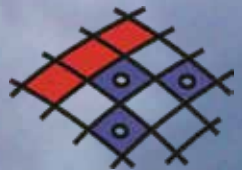


Up in the cloud:

Migrating an ArcGIS Server Application to Amazon EC2



Cartographic Modeling Lab
University of Pennsylvania



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Karl Dailey - Database Analyst

Mid-Atlantic User Group Conference , 2011

Presentation Outline

- Conceptual overview
- About our application
- Making the case for the Cloud
- Migrating to the Cloud
- Overall impressions
- Moving forward

Conceptual Overview

- **Cloud** – delivery of services over the internet
- **AWS** – Amazon Web Service – Amazon branded cloud services that provide virtual infrastructure
- **Amazon EC2** – Amazon Elastic Compute Cloud – one of the many services available through AWS
- **EC2 Instance** – Virtual machine running on Amazon EC2
- **AMI**- Amazon machine image – defines OS and software on the EC2 Instance
 - ESRI ArcGIS Server AMI
 - ESRI GeoDB AMI

MAPS HOME

Map Tool to Assess Timely Access to Trauma Centers

Select Year:

2005

Select Response Time:

60 Minutes

Select Transport Method:

Helicopter or Ambulance

Map Layers

- Major Cities
- States
- Interstates

Continental US

Alaska

Hawaii

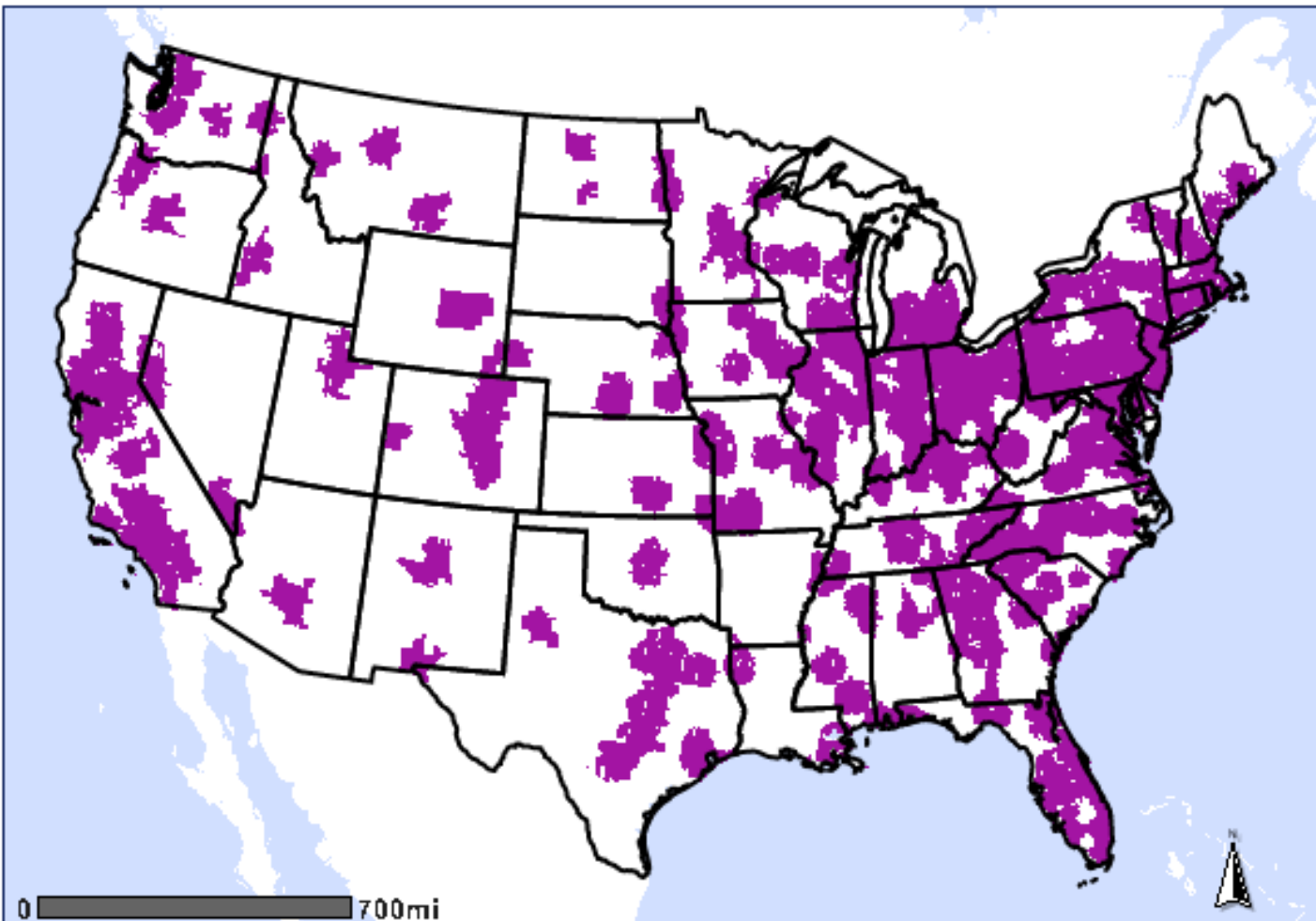
-- Select a state

Print Map
About

Level I/II Trauma Center Coverage	% Popn	% Land
Existing System:	81.1%	22.3%

Legend

- Helicopter
- Ambulance
- Either



HEALTH MAIN

LIVING WELL

DIET & FITNESS

MENTAL H

empowered **P A T I E N T**

March 26, 2009 -- Updated 1326 GMT (2126 HKT)

Natasha's lesson helps save Ohio girl

STORY HIGHLIGHTS

- Richardson's
- Dizziness, vo
- Take special
- Doc: "Someti

[Next Article in Health »](#)

READ

VIDEO

By Elizabeth Cohen
CNN Senior Medical Correspondent

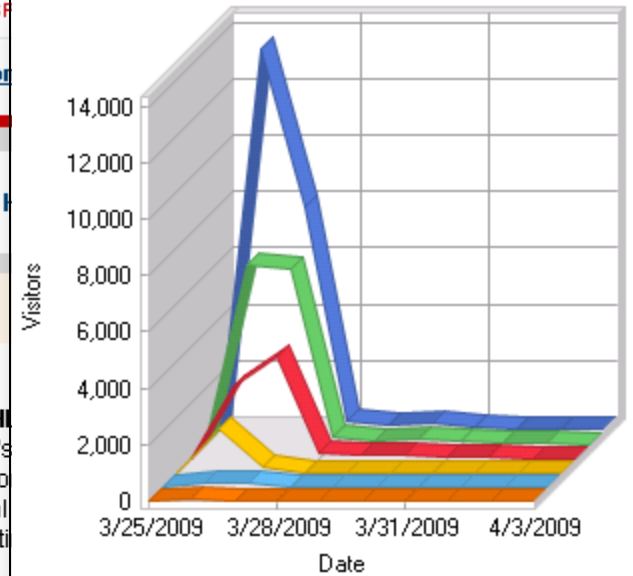
TEXT SIZE - +

(CNN) -- Connie and Donald McCracken were watching CNN one evening last week when they learned of the tragic death of actress [Natasha Richardson](#) from a head injury. Immediately, their minds turned to their 7-year-old daughter, Morgan, who was upstairs getting ready for bed.



Two days earlier, Morgan, her father, and brother had been playing baseball in the yard of their Mentor, Ohio, home when her father hit a line drive that landed just above Morgan's left temple. A lump formed, but the McCrackens iced it down and the swelling subsided within an hour.

"For the next two days, she was perfectly fine," Donald McCracken says. "She had no symptoms. She went to school both days and got an A on her



- Average 1,000 hits/week
- Spiked at 100k in one day



Geography:



Trauma Center Access 2010:

Helicopter or Ambulance

60 min. Include Neighboring State: Yes

Land% Pop%

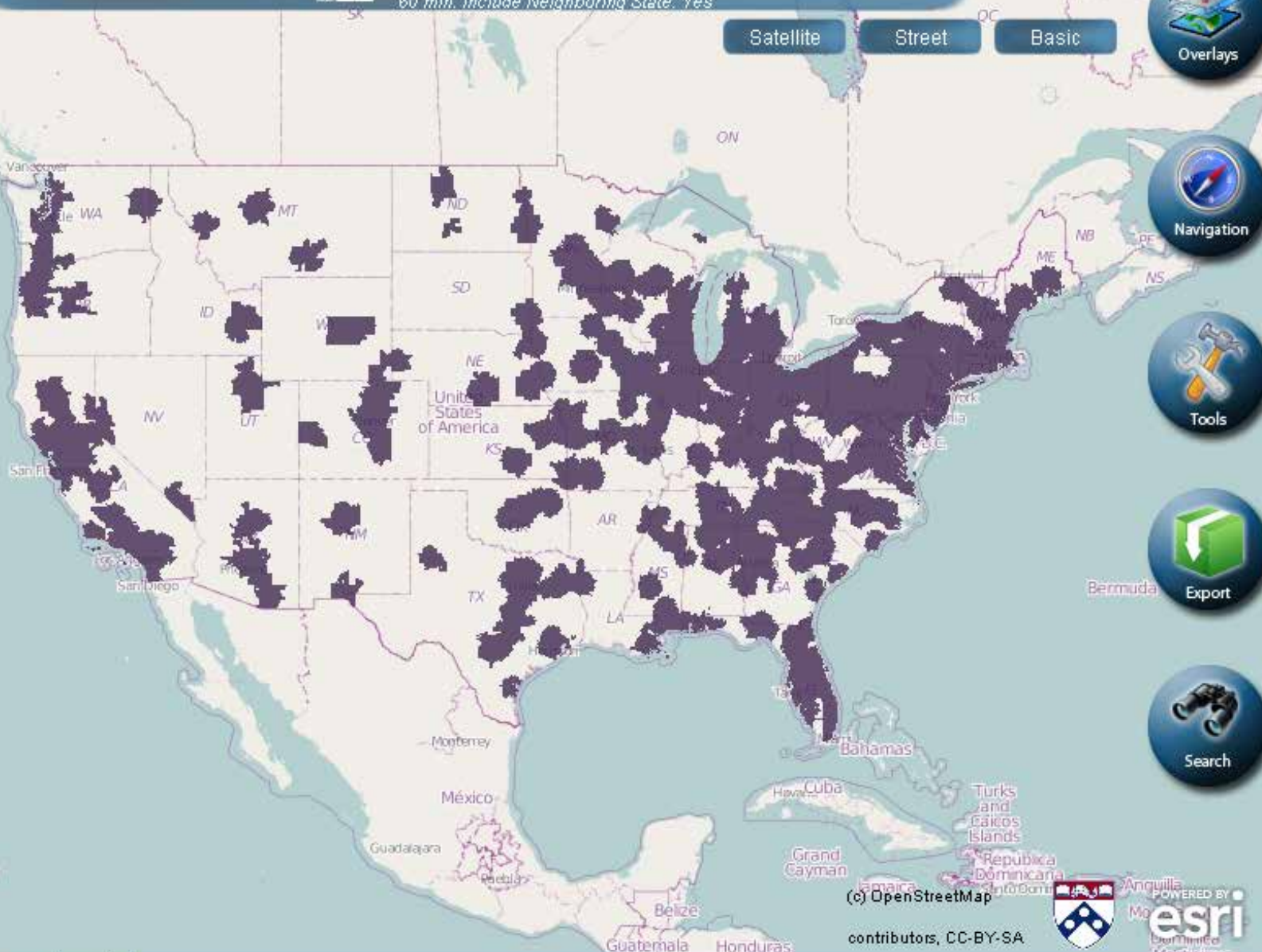
28.39

87.11

Satellite

Street

Basic



1000 km

500 mi

(c) OpenStreetMap

contributors, CC-BY-SA



Making the case for the Cloud: Our main objectives

1. Ability to handle usage spikes
2. Reduce hosting costs
3. Reallocate staff time

Making the case for the Cloud: Comparing our options

	Dedicated Servers	ArcGIS Server on Amazon EC2
Access	Physically accessible	Hosted on the Cloud
Software Maintenance	Must install patches and updates	No installation necessary
Hardware Maintenance	Drive failure, hardware replacements	Not necessary
Scalability	Require purchasing new servers	Scalable on demand
Usage Spikes	Limited resources	Emergency deployments
Prototyping	Limited resources	Easily configurable

Making the case for the Cloud: Looking at the numbers

	Dedicated Server	AWS ArcGIS Server	AWS Web Server
Server Specs	Quad Core 2.99 GHz	8x2.2 GHz	2x2.8 GHz
	4 GB RAM	7 GB RAM	7.5 GB RAM
Estimated Transactions (per min)	49,524	101,124	
One time cost (purchase/setup)	\$8,000	\$2,800	\$1,400
Yearly Cost (hosting/usage)	\$18,000	\$4,380	\$1,752
Replacement Cost	\$8,000	0	0
Yearly Maintenance Hours	80	20	20

FREE USAGE TIER: New Customers get free usage tier for first 12 months

Language:

English

Services

Estimate of your Monthly Bill (\$ 575.42)

Choose region:

Inbound Data Transfer is Free and Outbound Data Transfer is 1 GB free per region per month

- Amazon EC2
- Amazon S3
- Amazon SQS
- Amazon SES
- Amazon SNS
- Amazon Route 53
- Amazon CloudFront
- Amazon RDS
- Amazon ElastiCache
- Amazon CloudWatch
- Amazon SimpleDB
- Amazon VPC
- Amazon Elastic MapReduce
- AWS Import Export
- AWS Premium Support



Amazon Elastic Compute Cloud (Amazon EC2) is a web service that provides resizable compute capacity in the cloud. It is designed to make web-scale computing easier for developers. Amazon EC2 provides persistent storage to Amazon EC2 instances.

+ Compute: Amazon EC2 On-Demand Instances:

+ Compute: Amazon EC2 Reserved Instances:

	Instances	Description	OS	Type	Term	Usage
<input type="text" value="1"/>			Windows	Large	3 yr ter	100 % Utilized/Month
<input type="text" value="1"/>			Windows	High-CPU Extra Large	3 yr ter	24 Hours/Day

+ Storage: Amazon EBS Volumes:

	Volumes	Description	Provisioned Storage	Average IOPS in volume	Snapshot Storage
<input type="text" value="2"/>			35 GB-month	0	35 GB-month of Storage
<input type="text" value="1"/>			5 GB-month	0	5 GB-month of Storage
<input type="text" value="1"/>			100 GB-month	0	100 GB-month of Storage

Elastic IP:

Number of Elastic IPs:

Elastic IP Non-attached Time: Hours/Month

Number of Elastic IP Remaps: Times/Month

Amazon EC2 Data Transfer:

Data Transfer In: GB/Month

Data Transfer Out: GB/Month

Regional Data Transfer: GB/Month

Public IP/Elastic IP Data Transfer: GB/Month

Elastic Load Balancing:

Number of Elastic LBs:

Total Data Processed by all ELBs: GB/Month

Migrating to the Cloud Account setup

1. Create an Amazon Web Services (AWS) account with EC2 access
2. Contact Esri Customer Service with AWS account number
3. ESRI will enable the ready-to-use ArcGIS for Server and GeoDB AMIs

Migrating to the Cloud Configuration

1. Launch an Amazon EC2 instance with ArcGIS Server AMI
2. Manage instances via AWS Management Console
3. Login to instance via remote desktop
4. Configure machine
5. Transfer project files
6. Create map services and applications
7. Save the customized AMI

Navigation

Region:

US East (Virginia)

[EC2 Dashboard](#)
[Scheduled Events](#)

INSTANCES

Instances

[Spot Requests](#)

[Reserved Instances](#)

IMAGES

ELASTIC BLOCK STORAGE

NETWORK & SECURITY

My Instances

Launch Instance

Instance Actions

Show/Hide

Refresh

Help

Viewing: All Instances All Instance Types Search

1 to 9 of 9 Instances

	Name	Instance	AMI ID	Root Device	Type	State	Security Groups	Key Pair Name
<input type="checkbox"/>	WebServer	i-c813fea8	ami-42bd442b	ebs	m1.large	running	ArcGIS Allow	AWS
<input checked="" type="checkbox"/>	ArcGIS Server	i-62b71a02	ami-92738cfb	ebs	c1.xlarge	running	ArcGIS Allow	AWS
<input type="checkbox"/>	Desktop2	i-0beb1568	ami-d901cdb0	ebs	m1.xlarge	stopped	ArcGIS Allow	AWS
<input type="checkbox"/>	7b	i-490a9d2a	ami-2fdc1546	ebs	t1.micro	stopped	ArcGIS Allow	AWS
<input type="checkbox"/>	m1	i-4f0a9d2c	ami-2fdc1546	ebs	t1.micro	stopped	ArcGIS Allow	AWS

EC2 Instance: ArcGIS Server (i-62b71a02)

Description

Monitoring

Tags

AMI:
 Esri ArcGIS Server 10.0 Service Pack 2 (May 2011) (ami-92738cfb)

Security Groups: ArcGIS Allow

State: running

Owner:

Subnet ID: -

Virtualization: hvm

Reservation: r-d18d9cbe

Platform: windows

Kernel ID: -

AMI Launch Index: 0

Root Device: sda1

Zone: us-east-1a

Type: c1.xlarge

Scheduled Events: [No scheduled events](#)

VPC ID: -

Source/Dest. Check:

Placement Group:

RAM Disk ID: -

Key Pair Name: AWS

Monitoring: basic

Elastic IP:

Root Device Type: ebs

End Users



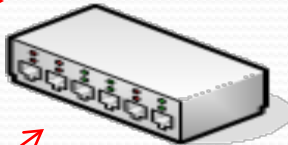
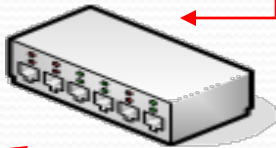
Cloud



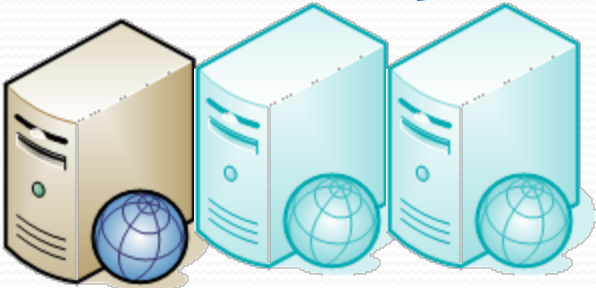
Firewall



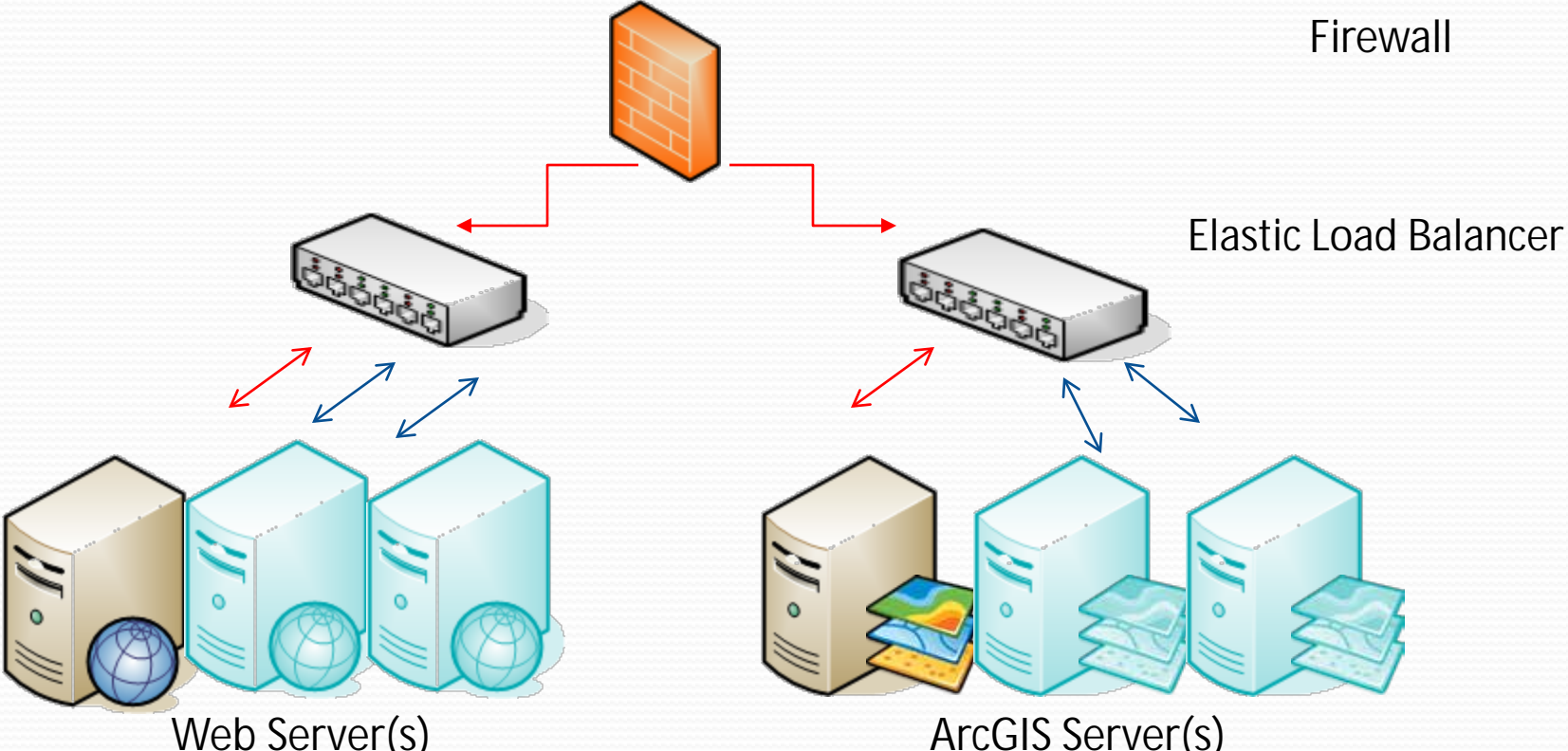
Elastic Load Balancer



Web Server(s)



ArcGIS Server(s)



Overall Impressions



- Easy to implement
- Documentation
- Optimal performance
- Expedite development
- Additional desktop option



- Auto scaling difficult to set up
- Data transfer (re-caching)
- AWS tech support
- Remote desktop glitches
- Downtime
- Potential ESRI license costs
- On going costs

Going Forward

1. Implement auto scaling
2. Load testing
3. Refine server configuration

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