



# Deploying Apps to the Cloud

Larry Boden

Erin Ross

# Agenda

- Cloud Overview
- ArcGIS Cloud Deployment Models
- Patterns and Use Cases
- Options and Considerations
- Challenges and Lessons Learned

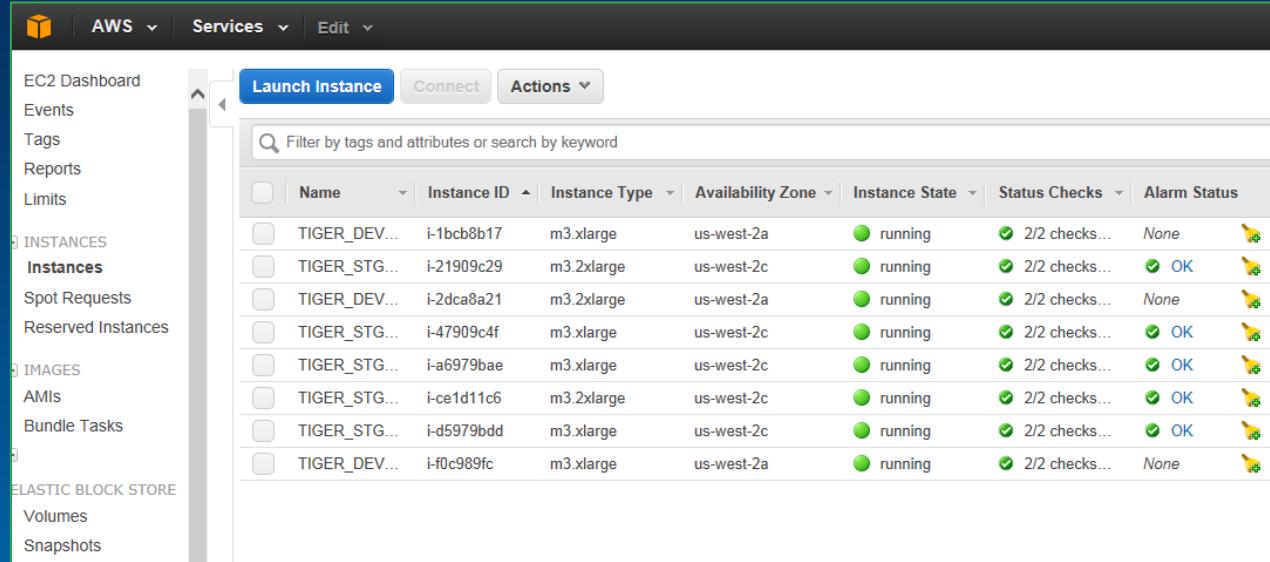
# Cloud Overview

# Cloud Service Models

Cloud Type	NIST Definition (summary)
Infrastructure as a Service (IaaS)	<p>The capability provided to the consumer is to <b>provision processing, storage, networks, and other fundamental computing resources</b> where the consumer is able to deploy and <b>run arbitrary software</b>, which can include operating systems and applications. The consumer does not manage or control the underlying cloud infrastructure but has control over operating systems, storage, and deployed applications; and possibly limited control of select networking components (e.g., host firewalls).</p>
Platform as a Service (PaaS)	<p>The <b>capability provided to the consumer is to deploy onto the cloud infrastructure</b> consumer-created or acquired applications created <b>using programming languages, libraries, services, and tools supported by the provider</b>. The consumer does not manage or control the underlying cloud infrastructure including network, consumer servers, operating systems, or storage, but has control over the deployed applications and possibly configuration settings for the application-hosting environment.</p>
Software as a Service (SaaS)	<p>The capability provided to the consumer is to <b>use the provider's applications running on a cloud infrastructure</b>. The applications are accessible from various client devices through either a thin client interface, such as a web browser (e.g., web-based email), or a program interface. The consumer does not manage or control the underlying cloud infrastructure including network, servers, operating systems, storage, or even individual application capabilities, with the possible exception of limited user-specific application configuration settings.</p>

# Infrastructure as a Service (IaaS)

- Managed infrastructure
  - Hardware
  - Storage
  - Load Balancing
  - Etc.
- Self-provisioning
  - Virtual Machines
  - Bare Metal
- Pay for what you use



The screenshot shows the AWS EC2 Dashboard. On the left, there's a sidebar with links for EC2 Dashboard, Events, Tags, Reports, and Limits. Under 'INSTANCES', it says 'Instances' and lists several entries. Each entry includes a checkbox, the instance name (e.g., TIGER\_DEV...), the instance ID (e.g., i-1bcb8b17), the instance type (e.g., m3.xlarge), the availability zone (e.g., us-west-2a), the state (e.g., running), the number of status checks (e.g., 2/2 checks...), and the alarm status (e.g., None). Most instances show 'OK' for status checks and 'None' for alarm status.

Name	Instance ID	Instance Type	Availability Zone	Instance State	Status Checks	Alarm Status
TIGER_DEV...	i-1bcb8b17	m3.xlarge	us-west-2a	running	2/2 checks...	None
TIGER_STG...	i-21909c29	m3.2xlarge	us-west-2c	running	2/2 checks...	OK
TIGER_DEV...	i-2dca8a21	m3.2xlarge	us-west-2a	running	2/2 checks...	None
TIGER_STG...	i-47909c4f	m3.xlarge	us-west-2c	running	2/2 checks...	OK
TIGER_STG...	i-a6979bae	m3.xlarge	us-west-2c	running	2/2 checks...	OK
TIGER_STG...	i-ce1d11c6	m3.2xlarge	us-west-2c	running	2/2 checks...	OK
TIGER_STG...	i-d5979bdd	m3.xlarge	us-west-2c	running	2/2 checks...	OK
TIGER_DEV...	i-f0c989fc	m3.xlarge	us-west-2a	running	2/2 checks...	None



verizon  
terremark

# Platform as a Service (PaaS)

- Infrastructure + software / tools
- Developers create applications on the provider's platform over the Internet
- Pay for what you use



# Software as a Service (SaaS)

- Infrastructure + platform + software / custom apps
- Examples
  - Salesforce.com
  - ArcGIS Online

The image shows two screenshots side-by-side. The left screenshot is the homepage of ArcGIS Online, featuring a background image of a city skyline with various data overlays like heatmaps and network lines. The header includes 'ArcGIS' with a dropdown, 'FEATURES', 'PLANS', 'GALLERY', 'MAP', 'SCENE', 'HELP', a search bar, and a 'Sign In' button. The main text reads 'Put Your Maps to Work with ArcGIS, the Mapping Platform for Your Organization'. Below the text are 'Try ArcGIS' and 'What Is ArcGIS?' buttons. The right screenshot is the Salesforce login page, showing a blue-themed interface with a 'salesforce' logo, input fields for 'Username' and 'Password', a 'Log in to Salesforce' button, and checkboxes for 'Remember Username' and 'Forgot your password? | Sign up for free.'. It also includes links for 'Log in to a custom domain.', 'GET THE FREE E-BOOK', and a 'service cloud' logo. The bottom section features a banner for 'Expert Hour: The Secret Sauce to Improving Agent Productivity by 40%' with a 'REGISTER NOW' button and the date 'FEBRUARY 25, 2015 AT 9 A.M. PST'.

# Cloud Deployment Models

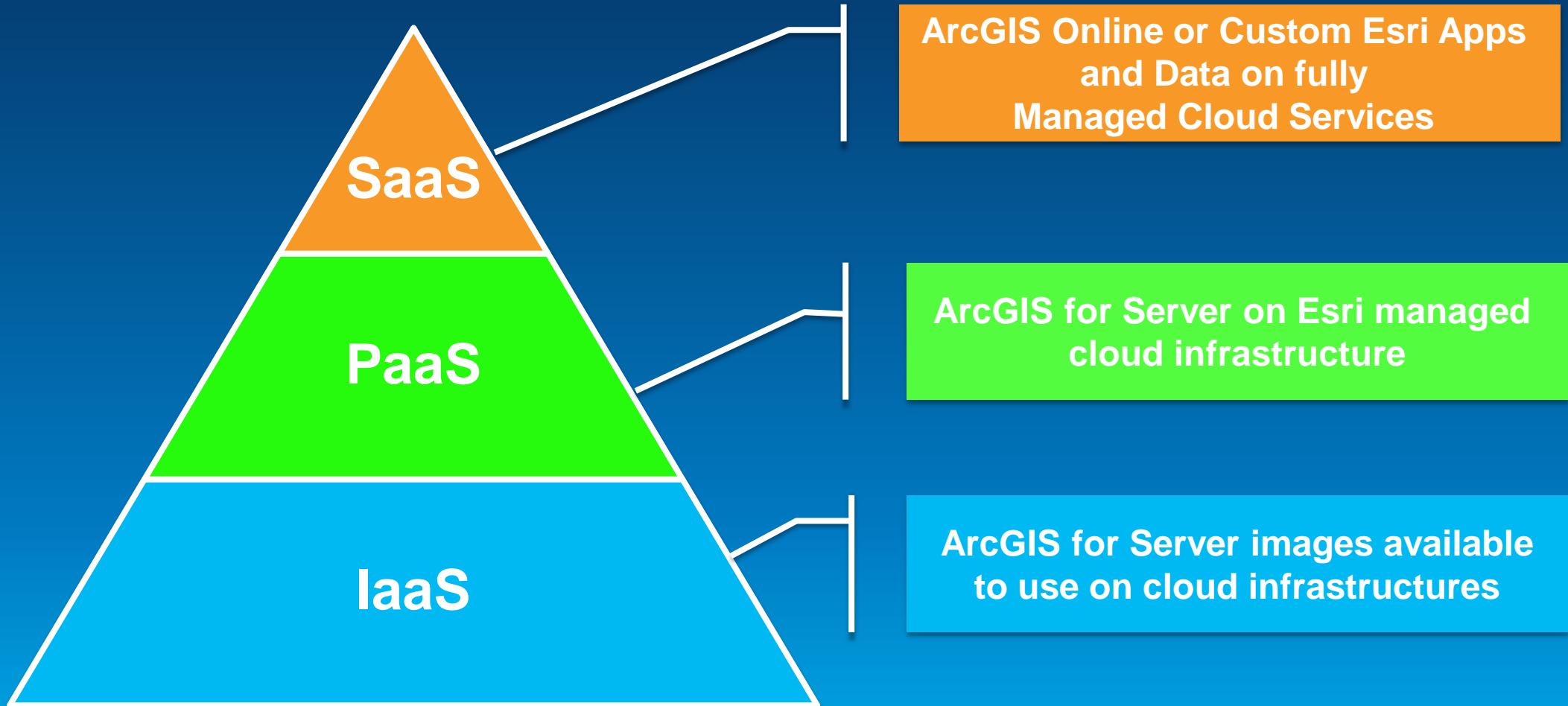
Cloud Type	NIST Definition(summary)
Public	Public cloud. The cloud infrastructure is provisioned for <b>open use by the general public</b> . It may be owned, managed, and operated by a business, academic, or government organization, or some combination of them. It exists on the premises of the cloud provider.
Private	The cloud infrastructure is provisioned for <b>exclusive use by a single organization</b> comprising multiple consumers (e.g., business units). It may be owned, managed, and operated by the organization, a third party, or some combination of them, and it may exist on or off premises.
Community	Community cloud. The cloud infrastructure is provisioned for <b>exclusive use by a specific community of consumers</b> from organizations that have shared concerns (e.g., mission, security requirements, policy, and compliance considerations). It may be owned, managed, and operated by one or more of the organizations in the community, a third party, or some combination of them, and it may exist on or off premises.
Hybrid	The cloud infrastructure is a <b>composition of two or more distinct cloud infrastructures</b> (private, community, or public) that remain unique entities, but are bound together by standardized or proprietary technology that enables data and application portability (e.g., cloud bursting for load balancing between clouds).

## Benefits of Cloud Computing

- Increase efficiency and business focus –
- High availability, quality and performance –
  - Reduce internal costs –
- Preserves data integrity, privacy and availability–
  - Increase usage and productivity –

# ArcGIS Cloud Options

# ArcGIS Cloud Options



# ArcGIS for Server on [Fill in the Blank]

- Supported on multiple cloud platforms
  - Virtual or bare metal
- Full ArcGIS for Server capabilities
- User-provisioned cloud infrastructure resources
- Pay for what you use
- BYOL or ArcGIS term licensing available



# ArcGIS Online

- Create, share, collaborate
- Subscription-based
  - Named User
  - Credits – pay as you go
- Updates and enhancements occur behind the scenes



# Esri Managed Cloud Services

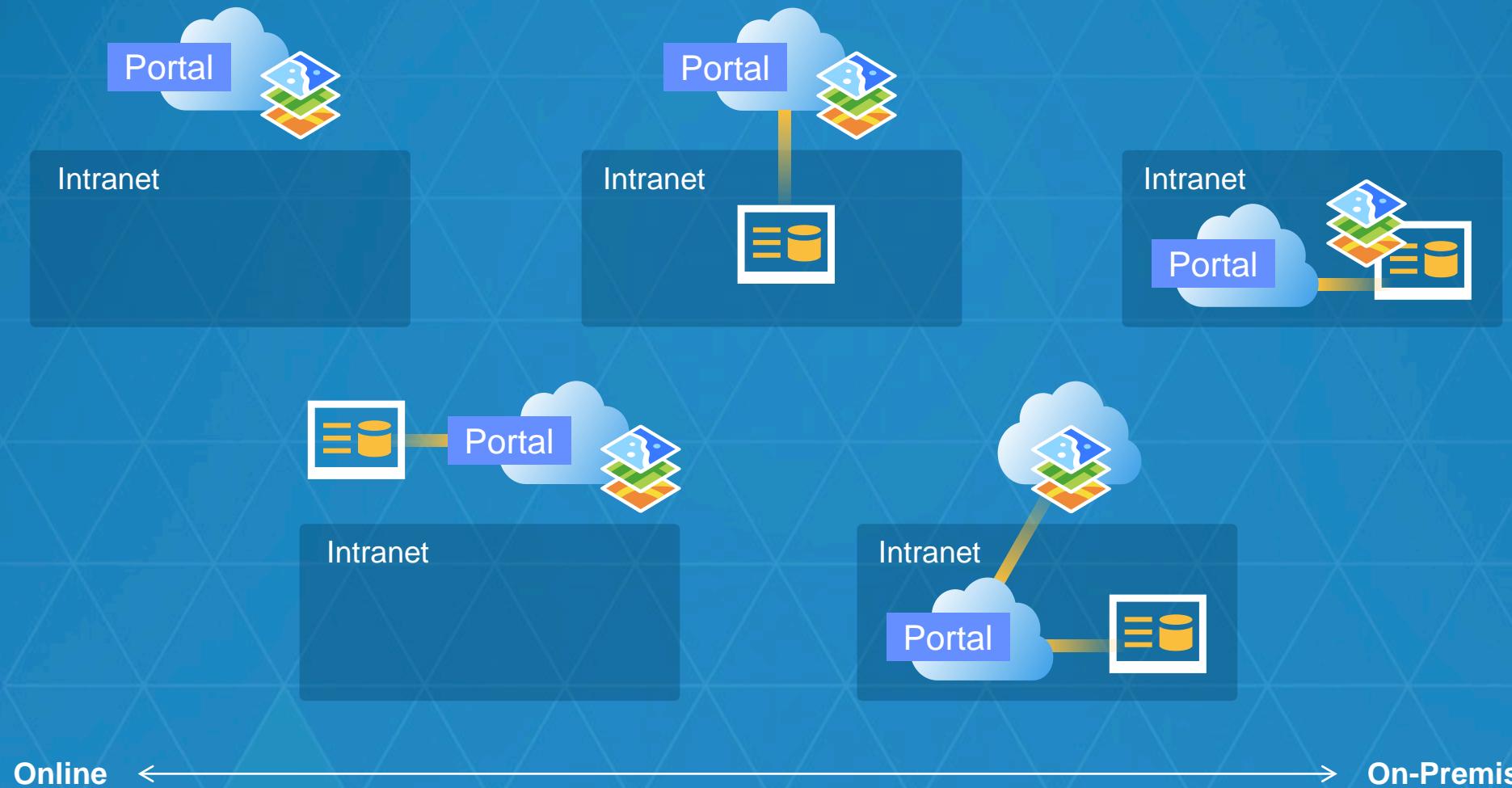
- **Cloud-based GIS infrastructure support, including:**
  - Enterprise system design
  - Infrastructure management
  - Software (Esri & 3<sup>rd</sup> Party) Installation, updates and patching
  - Application deployment
  - Database management
  - **24/7 support and monitoring**



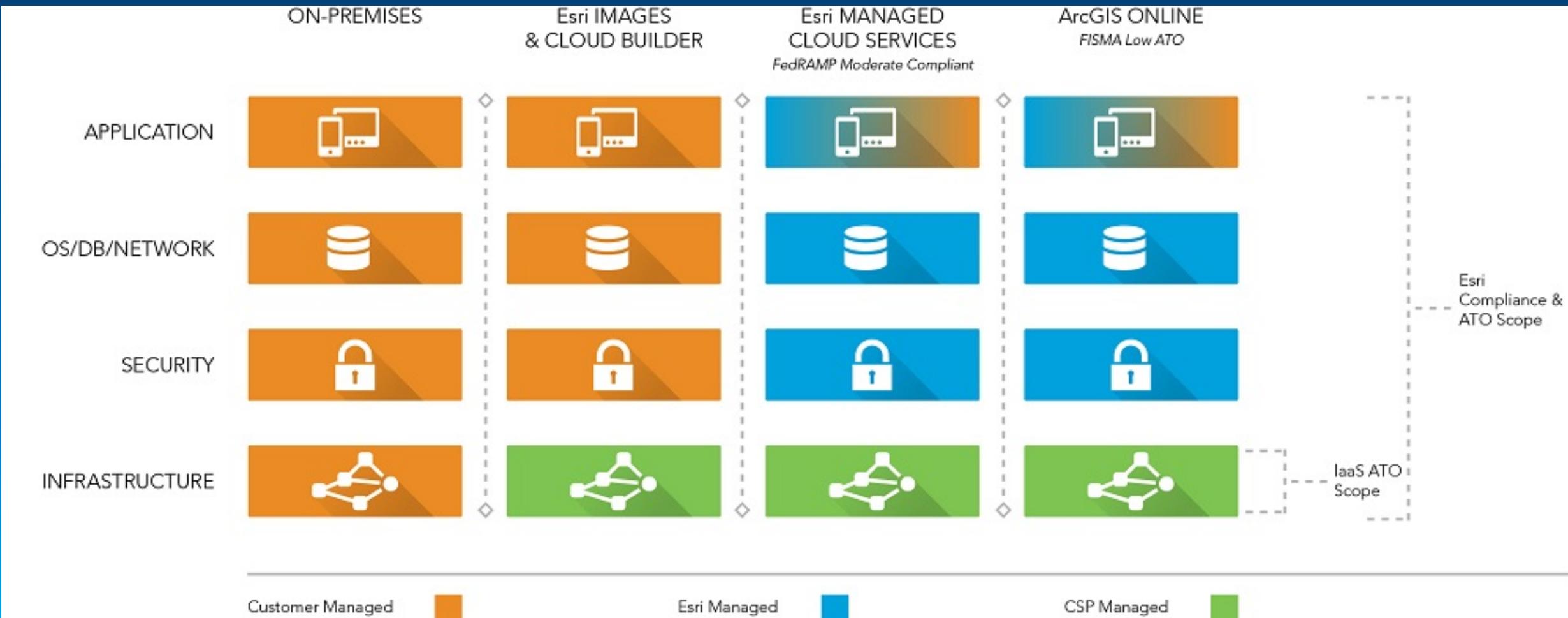
# ArcGIS Cloud Deployment Models



# Web GIS Deployment Patterns | Core Deployment Patterns

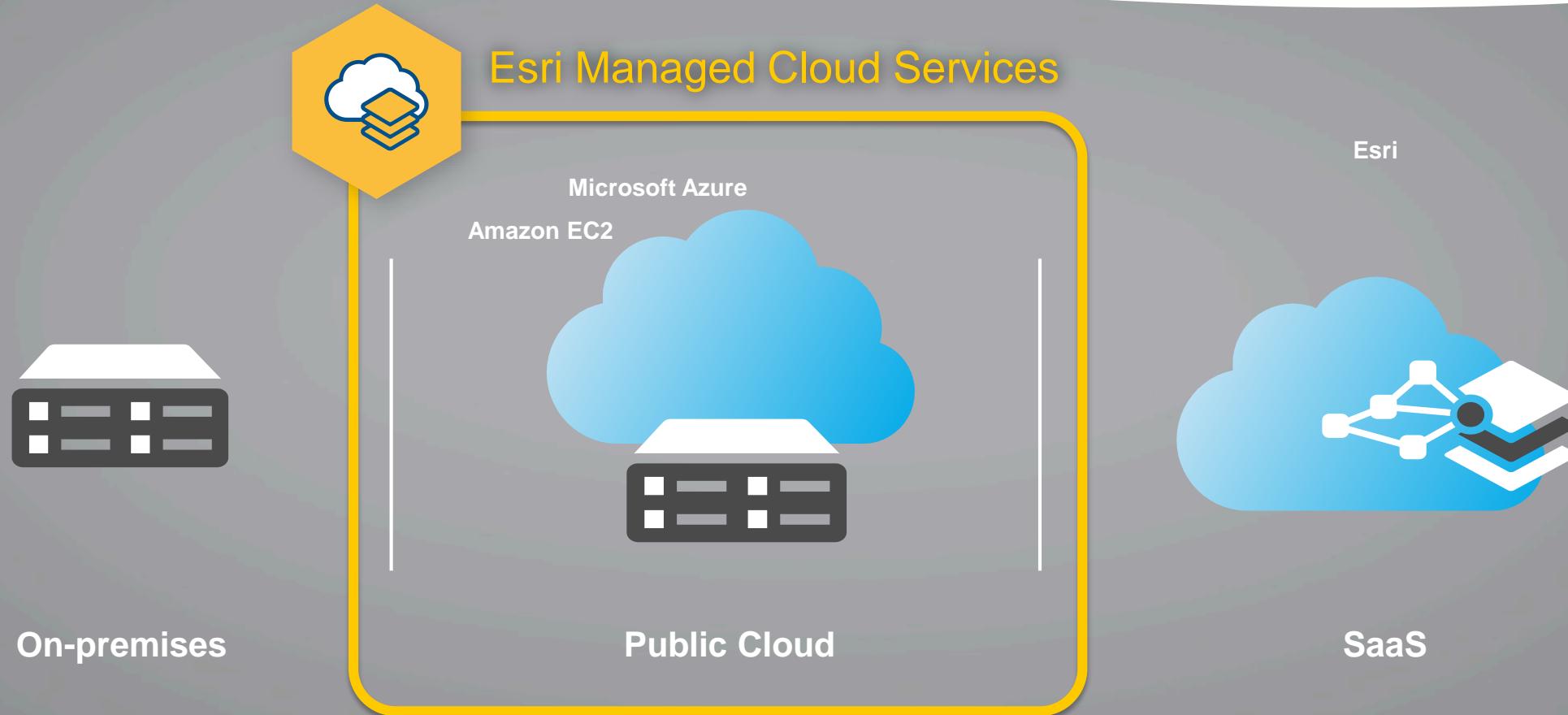


# Deployment Models



# Flexibility

► Deploy ArcGIS on-premises, in public clouds (PaaS), and/or use Esri's cloud (SaaS)

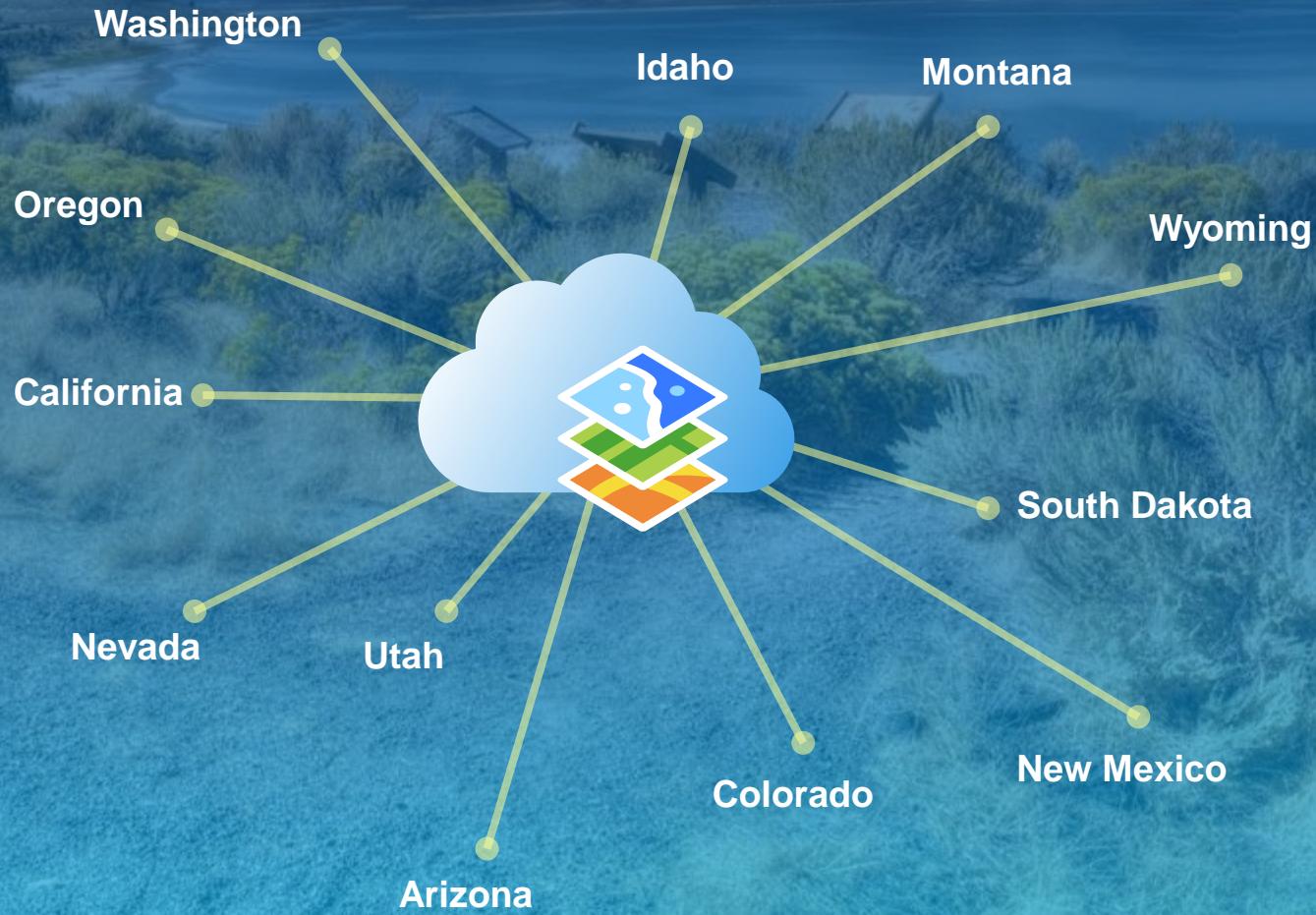


# Patterns and Use Cases

# Sandbox in the Cloud

# Data Center Consolidation Initiative

Reducing costs and improving GIS operations



3 month proof of concept

Testing day to day editing workflows

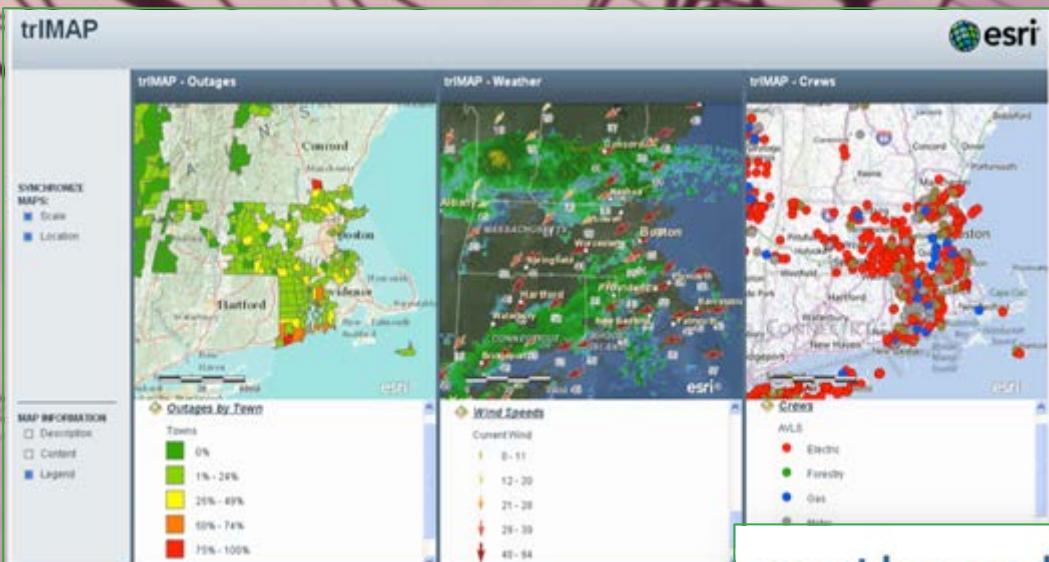
Evaluating ArcGIS for Desktop in the cloud

# Prototyping and Testing New Technology

Evaluate Prior to Making Significant Investments

Short-Term Engagements

Gain Management Buy-In and Adoption



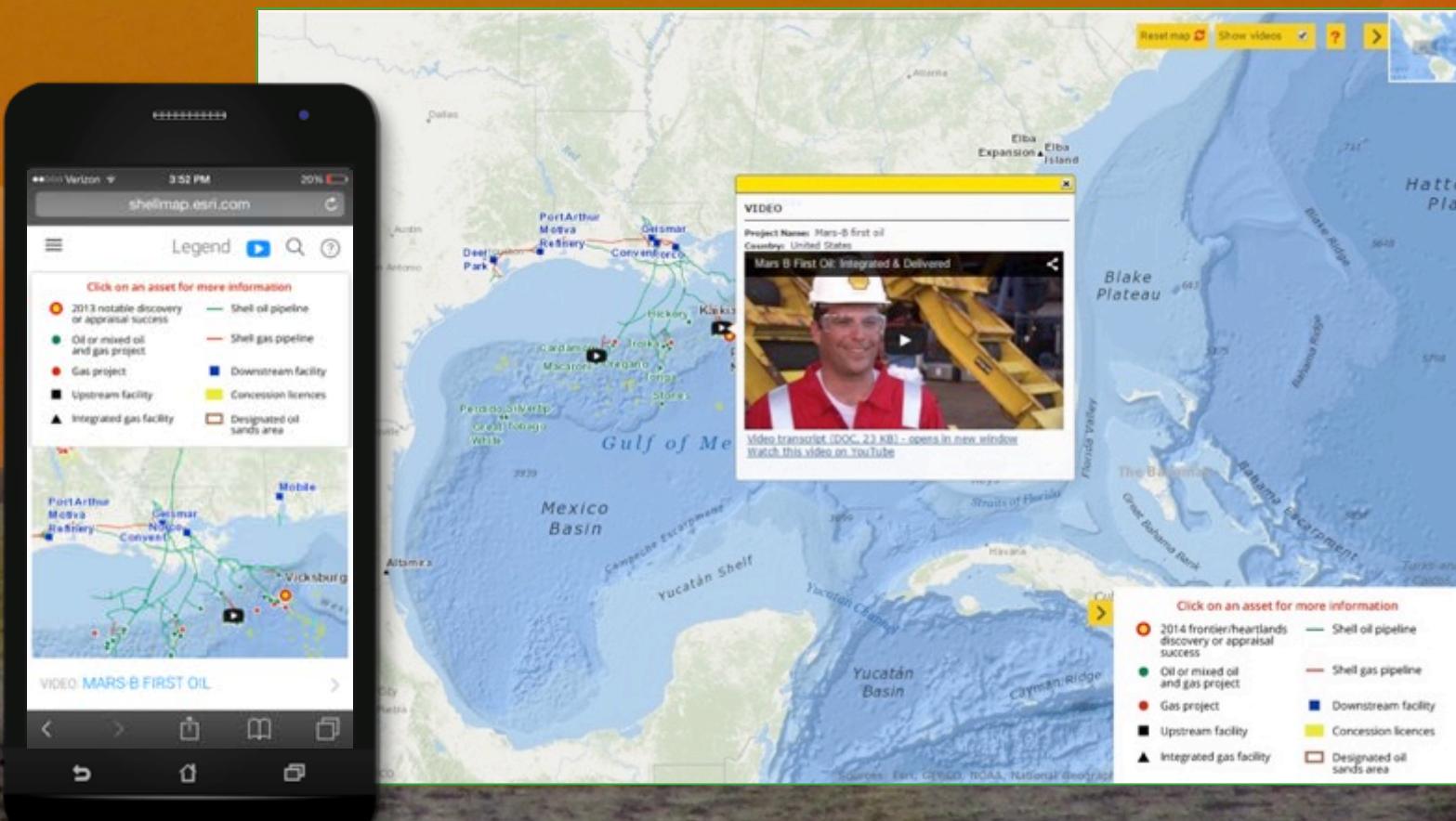
nationalgrid



# Public Facing Apps

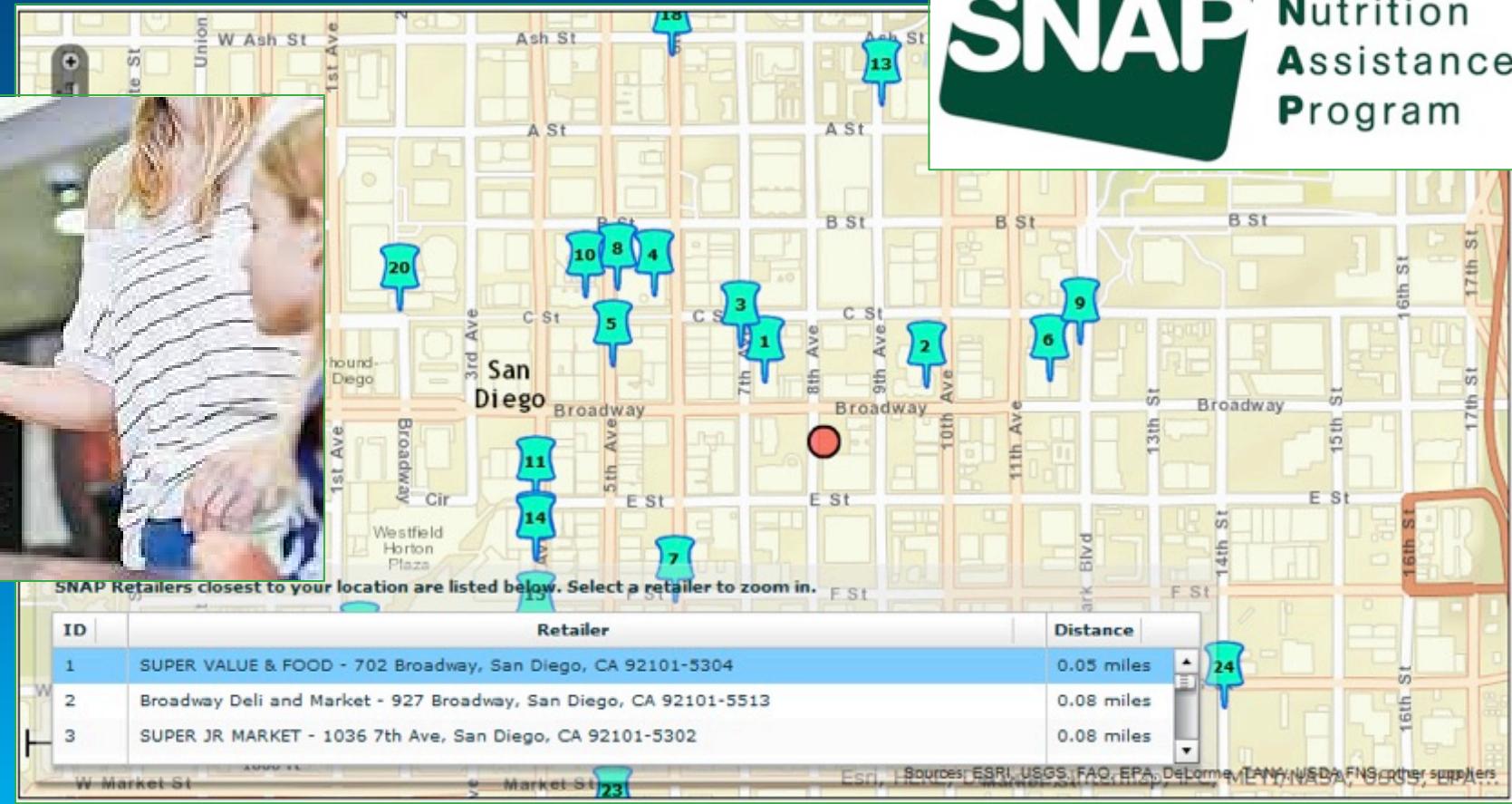
# Interactive Investor Handbook Map

## ***Sharing select information with stakeholders***



# Accessible Food Assistance Information

## ***Easy access to nutrition assistance resources***



# Business Critical Apps

# Improved Sales Execution in the Field

Rapid enablement with ArcGIS Server in the cloud



Esri-managed cloud environment

2.7 million records processed daily

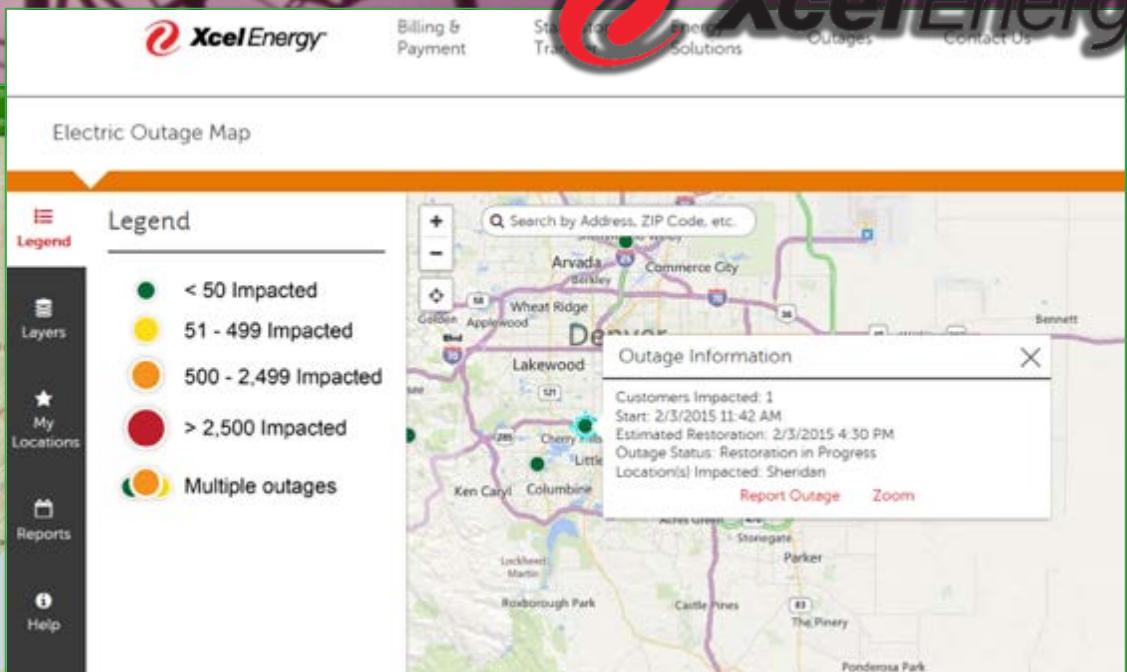
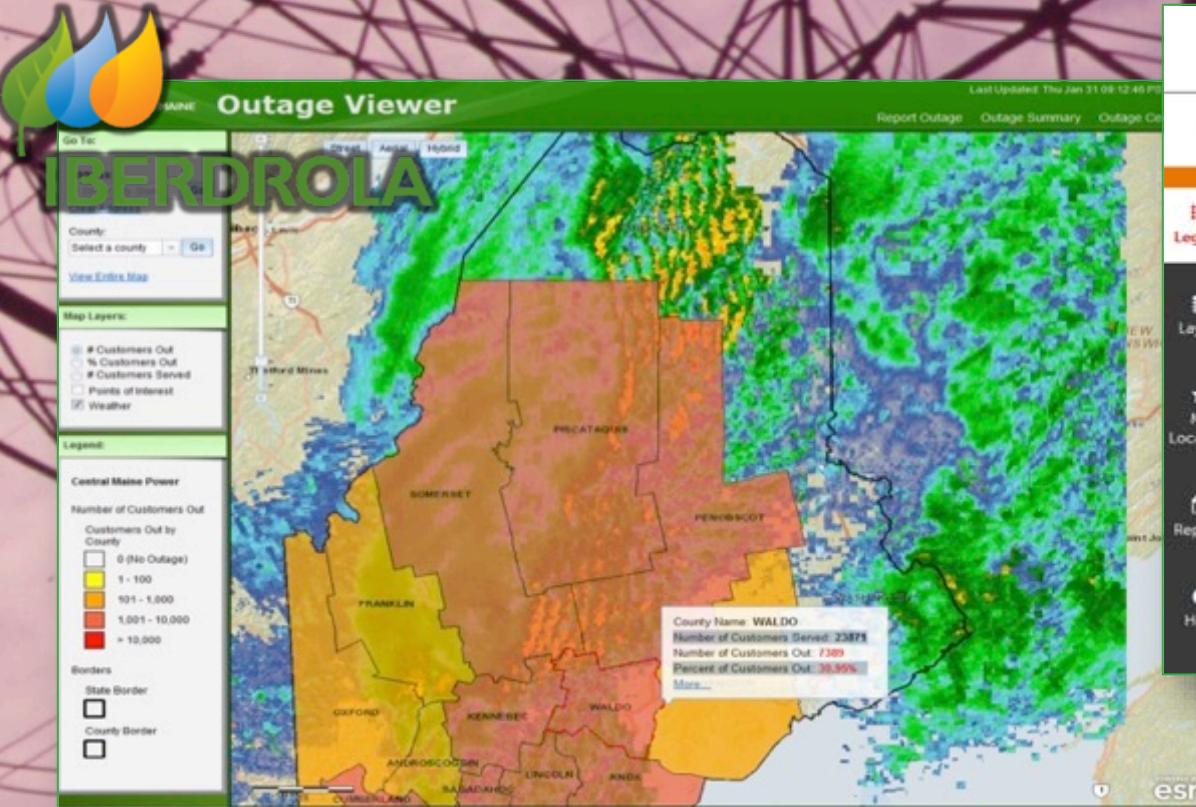
Automated processing and updates

# Apps with Fluctuating Usage



# Enterprise System & Outage Viewer

*Bringing critical outage information to the general public*



*Highly available, scalable systems  
ready to perform during major events*

*Frequent, automated data updates*

# State and Local Govt Apps



# Large Cloud Migration Initiatives

*Push to move State & Local Govt resources to the cloud*

CookViewer is a web-based mapping application for Cook County, Illinois. It features a satellite view of the area, a search bar for addresses, PINs, or intersections, and various thematic layers such as Medical Facilities, Transportation, Schools, Community, Political Districts, and Forest Preserve. A specific facility is highlighted with a red box, and a detailed view shows its address and a photograph.



Type Presentation Title Here

Montana Cadastral is a land ownership and cadastral mapping application. It includes a legend for land ownership categories, a search function, and a data viewer. The data viewer displays a map of Montana with various land parcels outlined in different colors corresponding to the ownership types listed in the legend. A sidebar provides details for a selected parcel, including ownership type, parking information, and a table of ownership records.



# Streamline Environment Review Process

*Web based decision support tools available in the cloud*



Managing partner apps in the cloud

Migration from on-premises deployment

Upgrade from legacy ArcIMS systems

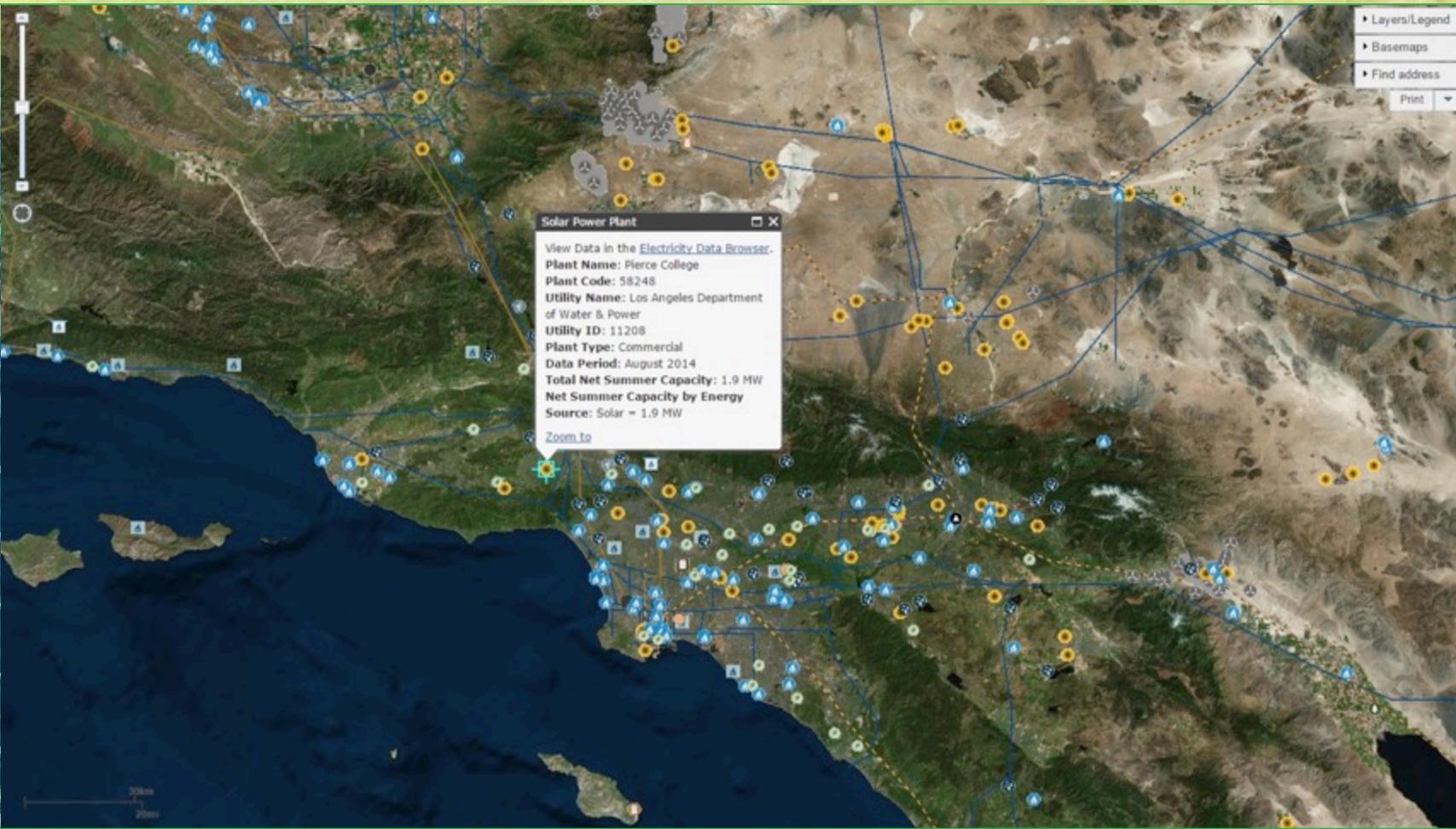
# Federal Apps



U.S. DEPARTMENT OF  
**ENERGY**

# Providing State Profile Data to the Public

Dynamic Services Provide Up to Date Energy Information



# USGS Topo Maps Publicly Available

## ***Large image services available in the cloud***

- More than 175,000 topographic maps published by the USGS since 1884
  - 22 TB data x 2 for redundancy
  - 1.6 million hits during Esri User Conference
  - Consumed by several apps; premium service available in ArcGIS Online

The USGS Historical Topographic Map Collection

Explore the comprehensive cartography of the United States' oldest mapping agency.

**1** [Older Maps of the Collection](#)

**2** [Exploration of Style](#)

**3** [Change Over Time](#)

Human and geological activity have changed borders, boundaries, and landscapes. Many of these changes can be explored by comparing maps created at different dates.

This map opens to Mount Saint Helens, which experienced the most dramatic natural geological change in recent United States history.

Use the map footprints as a guide to explore additional areas of interest highlighting change due to major urban sprawl, rapid

**4** [Exploration of Scale](#)

# Apps with Elevated Security Requirements



# Cloud Security and Compliance



# Supporting Small Business Development

Simple-to-use application for siting new businesses



The screenshot shows the initial steps of the tool:

- Step 1: "What type of business do you want to start?" with icons for Construction, Food Services, Healthcare, Personal Services, Professional Services, and Retail.
- Step 2: "Where do you plan to open the business?" with a map of Fairfax County, Virginia, showing employer establishments.
- Step 3: "Start analyzing" with a summary: "Employer establishments in Fairfax County, Virginia: 516".

Powered by the U.S. Census Bureau and Esri. For help using this tool, see the [Frequently Asked Questions](#). For more information about data from other Census programs, see [www.census.gov](#).

Business Development Tool—  
Small Business Edition

The screenshot displays demographic and economic data for Vienna town, Virginia:

**Local Business Profile of Offices of Real Estate Agents and Brokers (NAICS 53121) in Vienna town, Virginia**

**Who are my Potential Customers?**

**Demographic Characteristics**

Characteristic	Value
Total population	15,748
Population 18 and over (%)	74%
Population 65 years old and over (%)	14%

**Total Population**  
Vienna town, Virginia  
Population: 15,748

**Median Household Income**  
Vienna town, Virginia  
Income (\$): \$119,951

**Median Housing Unit Value**

Link Census economic and demographic data

Cloud security controls meet federal standards

# Options and Considerations

Understand what makes sense for the business... how do you know cloud is the way to go?

## Why aren't organizations moving to the cloud?

Meeting Organizational Security Requirements

Overcoming IT Cultural Barriers

Network Infrastructure Requirements

Expertise for Acquisition Process

Funding for Implementation

# Should I be using the cloud or not?

## When should I use the cloud?

- Lack of experience and people
- Cost to maintain in house is unsustainable
- I want to focus on new projects but managing my server is taking up too much time
- I want to quickly prototype and test out new capabilities
- I need an environment that scales

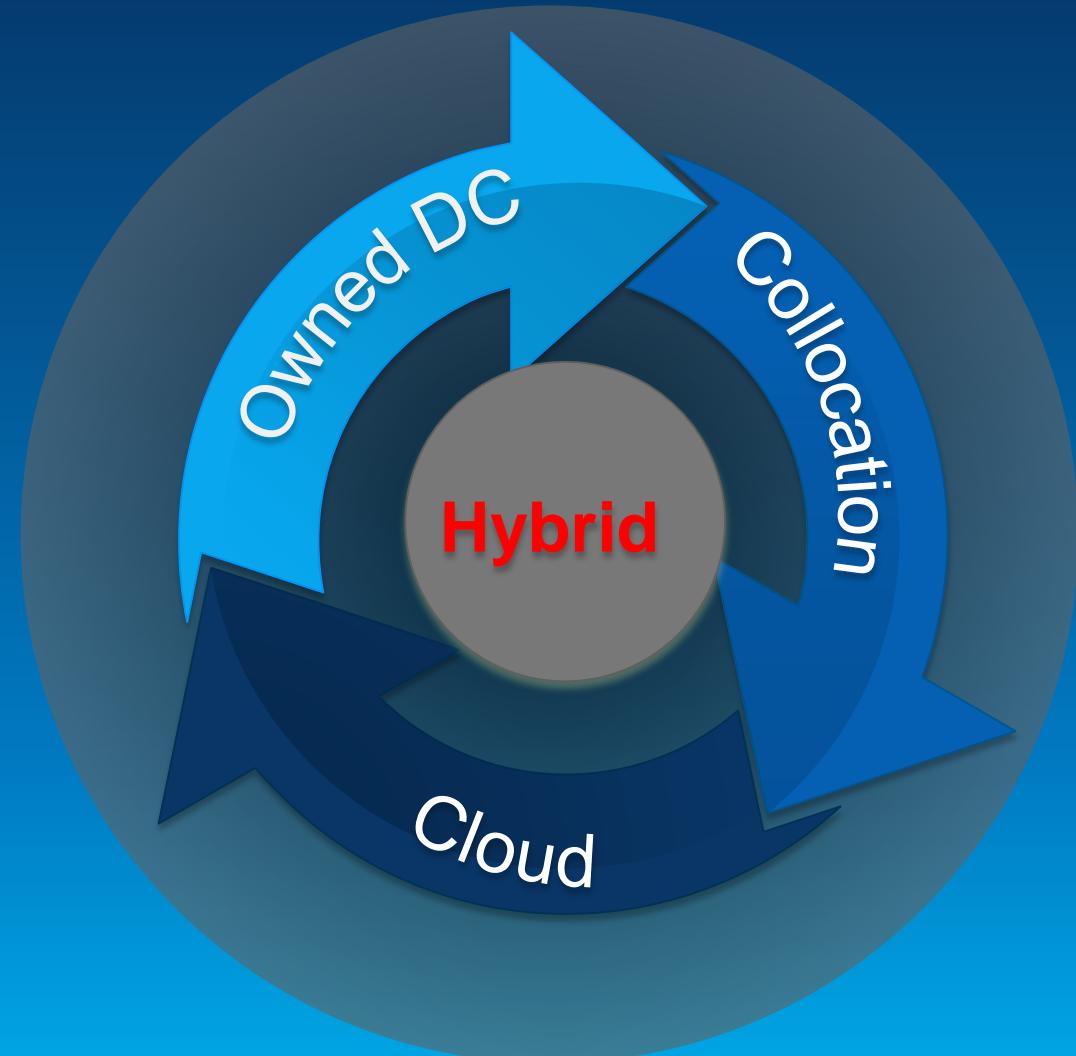
## When shouldn't I use the cloud?

- Heavy data editing workflows
- “If it ain’t broke, don’t fix it!”
- Experienced IT resources readily available
- Strict security policies not allowing data off premises

# What are the pricing options and considerations?

Private Clouds need to live somewhere

- When to use a cloud, a colocation data center, or an owned data center
- Apples-to-apples comparison for each to show how to avoid hidden costs and gotchas



*Over 60% of organizations engage in colocation, but 70% maintain their own –Info Tech Resource Group*

## Key Points-Organization owned data center



## Key Points-Collo & Cloud data center



**Of course, What a Data Centers “is” varies...**

I have witnessed it all with small and fortune 100 companies



## **When to use your data center**

- **It all depends on the conditions of your existing legacy data center**
  - Age of infrastructure
  - Power, space available
  - Meets reliability requirements
- **It all depends on the business requirements**
  - SLA's and availability requirements
  - Planned and unplanned growth
  - Audit Requirements
  - Future personnel resource requirements

## **When to use a Collocation provider data center**

- When you are low or running out of power and space
- When business requirements are unknown
- Unqualified or lack of personnel
- Inter-site connectivity
- Budget constraints
- When your data center cannot meet requirements for:
  - SLA's
  - Audits
  - Future growth
  - Support activities

# When to use a Cloud provider

- Infrastructure sizing
  - SaaS, IaaS, PaaS
- Auto scaling for unknown number of users/hits
- Lack of personnel
- Budget constraints and Pay-as-you-go
- Time to market critical
- In-house network constraints
- Hardware architectural size unknown

## **Comparisons and Gotchas**

- Create a template for apples to apples for comparisons
- Determine costs for your own IT & data center cost and limitations
- Determine Costs from the different cloud and colocation providers

# Pricing Collocation Considerations

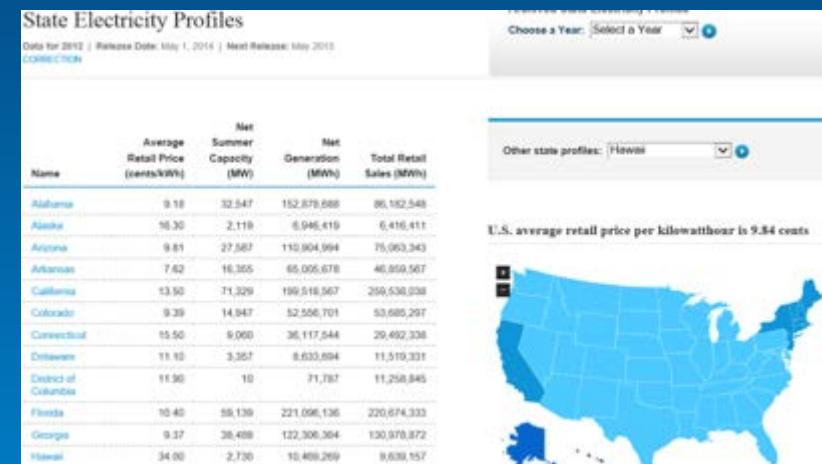
- Future site locations
- ROFR (Right Of First Refusal)
- Multiple RFP's
- Network costs
- Contract ending clauses
- Limited growth

1,3,5 Year Term – ? kW	Price
Capex Power	\$\$\$\$
Capex Space	\$\$\$\$
Capex Internet	\$\$\$\$
Capex Burstable Internet	\$\$\$\$
Capex Cross Connect	\$\$\$\$
Capex Totals	\$\$\$\$
Monthly Power	\$\$\$\$
Monthly Space	\$\$\$\$
Monthly Internet Access (1Gb)	\$\$\$\$
Monthly Burstable Internet	\$\$\$\$
Monthly Cross Connect	\$\$\$\$
Inter-Site Connectivity	\$\$\$\$
Monthly Totals	\$\$\$\$\$

## Power is a game changer

In general every 1.8F that you raise the temperature in your data center, you save 2-4% of your total energy bill

- 91 watts vs 70 watts processors = 21 watts / processor
- 21 watts x 2 processors = 42 watts savings
- 42 watts x 8760hrs / 1000 = 368 kwh
- 368kwh x \$0.07/kwh = \$25.75 per server
  
- 140 racks / 5000sqft DC                    13 servers / rack
- 140 racks x 13 servers / rack = 1680 servers
- 1680 x \$25.75 x 2                            \$86,520



<http://www.eia.gov/electricity/state>

Power is a huge factor by location

# Pricing Cloud Considerations

- Compare the like features
- Ensure they have the features you need
  - Shared storage, monitoring, etc.
- Reduced saving for long term commitments
- Contract ending clauses
- Ability to automate
- Unlimited growth

	QTY	unit cost	NRC	MRC	Annual Costs
Cloud (Acme)					
Acme CloudFront					
Acme Dynamo DB					
Acme Elastic Compute Cloud					
Acme Elastic MapReduce					
Acme ElastiCache					
Acme Glacier					
Acme RDS Service					
Acme Redshift					
Acme Route 53					
Acme Simple Email Service					
Acme Simple Notification Service					
Acme Simple Queue Service					
Acme Simple Storage Service					
Acme Simple Workflow Service					
Acme SimpleDB					
Acme Virtual Private Cloud					
Acme Data Pipeline					
Acme Data Transfer					
Acme Direct Connect					
Acme Import/Export					
Acme Storage Gateway					
AcmeSupportBusiness					
AcmeSupportDeveloper					
Sub-total					

## **Owned Data Center considerations**

- **Capitol expenditures**
- **Preventative maintenance cost for UPS, generators, HVAC**
- **Generator fuel cost**
- **Miscellaneous maintenance cost for prior years**
- **Anticipated maintenance cost, batteries capacitor replacement, etc.**
- **Personnel costs**
- **Testing**

## Collocation Gotchas

- Future site locations (national/global)
- ROFR (Right Of First Refusal)
- Multiple RFP's
- Network costs
- Contract ending clauses
- Limited growth

## Cloud Gotchas

- More expensive in the long run?
- Very easy to overspend
- Lack of standard processes for allocating cloud resources
- Lack of reviewing and monitoring expenses
- Shutting down of unused resources
- Experience and training using Cloud

# Challenges and Lessons Learned



## What to keep in mind...technical

- Take snapshots frequently!
- Be up to date on cloud certifications and compliance
- Don't assume your apps will just work – be prepared to test
- Utilizing the cloud is a **shared responsibility**
- Automate whenever possible
- Use monitoring tools and be proactive
- Continuously maintain, patch and update

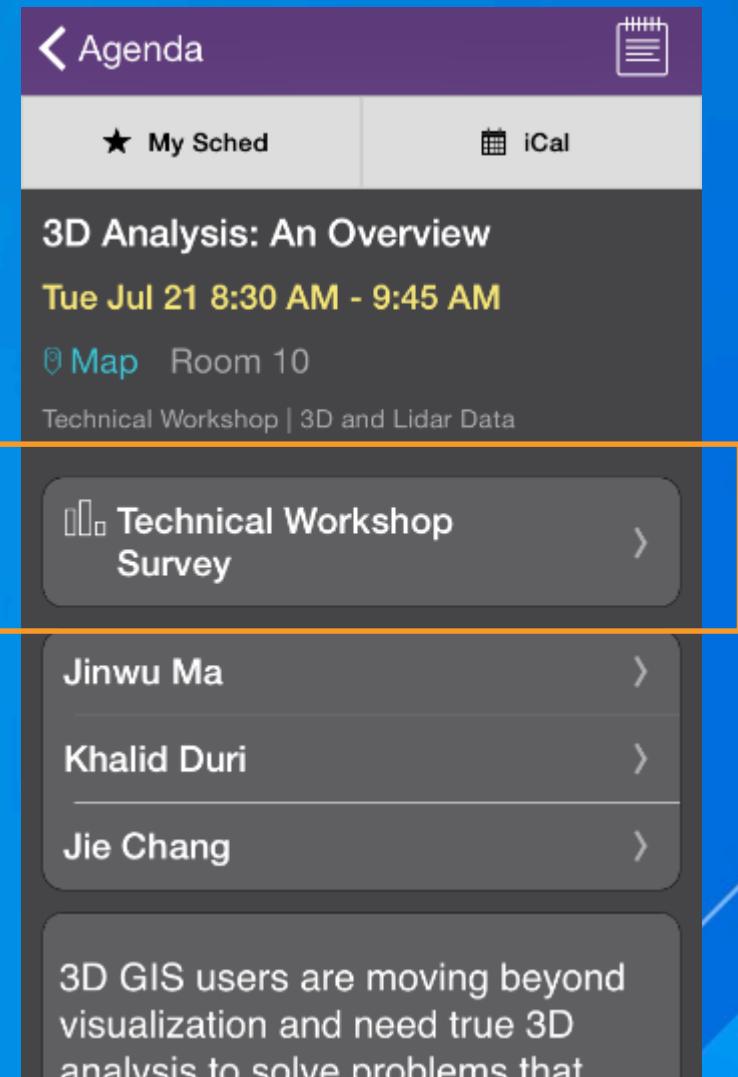
## **What to keep in mind...business**

- **Assess ROI for moving to the cloud**
- **Longer term commitments can offer significant discounts**
- **Frequently monitor your accounts, turn things off that are not being used**
- **If you have multiple accounts, separate them by business unit or function**
- **Analyze multiple cloud vendors and weigh pros and cons**
- **Consider using more than one cloud vendor**

# Questions

# Thank you...

- Please fill out the session survey in your mobile app
- Select Deploying Apps to the Cloud in the Mobile App
  - Use the Search Feature to quickly find this title
- Click “Technical Workshop Survey”
- Answer a few short questions and enter any comments





Understanding our world.