The Cloudy Future of GIS-T

What we should know about cloud computing?

Bo Guo, PhD, PE
Once Upon a Time...

Before there were financial institutions...

Before there were power utility companies

Then the computer, and the Internet...
Now & the Future...

Data is the new currency
Computing is utility
Software defines business
CC - A Consumer’s perspective

My data...

Stored on hard drives owned and operated by someone else.

Managed through applications developed and maintained by someone else.
CC: Benefits

Focus on business
Business agility
Security
Cost
  Economics of scale
  Competition
  Consumption-based
More innovation
Ownership & Security

Ownership = Physical possession?

Physical possession = Security?

Shared Responsibilities

- Infrastructure level
- Application
- User level
Different Clouds

Public cloud

Multi-cloud

Private cloud (On-premises or single tenant)

Hybrid cloud (Data center & Public cloud)
CC: Common Acronyms

SaaS
PaaS
IaaS
FaaS / Serverless / Jeff
CC: Technologies

Container / VM

Configuration / Orchestration Tools

DevOps / CICD

APIs / Microservices
Cloud-native application

Elasticity - Autoscaling
Zone and Region - Resiliency
CI/CD pipeline
Multi-tenant
Monitor/Alert - Infrastructure & APM
Adoption Challenges

Capital Investment vs Operating Expenses
Security and Compliance Concerns
Vendor-lock Concerns
Data Latency
Technology Complexity
Talents
GIS-T CC Options

- GeoSpatial
- Data w/ Location Info
  - LRS / HPMS
- Data w/o Location Info

Options
- Limited
- Plentiful Options
Example: Drive Texas By AppGeo

https://drivetexas.org

- Web page/Javascript delivery as a service via Google AppEngine
- Basemap and traffic as a service via Google Maps API
- Customer data serving as a service via MapLarge
- Parcel & thematic data serving as a service via CARTO
- NOAA delivered post-event imagery as a service via OGC WMTS
Hurricane Harvey Peak Stat:

30,000 concurrent users

500K daily users over 5 consecutive days
Datamark by Michael Baker

- Web-based collaborative map editing
- NG911 focused

GIS Cloud

- On-line mapping platform
- Web-based collaborative street network editing
LRS/HPMS Pain Points

Visualize / analyze HPMS data
Quality-check and feedback
Submission process
Performance
LinearBench HPMS Cloud App

Easy to sign-up
Simple to upload data and discover
QA/QC
Generate Reporting
Visualize and Explore the errors
Compare multi-year submittals.
Quality Control Reports:

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<th>COMMENTS</th>
<th>CODE</th>
<th>RULE</th>
<th>DATA_ITEM</th>
<th>LGP ID</th>
<th>BEGIN DATE</th>
<th>END DATE</th>
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### LinearBench for HPMS - OHIO

#### Route Geometry QC - Define Options

<table>
<thead>
<tr>
<th>Report Name</th>
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<tbody>
<tr>
<td>Description</td>
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<tr>
<td>Visibility</td>
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#### Quality Control (QC) Parameters

<table>
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<tr>
<th>Parameter</th>
<th>Value 1</th>
<th>Value 2</th>
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<tbody>
<tr>
<td>Minimum Route Segment Length</td>
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<td>Meters</td>
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<tr>
<td>Measure/Geom Length Difference</td>
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<td>Percent</td>
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<tr>
<td>Minimum Angle</td>
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<td>Degree</td>
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<tr>
<td>Minimum Gap Size</td>
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<td>Meters</td>
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</table>
## Data Load - Section Files

### Select Files
- **File Name**
  - Item_15_Toll_Charged.txt
  - Item_16_Toll_Type.txt
  - Item_56_Missing_Last_Overlay_Thickness.txt
  - Item_48_PSR.txt
  - Item_55_Year_Last_Construction.txt
  - Item_54_Year_Last_Improv.txt

### Table Data
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<th>State_Code</th>
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<th>End_Point</th>
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<th>Section_Length</th>
<th>Value</th>
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</table>

Total: 10
Embracing the Cloudy Future

Learn
Influence
Practice

Do not wait, the future is now!
Questions?

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