Cloud Technologies and GIS

An Overview

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Agenda

- What is Cloud Computing?
- How does it work?
- Cloud and GIS applications
- Esri Offerings
Lots of hype

Gartner Hype Cycle for Cloud Computing, 2010

39 Cloud topics of which 75% are either rising or at peak of hype

“Cloud computing remains the latest, most hyped concept in IT”
Figure 1. Hype Cycle for Emerging Technologies, 2009

- Cloud Computing
- E-Book Readers
- Social Software Suites
- Microblogging
- Video Telepresence
- Mesh Networks: Sensor
- Online Video
- Corporate Blogging
- Wikis
- Location-Aware Applications
- SOA
- Tablet PC
- Electronic Paper
- Idea Management
- Web 2.0
- Social Network Analysis
- Over-the-Air Mobile Phone Payment Systems, Developed Markets
- RFID (Case/Pallet)

Years to mainstream adoption:
- ○ less than 2 years
- ● 2 to 5 years
- • 5 to 10 years
- ▲ more than 10 years
- ✗ before plateau

Source: Gartner (July 2009)
People are riding the curve at their own pace, and that's just the way it is. That's reality, and it's not necessarily a shortcoming that everybody's not seeing it the same way or jumping on board aggressively. Everybody gets there eventually.

Marc Benioff, CEO of Salesforce.com
Cloud Definition for Today

Characterized as: **on-demand** **self-service** technology capabilities that are **delivered as a metered service via a network**.

Consumers of the cloud leverage a **multi-tenancy** model in an ‘**elastic**’ environment.

See NIST cloud definition and characteristics: http://csrc.nist.gov/groups/SNS/cloud-computing
Virtualization: How it works

- Server virtualization allows the conversion of one server into many virtual machines
- Main components
  - Physical Computer (Host)
  - Host Operating System + Virtualization Component (Hypervisor)
  - Virtual Machines
  - Management Suite + Tools
Virtualized systems that are shared by many companies are often referred to as “Multi-tenant systems.”
Many clouds, many services…
Cloud Computing Service Models

- **Software as a Service (SaaS)**
  - End-user applications, delivered as a service, rather than on-premise software
- **Platform as a Service (PaaS)**
  - Application platform or middleware as a service on which developers can build and deploy custom applications
- **Infrastructure as a Service (IaaS)**
  - Compute, storage, or other IT infrastructure as a service, rather than as dedicated capability.
## Changes to the Computing Model

<table>
<thead>
<tr>
<th>Models</th>
<th>Traditional</th>
<th>Cloud</th>
</tr>
</thead>
<tbody>
<tr>
<td>Procurement</td>
<td>Buy assets and build technical architecture</td>
<td>Buy service(s)</td>
</tr>
<tr>
<td>Business Model</td>
<td>Pay for fixed assets, overhead, administration</td>
<td>Rent assets; pay based on use</td>
</tr>
<tr>
<td>Access</td>
<td>LAN, WAN, client</td>
<td>Ubiquitous Network</td>
</tr>
<tr>
<td>Technical</td>
<td>Static and single tenant</td>
<td>Elastic and multitenant</td>
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</table>
Why the cloud?

- Reduce costs and improve cash flow.
- Minimize your financial and business risks.

Graphics courtesy: aws.amazon.com/economics
Workload Demand Variation: **Building to Peak**

*Courtesy: Joe Weinman, AT&T*
Workload Demand Variation: **Building to Baseline**

*Courtesy: Joe Weinman, AT&T*
Workload Demand Variation: Pure On Demand Cloud

Courtesy: Joe Weinman, AT&T
Hybrid: “Own the Base, Rent the Spike”

Quote by Jens Lapinski

Courtesy: Joe Weinman, AT&T
## Cloud Benefits

<table>
<thead>
<tr>
<th>On Demand Self Service</th>
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<tbody>
<tr>
<td>Frictionless sales</td>
<td>Shorter sales cycle</td>
</tr>
<tr>
<td>Friction-free Customer Access</td>
<td>To better meet customer experience</td>
</tr>
<tr>
<td>Improved time to market</td>
<td>Competitive advantage</td>
</tr>
<tr>
<td>Increased prototyping</td>
<td>Faster output of proof-of-concepts</td>
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## Cloud Benefits

<table>
<thead>
<tr>
<th>Ubiquitous Network Access</th>
<th></th>
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</thead>
<tbody>
<tr>
<td>Increased Availability</td>
<td>Always on, Always available</td>
</tr>
<tr>
<td>Better Support a Global and Mobile Workforce</td>
<td>Attract and Retain Valuable Staff</td>
</tr>
<tr>
<td>Measurable Metered Services</td>
<td></td>
</tr>
<tr>
<td>-----------------------------------------------------------------</td>
<td>-----------------------------------------------------------------</td>
</tr>
<tr>
<td>Monitor, control &amp; report resource usage</td>
<td>Provides transparency for provider and cloud consumer</td>
</tr>
<tr>
<td>Identifies unpopular/unused applications in portfolio</td>
<td>Streamline application stack</td>
</tr>
<tr>
<td>Pay per use</td>
<td>Reduces risk of paying for wasted resources</td>
</tr>
</tbody>
</table>
## Cloud Benefits

<table>
<thead>
<tr>
<th>“Elastic” Environment</th>
<th>Resources when you need them</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dynamic provisioning</td>
<td>Meet unpredictable or erratic demand</td>
</tr>
<tr>
<td>Extend existing, limited IT infrastructure</td>
<td>Renting assets only when needed</td>
</tr>
<tr>
<td>Shift from CapEx to OpEx</td>
<td>Avoid asset expenditures</td>
</tr>
</tbody>
</table>
## Cloud Benefits

<table>
<thead>
<tr>
<th>Other Tangible and Soft Benefits</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>More practical support of a global and mobile workforce</td>
<td>Local Installation and maintenance of resources unnecessary</td>
</tr>
<tr>
<td>Disaster Recovery, Business Continuity, Failover, Staging</td>
<td>Potentially more viable</td>
</tr>
<tr>
<td>Management and Administrative Work Reduced</td>
<td>Responsibility shifts to cloud vendor</td>
</tr>
</tbody>
</table>
Security and SLAs are always a factor

- Physical Security
- Cyber Security
- Government Regulations
- Geographic Location
- SaaS 70 Auditing
- Privacy
- Availability
What is the primary reason your organization will not use public cloud services?

- Fear of loss of control of data: 28%
- Fear of unauthorized access to our customer information: 17%
- Features & general maturity of Technology: 12%
- Security Defects in the technology itself: 8%
- Unpredictable costs: 6%
- Business viability of provider: 5%
- Vendor lock-in: 4%
- Application/system performance: 4%
- Other: 15%

Information Week analytics, January 2010
Private and community clouds are very interesting.
It’s not an all or nothing proposition
New? Business Models

• **Perpetual**
  Up front purchase plus annual maintenance. A traditional model for buying software licenses and ongoing maintenance.

• **Subscription**
  One fee for the right to use service for a finite period of time. Similar to how you subscribe to a magazine or newspaper.

• **Consumption**
  Pay-as-you-go for what you consume. Similar to how you buy electric and gas service from a utility.
The anatomy of GIS

- Discover
- Create
- Manage
- Visualize
- Analyze
- Collaborate

Cloud

Enterprise

Local
Things that used to cost money are now free
Things that used to be hard to find are now easier

Apps / Code

Analytic Models
Things that used to be complex are now easier
Creating new opportunities

CitySourced
Powering the GeoWeb of the future
Esri Cloud Offerings

• Software as a Service:
  - ArcLogistics Online
  - Business Analyst Online
  - ArcGIS Explorer Online

• Platform as a Service
  - ArcGIS.com / ArcGIS Online
  - ArcGIS Web Mapping
  - ArcGIS Server with Cloud Infrastructure

• Managed Services
ArcLogistics Online

A rich-client software solution supported by mapping, geocoding and routing services provided by ArcGIS Online. The services are provided in the cloud in support of the client software as a software-plus-services (S+S) model.
ArcGIS Business Analyst Online

On-Demand Reports and Maps for Informed Decisions

Welcome, Brenda! | Log Out
My Account | Preferences | Help | Feedback

Get Started

Resource Center | FAQs | Feedback

Copyright © 2009 ESRI | Tech Support: 1-888-377-1575 ext.2 | Sales/Data Support: 1-800-292-2224 | Privacy | License Agreement
ArcGIS Explorer Online

http://explorer.arcgis.com/
ArcGIS Server

Cloud Offerings
Traditional on-premise deployments

Face increasing costs in their IT infrastructure
Amazon offers an Infrastructure in the Cloud

Compliments your in-house infrastructure, may result in savings
The Amazon Cloud is an ideal environment
For developing ArcGIS Server applications

- **Saves time:**
  - Access a preconfigured ArcGIS Server instance in minutes
  - No need to allocate a machine within your organization
- **Saves money:**
  - Inexpensive servers available starting at less than a dollar per hour
  - ‘Terminate’ the dev machine when done (no capital investment)
- You may deploy your developed apps in the cloud… or on-premise

With ArcGIS 10, EDN customers can run ArcGIS Server in the Amazon cloud
Massive Ad-Hoc GIS Tasks
Are well suited for an environment with virtually unlimited computing power

- Massive Analysis:
  - Routing
  - Suitability Analysis
  - Geostatistics
- Map caching
- Batch geocoding

Saves Money and Time
ArcGIS Server in Amazon for public Web Mapping sites
Appealing for low budget sites and highly popular ones

- Simplified deployment
- High bandwidth
- Secure
- Scalable
- Resilient

For small cities, large enterprises and others who cannot afford being down
ArcGIS Server in Amazon for Public Safety and Emergency Response

Up on the web in minutes. Replicated

- Simplified deployment
- High bandwidth
- Secure
- Scalable
- Resilient

- With all the capabilities of ArcGIS Server
  - Web Mapping
  - Mobile access
  - Geocollaboration and VGI
  - Analysis…
Geodatabase back-up in the cloud
Secure storage of your geographic data for disaster recovery

- Geodatabase storage on remote locations
- Secure periodic synchronization
- For ArcGIS Server Basic users
VGI applications
A deployment model for crowd sourcing apps

- Secure
- Scalable
ArcGIS Server Cloud Solutions

- **ArcGIS Server on Amazon EC2**: your pre-configured ArcGIS Server hosted by a Cloud provider and managed by you. No software installation and no hardware to maintain. Plus, you get full access to a range of Cloud services.

- **ArcGIS Server with Cloud Infrastructure**: your pre-configured ArcGIS Server hosted and managed by Esri. Fast deployment. No Cloud accounts to manage. And no set up fees. We take care of everything.

- **Esri Managed Services**: your custom solution for hosted Web mapping applications and services. Your design. Our expertise. Let us help you build the right Cloud solution for your organization.
ArcGIS Server on Amazon EC2

- ArcGIS Server Amazon’s Elastic Compute Cloud (EC2).
  - Use existing license
  - All you need is an Amazon Web Services account to get started.
  - Contact Esri Customer Service.

- ArcGIS Server on Amazon EC2 includes the following Amazon Machine Images (AMIs):
  - ArcGIS Server on Windows 2008
  - ArcGIS Desktop SP1 (for Server administration only)
  - A 100 GB drive for GIS Data

- Enterprise Geodatabase AMI
  - PostgreSQL Enterprise Geodatabase on Windows 2008
  - A 100 GB drive for storage of data.

- More info: ArcGIS Server on Amazon EC2 Resource Center.
ArcGIS Server with Cloud Infrastructure

- ArcGIS Server 4-core Windows Server 2008 virtual machine in the Amazon EC2 cloud infrastructure.
  - 2.0 GHz processor per core
  - 15 GB of memory
  - 500 GB of storage
  - Microsoft Windows Server 2008 64-bit platform
- Cloud account management by Esri
- Available to U.S. customers only.
- No need to install or maintain software or manage Cloud accounts and no set up fees
- Software is always up-to-date
- 1, 3, and 12 month term licensing
- Documentation: deployment guide, best practices, and online help
Esri Managed Services: What do you get?

- **Infrastructure**
  - Facilities
  - Network
  - Security
  - Hardware
  - Software (ESRI and 3rd Party)

- **Deployment**
  - Staging
  - Production

- **Data Management**
  - Data Updates
  - Data Backup and Archive

- **Technical Support and Monitoring**
  - Tier 1 Helpdesk
  - Tier 2 Hosting Environment
  - Tier 3 Custom Application
Esri Managed Services - Examples

- **AT&T Coverage Viewer** - High availability and heavy usage
  - ArcGIS Server 9.3.1 JavaScript
  - Weekly Data Updates
  - ArcGIS Online & Weekly Data Update
  - 99.5% System Availability
  - 400,000 map requests per day max.

- **BP Gulf of Mexico Response Map** - Fast deployment, scalable
  - ArcGIS Server 10 Flex
  - Daily Data Updates
  - 99.9% System Availability
  - 90,000 map requests per hour max.
Thank You

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