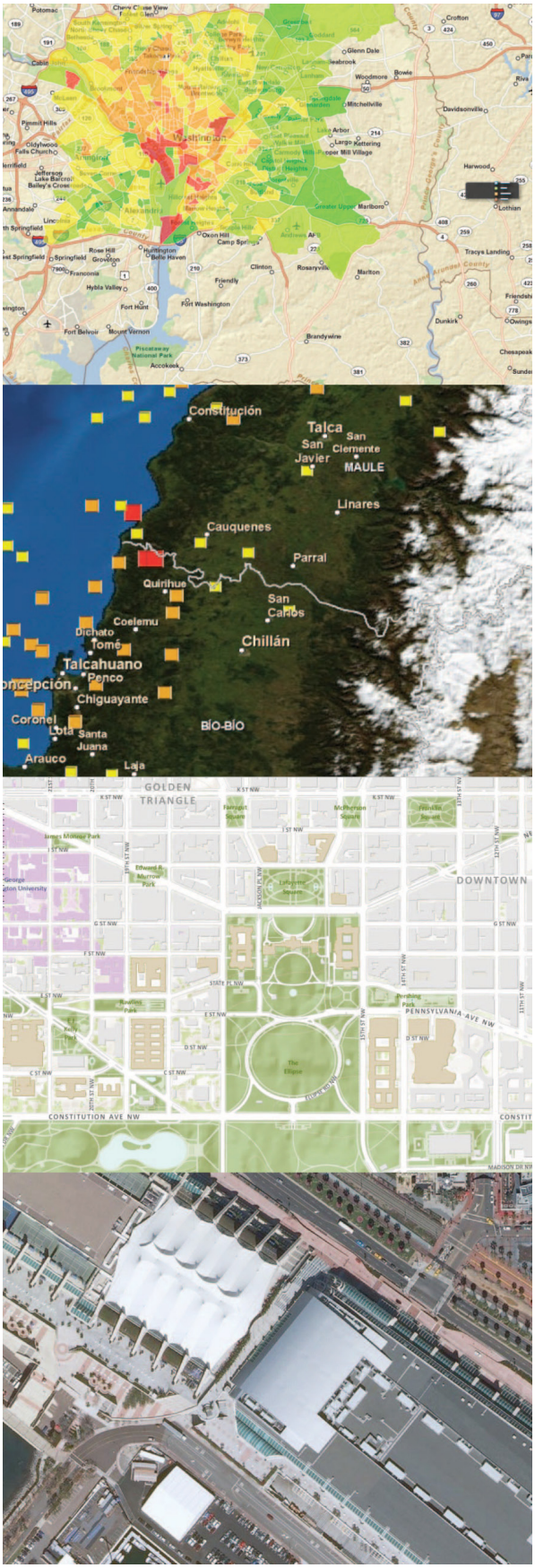
Create interactive maps of your spreadsheet data with the Esri® Maps for Office add-in. Make color-coded, point, clustered point, and heat maps directly in Microsoft® Excel®. Add geographic data enrichment services that show demographic and lifestyle data for a specific area. Then share your maps in ArcGIS Online so others in your organization can access and use them.

Access Ready-to-Use Content

When you subscribe to ArcGIS Online, your organization gets access to ready-to-use, high-quality basemaps (imagery, topographic, and streets), demographic maps, and image services, as well as geoservices such as geocoding and routing. These basemaps and geoservices are delivered as a web service and can be used by anyone in the organization to make maps and apps. Esri updates the basemaps on a regular basis with content from commercial data providers, and authoritative content from the user community around the world contributed through the Esri Community Maps Program.

Create Hosted Services

With ArcGIS Online, it's easy to publish maps and data as a web service. This frees up your internal resources, since these web services are hosted in Esri's cloud and scale dynamically as demand goes up or down. You can add these services to web, desktop, and mobile applications and allow others to use them as well. GIS professionals can publish these services directly from ArcGIS for Desktop without needing to install their own server, and share them with knowledge workers inside their organizations, who can add map or geoprocessing web services to their own maps and apps.

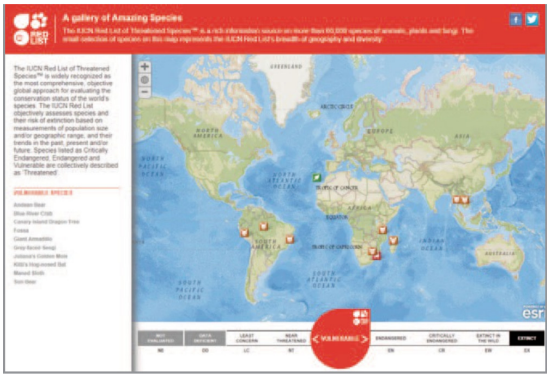


ArcGIS Online includes ready-to-use basemaps, demographic maps, and image services.

Collaborate and Share

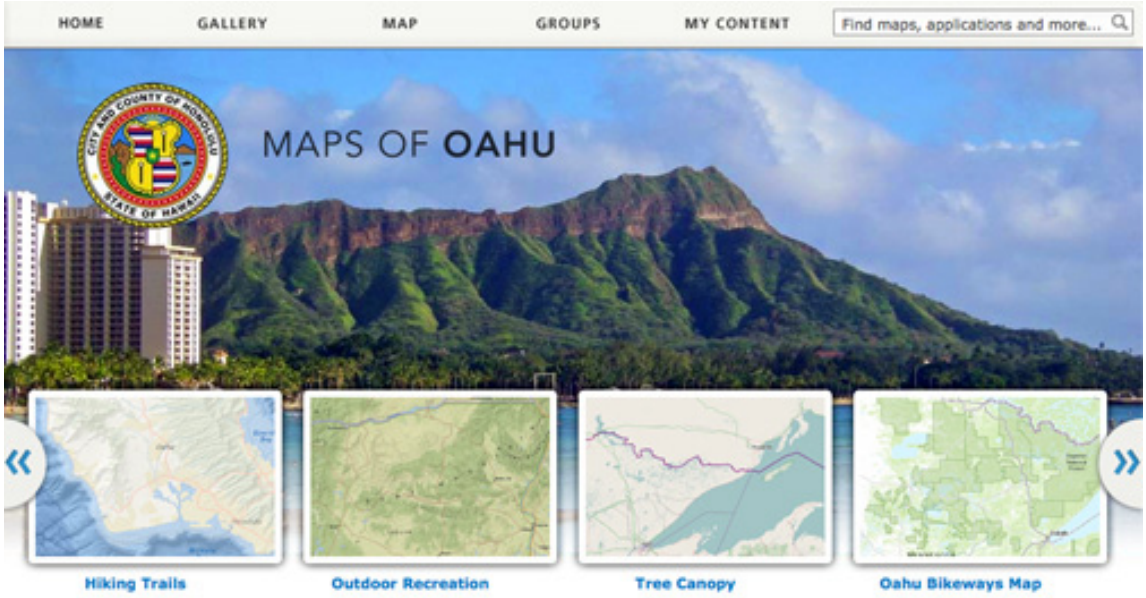
Enable interaction with your organizational data by sharing content related to a common activity. You can set up groups that are private and by invitation only, or public groups that are open to everyone.

You can also share maps by embedding them in web pages, on blogs, in web applications, and through social media. ArcGIS Online includes a number of ready-to-use and configurable web application templates with different layouts that you can choose from. With just a few steps and no programming, you can publish a web application that features a dynamic map that anyone can access through a browser.



Go Mobile

Access maps from anywhere, on any device, with the free, downloadable apps for smartphones and tablets. Browse and navigate maps, collect and report data, and perform GIS analysis using these apps or, alternatively, via a browser on your mobile device.



Customize ArcGIS Online

Customize the ArcGIS Online home page to fit the branding and operational needs of your organization. For example, you can add your logo and banner, choose what content to feature on the home page and gallery, and set a basemap and extent default for the map viewer.

In addition, you can set the preferred language and region for ArcGIS Online. The language settings determine how the interface, time, date, and numerical values appear. More than 22 languages are supported, including Arabic, Chinese (simplified Han), Dutch, Norwegian, Polish, Russian, and Spanish. The region setting lets you choose a specific geographic region for the map on your home page, the content in your gallery, and the default map and extent in the map viewer. Regional content is available for more than 60 countries, including Argentina, Bulgaria, Colombia, Denmark, Estonia, Hong Kong, Indonesia, Japan, Kenya, the Netherlands, Peru, South Korea, Spain, Sweden, and Thailand.

ArcGIS Online gives you control over how you share your maps, apps, and data. You decide whether to share items—publicly, with everyone in your organization, or with only specific groups—or keep them private.

Esri's security strategy is based on an industry-standard, defense-in-depth approach that provides security controls at every level, for every user. Organizations retain ownership of intellectual property rights for data they publish and control when and what to delete.

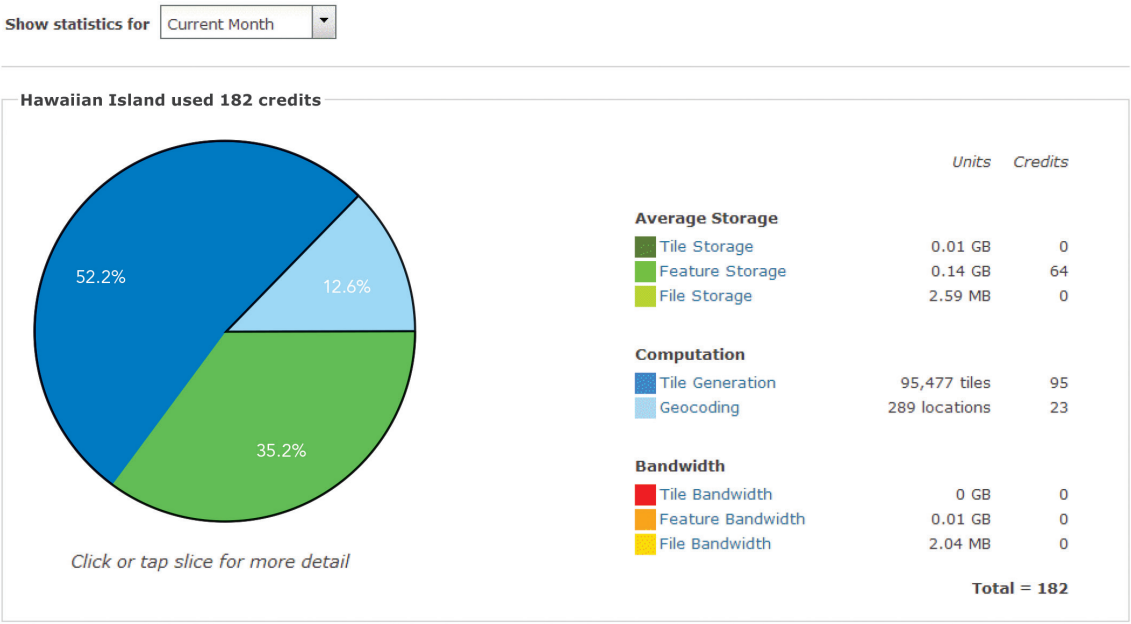
Managing Your ArcGIS Online Subscription

ArcGIS Online includes tools and settings that allow the administrator of the subscription to not only customize the home page but also manage user accounts and access privileges and monitor account usage through an intuitive dashboard. Administrators can invite users, determine their access role, delete content and groups, and set and manage the security policy.

Flexible Subscription Plans

ArcGIS Online is available through an annual subscription plan. The plans are structured to support organizations of any size. Each subscription plan includes a set number of named users and service credits. Service credits are the currency of the ArcGIS Online system and entitle an organization to use certain ArcGIS Online services such as geocoding or hosted feature or tile services, data storage, and transferring data out of ArcGIS Online.

Roles	User	Publisher	Administrator
Add data	*	*	*
Create web maps	*	*	*
Share content	*	*	*
Participate in groups	*	*	*
Publish hosted services from feature or map tile data		*	*
Manage organization			*
Manage users			*



To learn more and sign up for a free 30-day trial, visit esri.com/agol.

Source: Esri

The Business Case for Cloud

An Esri Whitepaper, April 2013
This paper discusses the inherent challenges and advantages of private, pubic, and hybrid cloud deployment models.

"The next sea change is upon us. The broad and rich foundation of the internet will unleash a 'services wave' of applications and experiences available instantly. This [new wave]... will be very disruptive."

Bill Gates to top managers and engineers
Microsoft "Internet Tidal Wave" memorandum[1]
October 30, 2005

The expansive computing grid that we know as cloud computing has become the newly poured foundation for how businesses will deliver and consume products, as services. As new civilizations have built on top of the structures (and ruins) of older civilizations, cloud infrastructure has been laid over and built up from a rich history of previous computing substrates. Scratch below the surface of cloud computing and you'll find the era of the corporate data center, which required a cadre of technology specialists to provide for the ongoing maintenance of the system. These entities evolved into storing single-purpose systems, requiring dedicated hardware and an application stack configured for maximum load, resulting in under-utilized processing capacity and overweight electric consumption. Dig a little deeper and you'll uncover the mainframe, once housing the notable UNIVAC (for the few who could afford such mechanical behemoths). The mainframe transformed computing into modern-day engine rooms, to run the business for all types of organizations. The cloud takes these artifacts and taps into the ubiquitous, affordable, on-demand internet connectivity that drives nearly every technological advance nowadays.

The concept of cloud computing, or on-demand technology, emerged with new workflow paradigms attributable to the arrival of Web 2.0. Cloud computing is defined by research and advisory company Gartner, Inc., as "a style of computing where massively scalable IT-enabled capabilities are delivered as a service to external customers using Internet technologies." Forrester defines the cloud as "a standardized, multi-tenant IT capability delivered via Internet technologies in a pay-per-use and self-service way".

There are several permutations of the cloud computing definition. For example, the National Institute of Standards and Technology (NIST) explanation is emerging as the preferred de facto definition of cloud computing. Indeed, there are some basic tenets that characterize cloud computing, including: on-demand, commonly off-premise, technology capabilities that are delivered as a service via the Internet. Consumers do not own the assets in the cloud computing model, but consume them in a pay-per-use and self-service manner, in essence, renting physical assets based on an organization's computing requirements, and leveraging economies of scale to reduce capital and operational expense. Most commonly, these cloud services are owned and managed by a third party, and offerings can range from data storage to Web applications to other focused computing services.

Changes to the Computing Model

There are four key differences that distinguish cloud computing from traditional computing models:

Procurement: Traditionally, individuals and organizations buy assets (computer and network components) and build the technical architecture to accommodate the hardware and software needed by staff and customers. In the cloud model, it is a service, commonly off-premise, that is consumed. In essence, you rent these assets, leveraging the cloud provider's infrastructure or applications instead of buying your own. However, since you are using a dedicated cloud hosting provider, you also gain access to state-of-the-art systems without the capital investment. It is in the cloud provider's interest of continuing business success to provide high reliability, quick response times, and the flexibility to handle traffic fluctuations. This in turn allows cloud consumer organizations to reassess use of a previously fragmented on-premises infrastructure, which could subsequently drive down capital expenditures on equipment to be freed up to invest in core business and other more productive uses.

Business Model: Unlike the traditional model where one pays for fixed assets, overhead and administration, organizations typically do not own assets in the cloud computing model and instead, pay based only on the use of the service.

Accessibility: Deviating from traditional computing, cloud computing services are available only through standard internet protocols -- through any device that supports web access, whether that's mobile, tablet, desktop, server, laptop, or smartphone.

Technical: Instead of a single-use, dedicated, static system with underutilized capacity built for a maximum load (which indeed may never realistically happen), cloud computing supports dynamically scalable, "elastic" systems. The ability to dynamically scale up and/or down improves IT's ability to rapidly provision its systems based on traffic and demand. In other words, system capacity can be increased or reduced as needed. Another critical difference between traditional and cloud computing is that the latter supports multi-tenancy - where systems are configured such that they can be shared by many companies, business units or individuals. Virtualization technology allows cloud providers to convert one server into many virtual machines, thereby eliminating client-server computing with single-purpose systems, maximizing hardware capacity, and allowing customers to leverage economies of scale. Virtualization is a common and integral part of cost optimization strategies for private and public cloud architectures.

Service Models

Although there are many ways to take advantage of the services that are hosted in a cloud computing environment, there are [at least] three core cloud service delivery models:

Software as a Service (SaaS) typically refers to end-user applications that are delivered on-demand, as a service, for example Salesforce.com and ArcGIS.com. Since its first introduction back in the late 1990's, SaaS has grown considerably, moving into mainstream business solutions, and ubiquity in technology portfolios.

Platform as a Service (PaaS) provides an application platform or middleware as a service on which developers can build and deploy custom applications. Common solutions provided in this tier range from APIs, database services and security, to IDE integration and identity, allowing developers to build applications and run them on the infrastructure typically owned and maintained by a cloud provider. Examples include Microsoft's Windows Azure and Esri's ArcGIS.com APIs.

A Word on Virtual Servers

Background Information

Virtual server technology has been traditionally used to reduce testing and development costs by allowing a user to create multiple "virtual" servers on a single physical server. A virtual server mimics the behavior and capabilities of a separate stand-alone physical computer. This gives the user the ability to test software applications running on multiple operating systems (OS), with each OS running on a different virtual server, but all virtual servers running on a single physical server. Until recently, each of the virtual server environments was logically isolated from another, but in reality, they physically shared the same hardware resources (including all available sockets and CPU cores of the physical server). In this regard, virtual servers were different from "logical" servers that segregate hardware resources.

Virtual server technology can also be used to run different applications, each of which is compatible with different OS versions, on the same server. For example, a single physical server may have one virtual server instance running Windows Server 2012 and its supporting applications, while another virtual server instance could be running RedHat Linux, with another enterprise application suite - in both instances, all hardware resources of the physical server host are shared amongst each of the virtual server instances.

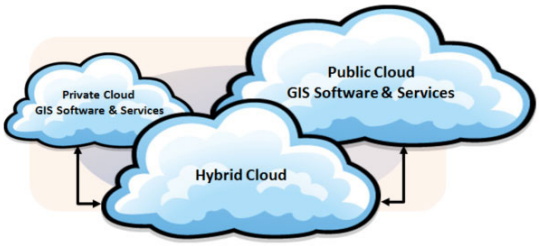
Business Benefits

Server virtualization is getting a lot of attention because of the business benefits gained when organizations move to a virtualized environment, primarily, optimization of their hardware assets. IT departments realize an increase in productivity through faster provisioning times for new servers which in turn, results in faster availability of resources for users. Virtualized servers can take advantage of the same server network tools that logical servers employ for business continuity and disaster recovery. Tremendous cost savings can also be realized through reducing and eliminating the need for new hardware and better utilization of the existing server hardware. Less hardware translates into lower energy costs and a reduction in floor/rack space. Besides being beneficial for the environment, this translates into improving the external image of a company as being socially responsible and eco-friendly.

Infrastructure as a Service (IaaS) primarily encompasses those offerings that comprise the server-based hardware and technology that business processes would require for computing power, storage, or other infrastructure, as a service. IaaS is also referred to as compute as a service or storage as a service. Amazon Elastic Compute Cloud (Amazon EC2) and ArcGIS for Server on Amazon Web Services are examples.

Deployment Models

When cloud computing came to the forefront by 2008, conversation centered around the public cloud model, which leverages applications and infrastructure access on-demand and is typically hosted off-premises by a trusted cloud provider. Given the benefits of economies of scale, the public cloud can often be an economical option for organizations that aim to reduce their data management and application distribution costs. The public cloud is the most commonly referenced and assumed platform when discussing the topic of cloud computing.



However, many organizations and users of the traditional compute model are still not quite ready to jump into public cloud computing, or are restricted from doing so by company policies or legal mandates. These organizations may be particularly concerned about their security, privacy, permissions, firewalls, authentication, and data protection requirements. In these situations, the core service tiers can be replicated within a private cloud environment, behind a firewall, and maintained within the parameters of the host organization. A private cloud model, according to the National Institute of Standards and Technology (NIST), is "operated solely for an organization ... managed by the organization or a third party and may exist on premise or off premise."

Adopting and building for a private cloud may make it possible for the company to meet its business requirements for additional security, enterprise integration, and specific customization, which a public cloud option would not entirely expose or allow.

Increasingly, however, exploiting a hybrid cloud deployment model has emerged as an attractive compromise between these two very different choices. No longer is it a decision involving either public or private cloud adoption. Organizations can take advantage of both models, balancing more or less of services from either source based on the business rules of the organization. By example, if a public cloud service currently exists that provides a needed function for an organization, that company could make use of running that public service against their data or information, with results that are company-specific. A task or job can be initialized against a public cloud service, and the result of that job can be leveraged solely by the organization. In this manner, the public cloud-hosted application and infrastructure would be consumed only for a project-based time frame, without additional capital expense incurred by permanent procurement of hardware or software. In this hybrid model, cloud-based applications integrate with enterprise-based software infrastructure.

Another variation of an organization leveraging a hybrid cloud is the decision to host certain non-critical functions of an organization as services in a public cloud, while at the same time keeping applications and services that are considered sensitive or proprietary on-premises within a private cloud. Further, if the on-premises applications reach a certain maximum load, leveraging a hybrid cloud would allow certain tasks to be drafted to the public cloud services – commonly referred to as "cloudbursting".

According to Gartner, through 2014, IT organizations will spend more money on private cloud computing investments than on offerings from public cloud providers.[2] Additionally, a Gartner data center conference poll in November 2012 indicated that more than 50% of identity and access management deployments will be hybrid.[3]

Considerations with Private and Hybrid Cloud

The adoption of a private cloud has certain characteristics which set it apart from a public cloud option. Specifically, several of the benefits that are drivers to the public cloud, are diluted or eliminated when a private cloud is built and/or adopted.

By example, if an organization's private cloud exists on-premises, the maintenance and overhead costs will continue, as with any previous centralized compute data center. In fact, system and architecture administration will need to include service catalogs, virtualization and virtualization

management, self-service administration, possible metering or implementation of tools and apps for measuring usage. Applications must ensure scalability based on demand, and be selected judiciously based on usage, automation, and other key criteria for the organization or business. Further, applications and middleware must ensure the latest security patches, upgrades, or updates. And an infrastructure management team is still required, to perform backups, patches, etc. As such, operational expenses must continue to be budgeted for private cloud success.

Likewise, capital costs are not eliminated with private cloud implementations. Physical infrastructure will need to be maintained and kept to the level of sophistication that meets business requirements for traffic response and storage and task load. Initially, the upfront costs and investments in a private cloud may be heavy – front-loaded.

If an organization decides to build and maintain a private cloud, particularly on-premises, both capital and operational expenses must be factored into the ROI calculations. Economies of scale that may have been realized through massively shared infrastructure in an established public cloud provider's data center cannot be leveraged. Further, operating a private cloud "brokerage" becomes part of the business, whether or not it is a core competency of the company hosting the private cloud.

However, with services that are managed on-premises in a private cloud, organizations know exactly where the host and the data are located, meeting organizational or legal requirements. Compliance concerns are evident and include business continuity/disaster recovery, logs and audit trails, specific compliance requirements (Sarbanes Oxley, HIPAA, PCI). The "typical" vendor lock-in that can be experienced in a public cloud are eliminated with an on-premises private cloud, but are replaced by other characteristics, as previously outlined.

Indeed, although the onus is on the organization to scale their private cloud, and continually re-invest in the on-demand IT architecture and services ,given judicious selection of services, the opportunity for increased business agility is unmistakable. In addition, leveraging public cloud services in a hybrid architecture can mitigate some of the capital spend of a pure on-premises private cloud system.

Additionally, multi-generational workforces add an additional challenge to successful business operations and workflows in the 21st century. The demographics of organizational staff can span multiple age groups, each with their own expectation of effective worker productivity tools. The "digital natives", for example, having grown up with technology, collaborate extensively and approach real-time information at a different pace than "digital immigrants". Team productivity may comprise multiple people in different geographies, on different operating systems, working with different languages, commonly using on-demand applications. As such, cloud services that are available 24 x 7, accessed from any browser on any device, regardless of time or time zone, can provide faster, easier access for these "native" workers to do their jobs, allowing competitive differentiation for the organization and, likewise, the retention and attraction of valuable and talented staff.

In Conclusion

With the potential for unlimited scalability, availability, and reliability that comes from taking advantage of cloud services, opportunities emerge. Since servers can be launched when needed for predicted content load, the downtime of the traditional on-premise infrastructure process is avoided, allowing for faster deployment times and variable capacity.

As business challenges evolve, on-demand services are meeting these tasks, with many potential advantages to the cloud consumer and the businesses organization. The disruptive power of cloud is evident in the growing trend of organizations migrating their IT infrastructures to private clouds as well as taking advantage of public cloud infrastructures. Hybrid clouds allow organizations to get the best of both worlds, while accommodating diverse requirements. Hybrid clouds may also enable a smoother transition into the utility model offered in public clouds. Whether the hybrid cloud model is the solution or simply a transition model, organizations are finding more incentives to move some or all of their business into the cloud.

[1] http://csrc.nist.gov/publications/nistpubs/800-145/SP800-145.pdf
[2] Five Cloud Computing Trends that will Affect your Cloud Strategy Through 2015, 10 February 2012, ID: G00230221
[3] "Predicts 2013: Cloud and Services Security", Gartner, Inc., 28 November 2012, Document ID: G00245775

Source: Esri

Gartner Analyst Insight:

Cloud Computing Positions Itself for Growth

Enterprises continue to adopt cloud computing, despite facing potential risks as cloud computing evolves.

Analysis

Cloud computing — a phrase referring to what is hyped and heralded as the most impactful change going on in the IT industry — is growing beyond confusion into real-world value scenarios. While the model of cloud computing has a long way to go to prove itself as the universal answer for computing solutions (i.e., for enterprises and consumers alike), it is being adopted, despite risks to users and some visible failures from providers.

Here, we examine some of our positions on cloud computing, striking a balance between excitement for the cloud model and practical issues that cloud customers will face.

IT organizations are struggling with when and how to adopt cloud computing, while simultaneously facing the prospect that their customers (the business) can consistently do computing projects without them. On the practical side, the IT organization can still be a partner to advance business needs. In "How IT Can Work With (Not Against) the Cloud," we discuss the idea that there is a significant role for IT departments in cloud adoption, even in companies where the business may be bypassing IT. Building out a good portfolio, supporting automation through cloud computing, and managing the information of an organization will always be a desirable role. This is highlighted even further in "Five Cloud Computing Trends That Will Affect Your Cloud Strategy Through 2015." IT is becoming a hybrid IT department, handling cloud and noncloud solutions together. The role of cloud services brokerage is a particular hybrid IT role that can be mined for a more relevant role in the business.

Cloud services brokerage (CSB) takes center stage once again in "Examining the Magnitude of the Cloud Services Brokerage Opportunity." We lay out a simple model for calculating the potential magnitude of money to be spent on cloud brokerage scenarios. This is notably useful to cloud providers and IT service providers who are struggling with how much to invest for moving their business models to cloud-centric customers. This type of disruption to IT service providers is supported by a practical reality that is examined in "Gartner Position: BPM Is Critical for the Adoption of Applications and Business Processes in the Cloud." Primary research shows that the inability to customize business processes is a challenge in software as a service (SaaS), business process utility (BPU) and business process as a service (BPaaS) deployment, and is an inhibitor to cloud services adoption. Business processes (often the target of cloud brokers that integrate or customize services) are becoming an essential part of cloud successes.

However, beyond just the role of IT and intermediaries to the cloud, we challenge several assumptions. First among these is that email is a simple transition into the cloud. Our research finds that while email is one of the first options considered for cloud adoption, the issue of making the transition is much more complex than might be expected. In "The Gartner Position on Cloud Email," we examine several assertions. For example, at the start of 2012, 6% of enterprise email users were using public cloud email, but at least 75% of these enterprises have fewer than 500 users. This follows the notion that smaller cloud email installations are easier to deal with than larger ones. In addition, email is not necessarily less expensive in the cloud. Organizations should ensure that email is treated as a core part of a larger strategy for collaboration tools, rather than as a stand-alone communication service.

Because cloud computing continues to evolve, it is important that we always challenge our notions of what fits the cloud model. This fits nicely with the idea that new cloud notions are always arriving to deliver different value propositions. For example, "The Disruptive Effect of the Personal Cloud" introduces the concept of "personal cloud," wherein individuals can gather desirable cloud services together to facilitate data storage, content management, and even access to applications and services. This is a continuation of the consumerization of IT and the migration away from using local computing exclusively. While the personal cloud enhances the use of PCs and laptops instead of replacing them, it provides a rich ecosystem of services for consumers to tailor the cloud to their needs.

Evolution of the cloud is as important as adoption of the cloud. The movement of companies to cloud computing will depend dramatically on which types of services evolve in which ways. Even multiple cloud categories are starting to evolve in similar directions, perhaps leading to more confusion in some cases. In "Understand IaaS, PaaS and the Role of Middleware to Make the Most of Each," it becomes clear that integration as a service (IaaS), the fastest-growing segment of cloud computing, is gaining more platform as a service (PaaS)-like functionality while PaaS continues to evolve. Clients may find this research useful to decide when PaaS is the desirable type of cloud service or whether IaaS will suffice for building new applications. "Five Things That Private Cloud Is Not" allows us to examine misrepresentations about what private cloud is — which might lead to undervaluing the paradigm.

Finally, our "Hype Cycle for Cloud Computing, 2012" provides a breadth of viewpoints on the most critical cloud issues. This is a window into the larger world of cloud from multiple angles that are sure to cover your most relevant needs.

Conclusion

Cloud computing is growing and changing in many ways. In some cases, the growth of cloud computing creates risks to adoption. Use the cloud positions highlighted in the referenced research to determine which key trends are most critical to your organization, and how you will evolve to meet the cloud on your own terms.

Gartner RAS core Research Note G00237091,
D. Plummer, D. Mitchell Smith, 15 August 2012

About Esri

Esri's geographic information system (GIS) technology gives you the power to think and plan geographically. Used today in more than 350,000 organizations worldwide, Esri's GIS helps governments, universities, and businesses save money, lives, and our environment.

GIS helps you understand and question data in ways that reveal relationships, patterns, and trends. So whether you are transporting ethanol or studying landslides, you can use GIS to solve problems and make better decisions, because a GIS enables you to look at your valuable data in a way that is quickly understood and easily shared.

Esri supports the implementation of GIS technology on desktop, servers, online services, and mobile devices.

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