



# MIGRATING DEPARTMENT OF EDUCATION WEB MAPPING APP TO AWS EC2

2013 ESRI International User Conference – July 11, 2013

**ies** NATIONAL CENTER FOR  
EDUCATION STATISTICS

**BLUERASTER**  
A RASTER SOLUTION

**SANAMETRIX**

Presented by Tai Phan, NCES & Amy Ramsdell, Blue Raster

# FGDC'S GEOCLOUD INITIATIVE



- q FGDC-sponsored hosting in Amazon Web Services (AWS)
- q A Geospatial Platform activity led by FGDC's Douglas Nebert
- q GeoCloud provides a common platform for deploying and documenting geospatial cloud services
- q Enables organizations to
  - q Leverage other agencies' experiences
  - q Reuse and share server configurations
  - q Gain experience in cloud-based server and application deployment



<http://www.fgdc.gov/initiatives/geoplatform/geocloud>

# DEPT OF ED'S PARTICIPATION IN GEOCLOUD

- q National Center for Education Statistics (NCES)  
The primary federal entity for collecting and analyzing education-related data
- q NCES uses ESRI technologies to provide geospatial context to education data
- q Two NCES Projects have migrated to GeoCloud in 2012
  - q School District Demographic Data System
  - q Public School Boundary Collection and Verification Project  
<http://nces.ed.gov/surveys/sdds/>





## SDDS SCHOOL DISTRICT DEMOGRAPHICS SYSTEM

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[Data Tables](#)

[Profiles](#)

[Map Viewer](#)

[Download Data](#)

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[Reference](#)

### What is SDDS?

The School District Demographics System provides access to school district demographic and related geographic data. The site's purpose is:

1

To provide access to information about demographics, social characteristics, and economics of children and school districts from the National Center for Education Statistics (NCES) of the U.S. Department of Education.

2

To enable users to directly access school district geographic and demographic data.

3

To provide information about school district demographic concepts, uses, and applications to facilitate effective use of these information resources.

### Map Viewer



#### STANDARD

Map Viewer allows users to view maps of states, school districts and school points, while overlaying U.S. Census Bureau and Education data.

Select



#### EXPRESS

Create your map the easy way. Select your data theme, set your options, and you're done.

[Start Map Viewer Express](#)

#### MOBILE

Introducing the **NEW** SDDS Map Viewer Mobile designed especially for iPad (also for use by other mobile devices).

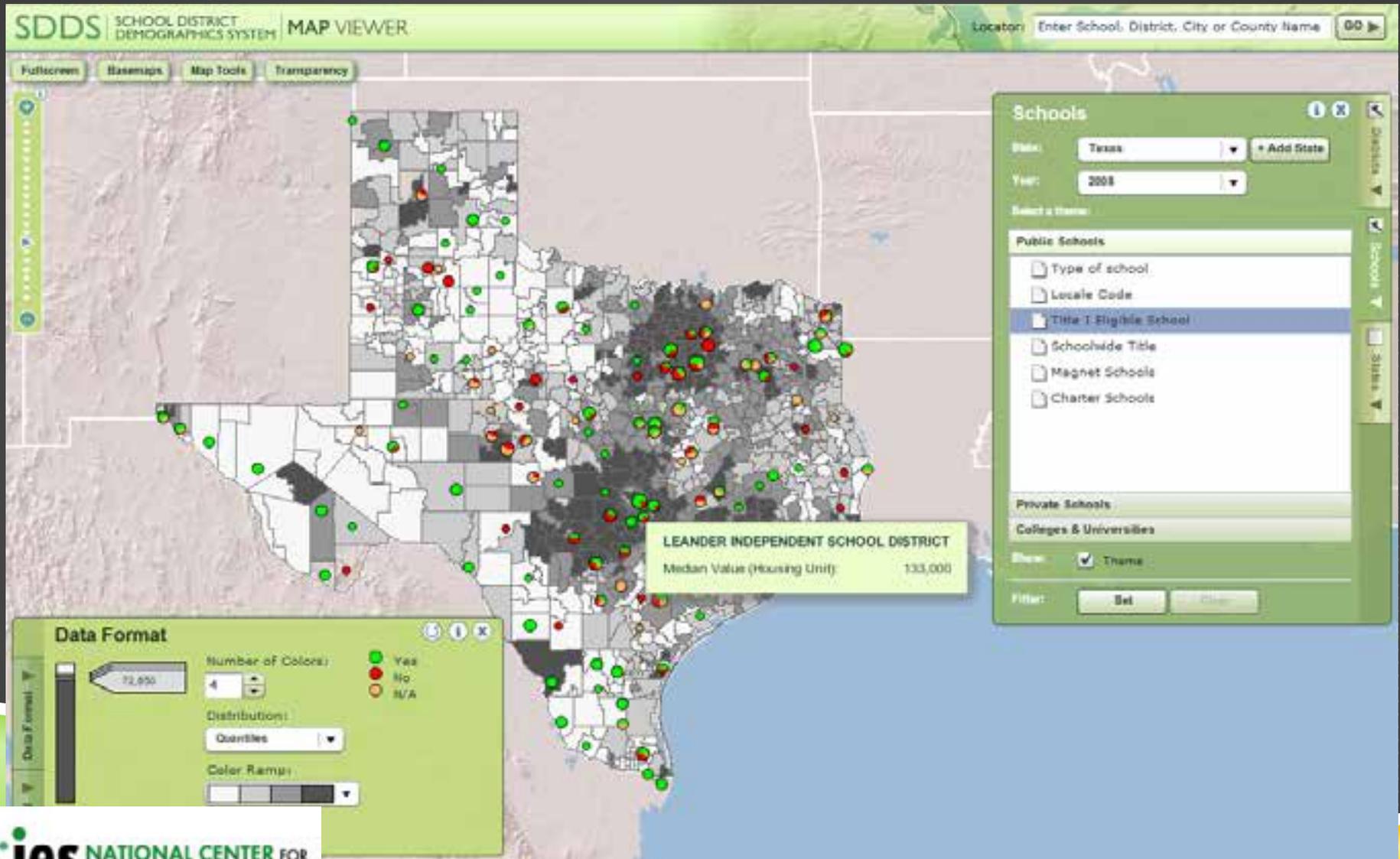
[Start Map Viewer Mobile](#)

### Snapshot Reports



Snapshot Reports provide a quick overview of the demographics, economics, financials, occupation and employment American Community Survey (ACS) and Common Core of Data (CCD) at the

# SCHOOL DISTRICT DEMOGRAPHIC SYSTEM



# PUBLIC SCHOOL BOUNDARY COLLECTION AND VERIFICATION TOOL

## Public School Boundary Collection and Verification System

Hello, John Doe [Logout](#)

[Dashboard](#) | [Tutorial](#) | [FAQ](#) | [Contact](#)

### 1 Elementary Schools

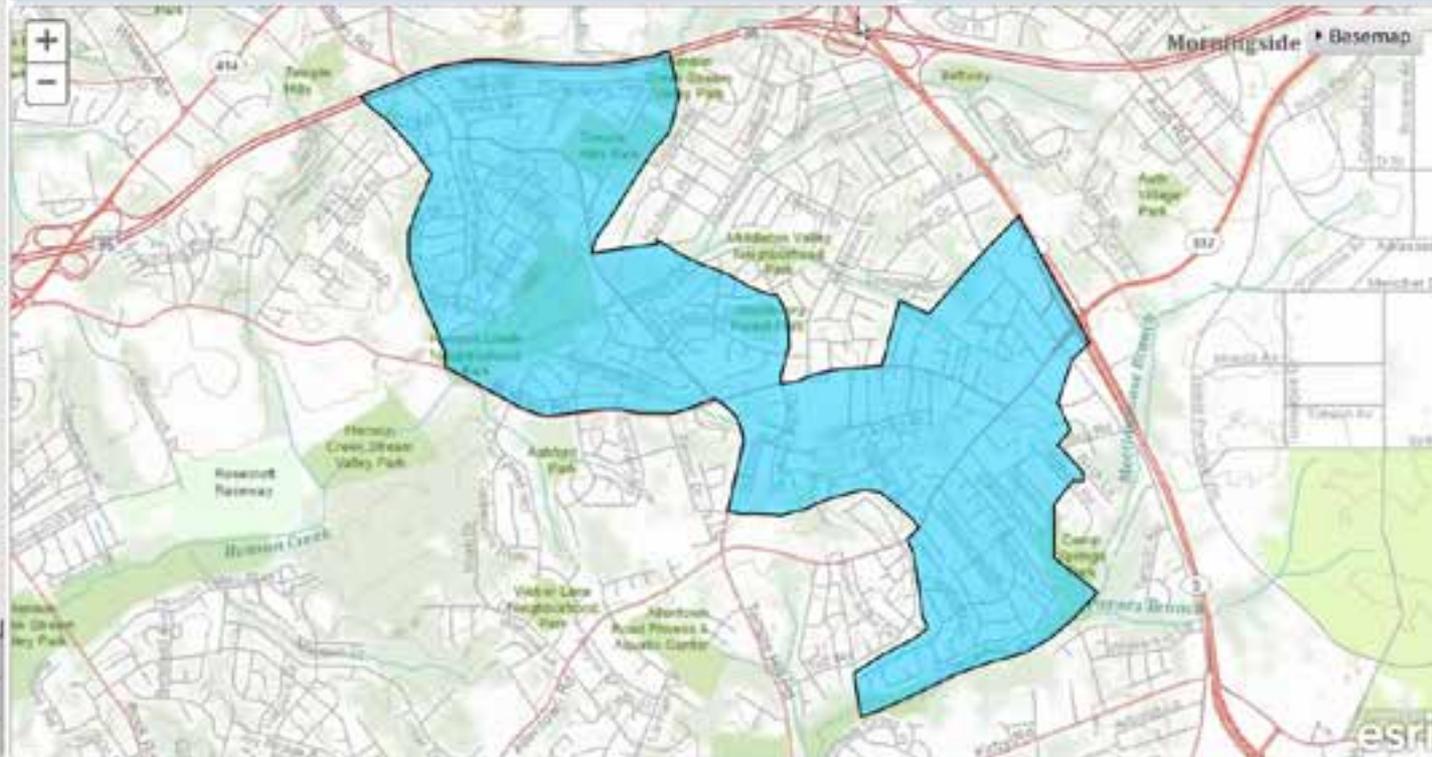
- adelphi elementary  
240051000965
- allenwood elementary  
240051000966**
- apple grove elementary  
240051000969
- ardmore elementary  
240051000970
- arrowhead elementary  
240051000971
- avalon elementary  
240051000972
- baden elementary  
240051000973
- barnaby manor elementary  
240051000974
- beacon heights elementary  
240051000975
- beltsville academy  
240051000978
- berwyn heights elementary  
240051001272
- bladensburg elementary

- Middle Schools
- High Schools
- Other Schools

**ALLENWOOD ELEMENTARY** has boundaries submitted for the 2011 – 2012 school year  
Do you want to make changes to the boundary for the 2013 – 2014 school year?

Draw

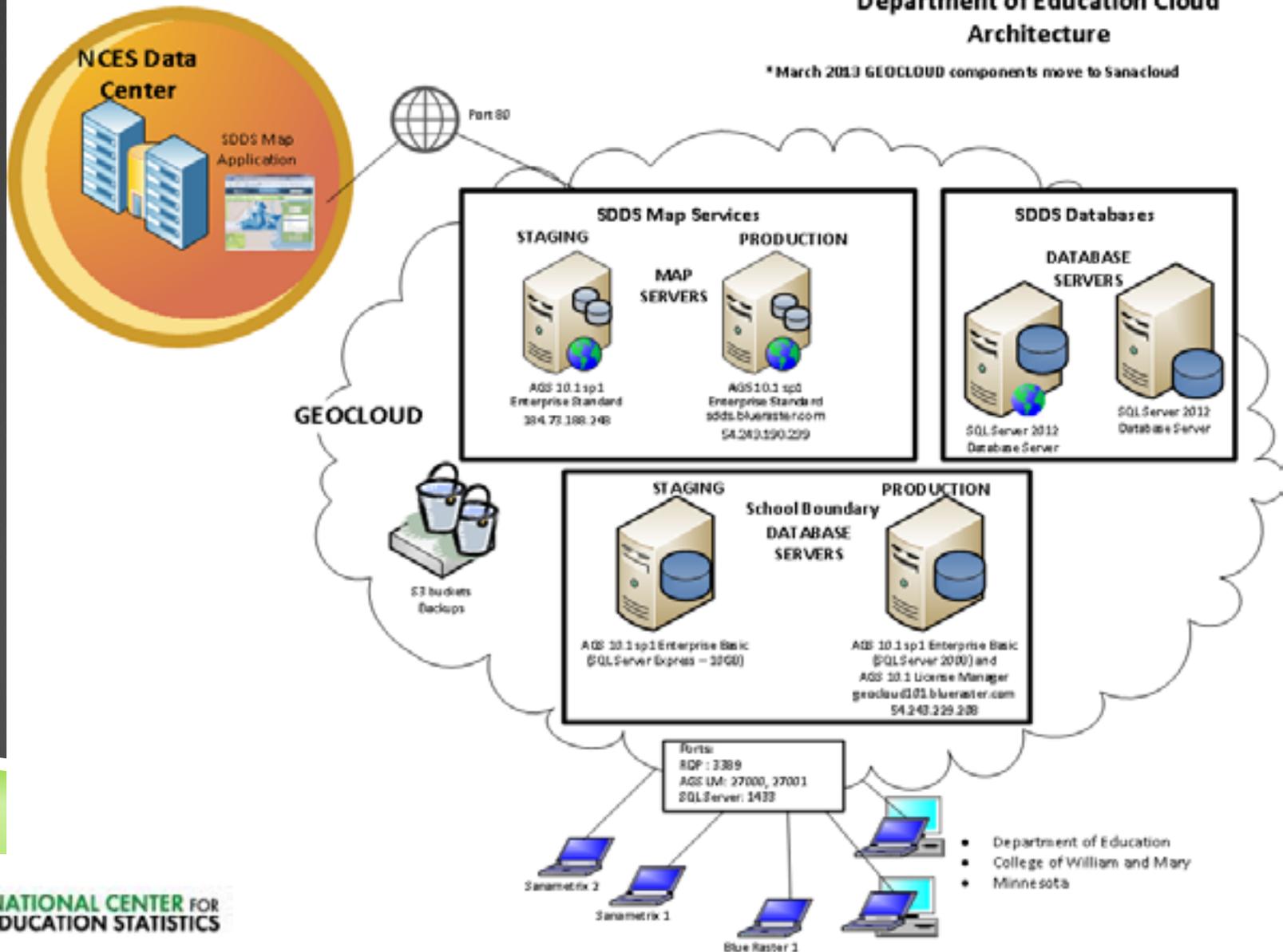
Keep Existing



# GEOCLOUD ARCHITECTURE

## Department of Education Cloud Architecture

\* March 2013 GEOCLOUD components move to Sanacloud



# PLANNING

- q Costs to project for expansion:
  - q Operating hours – Reserved instances
  - q BYOL for RDS and AMIs with database
  - q ArcGIS licensing
- q Disk space
  - q ~ 40 GB taken by OS and Programs
- q Support forums or paid support
  - q Amazon staff active in forums
- q Amazon restrictions:
  - q Elastic IPs – Limit of 5
  - q Security groups – Can't change once applied
  - q SMTP – Undisclosed limit, consider Simple Email Service (SES)



# SERVER CONFIGURATION – AWS CONSOLE

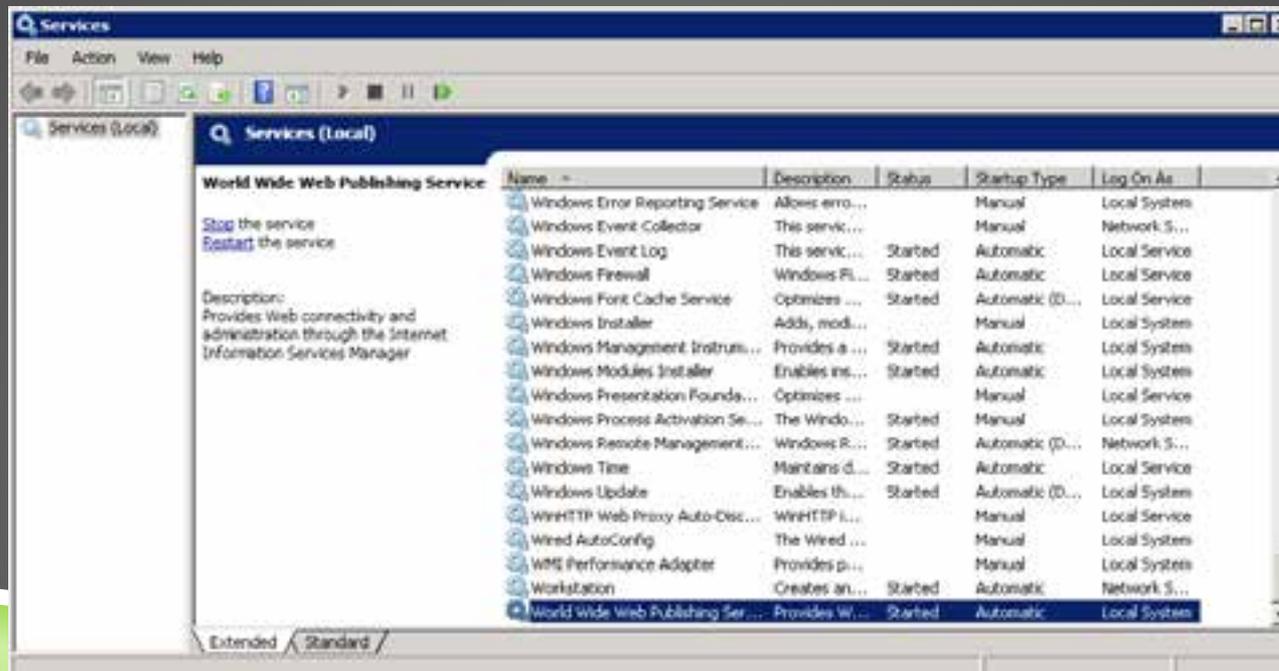
The screenshot displays the AWS Management Console interface for the 'Request Instances Wizard'. The wizard is currently on the 'CHOOSE AN AMI' step. The 'Community AMIs' tab is selected, and the search filter is set to 'esri'. A table of AMIs is shown, with a red arrow pointing to the second row, 'ami-19199370'.

AMI ID	Root Device	Manifest	Platform
ami-149d387d	ebs	248675906072/Esri ArcGIS 10.1 Server with SQL Express (June 2012)	Win
ami-19199370	ebs	248675906072/Esri ArcGIS 10.1 SP1 for Server with SQL Server (Jan 2013)	Win
ami-96cb75ff	ebs	248675906072/Esri ArcGIS 10.1 SP1 for Server on Ubuntu with Postgresql (Oct 2012)	Ubu
ami-c89d38a1	ebs	248675906072/Esri ArcGIS 10.1 Server with SQL Server (June 2012)	Win
ami-e066c389	ebs	248675906072/Esri ArcGIS 10.1 Server on Ubuntu with Postgresql (June 2012)	Ubu
ami-019939a	ebs	248675906072/Esri ArcGIS 10.1 SP1 for Server with SQL Server Express (Jan 2013)	Win

★ Free tier eligible if used with a micro instance. See [AWS free tier](#) for complete details and terms.

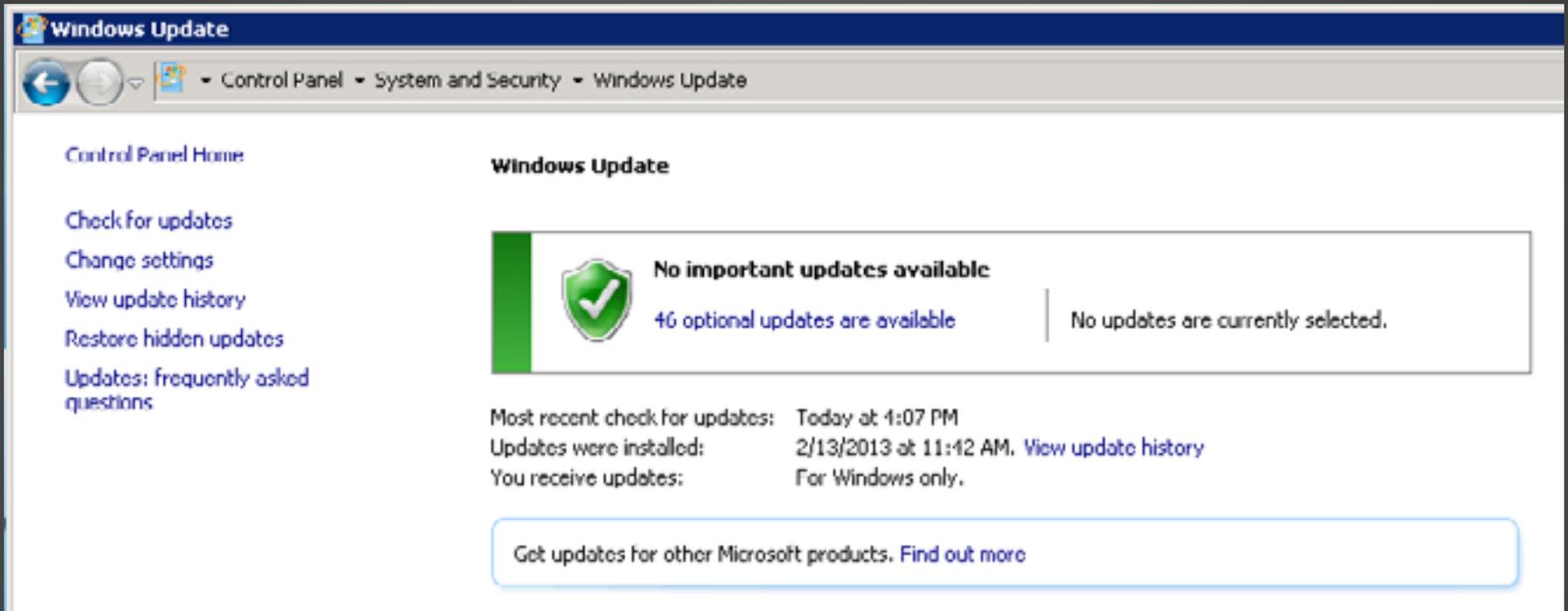
# SERVER CONFIGURATION - AGS AMI

- q Considerations for ArcGIS Server Windows 2008 Server AMI
  - q Need Web Adaptor for port 80 otherwise open port 6080 in security group
  - q WWW service turned off by default



# SERVER CONFIGURATION - UPDATES

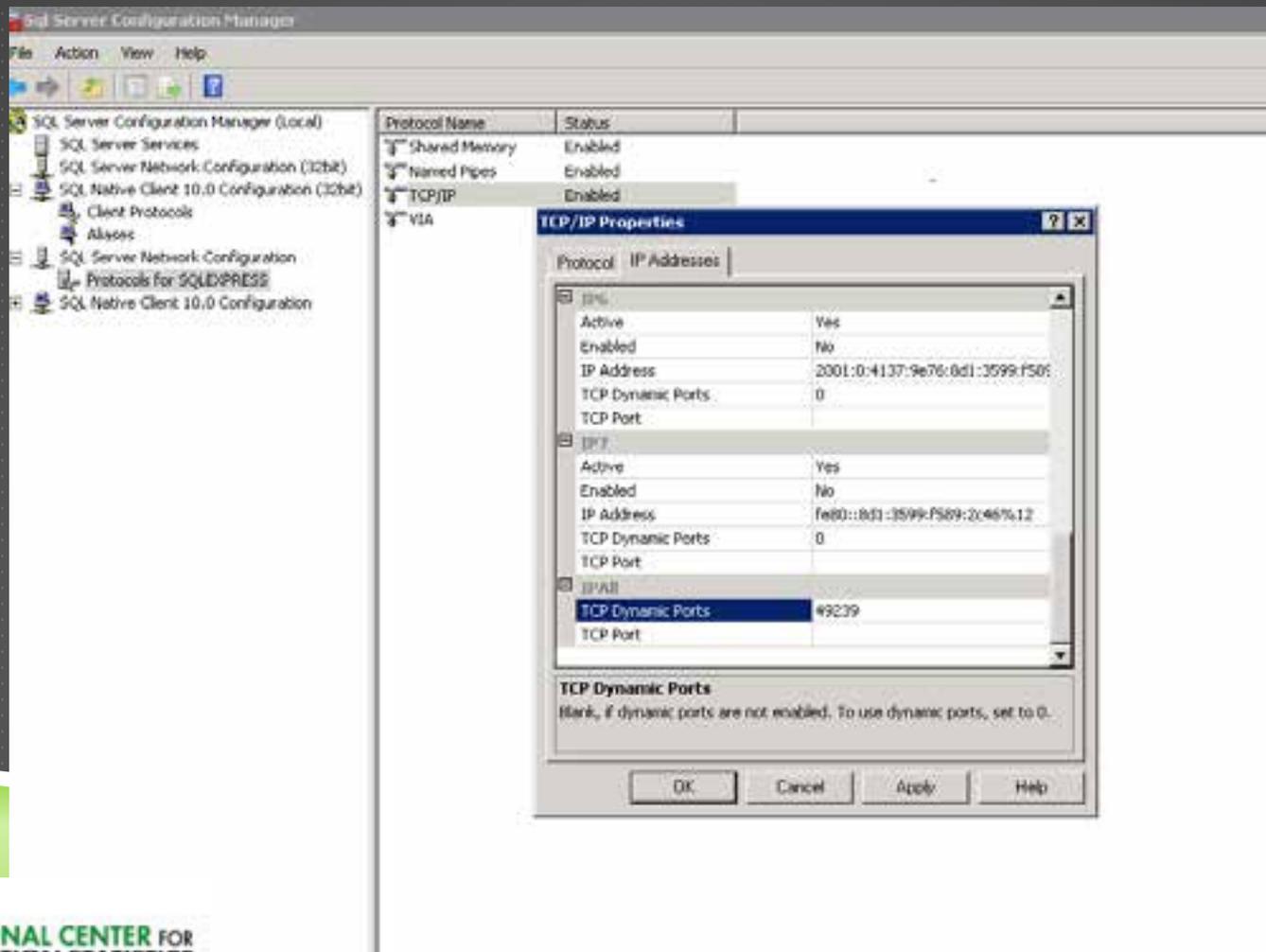
q Apply any Windows updates



The screenshot shows the Windows Update control panel window. The title bar reads "Windows Update". The breadcrumb navigation shows "Control Panel > System and Security > Windows Update". On the left, there is a sidebar with links: "Control Panel Home", "Check for updates", "Change settings", "View update history", "Restore hidden updates", and "Updates: frequently asked questions". The main content area is titled "Windows Update" and features a green shield icon with a white checkmark. The status message reads: "No important updates available" and "46 optional updates are available". To the right of this message, it says "No updates are currently selected." Below this, there is a summary of update activity: "Most recent check for updates: Today at 4:07 PM", "Updates were installed: 2/13/2013 at 11:42 AM, View update history", and "You receive updates: For Windows only." At the bottom, there is a button that says "Get updates for other Microsoft products. Find out more".

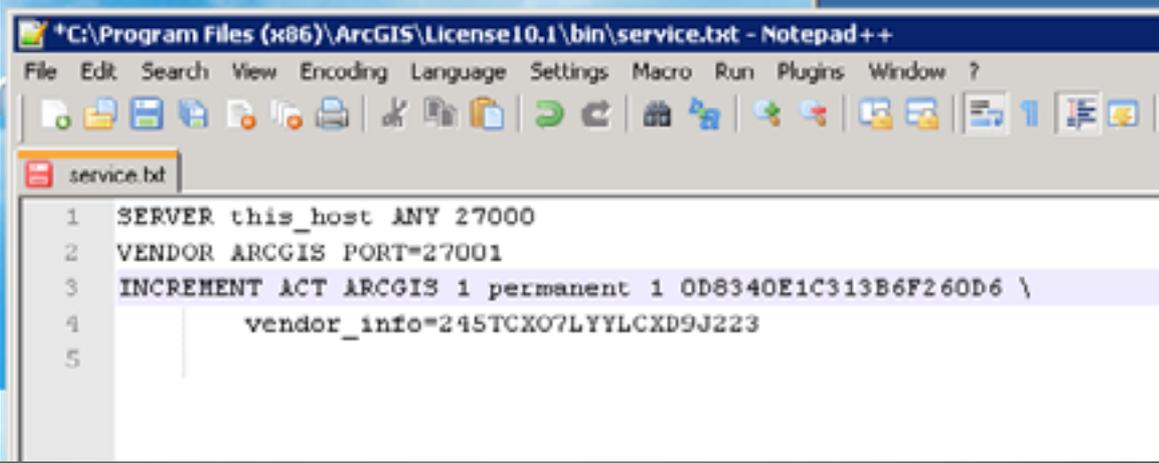
# SERVER CONFIGURATION - PORTS

- q Lock down SQL Server Express dynamic port setting to 1433



# SERVER CONFIGURATION - PORTS

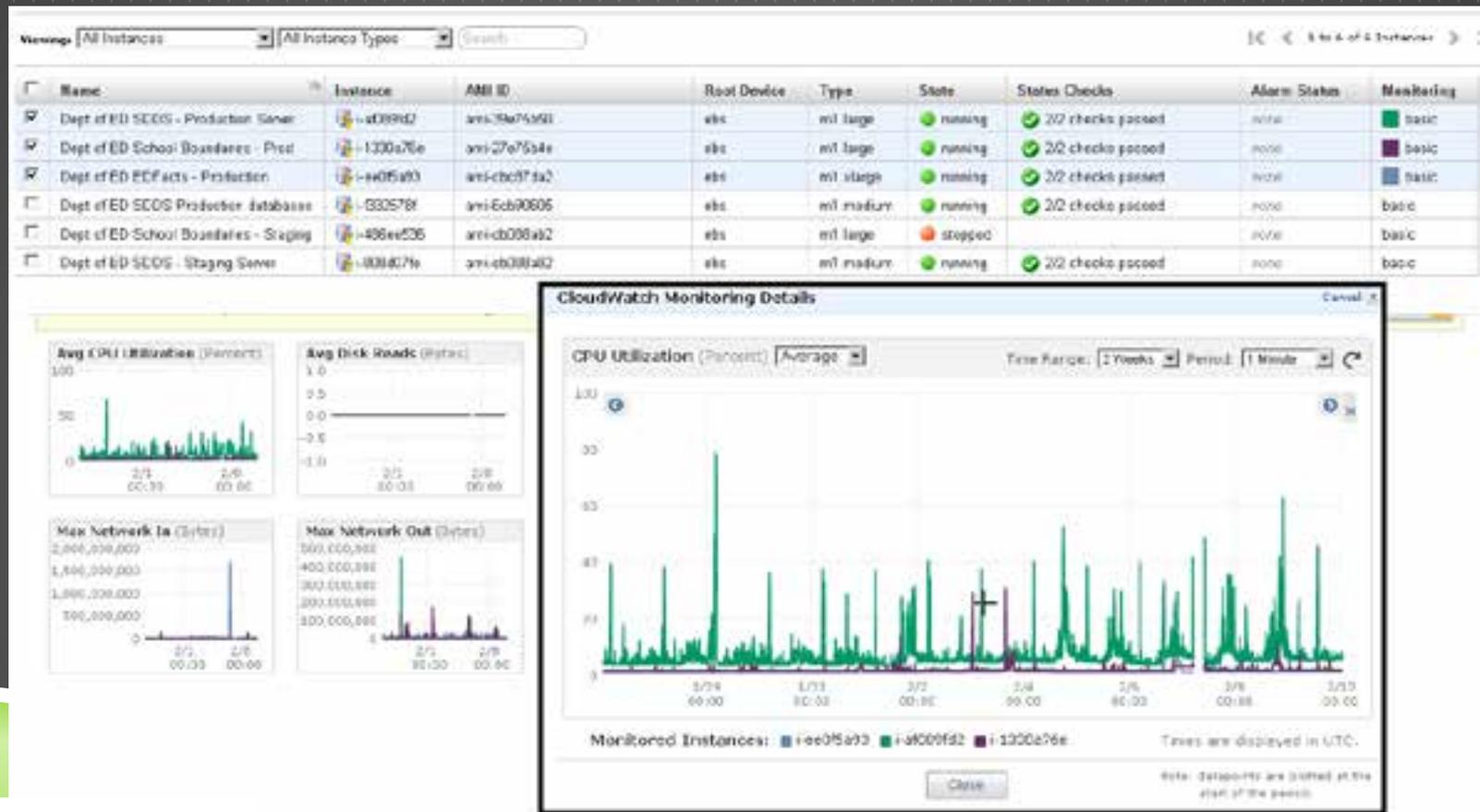
- q ArcGIS license manager is based on machine ID
  - q ID will change when used as an AMI template
- q Lock down the license manager ports to 27000 and 27001



```
+C:\Program Files (x86)\ArcGIS\License10.1\bin\service.txt - Notepad++
File Edit Search View Encoding Language Settings Macro Run Plugins Window ?
service.txt
1 SERVER this_host ANY 27000
2 VENDOR ARCGIS PORT=27001
3 INCREMENT ACT ARCGIS 1 permanent 1 OD8340E1C313B6F260D6 \
4 vendor_info=245TCXO7LYYLCXD9J223
5
```

# MONITORING

- q System/instance Status Checks - 2/2 checks
- q Can create status check alarm



# MONITORING

q Amazon Service Health Dashboard

Amazon Elastic Compute Cloud (N.Virginia)

<http://status.aws.amazon.com/>



q Website monitoring

pingdom



# SCALING CONSIDERATIONS



# BACKUP STRATEGY

## Severe storms cause Amazon Web Services outage

by Om Malik JUN. 29, 2012 - 9:36 PM PST

 19 Comments    +1 

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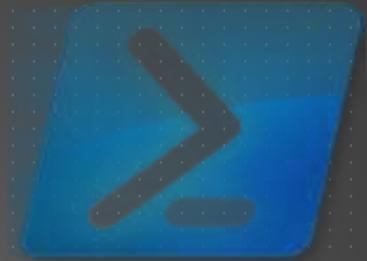
*SUMMARY: For second time in less than a month, Amazon's Northern Virginia data center has suffered an outage and is impacting many popular services such as Instagram, Pinterest & Netflix. Amazon previously suffered an outage in its Northern Virginia facilities on June 14, 2012.*

 [tweet this](#)



# BACKUP STRATEGY

- q Instance backups
  - q Powershell scripts
    - q <http://messor.com> : AWS Disaster Recovery Automation
    - q Scheduled task on Micro instance Windows 2008 server
    - q Daily volume snapshots
    - q Weekly AMIs
    - q Clean up snapshots and AMIs
- q Database backup to S3
  - q Using Cloudberry and Powershell



# SECURITY – AMAZON LEVEL

- q May, 2013 AWS received ATO from the Department of Health and Human Services FedRAMP at the Moderate impact level for AWS GovCloud (U.S.) and all U.S. Regions
- q AWS admins
  - q All accesses logged and audited
  - q Cannot log in to instances
- q EC2 Instance isolation on physical machine
  - q Use VPC for dedicated instances



# SECURITY – IAM CONSOLE

- q Control users and groups within account
- q Unique security credentials for access keys and login/passwords

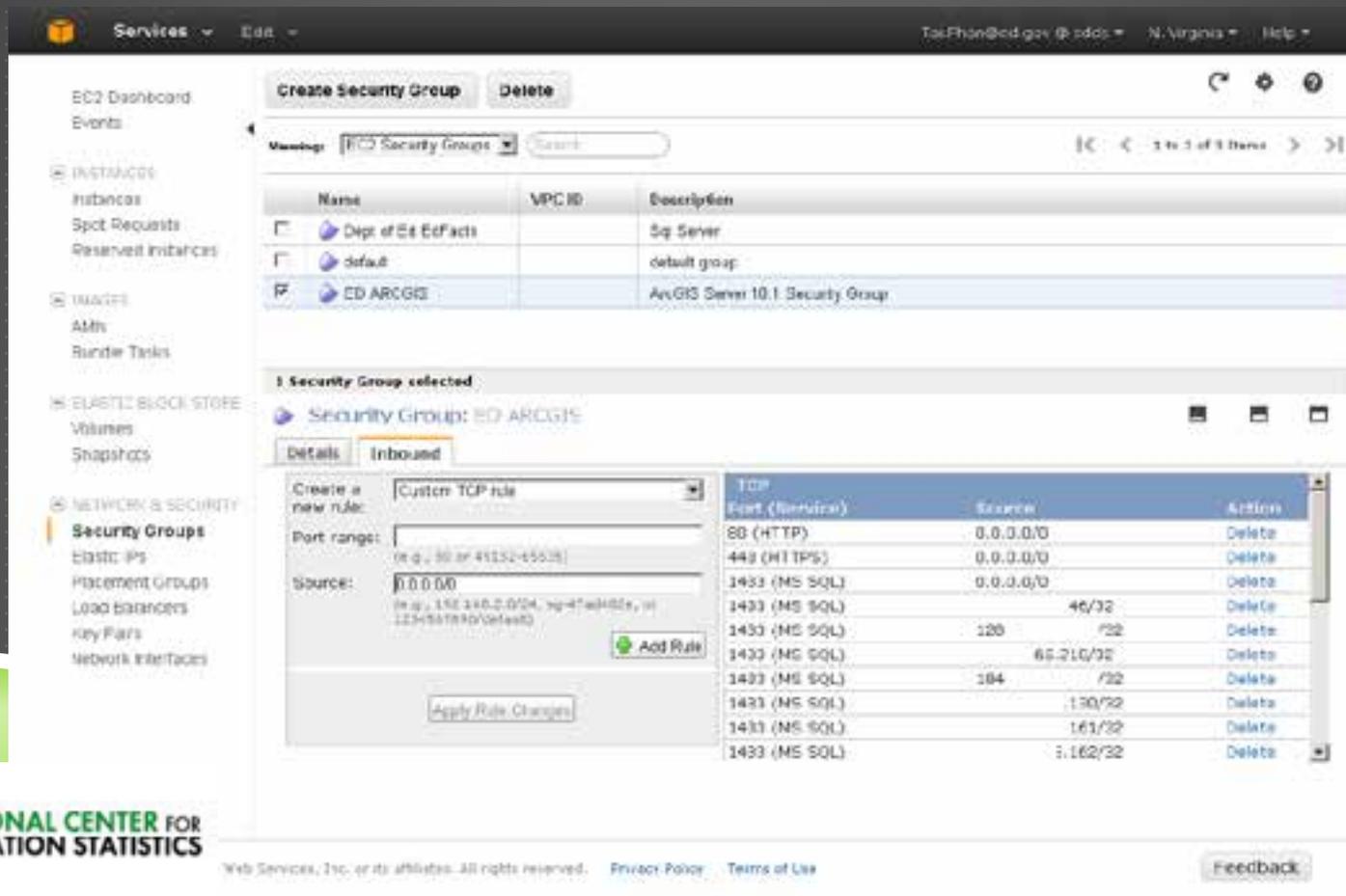
The screenshot displays the AWS IAM console dashboard. At the top, there is a navigation bar with 'Services' and 'Exit' on the left, and the user 'Tai Phan@ed.gov @ sdds' with 'Global' and 'Help' on the right. The main content area is divided into several sections:

- Getting Started:** A yellow banner with the text 'AWS Identity and Access Management (IAM) enables you to manage access to your AWS resources.' and a button 'Create a New Group of Users'.
- What Are Users?:** Explains that users interact with websites and services.
- What Are Groups?:** Explains that groups enable you to manage permissions for multiple users.
- What Are Permissions?:** Explains that permissions specify which actions a user can perform.
- What Are Roles?:** Explains that roles allow AWS services and IAM users to act on your behalf.
- Security Status:** Shows 'Root account MFA' as 'Disabled' and 'Password Policy' as 'Enabled'. There is a 'Manage Password Policy' button.
- IAM Resources:** Lists '5 Groups', '10 Users', and '0 Roles'.
- AWS Account Alias:** Shows 'Your AWS Account Alias is sdds' and provides an IAM users sign-in link: 'https://sdds.signin.aws.amazon.com/console'. There is a 'Remove Account Alias' button.
- IAM Documentation:** Lists links for 'IAM Getting Started Guide', 'Using IAM', 'IAM CLI Reference', 'IAM API Reference', and 'Report an Issue'.

At the bottom of the console, there is a footer with 'Feedback' and 'Privacy Policy' links.

# SECURITY – INBOUND RULES

- q Inbound network traffic controlled through security groups
  - q Ports 80 and 443 only open to the internet
  - q RDP 3389, MS SQL 1433, ArcGIS License Manager 27000, 27001 ports by IP



The screenshot displays the AWS Management Console interface for configuring a Security Group. The 'Inbound' tab is selected, showing a list of rules. The 'Port range' field is set to 'Custom TCP rule'. The 'Source' field is set to '0.0.0.0'. The 'Add Rule' button is visible. The table below shows the current rules for the security group.

Protocol	Port (Service)	Source	Actions
TCP	80 (HTTP)	0.0.0.0/0	Delete
TCP	443 (HTTPS)	0.0.0.0/0	Delete
TCP	1433 (MS SQL)	0.0.0.0/0	Delete
TCP	1433 (MS SQL)	46/32	Delete
TCP	1433 (MS SQL)	120	Delete
TCP	1433 (MS SQL)	65.210/32	Delete
TCP	1433 (MS SQL)	184	Delete
TCP	1433 (MS SQL)	130/32	Delete
TCP	1433 (MS SQL)	161/32	Delete
TCP	1433 (MS SQL)	3.162/32	Delete

# FUTURE PLANS

- q Transition instances to NCES cloud environment
- q Migrate front-facing applications to NCES cloud
- q Achieve FISMA C&A for Low Impact/Low Risk system

# GAL (GIANT ACRONYM LIST)

- 1) AGS – ArcGIS Server
- 2) AMI - Amazon Machine Images
- 3) ATO – Authority to Operate
- 4) AWS – Amazon Web Services
- 5) BYOL - Bring Your Own License
- 6) C&A - Certification and Accreditation
- 7) EC2 - Elastic Cloud Compute
- 8) FedRAMP – Federal Risk and Authorization Management Program
- 9) FISMA - Federal Information Security Management Act of 2002
- 10) HHS – Department of Health and Human Services
- 11) IAM – Identity and Access Management
- 12) RDP - Remote Desktop Protocol
- 13) RDS - Relational Database Service
- 14) S3 - Simple Storage Service
- 15) SES – Simple Email Service
- 16) SMTP - Simple Mail Transfer Protocol
- 17) VPC – Virtual Private Cloud

# FOR MORE INFORMATION:



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