

**The GeoCloud:
What is it,
Why you should care
&
What is it going to do to you!**

Zsolt Nagy: AECOM

&

Anne Hale Miglarese: Booz Allen Hamilton

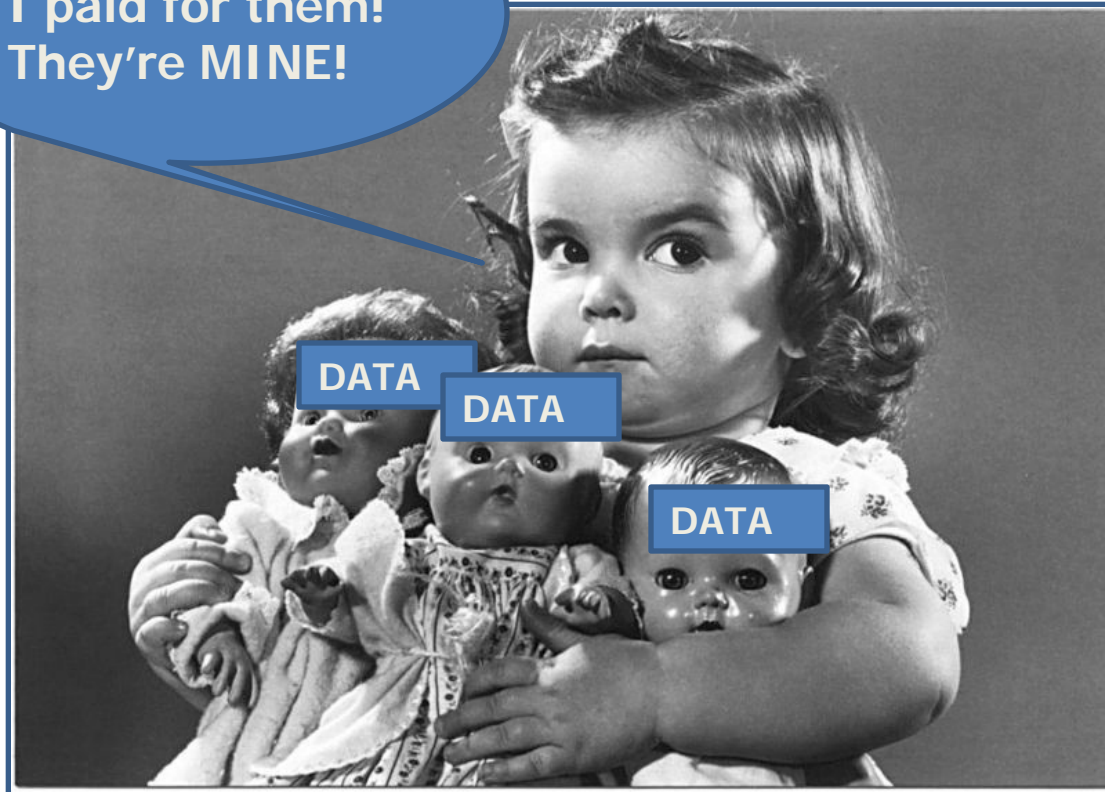


The Promise of the NSDI

- Consistent means to share geographic data among all users could produce significant savings for data collection and use and enhance decision making. [Executive Order 12906](#) calls for the establishment of the National Spatial Data Infrastructure defined as the technologies, policies, and people necessary to promote sharing of geospatial data throughout all levels of government, the private and non-profit sectors, and the academic community.

Believe it or not... just ten years ago

I built them!
I paid for them!
They're MINE!



C'mon, won't you share your data?



NO! If I share my data, other people will:

- take credit for it
- mess it up
- use it for their own good!

But if you share your data, others will share their data with you...

I don't want their stinky data – who knows where it's been?

- **How was it created?**
- **What sources were used?**
- **Were there field checks?**
- **What attributes, measures, methods, did they use?**



Cloud Computing Service Models

**Software as a
Service
(SaaS)**

End-user applications, delivered as a service, rather than on-premises software

**Platform as a
Service (PaaS)**

Application platform or middleware as a service on which developers can build and deploy custom applications

**Infrastructure
as a Service
(IaaS)**

Compute, storage, and other IT infrastructure as a service, rather than as a dedicated capability

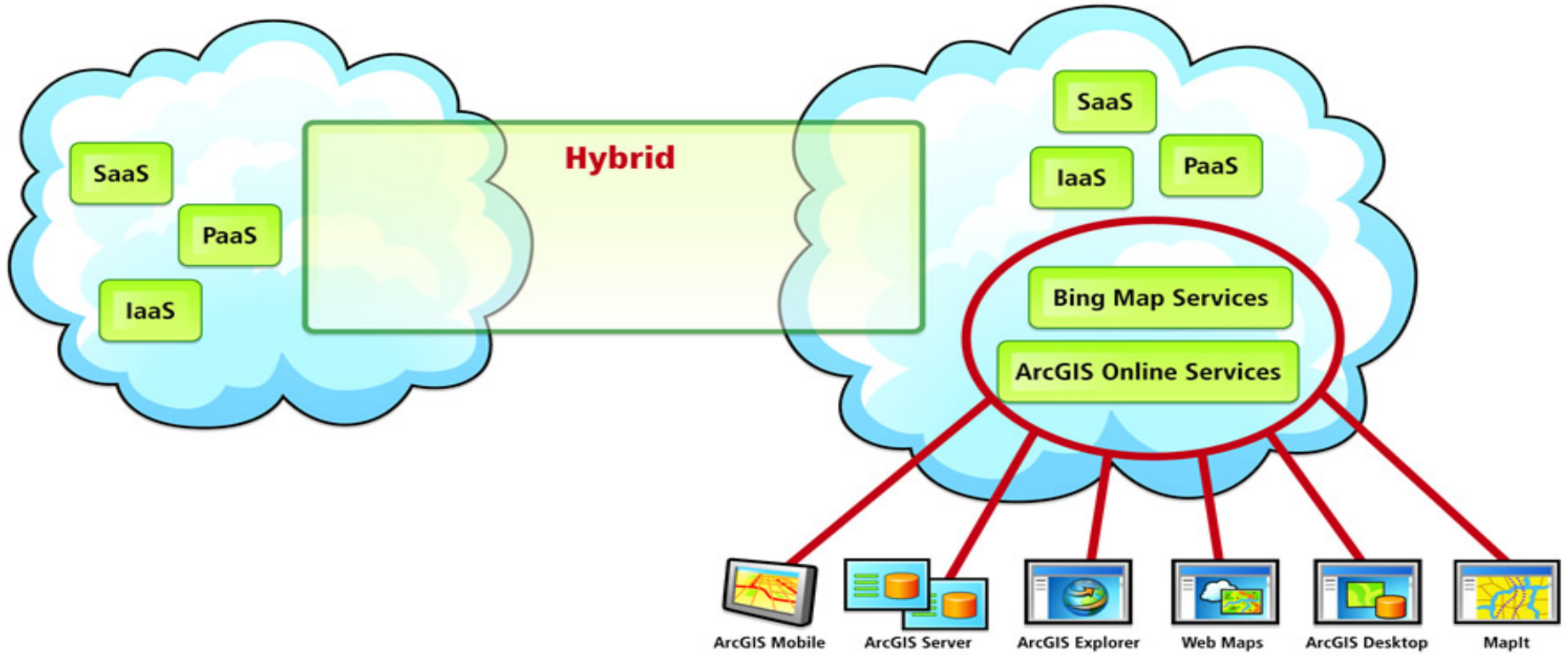
**Data as a
Service (DaaS)**

Multi-tenancy system configured to be a pooled and shared resources

Cloud Types

Private Cloud
On-Premises/Internal

Public Cloud
Off-Premises/External



Cloud Computing Enterprise Benefits

- ▶ Provides organizations a way to add/increase services “just-in-time” without investing in new infrastructure, training new personnel, or licensing new software
- ▶ Enables reallocation of Enterprise budgets, assets, and people into primary business/mission areas
- ▶ Supports interoperability and improvements in information sharing, analytics, intelligence, and knowledge management with increased intra- and inter-organizational adoption
- ▶ Supports new value added Mission services e.g. Next Gen Analysis



Cloud Computing IT Benefits

▶ Speed-to-Delivery

- Allows new capability development without new infrastructure development
- Supports rapid scalability
- Diminishes constraints of scale and complexity

▶ Cost

- Massive scale leads to true economies of scale
- Reduced complexity leads to improved sustainability and reductions in O&M costs

▶ Information Sharing and Interoperability

- Flat data sets
- Streamlined data management
- Data availability - enabling information generation

▶ Changing Ecosystem

- Technology inflection point, impacting client buying patterns and introducing highly capitalized non-traditional players into federal IT market e.g. Amazon, Google



Cloud Computing Needs To Be Seen As A Transformation

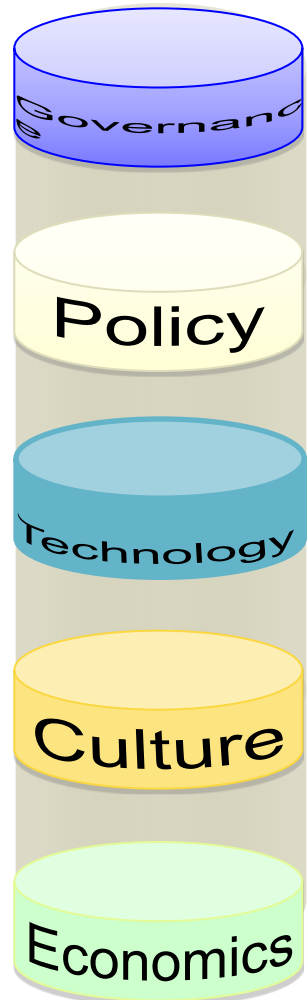
Enterprise Savings

- ▶ **Minimize maintenance costs**
 - Cooling
 - Electricity
 - Servers maintenance, backups, etc
- ▶ **Elasticity and scalability**
 - Massive scale leads to true economies of scale
 - Eliminate need to build for infrequent peaks
 - Make capacity available on demand
- ▶ **O&M cost reduction**
 - Flat data sets
 - Streamlined data management
 - Data availability - enabling information generation
- ▶ **COOP and DR cost reduction**
 - Continuity of operations in case of emergencies
 - Recovery

Disruptive Technology

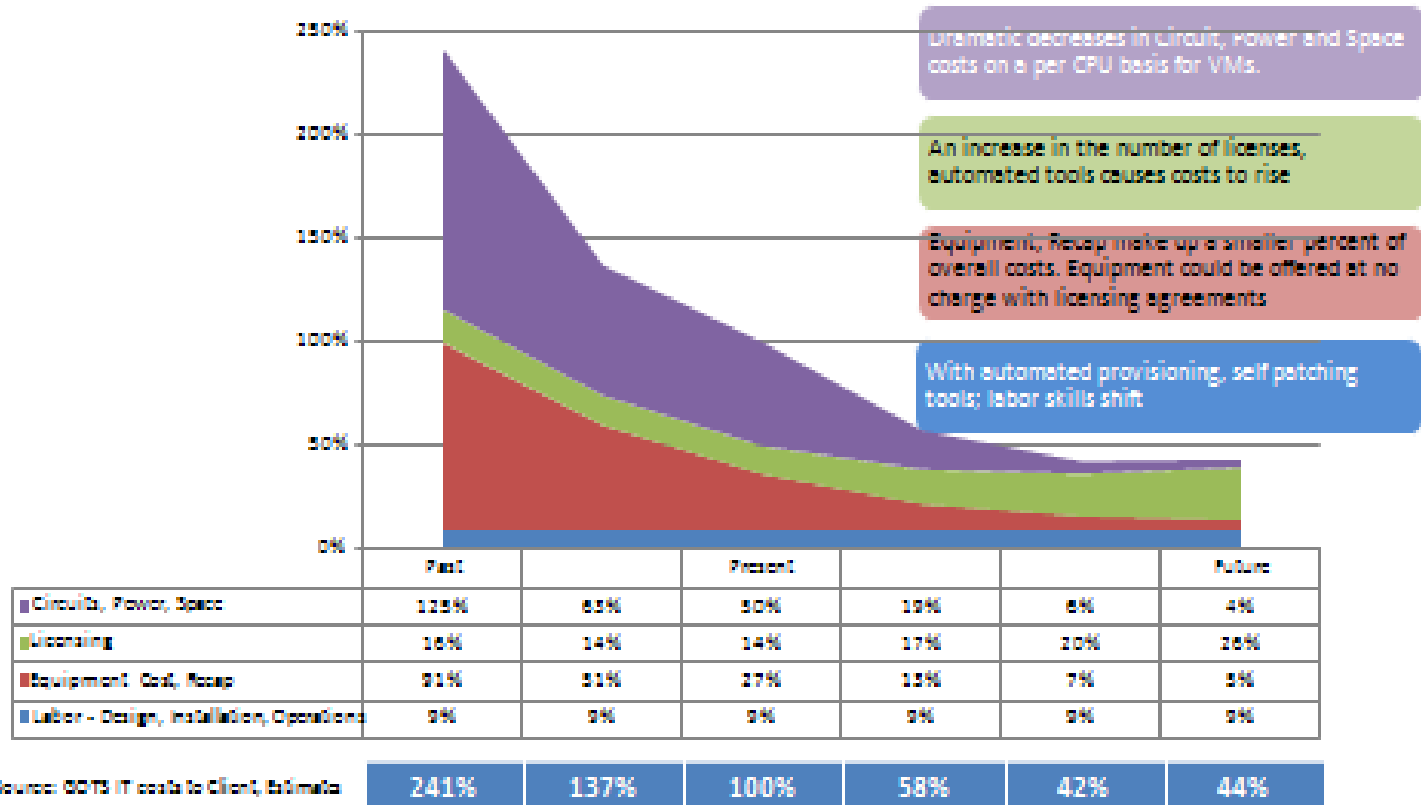
- ▶ *Allows users to perform mission tasks that were not able to achieve otherwise*
- ▶ *Enables and promotes faster and cheaper innovation*
- ▶ *Transform the way the government does business; enable collaboration in real time*
- ▶ *New tools like Hadoop and Map Reduce allows for amazing processing*
- ▶ *Ubiquitous access to unlimited amount of computing power*
- ▶ *Ubiquitous access to unlimited amount of storage*
- ▶ *Prototyping enablement*
 - *Publish databases*
 - *Reduce start-up*

A comprehensive framework that includes five critical building blocks for a successful cloud computing initiative



Building Blocks	Description	Key Questions
Governance	Oversight and leadership that helps governs information sharing. How managers drive initiatives within organization and in cross-agencies. Standards and guidelines to ensure a consistent approach.	<ul style="list-style-type: none"> ✓ Who are the program stakeholders? ✓ Is there a clear value proposition among partners, i.e., quid pro quo or negotiated trade-offs? Are MOUs or service-level agreements required? ✓ Have common needs and objectives been identified? ✓ What do customers/stakeholders expect of the organization?
Policy	National policies, internal policies, rules of engagement, standards, and role of players internal and external to the organization.	<ul style="list-style-type: none"> ✓ Are laws in place that authorize, mandate and/or enable the organization to implement cloud services? ✓ Do laws/regulations impede or constrain the organization/ people from implementing cloud application/services? ✓ Are privacy and civil liberties sufficiently protected? ✓ Is the organization in compliance with current laws?
Technology	The technology, systems, and protocols that provide the platform for enabling cloud computing and that address security and privacy issues	<ul style="list-style-type: none"> ✓ Is there a common cloud architecture or taxonomy and system for organizing, identifying and searching? ✓ Can participants push and pull data? ✓ Is the system accountable and auditable? ✓ Are tools/mechanisms available to manage identities, authorize and authenticate users, and ensure confidentiality?
Culture	The organizational approach and philosophy around cloud computing and its ability to 'realign' and adapt as circumstances change	<ul style="list-style-type: none"> ✓ How is the organization structured? ✓ Does the organization communicate across all levels? ✓ How does the organization adapt to change? How responsive is the organization to stresses and opportunities? ✓ How are decisions and conclusions reached?
Economics	Ability to obtain and provide resources for cloud computing initiatives and external pressures (e.g., budget) that influence how resources are allocated and managed	<ul style="list-style-type: none"> ✓ Has sufficient funding been appropriated to support the initiative? ✓ Have incentive structures been developed? ✓ Is the funding reaching the appropriate level within the enterprise to fully implement the sharing program? ✓ Who funds/should fund the initiative, i.e., public, private, or a combination of the two?

Technology advances significantly lowers per unit virtual server costs in the future



Promising Features of Cloud Computing for Geospatial Data and Analytics

- Data as a Service (DaaS);
 - Multi-tenancy, system configuration to be a pooled and shared resource by many institutions and governments enhancing the ability to discover and share data
 - Ability to access this storage intensive (raster) data quickly and given the low cost the ability to store more time dependant/historical data
 - Pay as you go for data access may provide promise for a business model that in the long-term could support the financing of the NSDI

The Security Challenge: Protection of Data

- Enterprises will want assurances from Cloud providers that their proprietary and personal data will be adequately protected
- Data must be adequately protected as it is transferred between the end user and the Cloud Data Center
- Vendors will be responsible for ensuring users have 24x7 access to their data, and the data must be immediately recoverable in all cases
- Cloud vendors must understand the part they play in assisting customers in meeting and maintaining compliance with Federal data protection, privacy laws, and regulations

The GeoCloud Game Board

Tier 1	Tier 2	Tier 3	Tier 4	Tier 5	Tier 6	Tier 7	Tier 8	Tier 9	Tier 10	Tier 11	Tier 12	Tier 13	Tier 14	Tier 15	Tier 16	Tier 17
Tax Mapping Property Assessment System	Building Permitting System	Parks Management System	Crime Analysis Application	Zoning Application & Mapping System	Environmental Permitting System	Traffic Management System	Storm Water Management	Disaster Information/Management System	Watershed Management System	Web-Based Geospatial Mapping System	Data Dissemination Service	Data Storage Service	Geocoding Service	Reverse Geocoding Service	Data Validation Service	Map Production Tracking Service
3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Data 1: Aerial/Drifts Imagery 2 Data 2: Parcel Database 4 Data 3: Street Address Data 7 Software: Image Processing 3 Infrastructure: 3	Data 1: Aerial/Drifts Imagery 3 Data 2: Land Use Data 4 Data 3: Parcel Database 4 Software: GIS 7 Infrastructure: 3	Data 1: Demographic Data 3 Data 2: Environmental Data 4 Data 3: Land Cover Data 7 Software: GIS 7 Infrastructure: 3	Data 1: Demographic Data 3 Data 2: Street Address Data 4 Data 3: Transportation Data 7 Software: GIS 7 Infrastructure: 3	Data 1: Land Use Data 3 Data 2: Parcel Database 4 Data 3: Transportation Data 7 Software: GIS 7 Infrastructure: 3	Data 1: Aerial/Drifts Imagery 4 Data 2: Elevation Data 4 Data 3: Traffic Data 7 Software: Image Processing 3 Infrastructure: 3	Data 1: Traffic Data 4 Data 2: Transportation Data 4 Data 3: Weather Data 7 Software: GIS 7 Infrastructure: 3	Data 1: Elevation Data 4 Data 2: Hydrology Data 4 Data 3: Land Cover Data 7 Software: GIS 7 Infrastructure: 3	Data 1: Demographic Data 4 Data 2: Street Address Data 4 Data 3: Transportation Data 7 Software: GIS 7 Infrastructure: 3	Data 1: Environmental Data 4 Data 2: Hydrology Data 4 Data 3: None 7 Software: Database 3 Infrastructure: 3	Data 1: Aerial/Drifts Imagery 3 Data 2: Street Address Data 3 Data 3: None 7 Software: Database 7 Infrastructure: 3	Data 1: None 4 Data 2: None 4 Data 3: None 7 Software: Database 7 Infrastructure: 3	Data 1: None 4 Data 2: None 4 Data 3: None 7 Software: Database 7 Infrastructure: 3	Data 1: Street Address Data 4 Data 2: Transportation Data 4 Data 3: None 7 Software: Database 7 Infrastructure: 3	Data 1: Street Address Data 4 Data 2: Transportation Data 4 Data 3: None 7 Software: Database 7 Infrastructure: 3	Data 1: Aerial/Drifts Imagery 4 Data 2: Elevation Data 4 Data 3: Survey/Map Data Control 4 Data 4: None 7 Software: Database Publishing 3 Infrastructure: 3	

State Mission Value Points

Transactions to Local

Transactions to Federal

State Resources

Policy Investment

Process Investment

Mitigation Investment

Transactions from Local

Transactions from Federal

State Infrastructure

Local Infrastructure

Local Resources

Policy Investment

Process Investment

Mitigation Investment

Transactions from State

Transactions from Federal

Local Infrastructure

Local Resources

Policy Investment

Process Investment

Mitigation Investment

Shortfall Tracker

Current Risk Load

National Geospatial Cloud

Tier 1

Tier 2

Tier 3

Cloud Development Resources

Cloud Tier 1 Infrastructure

Cloud Tier 2 Infrastructure

Cloud Tier 3 Infrastructure

The GeoCloud Game

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Federal Infrastructure

Potential Federal Tasks

Federal Mission Value Points

Federal Resources

Transactions to State

Transactions to Local

Transactions from Local

Transactions from State

Transactions from Federal

Local Infrastructure

Local Resources

Policy Investment

Process Investment

Mitigation Investment

Transactions from State

Transactions from Federal

Local Infrastructure

Local Resources

Policy Investment

Process Investment

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Policy Investment

Process Investment

Mitigation Investment



What Worked!

- **The game successfully pointed out the importance of**
 - **Collaboration and sharing**
 - **The varying fidelity of spatial data between federal, state and local agencies**
 - **The interdependencies of these data sets in solving real-world geospatial opportunities/problems**
 - **The importance of role-playing to think through and experience complex organizational behavior issues**
 - **The importance of guiding policies and process to facilitate process between and among government agencies**

Geospatial Platform Background

"In 2010 and 2011, Federal data managers for geospatial data will move to a portfolio management approach, creating a Geospatial Platform to support Geospatial One-Stop, place-based initiatives, and other potential future programs. This transformation will be facilitated by improving the governance framework to address the requirements of State, local and tribal agencies, Administration policy, and agency mission objectives. Investments will be prioritized based on business needs. The Geospatial Platform will explore opportunities for increased collaboration with Data.gov, with an emphasis on reuse of architectural standards and technology, ultimately increasing access to geospatial data."

President's Budget, Fiscal Year 2011



What it Will Take...

Moving Forward

- **Common Understanding** – shared vision, shared opportunities, and shared commitments
- **Open Governance** – define a structure where all sectors have a voice and a role, clear and unambiguous policy
- **Technology** – seize upon advances in geospatial technologies and standards to implement shared vision
- **Leadership** – identify and cultivate true leaders within the community. Develop the diverse workforce needed to support this multidisciplinary profession

What We Could Achieve *Moving Forward*

- **Open and transparent government**
- **High quality and timely geospatial data, services and applications, easy to discover and use by all sectors of the economy**
- **Enhanced shared infrastructure and interoperability**
- **Attain cost-savings and economies of scale through collaborative**
- **Expand the geospatial marketplace and industry**
- **Ensure U.S. maintains global competitiveness in the geospatial field**

Take aways and the Implications for the GeoCloud

- **Cloud technology holds great promise for the realization of the NSDI**
- **Much work needs to be done around data content standards and metadata documentation as data moves more frequently**
- **Much work needs to be done around the business model of the cloud and particularly the pay-as-you-go revenue stream for DaaS**
- **It all starts at the grass roots, at the individual office/implementation**