ArcGIS Server in the Cloud

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Session overview

- What is ArcGIS Server for Amazon EC2?
- Working with ArcGIS Server for Amazon EC2
- Elastic configuration of ArcGIS Server

Topics
What is ArcGIS Server on Amazon EC2?
What is Amazon Web Services (AWS)?

- A Cloud Infrastructure
  - Data centers around the world
- Accessible via Web Services
  - EC2 (Elastic Cloud Computing)
  - Cloud Watch (Monitoring)
  - Cloud Front (Web Content Delivery)
  - Virtual Private Network (Secure networks)
  - Simple (S3) and Block (EBS) storage (Storage)
- Following a ‘pay as you go’ business model

“the Amazon Cloud’
Advantages of running ArcGIS Server on Amazon EC2

- Simplified management
  - Preconfigured machine images
  - Monitoring, back-ups, scaling
- Real time access to massive amounts of
  - Computing power
  - Network bandwidth
  - Storage
- No long term investments in infrastructure
  - Elastic computing
An ideal environment to develop with ArcGIS Server
Available to EDN subscribers

• 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
  - Stop paying for the servers when you do not need them (no capital investment)

• You may deploy your developed apps in the cloud… or on-premises
Massive Ad-Hoc GIS tasks are well suited for an environment with virtually unlimited computing power

- **Massive Analysis:**
  - Routing
  - Suitability Analysis
  - Geostatistics

- **Batch geocoding**
Web Mapping sites

Getting on the web quick and for good, or just for ad-hoc projects

- Simplified deployment
- High bandwidth
- Secure
- Scalable
- Resilient
What is Amazon (EC2)?

- Amazon Elastic Compute Cloud (EC2)
  - Infrastructure as a service
What is Amazon (EC2)?

- Amazon Elastic Compute Cloud (EC2)
  - Infrastructure as a service

Your Server Room
What is Amazon (EC2)?

- Amazon Elastic Compute Cloud (EC2)
  - Infrastructure as a service
What is Amazon (EC2)?

- Amazon Elastic Compute Cloud (EC2)
  - Infrastructure as a service
- ArcGIS Server 10 supported on a new platform

Your Server Room

Amazon EC2
Advantages of Amazon EC2

• Robust hardware and network infrastructure
Advantages of Amazon EC2

- Robust hardware and network infrastructure
- Easy administration
  - Amazon Web Services Management Console
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- Simplified hardware procurement
- Elastic Deployments
What is an Amazon Machine Image (AMI)?

• Synonymous with virtual machine
  - An Amazon Machine Image (AMI) is simply a packaged-up environment that includes all the necessary bits to set up and boot your instance
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• **Running AMI is an EC2 instance**
Esri-developed AMIs

• ArcGIS Server AMI
  - ArcGIS Server 10.0 for Microsoft .NET Framework
  - ArcGIS Desktop
  - Any extension you can license
Esri-developed AMIs

- **ArcGIS Server AMI**
  - ArcGIS Server 10.0 for Microsoft .NET Framework
  - ArcGIS Desktop
  - Any extension you can license

- **Enterprise geodatabase AMI**
  - ArcSDE 10
  - PostgreSQL
ArcGIS Geodatabase AMI

- PostgreSQL 8.3.8
  - extended with the ESRI ST_Geometry type

- PgAdmin III 1.8.4

- ArcSDE 10 for PostgreSQL
ArcGIS Server AMI

- Microsoft Windows Server 2008 R1 SP2
  - Datacenter edition (x64)
- IIS 7

- Microsoft SQL Server Express 2008
  - Management Studio

- ArcGIS Desktop

- ArcGIS Server for the Microsoft .NET Framework
- ArcGIS Server home page with links to:
  - Manager, Services Directory, Help
Workgroup SDE

- Installed on AcGIS Server AMI

- Database server name & default instance name
  - localhost\sqlexpress
  - can’t specify specific hostname since it changes

- Create spatial database connection file in a location that the ArcGIS SOC user
  - Not under Database Servers

- limited to a size of 4 GB

- Windows Authentication Only
  - SOC, other users RDP
Attached Storage

- EBS volume
  - attached 100 GB EBS volume
  - "GIS Data"
  - mounted as drive D:
  - connection preconfigured in ArcCatalog
Pre-configured Accounts

- arcgissom—The SOM account
- arcgissoc—The SOC account
- arcgiswebservices—The ArcGIS Web Services account
- arcgisstartup—An account used to run the ArcGIS Server AMI StartUp Service. This service runs when you start an EC2 instance of ArcGIS Server.
Permissions pre-configured

- arcgisserver folder
  - SOM and SOC accounts
  - Read and Write

- arcgisserver\arcgisinput folder
  - agsadmin group –
  - Read and Write

- GIS Data folder
  - SOC account
  - Read and Write
Recommend Security Groups (Development)

• Remote Desktop Protocol  RDP
  - Port 3389
  - your external IP – ex. 92.23.32.51/32

• HTTP
  - Port 80
  - Everyone – ex. 0.0.0.0/0

• Your other cloud instances
  - Custom
  - Source (IP or group) – enter security group name
Recommend Security Groups (Production)

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Recommend Security Groups (Production Secure)

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  - Port 3389
  - your external IP – ex. 92.23.32.51/32

• HTTPS
  - Port 80 Port 443
  - Everyone – ex. 0.0.0.0/0

• Your other cloud instances
  - Custom
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Recommend Security Group (Enterprise GDB AMI)

- Remote Desktop Protocol (RDP)
  - Port 3389
  - Your external IP – ex. 92.23.32.51/32
  - Change PostgreSQL passwords then can drop this

- HTTP
  - Port 80
  - Everyone – ex. 0.0.0.0/0

- Your other cloud instances
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- PostgreSQL
  - Access by computers outside security group (Port 5432)
Transferring Data

• Remote Desktop copy and paste

• S3 client utilities
  - Amazon API
  - S3Fox Organizer - Firefox plugin
  - Bucket Explorer

• Your own web server (web facing)

• FTP

• AWS Import/Export
Important Links

- Amazon
  - http://aws.amazon.com/ec2

Esri

Considerations when using EC2

- Is Amazon EC2 secure?
- How stable are EC2 instances?
- How am I billed?
Amazon EC2 security

- Secured physical facilities
Amazon EC2 security

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- Logically secure EC2 instances
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- Configurable firewall to control access
Amazon EC2 security

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- Standard ArcGIS Server security
Amazon EC2 security

- Secured physical facilities
- Logically secure EC2 instances
- Configurable firewall to control access
- Standard ArcGIS Server security
- Optional multifactor authentication
Amazon EC2 stability

• 99.95% service level agreement in contract – 4.5 hours per year
Amazon EC2 stability

- 99.95% service level agreement in contract
- Lost instances easily replaced
  - Configurable automatic recovery
Amazon EC2 stability

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- Lost instances easily replaced
  - Configurable automatic recovery
- Easy implementation of high availability configuration
Amazon EC2 stability

- 99.95% service level agreement in contract
- Lost instances easily replaced
  - Configurable automatic recovery
- Easy implementation of high availability configuration
- Physical redundancy in differing geographic locations
Amazon EC2 billing

- **Software**
  - Esri product licenses same as on premises
  - Enterprise license agreement is most flexible
Understanding ArcGIS Server licensing on Amazon EC2

- Just like on-premises: core licensing
- Perpetual or termed license
  - New in ArcGIS 10
    - 1, 3 and 12 month licenses for ArcGIS Server
- Also available through Enterprise License Agreement (ELA)
- And EDN (ESRI Developer Network)
Amazon EC2 billing

- **Software**
  - Esri product licenses same as on premises
  - Enterprise license agreement is most flexible

- **Hardware**
  - Amazon provides different options
  - On-demand instances by the hour
  - Long-term reserved instances
Understanding EC2 instance pricing

- Always an hourly price

- Prices vary by:
  - Instance Type: Size of the virtual machine
  - Location: Which Region you are running on
  - Term:

- Reserved Hourly rate not applied if your EC2 instance is stopped

Software demonstration
Review and Q & A

- ArcGIS Server software is the same
- Server hardware rented by Amazon Web Services
- Accelerated deployment of ArcGIS Server
- Secure environment
- Flexible systems and pricing
Working with ArcGIS Server on Amazon EC2
Configuring the instance

- Administrator password change strongly encouraged
- No post install required
- ArcGIS Server already configured
- License ArcGIS Server
Moving data to EC2

• Transferring data to the instance
  - Various options outlined in the help
    - Personal preference
    - Additional local security policies may be required
How to move your data in and out of the cloud?
Remote Desktop Copy & Paste

- You can copy files by simply using
  - Your Windows clipboard into your Remote Desktop connection
- Convenient for small files
  - Around 100Mb
- Not safe
- Must enable before starting RDC
FTP

- Ideal for bulk data transfers (few hundred GBs)
- Two strategies:
  - FTP client on Amazon EC2
  - FTP server on Amazon EC2

Isolated FTP Server. Not your ArcGIS Server Production instance!
S3 Utilities

- Upload to S3, then download to EBS or local device
- Many utilities:
  - AWS Management Console
  - S3 Organizer Firefox Add-On, Bucket Explorer
  - Other third party utilities and Amazon partners
- Handles well few hundreds of GBs
AWS Import/Export Service

- Physically ship (mail) your device to an Amazon Region
- Get data into S3 or off S3
- For very large amounts of data (TBs)
  - First load
  - Disaster recovery
  - Incremental udpates

http://aws.amazon.com/importexport/
Tips for uploading GIS data to Amazon EC2

• Organize your data for transfer:
  • **Relative paths in maps, locators**…
• Eliminate unnecessary data
• Compress whenever possible (zip, rar…)
• Break down your compressed files into chunks of 1 to 2 Gb
• Be aware of S3 Bucket and Restrictions (see AWS doc)
• If large amounts data and time matters: go Import/Export
• Create a data transfer strategy:
  • Plan in advance for updates
Moving data to EC2

• Transferring data to the instance
  - Various options outlined in the help
    - Personal preference
    - Additional local security policies may be required

• Adding or removing disk space
  - 100GB drive attached by default
  - Optionally, replace with drive of different size
Storage in AWS: EBS and S3

- **EBS (Elastic Block Storage)**
  - Fast access from your EC2 instance
  - Ideal storage for access from ArcGIS Server and Databases

- **S3 (Simple Storage Service)**
  - Storage for the internet
  - Uses:
    - Backups: Create S3 Snapshots from your EBS volumes
    - Staging area for moving data into EBS
    - Repository of map tiles
Understanding EBS volumes of your ArcGIS Server instance

- Your ‘C:\’ drive:
  - Just 30Gb
    - Used by your server:
      - Temp folders, virtual memory, recovery…
      - Do not compromise this space
    - Not a safe place!
      - Will be destroyed upon termination of your instance
Understanding EBS volumes of your ArcGIS Server instance

- D:\GIS Data
  - 100Gb
- Ideal for your GIS data:
  - Fast access from EC2 instances
  - Easy to move around EC2 instances
    - In same availability zone
  - Easy to back up (through S3 Snapshots)
- You can attach more EBS volumes or detach them
  - Attach up to 12 EBS drives to your instance
  - Maximum size of each EBS volume is 1Tb

The ArcGIS Server AMIs come with one 100Gb EBS drive attached; your D: \ GIS Data folder
Publishing services

- Same as using ArcGIS Server on premises
Publishing services

• Same as using ArcGIS Server on premises

• Considerations
  - How will your data be updated?
  - Do your services require an enterprise geodatabase?
Publishing services

• Same as using ArcGIS Server on premises

• Considerations
  - How will your data be updated?
  - Do your services require an enterprise geodatabase?

• Caching map services
  - Upload to Amazon Web Services
  - Generate in EC2
    - High-Memory Extra Large or bigger
    - Set map service instance cores+ 1 or 2
  - Send a copy to Amazon
Storing map cache

- Not on EC2!! (C:\ drive)
- Okay on EBS
  - Consider S3 backup
- Possible to store on S3 only but Web APIs would use custom layer programming to access files directly
  - Amazon API tools to move cache from EC2
Limitations

- Things you can’t do here in the cloud
  - ArcGIS Server Web ADF application
  - Nonpooled Services
  - Asynchronous geoprocessing services
  - Map caching in a distributed deployment
Review and Q & A

- ArcGIS Server license required
- Software already installed and configured
- Transferring data to EC2 instance
- Planning map service deployments
Elastic configuration of ArcGIS Server
Configuring applications

- Are you working with a single instance or multiple instances in a high availability deployment?
Configuring applications

- Are you working with a single instance or multiple instances in a high availability deployment?
  - Elastic IP
    - Single machine
Configuring applications

• Are you working with a single instance or multiple instances in a high availability deployment?
  - Elastic IP
    - Single machine
  - Elastic Load Balancer
    - Multiple machines
Configuring applications

- Are you working with a single instance or multiple instances in a high availability deployment?
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- Set all references to new URL
Configuring applications

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• Set all references to new URL

• Create new AMI
ArcGIS Server architecture on EC2

- Using instances in development
- Moving instances to production
- Scaling ArcGIS Server
ArcGIS Server architecture on EC2

- Using instances in development
- Moving instances to production
- Scaling ArcGIS Server

AMI

Instance

Vertical scaling
ArcGIS Server architecture on EC2

- Using instances in development
- Moving instances to production
- Scaling ArcGIS Server

Vertical scaling

AMI → Instance → Instance
ArcGIS Server architecture on EC2

- Using instances in development
- Moving instances to production
- Scaling ArcGIS Server

AMI

Instance

Vertical scaling

Instance

Horizontal scaling
Auto scaling

- Auto scaling for demand on user defined triggers
- Auto recovery is configurable part of auto scaling
Simple Deployment – Suitable for Development

EC2 instance with ArcGIS Server (C:)
30 GB

EBS volume
“GIS Data” (D:)
100 GB
Simple Deployment – Multiple volumes
Adding Enterprise Geodatabase in the Cloud

EC2 instance with ArcGIS Server (C:) 30 GB

Spatial database connection

EC2 instance with ArcSDE (C:) 30 GB

On-premise ArcSDE

Optional synchronization using geodata services

EBS volume with PostgreSQL cluster "pgdata" (D:) 100 GB

Elastic IP address
Load balanced GIS Server w/o EGDB
Review and Q & A

- Develop with smaller instance
- Plan architecture that works best for you
- Update URL’s application
- Create your own AMI with data and application
For more information

ArcGIS Server product information
www.esri.com/arcgisserver

ArcGIS Server blog
http://blogs.esri.com

ArcGIS Server on Amazon EC2 Resource Center
http://resources.arcgis.com

ArcGIS Server: Web Administration Using the Microsoft .NET Framework
http://training.esri.com/catalog

AWS Economics Center
http://aws.amazon.com/economics