Deploying ArcGIS in the Cloud: A Business Perspective

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Topics

• ArcGIS - A Cloud GIS
• Business Cases For Cloud GIS
• Deployment Patterns
• Costing Example
A Pattern: Leveraging the Platform

What part of IT is core to your mission critical workflows?

...is GIS part of it?
ArcGIS | The Mapping and Analysis Platform
Elasticity

"...the tendency of a body to return to its original shape after it has been stretched or compressed...”

Capacity on Demand; ‘Cloud Bursting’ is a solution to over-provisioning. It rapidly migrates workloads from an overstretched resources to a cloud service on demand.

Source: wordnetweb.princeton.edu, and Andy Hendrickson
Elasticity

- Can adjust for peaks and troughs in demand for...

  **Data Management**
  - High Availability w/ ArcGIS Server + EGDB
  - High Availability w/ ArcGIS Server + EGDB using updates
  - Hosted Features

- Enhanced & Dynamic Processing -- Batch Data Processing, Large Scale *Analysis*
  - Cache cooking / Cache deployment in S3 or ArcGIS.com
  - Geocoding | Network Analysis | Spatial Analysis
Elasticity

- **Visualization & Mobile enablement**
  - Grow out capacity as needed
  - Expand capabilities in near real time
  - One Server Access w/ ArcGIS Server
  - High Availability w/ ArcGIS Server
  - The Web Map
Virtualization Basics

Hardware

Virtualization Platform
(VMWare, Microsoft, others)

Operating System
(Windows, Linux)

ArcGIS

New IP
Creating a Base Image

Virtualization Management

ArcGIS

Operating System
(Windows, Linux)

Virtualization Platform
(VMware vSphere)

Hardware

Machine Image (Files)
Launching a new VM from Image

Virtualization Management

Machine Image (Files)

ArcGIS

Operating System (Windows, Linux)

Virtualization Platform (VMWare)

Hardware
Desktop Virtualization

ArcGIS for Desktop

Citrix XenApp

Windows

Hardware

Internet
Infrastructure: A key problem in IT

Organizational Resources

CRM  ERP  GIS
IT Infrastructure and Cloud Features

Organizational Resources

CRM  ERP  GIS
Dynamic Resource Allocation

Organizational Resources

CRM        ERP        GIS
Instant Planned Recovery

GIS

Production

Staging

Development & QA
Instant Planned Recovery

GIS

Production

Staging

Development & QA
Copy and Run

GIS

Data Visualization

Data Management
ArcGIS compatibility with Cloud Stack

- Management Tools
- ArcGIS
- Operating System (Windows, Linux)
- Virtualization Platform (VMWare, Microsoft, Citrix, other)
- Hardware
Cloud Computing Categories

ArcGIS Leverages Each One

<table>
<thead>
<tr>
<th>Software As A Service (SAAS)</th>
<th>Web (e.g. YouTube, SalesForce, ArcGIS Online)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Framework APIs (e.g. Azure, Google App Engine, ArcGIS Online Services)</td>
<td></td>
</tr>
<tr>
<td>Web Services API (e.g. Amazon, IBM, Microsoft, other)</td>
<td></td>
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</table>
Leveraging the Cloud – Security & Control

Public Cloud

Private Cloud

LESS  MORE

Security & Control
Time to Market

Erase the limit to creativity with the ability to quickly respond to business needs
Increase Time to Market

- Rapid provisioning of ArcGIS Server = less time to spin up servers and capacity
- Easy to set up and administer
- Extremely fast release of web maps
- Non constraining for innovation
- Lowering Cost
- Simplicity
- Scalability
Risk Aversion

Growing GIS into the Enterprise - as your Business demands more - should not be limited due to cost ceilings and a limit to your ability to test
Limit Risk

- Performance & Scalability
- Does the implementation meet your SLAs
- Security requirements
- Ideal Effective Utilization
- Utilization of owned equipment vs. rented
- Compliance (e.g. green computing claims)
Budget

Growing GIS into your Business Enterprise requires unique budgetary planning.
Budgetary

- **Limit** capital expenditures
- **Flexible (expense) budgets** can be used
- **Reduced operational cost**
  - No heavy lifting
  - **Time to market effect**
Geocentric Patterns and Alignment

A Complete Integrated System

Data Management
- Collect, Organize, & Exchange Data

Analysis
- Transform Data Into Actionable Information

Field Enablement
- Get Information Into and Out of the Field

Visualization
- Disseminate Information Where and When it is Needed

Constituent Engagement
- Get Feedback and Make Informed Decisions
ArcGIS deployment On-premises

User

ArcGIS Desktop

ArcGIS Server

editing

ArcGIS Online on-premises (Portal for ArcGIS)
Data Management Deployment to Cloud

On-premises User

Public Or Private

ArcGIS Desktop
ArcGIS Server
ArcGIS Online

User
Hybrid Deployment with Redundancy

On-premises
Data Management & Analysis

Visualization
In Cloud

Public
Or
Private

ArcGIS Server 1
ArcGIS Server 2
ArcGIS Server 3
ArcGIS Server n

ArcGIS Desktop
ArcGIS Server
editing
Deployment with redundancy

On-premises User

Public Or Private

ArcGIS Desktop
ArcGIS Server

In Cloud

ArcGIS Server 1
ArcGIS Server 2
ArcGIS Server 3
ArcGIS Server n

ArcGIS Online

Publication & Visualization

In Cloud

Data Management
Data Publication & Analysis

In Cloud
Hybrid Deployment with Redundancy

On-premises
Data Management & Analysis

ArcGIS Desktop
ArcGIS Server
editing

Public
Or
Private

ArcGIS Server

2-way replication

ArcGIS Server 1
ArcGIS Server 2
ArcGIS Server 3
ArcGIS Server n

ArcGIS Online
Publication & Visualization
In Cloud

Data Publication
In Cloud
Hybrid Deployment with Redundancy

On-premises
Data Management & Analysis

Public Or Private

ArcGIS Server

passive

1-way replication

active

ArcGIS Server

ArcGIS Server 1

ArcGIS Server 2

ArcGIS Server 3

ArcGIS Server n

ArcGIS Desktop

ArcGIS Server

editing

Data Publication In Cloud

Publication & Visualization In Cloud

ArcGIS Online
Cloud Deployment with Redundancy

Cloud Based Data Management & Analysis

ArcGIS Desktop

ArcGIS Server

editing

ArcGIS Server

passive

1-way replication

ArcGIS Server

active

Public Or Private

ArcGIS Server 1

ArcGIS Server 2

ArcGIS Server 3

ArcGIS Server n

ArcGIS Online

Publication & Visualization In Cloud

Data Publication In Cloud
Deployment with Redundancy & Test

On-premises
Data Management & Analysis

ArcGIS Desktop
ArcGIS Server
editing

ArcGIS Server
2-way replication

Data Publication
On-premises

ArcGIS Server
active
ArcGIS Server
active

ArcGIS Server 1
ArcGIS Server 2
ArcGIS Server 3
ArcGIS Server n

ArcGIS Online
on-premises

Publication & Visualization
On-premises
Examples: Cloud Deployment
Aspects of Cost

- Procurement costs
- Maintenance and Management costs
- Time
The cost of Time

- Time to Market
- Labor time
The value of Virtualization

- Data & Application Loading
  - Software Setup
  - IT Setup
  - Hardware Setup
  - Procurement

- Launch VM from Image

Launch VM from your Image
ArcGIS virtualization spectrum

- **ArcGIS for Server On Virtualized Infrastructure**
- **ArcGIS for Server On Private Cloud**
- **ArcGIS for Server On Amazon Web Services**
- **ArcGIS Online**

Manage it Yourself
ArcGIS for Server on AWS AMIs 10.1

- **ArcGIS Server 10.1 AMI**
  - Windows 2008 R2 64 bit
  - ArcGIS Server GIS Services
  - Microsoft SQL Server Express or Microsoft SQL Server Standard - ArcSDE enabled (Optional)
  - ArcGIS Desktop
  - 100Gb of storage (optional)

- **Enterprise Geodatabase AMI (Created Automatically)**
  - Windows 2008 R2 64 bit
  - Microsoft SQL Server Standard (ArcSDE enabled)
  - 100Gb of storage (optional)

- **ArcGIS Server 10.1 AMI**
  - Ubuntu 64 bit
  - ArcGIS Server GIS Services
  - 100Gb of storage (optional)
  - Postgres SQL - ArcSDE enabled (Optional)

- **Enterprise Geodatabase AMI**
  - Ubuntu 64 bit
  - PostgreSQL (ArcSDE enabled)
  - 100Gb of storage (optional)
ArcGIS Cloud Builder for Amazon Web Services
Calculating cost in Amazon

• Machine cost
  - Instance size and type
  - Storage
  - Bandwidth

• Other costs
  - Extra storage: S3, CloudFront
  - Elastic Load Balancer, Elastic ip, Route 53
  - Monitoring: CloudWatch
AWS Cost Models

- EC2
  - On Demand
  - Reserved
  - Spot

- S3 utilization
## AWS Bill

### Cost Breakdown

<table>
<thead>
<tr>
<th>Service</th>
<th>Price per Unit</th>
<th>Hours (or Units)</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>US West (Oregon) Region</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Amazon EC2 running Linux/UNIX</td>
<td>$0.042 per Small instance-hour (or partial hour) consumed (blended price)*</td>
<td>4 Hrs</td>
<td>0.17</td>
</tr>
<tr>
<td>Amazon EC2 running Windows</td>
<td>$0.364 per M1 Standard Large (m1.large) Windows instance-hour (or partial hour)</td>
<td>740 Hrs</td>
<td>269.36</td>
</tr>
<tr>
<td>Amazon EC2 EBS</td>
<td>$0.095 per GB-Month of snapshot data stored (blended price)*</td>
<td>30.467 GB-Mo</td>
<td>2.89</td>
</tr>
<tr>
<td>Elastic IP Addresses</td>
<td>$0.005 per Elastic IP address not attached to a running instance for the first hour (blended price)*</td>
<td>238 Hrs</td>
<td>1.19</td>
</tr>
<tr>
<td>Elastic Load Balancing</td>
<td>$0.025 per LoadBalancer-hour (or partial hour)</td>
<td>1,003 Hrs</td>
<td>25.07</td>
</tr>
<tr>
<td>Amazon CloudWatch</td>
<td>$0.100 per alarm-month (blended price)*</td>
<td>7,055 Alarms</td>
<td>0.71</td>
</tr>
<tr>
<td></td>
<td>$0.500 per metric-month (blended price)*</td>
<td>7,197 Metrics</td>
<td>3.60</td>
</tr>
</tbody>
</table>

**Total Cost:** $349.50
AWS Cost Savings Best Practices

• Only Use what you need, when you need it

• Put AMIs to use

• Elasticity is your friend

• Use Amazon Features

• Automate wisely
Desktop Virtualization

- Citrix XenApp is Certified
- Launch ArcGIS for Desktop from the browser
- Access ArcGIS for Desktop from any machine with web access
- ArcGIS for Desktop access to data is over the network where it’s running
ArcGIS on Public Cloud

![Amazon Web Services](image1.png)
![Microsoft](image2.png)
![Verizon Terremark](image3.png)
![vmware](image4.png)
![IBM](image5.png)
ArcGIS on Private Cloud

- Verizon Terremark
- Amazon Web Services
- VCE (Virtual Computing Environment Company)
- IBM
- VMware
- Microsoft
Resources

• White papers
  - Deploying ArcGIS for Server on Azure Workspace – http://ideas.esri.com
ESRI Can Help You Start Today

- ArcGIS for Server on Amazon Web Services (AMIs)
- Cloud Bundles – including ArcGIS Online
- Cloud hosting packages
- Jumpstart packages
- Custom Services
- Subscriptions
- Architecture assistance
Topic Summary

- ArcGIS - A Cloud GIS
- Business Cases For Cloud GIS
- Deployment Patterns
- Costing Example: Amazon
Thank you...

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