Leveraging the Cloud to Enhance the User Experience

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Agenda

Introductions

Executive summary

Defining the Cloud

The Cloud in detail

Case Study: Air Combat Command GeoBase

Case Study: HQ ARCENT, 3rd Army

Three implementation scenarios

Open discussion

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Executive Summary

Defining what cloud computing is can be as difficult as quantifying its value to your organization

Geospatial programs have both common and unique needs that can benefit from cloud based architectures

This discussion will –

- Define ‘Cloud Computing’
- Provide real-world case study examples of cloud computing applied to a Geospatial IT program
- Offer other examples of how cloud computing principles can be applied to different GIS programs

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Akamai

The world's largest on-demand, distributed computing platform; delivering all forms of Web content and applications for over 3,100+ customers and 130,000+ domains.

- 85,000+ Servers
  1,700 Locations
  1,000 Networks
- Akamai "edge" is within one network hop of 90% of Internet users
- Transparent to end-users and applications
- Managed services based on DNS resolution
- Delivers daily Web traffic reaching more than 5 Terabits per second
- Latest peak: 6.01 Tbps on 6/6/2011
  - *"The traffic peak of 6.1 Tbps is roughly equivalent to the capacity needed to download the entire printed contents of the U.S. Library of Congress in less than a minute."*

Akamai Delivers 15 - 30% of All Internet Web Traffic

EM-Assist

A government trusted partner for environmental services, technical support, and training solutions. EM-Assist delivers clients turn key information management services to improve decision-making.

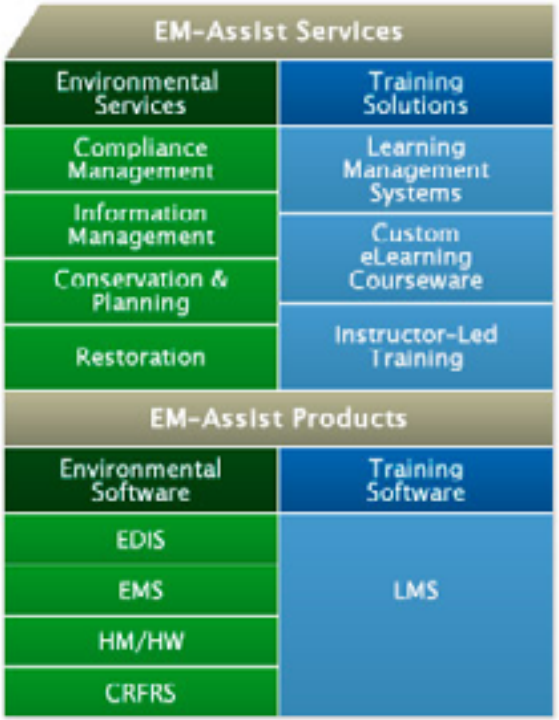
Geospatial Information Technology Group (GIGT)

Who are we?

- A *NEW* Geospatial business line determined to provide **Innovative**, **Cost Effective**, **High Return** solutions.
- Distinguished GIS professionals infusing leading edge IT to deliver **Results**!

Where we're heading?

- To clients and environments seeking **Modern**, more effective solution to **Complex** challenges.
- To industry to become the premier integrator of emerging technologies for the **Non-average** GIS.



Defining the Cloud

- **Central Thesis –** There is no single agreed upon definition – as the technology evolves, so does its definition
- **What it's Not**
  - It's not a thing – rather it's an approach or architecture
  - It's not a singular technology
  - It's not just Internet or "hosted" services
  - It's not just a buzz word
- **Common Myths:**
  - It's not Secure, It's Simple, and It's Cheaper
  - It's a marketing driven trend rooted in semantics
  - The benefits of private and public clouds are similar
  - It's a return to the mainframe model of centralized computing

http://www.cio.com/article/678463/6_Biggest_Cloud_Computing_Myths
http://www.eweek.com/c/a/Cloud-Computing/Amazon-Debunks-Top-5-Myths-of-Cloud-Computing-273198/
http://blogs.computerworld.com/what_cloud_computing_isnt

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Defining the Cloud…

- **Defined**
  - "Cloud computing is a model for enabling convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction." http://csrc.nist.gov/groups/SNS/cloud-computing/

- **Key Tenets**
  - Self Provisioning / On Demand Capabilities
  - Elasticity / Burst / Efficient Growth
  - Pooling / Sharing / Redistributing of Resources
  - High Uptime and Availability
  - Active Measuring and Monitoring of the "system"
  - The Ubiquitous-ness of Networks

- http://csrc.nist.gov/groups/SNS/cloud-computing/
- http://www.infoworld.com/d/cloud-computing/what-cloud-computing-really-means-031?page=0,0

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Defining the Cloud…

Common Cloud Industry Terms

What it Means to the End User
(when done correctly)

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GISs currently face multiple challenges that hurt the end user experience

1. Performance
   - How do you make your web maps as fast as possible?
   - How do you ensure that end users receive maps AND data quickly?

2. Scalability + Availability
   - How much capacity, storage, servers, and infrastructure is needed to serve your traffic?
   - How do you grow when needed?
   - Will your users tolerate down time?

3. Delivery
   - Can you deliver 1 GB+ files over the web?
   - How do applications with a global user base ensure a positive user experience?

GIS Applications face Critical Challenges to allow Customers access to Critical Data

The Cloud consists of multiple layers

Computing made accessible as scalable, on-demand services over a network (the "cloud")

Infrastructure-as-a-Service (IaaS)

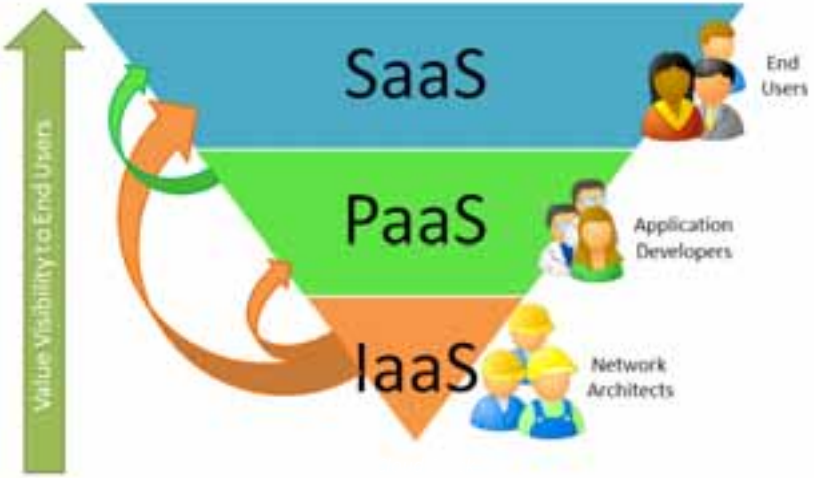
- ✓ Makes computing resources — such as storage, disk space, and servers — available as on-demand services.
- ✓ Rather than using physical machines, IaaS customers get access to virtual servers
- ✓ Eliminates expenditures to deploy local infrastructure

Platform-as-a-Service (PaaS)

- ✓ Enables easy development and deployment of scalable Web applications

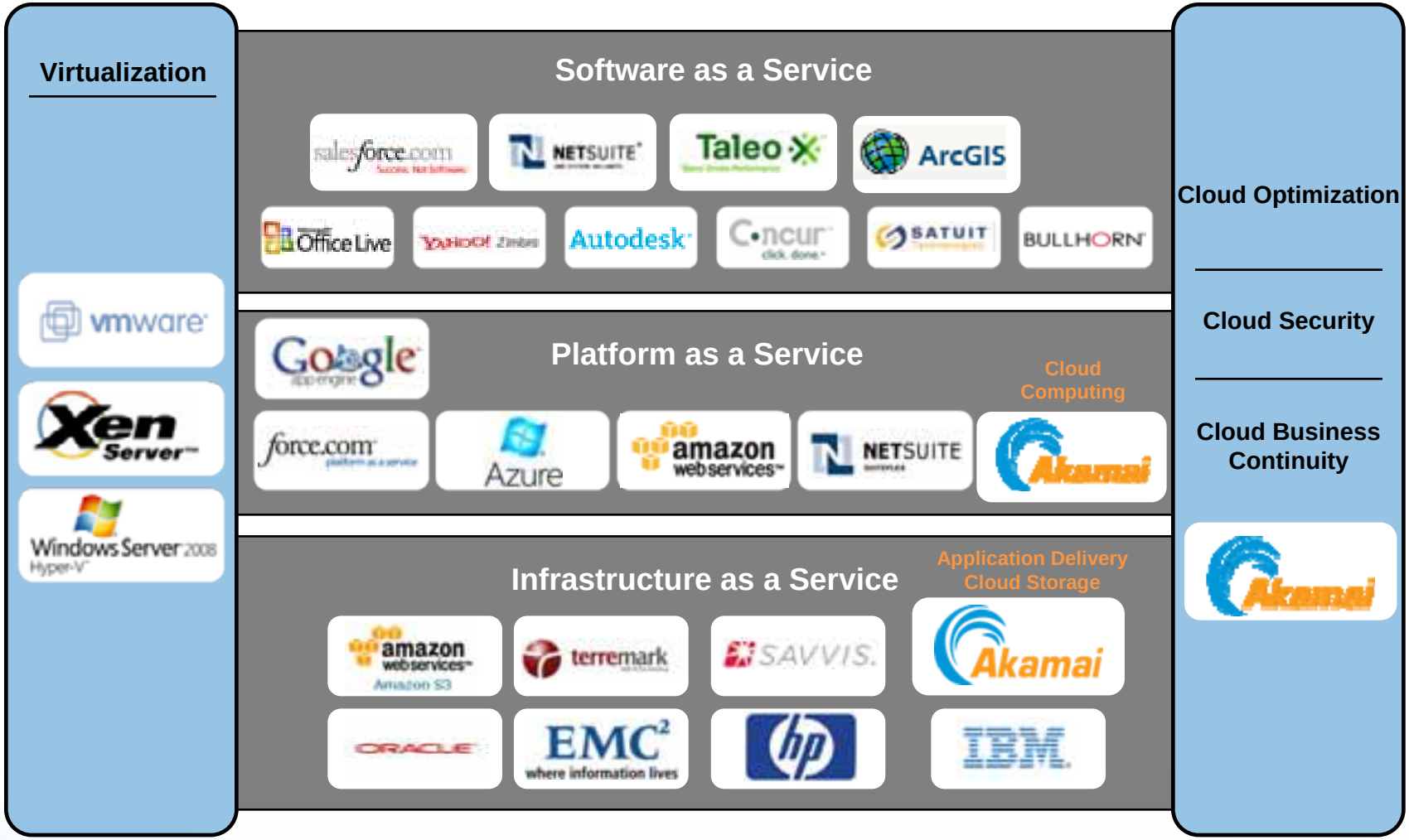
Software-as-a-Service (SaaS)

- ✓ Complete end-user applications are deployed, managed, and delivered over the Web.



There is no singular "Cloud" computing. Cloud computing is broken up into different components

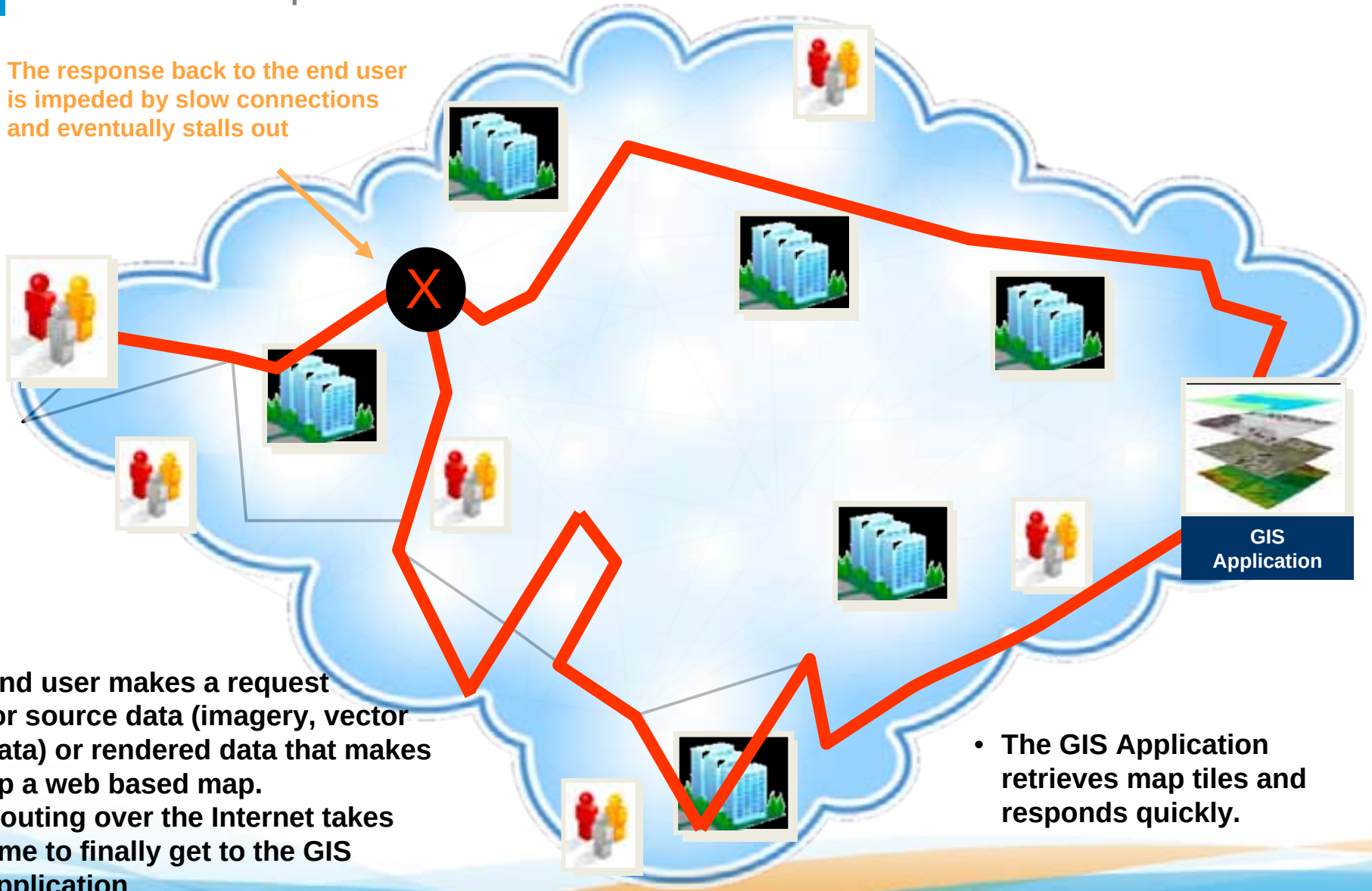
Different players serve different pieces of the Cloud



There are many components to cloud computing and it is common for web applications to utilize more than one cloud service

Client to GIS performance is often hindered on the network

- The response back to the end user is impeded by slow connections and eventually stalls out

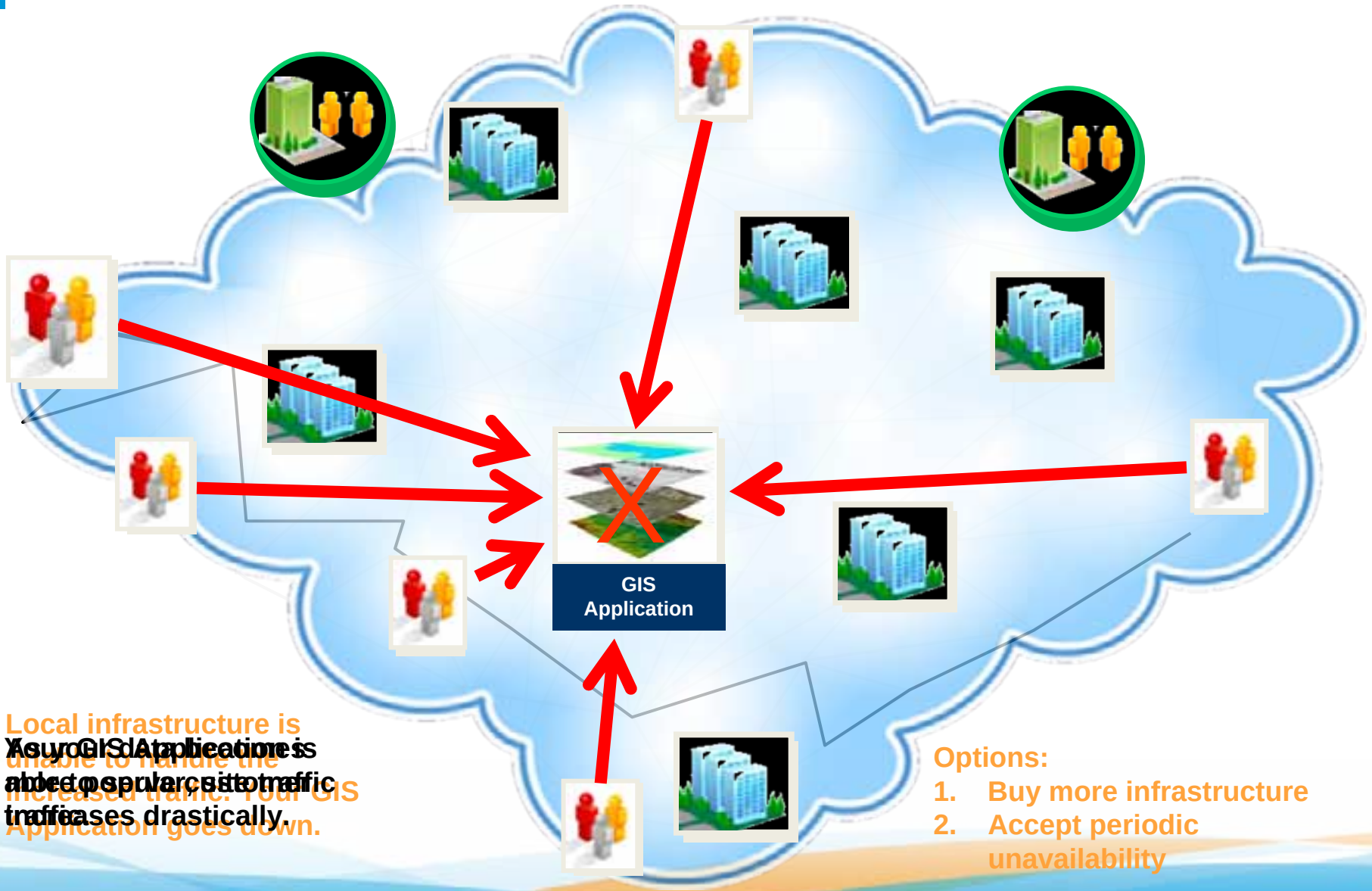


- End user makes a request for source data (imagery, vector data) or rendered data that makes up a web based map.
- Routing over the Internet takes time to finally get to the GIS application

- The GIS Application retrieves map tiles and responds quickly.

Poor Performance can Derail the Use of even the Fastest GIS Application

Critical GIS data is often unavailable during crisis



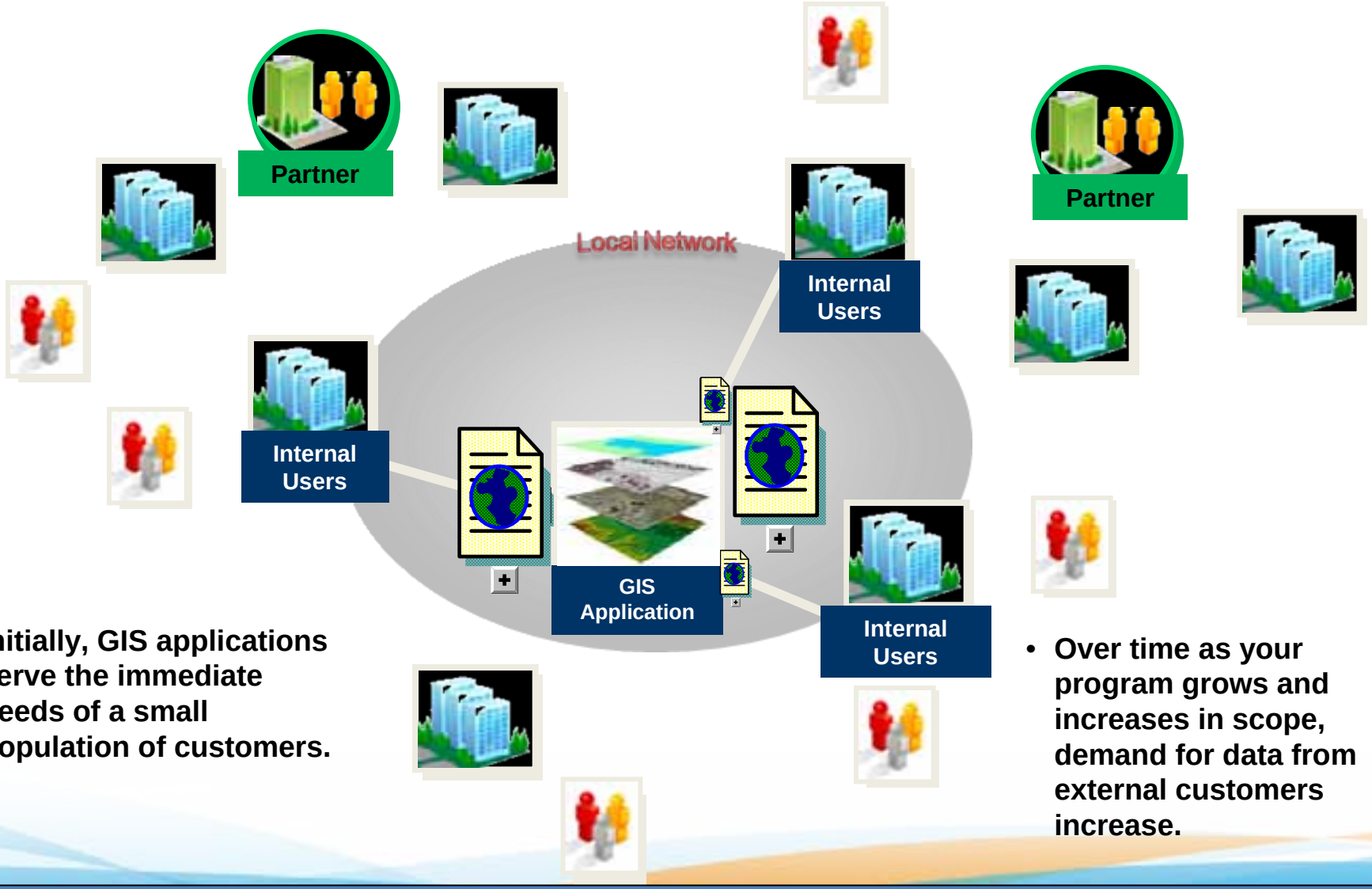
- Local infrastructure is unable to handle the increased traffic. Your GIS Application goes down.
- As your GIS Application is about to serve site traffic traffic increases drastically.

Options:

1. Buy more infrastructure
2. Accept periodic unavailability

GIS Applications need to Scale in order to Meet Customer Needs

Delivering GIS data to different user communities is a common challenge



- **Initially, GIS applications serve the immediate needs of a small population of customers.**
- **Over time as your program grows and increases in scope, demand for data from external customers increase.**

GIS Data Delivery is Challenging when there is a Dispersed Customer Base

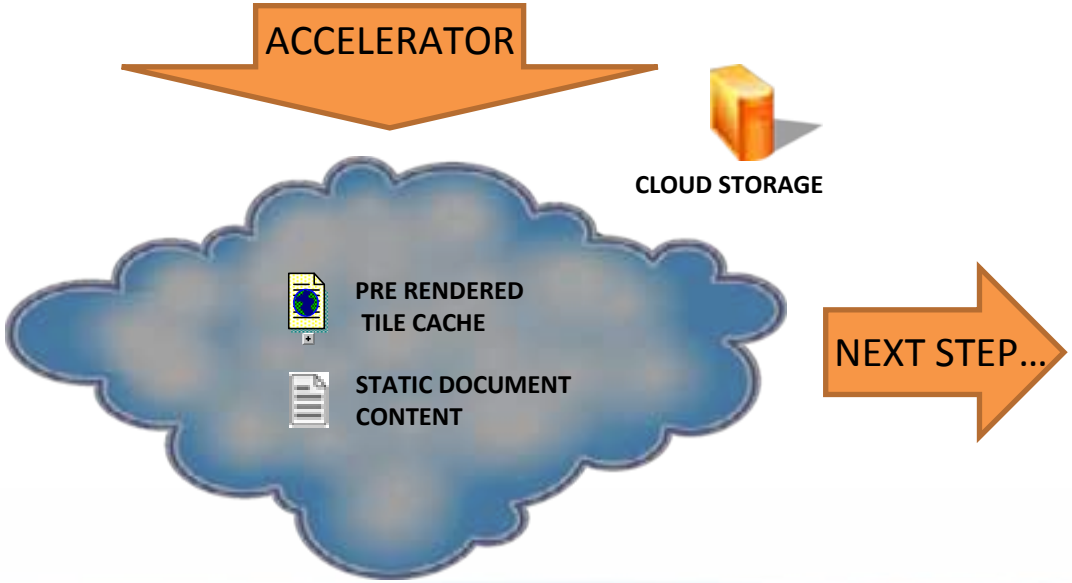
Case Study: ACC Web Applications

Leveraging the ACC GeoBase implementation to accelerate application performance and accessibility. Building client confidence and acceptance of Geospatial investments.

Customer Service Top 5 :

1. Google maps is faster
2. With Google maps I can…
3. Where do I get GeoBase?
4. Here's the workaround
5. The map is too slow!

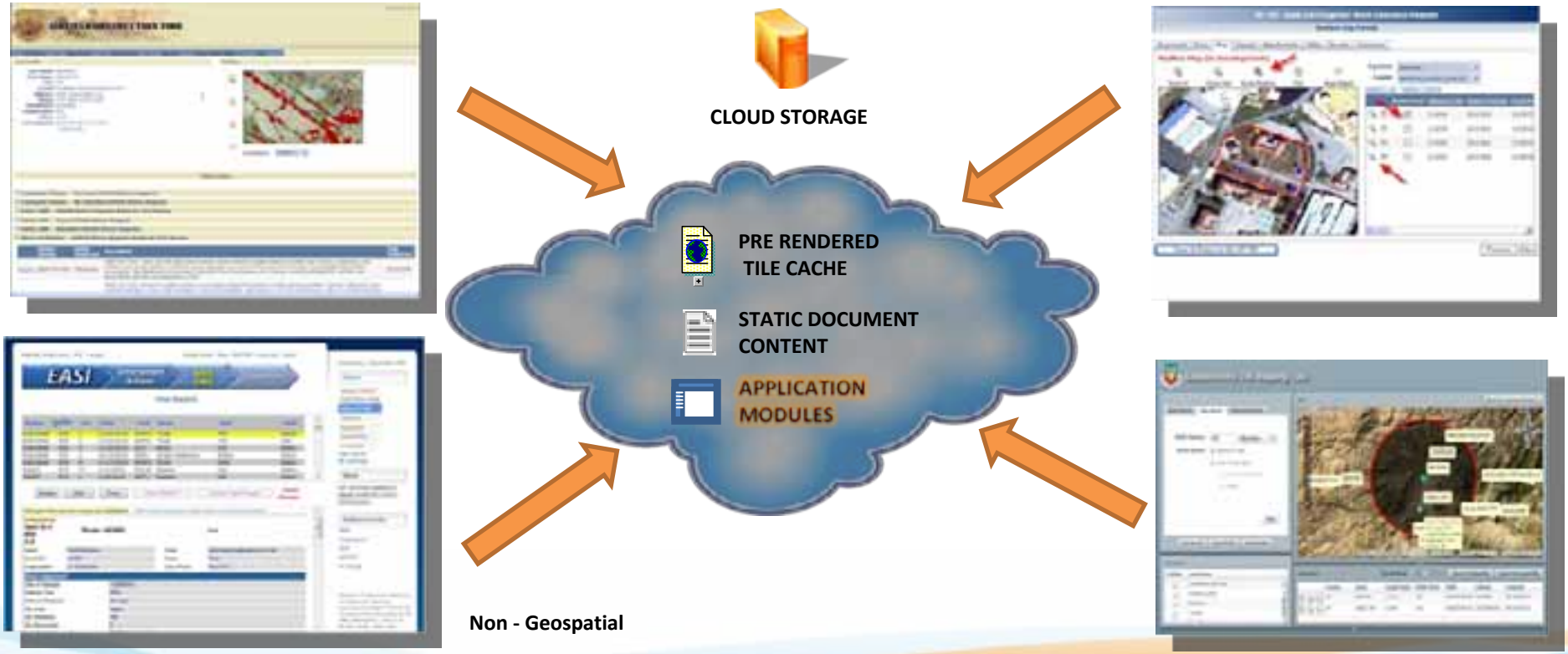
PROBLEM: MAP TAKES TOO LONG TO RENDER / SOLUTION: PRE RENDER MAP WITH TILE CACHE



Akamai allowed us to deliver an expected level of mapping performance

Case Study: ACC Web Applications

This model allows us to consolidate app data sources and reduce local storage dependencies for infrastructure we don't own. As users, we now have access to securely manage app data, minimizing administrative burdens while optimizing app performance. Win/Win!!



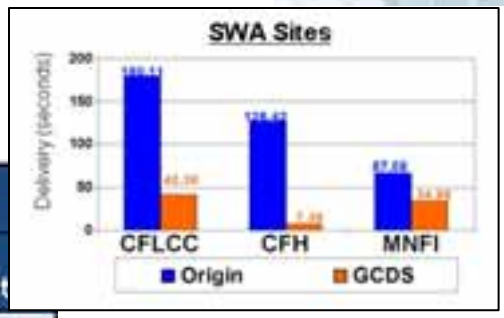
Multiple applications QUICKLY leveraging common, authoritative data sources.

Case Study – HQ USARCENT

Requirement: Remedy slow web mapping

Result:

- Application as a service integration
- Global CDN on secure networks
- Dramatic performance increase
  - 17 X decrease in draw times
  - Reduction in load on local servers



Delivery Times Faster via GCDS						
	INTELINK-S	NGA	AFWA	MARCENT	ARCENT	CTF Afghanist
CFH	20.62X	12.66X	2.85X	4.48X	4.26X	7.73X
CFLCC	2.73X	3.26X	1.27X	2.94X	17.17X	3.10X

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Three Implementation Scenarios

- Small - Single Site
  - Local County GIS Program
    - One editing location with localized web services
    - Biggest challenge – limited resources
- Medium – Multiple Locations
  - Major US Retail Chain
    - 12 offices with web services servicing a primarily US audience
    - Biggest Challenge – Adroitly managing growth
- Large – Global
  - Federal Agency
    - >30 global locations with global audience
    - Biggest Challenge – Supporting a massive system with a global footprint

GIS Needs	Cloud Elements
Delivery / Network Transit & Acceleration	Content Delivery Network (Akamai)
Storage Repository	Cloud Storage (Akamai, Rackspace, Terremark, Amazon)
Servers / Computing	IaaS (Rackspace, Terremark, Amazon EC2)

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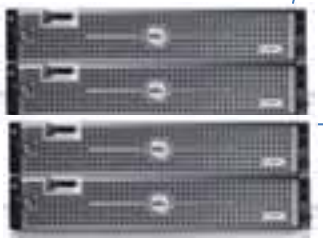
Three Implementation Scenarios – Single Site

Existing

City or County GIS Program

Internet Web Map Users



- DB Server
- File Server
- Web Server
- Application Server

Challenges

- Underutilized Hardware
- Poor web performance when tax bills are due, IOW when the site is most needed.
- Lack of administrative support
- Outages and downtime due to core system issues

Cloud Integration

Internet Web Map Users

Rackspace Server Instances Running Win/ArcGIS

amazon web services™

ArcGIS Sever Map Tiles Stored on Amazon S3

rackspace HOSTING

Benefits

- Pay for what is used
- Guaranteed uptime
- Burst performance for high traffic but no need to invest in
- Reduction in costs: HW, Infrastructure, and Staff

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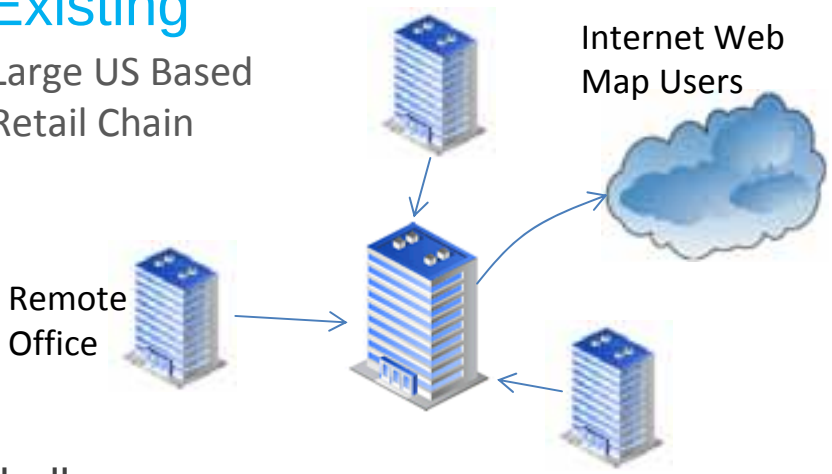
Three Implementation Scenarios – Multiple Site

Existing

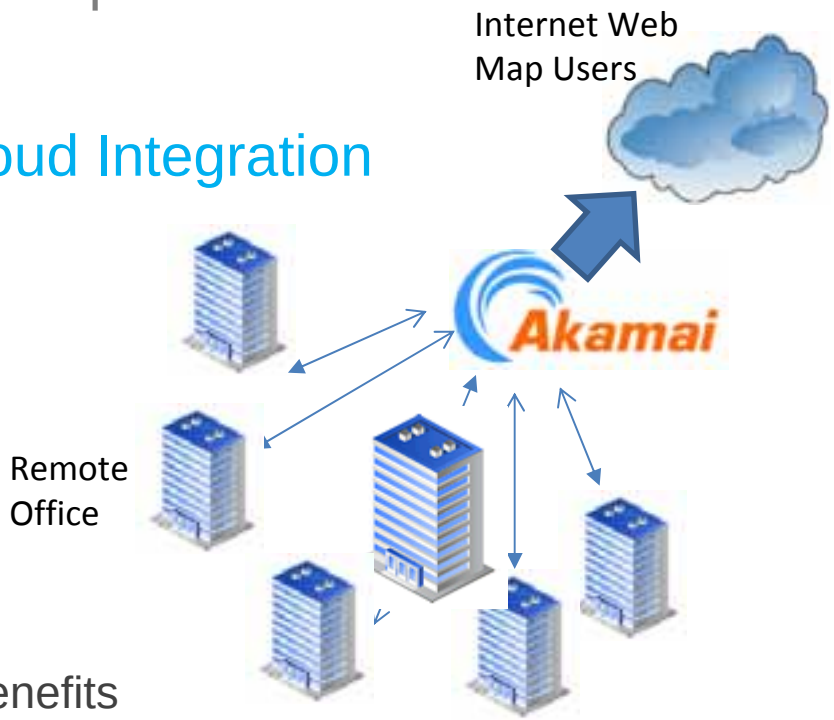
Large US Based Retail Chain



Challenges

- Authoritative data only exists in central location, remote users must login
- Web serving infrastructure cannot keep up with growing Internet usage
- Poor inter-site performance during peak usage
- Laborious process to bring new site online
- Updates to web content must wait on replication to central node

Cloud Integration



Benefits

- Rapid deployment of new offices using remote deployment and virtualization
- All offices have direct access to authoritative data using iSCSI parallel replication for their ArcSDE nodes
- The Akamai Global CDN intercepts Internet requests to offload traffic to origin
- **SCALABILTY!**

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Three Implementation Scenarios – Global Program

Existing

Large USG
Federal Program

Challenges

- Lack of fail-over capability
- Poor oversight of costs: staffing, HW, SW, Data
- Slow and Bureaucratic provisioning of new resources, especially when needed
- Accreditation, Standardization, and Security concerns
- Slow refresh and update cycles

Cloud Integration

Federal Cloud Computing Initiatives

Benefits

- Inherited USG accreditation and audited security and hardening
- Defined SLAs and accountability
- Purpose built rapid deployment of resources: OSs, Storage, Cores, etc.
- Improved management of licensing and usage costs and a fee-for-use service model

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Close of Briefing and Open Discussion

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Open / Panel Discussion

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BACKUP SLIDES

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Akamai will Cloud-enable your GIS delivery

1. Customer requests GIS data (i.e., map tiles).
2. If the requested tiles are not already cached on the closest Edge Server, it will pull the tiles from Akamai's Cloud Storage solution, NetStorage. Those tiles will then be cached for next use.
3. If the tiles are not in storage, the Edge Server will go to the GIS application to retrieve the imagery using Akamai's acceleration services. The GIS application may have to generate the map tiles before serving them.

Integrating Akamai with GIS:

1. **Enhances out-of-box GIS caching capabilities**
2. **Accelerates content delivery for origin-bound requests**
3. **Reduces traffic and storage needs**