Deploying ArcGIS in the Cloud: A Business Perspective

Andrew Hendrickson & Marwa Mabrouk
Topics

• ArcGIS - A Cloud GIS
• Business Cases For Cloud GIS
• Deployment Patterns
• Costing Example: Amazon
A New Pattern: ArcGIS a Cloud GIS

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

...is GIS part of it?

ArcGIS has evolved to a cloud platform
Cloud Computing Categories

ArcGIS Leverages Each One

**Infrastructure As A Service (IAAS)**

- Web Services API (e.g. Amazon, IBM, Microsoft, other)

**Platform As A Service (PAAS)**

- Framework APIs (e.g. Azure, Google App Engine, ArcGIS Online Services)

**Software As A Service (SAAS)**

- Web (e.g. YouTube, SalesForce, ArcGIS Online)
Deployed How You Want

Aligning with Organizational Goals

On Premises

Cloud

Hybrid

Complimenting Existing Desktops & Servers
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

- Enhanced & Dynamic Processing -- Batch Data Processing, Large Scale Analysis
- Cache cooking / Cache deployment in S3 or ArcGIS Online
- Geocoding
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
ArcGIS compatibility with Cloud Stack

- Management Tools
- ArcGIS
- Operating System (Windows, Linux)
- Virtualization Platform (VMWare vSphere, Microsoft Hyper-V)
- Hardware
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
Copy and Run

GIS

Data Visualization

Data Management
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
Growing the 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

- What is it appropriate for?
- Performance & Scalability
- The Cloud may not be reliable enough - you need to evaluate - SLA
- Is the cloud secure enough?
- Ideal Effective Utilization
- Real Utilization of owned equipment vs. rented
- Compliance (e.g. green computing)
Growing the 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

Data Management: Collect, Organize, & Exchange Data
Planning & Analysis: Transform Data Into Actionable Information
Field Mobility: 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

A Complete Integrated System

ArcGIS Aligns Value with Business
ArcGIS deployment On-Premise

User

ArcGIS Desktop
ArcGIS Server
Editing
ArcGIS Online on-premise
Data Management Deployment to Cloud

On-Premise
User

Public
Or
Private

ArcGIS Server

ArcGIS Online

ArcGIS Desktop
Hybrid Deployment with Redundancy

On-Premise
Data Management & Analysis

Public
Or
Private

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

ArcGIS Online

Visualization
In Cloud

ArcGIS Desktop
ArcGIS Server

editing
Deployment with redundancy

On-Premise
User

Public
Or
Private

ArcGIS Desktop
ArcGIS Server
ArcGIS Server 1
ArcGIS Server 2
ArcGIS Server 3
ArcGIS Server n
ArcGIS Online

Data Management
Data Publication & Analysis
In Cloud

Publication & Visualization
In Cloud
Hybrid Deployment with Redundancy

On-Premise
Data Management & Analysis

ArcGIS Server
ArcGIS Desktop
ArcGIS Server
editing

2-way replication

Public Or Private

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

ArcGIS Online

Data Publication In Cloud

Publication & Visualization In Cloud
Hybrid Deployment with Redundancy

On-Premise
Data Management & Analysis

ArcGIS Server

Public Or Private
ArcGIS Server 1
ArcGIS Server 2
ArcGIS Server 3
ArcGIS Online

Publication & Visualization
In Cloud

Data Publication
In Cloud

ArcGIS Desktop
ArcGIS Server
editing
Deployment with Redundancy & Test

On-Premise Data Management & Analysis

ArcGIS Server

ArcGIS Server 1
ArcGIS Server 2
ArcGIS Server 3

ArcGIS Desktop

ArcGIS Server

editing

2-way replication

ArcGIS Server

active
active

ArcGIS Online on-premise

Publication & Visualization On-Premise

Data Publication On-Premise
Leveraging the Cloud

Public Cloud

Private Cloud

LESS  MORE

Security & Control
Example: Cloud Deployment with Amazon
Aspects of Cost

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

- Time to Market
- Labor time
### Important Concepts

- **Instance Types**

<table>
<thead>
<tr>
<th>Instance Type</th>
<th>Memory</th>
<th>EC2 Compute Units</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Standard Large</strong></td>
<td>7.5 GB</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(2 virtual cores with 2 EC2 Compute Units each)</td>
</tr>
<tr>
<td><strong>High CPU Extra Large</strong></td>
<td>7 GB</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(8 virtual cores with 2.5 EC2 Compute Units each)</td>
</tr>
<tr>
<td><strong>High Memory Quadruple Extra Large</strong></td>
<td>68.4 GB</td>
<td>26</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(8 virtual cores with 3.25 EC2 Compute Units each)</td>
</tr>
</tbody>
</table>
Important Concepts

- Amazon Machine Image
Important Concepts

- Storage
  - Simple Storage Service (S3)
  - Elastic Block Storage (EBS)
Regions & Availability Zones

Different prices per Region

- Four regions
  - East Coast
  - West Coast
  - Europe (Ireland)
  - APAC (Singapore)
  - APAC (Japan)

- Different zones = Different data centers
Esri provided AMIs

- ArcGIS 10 sp2
- Available in all regions

**ArcGIS Server 10 AMI**
- Windows 2008 64 bit
- ArcGIS Server GIS Services
- Microsoft SQL Server Express (ArcSDE enabled)
- ArcGIS Desktop
- 100Gb of storage (optional)

**Enterprise Geodatabase 10 AMI**
- Windows 2008 64 bit
- PostgreSQL 8.3.0 (ArcSDE enabled)
- 100Gb of storage (optional)
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
Data Management deployment in Amazon EC2

On-Premise
User

Amazon EC2

ArcGIS Desktop
ArcGIS Server
editing
Cost items

• **ArcGIS Server Machine**
  - Instance Size
  - EBS Volume Size
  - Data Transfer
  - eip

• **Geodatabase Server**
  - Instance Size
  - EBS Volume Size
  - Eip

• **Cost Considerations**
Hybrid Deployment with Redundancy

On-Premise
Data Management & Analysis

Visualization In Cloud

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

ArcGIS Desktop
ArcGIS Server
Cost items

- **ArcGIS Server 1**
  - Instance Size
  - EBS Volume Size
  - Data Transfer
  - eip

- **ArcGIS Server n**
  - Instance Size
  - EBS Volume Size
  - Data Transfer
  - eip

- **Cost Considerations**
Amazon Elastic Compute Cloud

US East (Northern Virginia) Region

Amazon EC2 running Windows

- $0.476 per Large instance-hour (or partial hour) consumed (blended price)*
  - 1,476 Hrs: 701.94

- $0.96 per Extra-Large Windows Instance (m1.xlarge) instance-hour (or partial hour)
  - 1 Hr: 0.96

Amazon CloudWatch

- $0.00 per alarm-month - first 10 alarms
  - 0.495 Alarms: 0.00

Elastic IP Addresses

- $0.01 per non-attached Elastic IP address per complete hour
  - 184 Hrs: 1.84

Amazon EC2 EBS

- $0.10 per GB-month of provisioned storage
  - 456.472 GB-Mo: 45.65

- $0.10 per 1 million I/O requests
  - 12,516,462 I/Os: 1.25

- $0.15 per GB-Month of snapshot data stored
  - 45.571 GB-Mo: 6.84

- $0.01 per 10,000 gets (when loading a snapshot)
  - 79,160 Requests: 0.08

- $0.01 per 1,000 puts (when saving a snapshot)
  - 3 Requests: 0.00

Elastic Load Balancing

- $0.008 per GB Data Processed by the LoadBalancer
  - 0.000007 GB: 0.00

- $0.025 per LoadBalancer-hour (or partial hour)
  - 184 Hrs: 4.60

763.15

Asia Pacific (Singapore) Region

Amazon EC2 running Windows

- $0.48 per Large Windows Instance (m1.large) instance-hour (or partial hour)
  - 184 Hrs: 88.32

Amazon EC2 EBS

- $0.11 per GB-month of provisioned storage
  - 2,084.599 GB-Mo: 229.31

- $0.11 per 1 million I/O requests
  - 2,534,649 I/Os: 0.28

- $0.15 per GB-Month of snapshot data stored
  - 2.617 GB-Mo: 0.39

318.30

1,081.45
Amazon Bill

Complete Cost

This Month's Activity as of July 8, 2011

The billing cycle for this report is July 1 - July 31, 2011. The AWS service usage charges on this page currently show activity through approximately 07/08/2011 19:59 GMT.

<table>
<thead>
<tr>
<th>Service</th>
<th>Charges</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amazon Elastic Compute Cloud</td>
<td>$1,081.45</td>
</tr>
<tr>
<td>Amazon Simple Storage Service</td>
<td>$1.83</td>
</tr>
<tr>
<td>AWS Data Transfer (excluding Amazon CloudFront)</td>
<td>$0.06</td>
</tr>
</tbody>
</table>

Bill Summary

- Usage charges and monthly recurring fees during this billing cycle: $1,083.34
- One-time fees during this billing cycle: $0.00
- Taxes: $0.00

Total new charges this billing cycle: $1,083.34

No payments received to date.

Current estimated unpaid balance to be charged for this billing cycle: $1,083.34
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
Example: Cloud Deployment On Premise - VCE

- Cisco/ VMware/ EMC²

- Vblock

- Running in your DataCenter

- ArcGIS Server on Vblock
  - Custom Templates
  - Support different architectures
References

- **Amazon Web site**
  - Calculator
  - Keep an eye on prices and new services

- **Blogs**
  - How to best save costs and use the cloud

- **VCE Web Site**
  - Whitepaper
  
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

For more information contact your account executive
Topic Summary

- ArcGIS - A Cloud GIS
- Business Cases For Cloud GIS
- Deployment Patterns
- Costing Example: Amazon
Steps to evaluate UC sessions

- My UC Homepage > “Evaluate Sessions”
- Choose session from planner
  OR
- Search for session

www.esri.com/ucsessionssurveys
• Thank you for attending
• Have fun at UC2012
• Open for Questions

• Please fill out the evaluation:

  www.esri.com/ucsessionssurveys

  First Offering ID: 649
  Second Offering ID: 774