



# Get a Second Opinion: Enterprise GIS Health Checks

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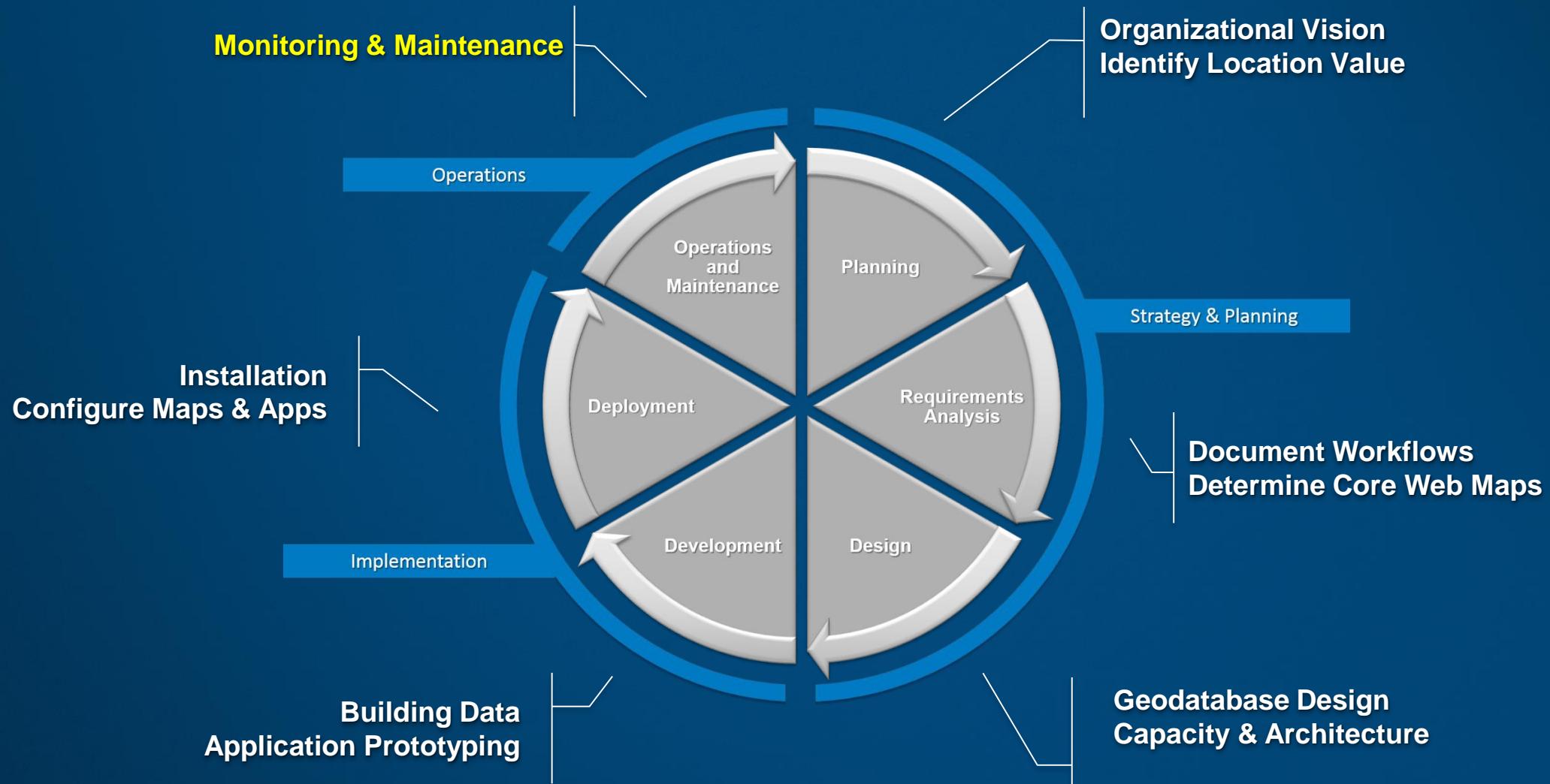
# What is an Enterprise GIS Health Check



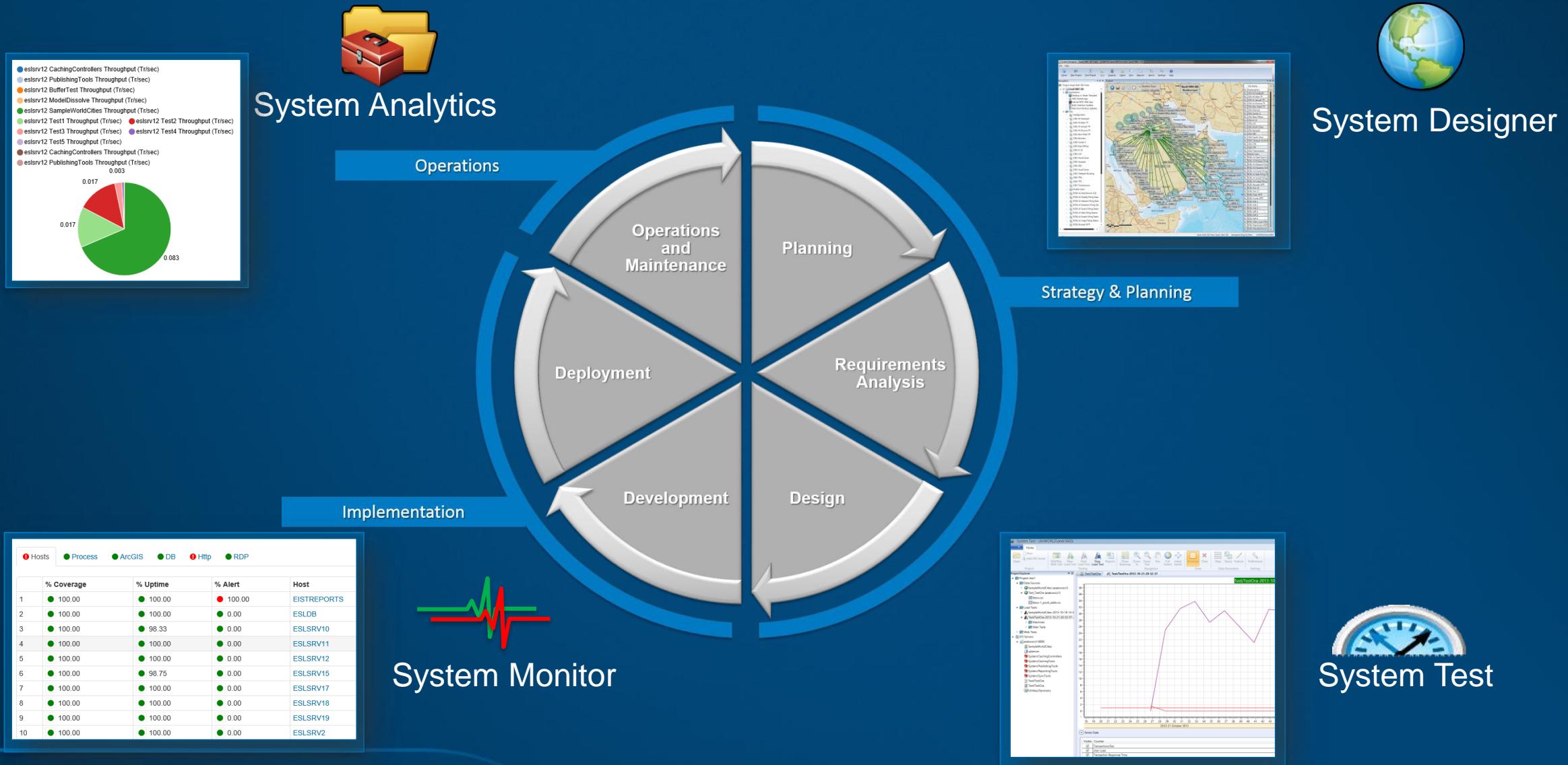
- An Onsite Engagement Focusing On:
  - Proactively reviewing and assessing current GIS server(s) and web services
  - Monitoring, testing and reviewing configuration and operations
  - Early detection and evaluation of potential issues



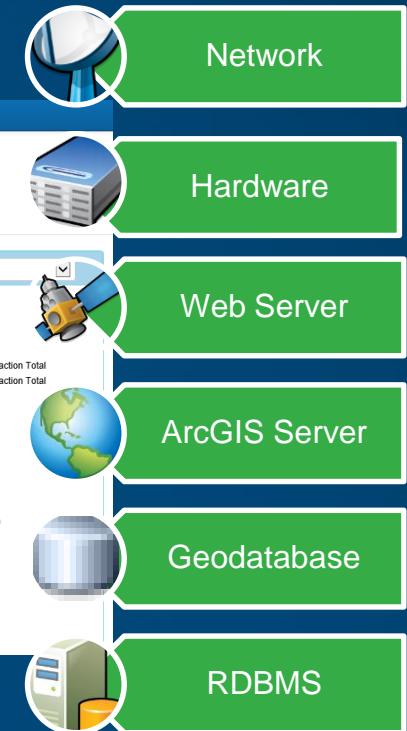
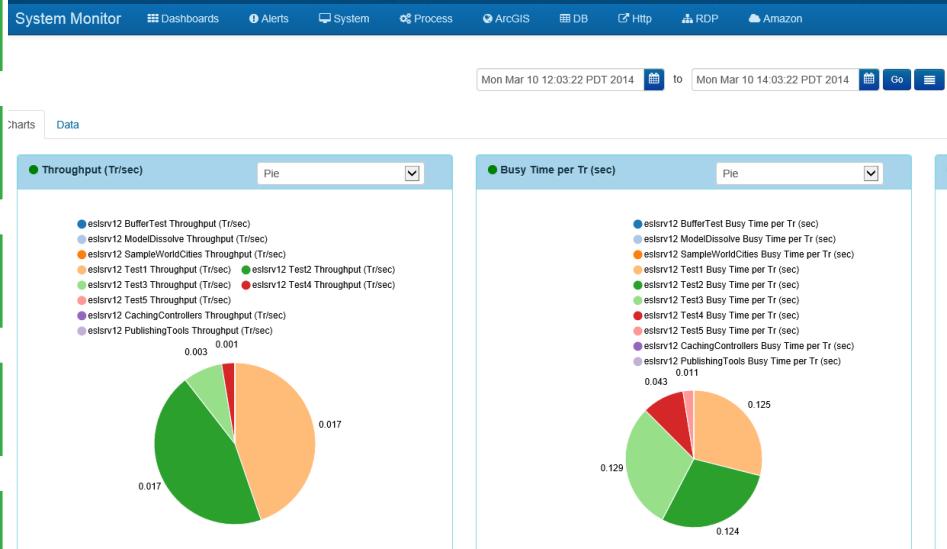
# Why Create an Enterprise Health Check?



# System Tools For a Science Based Approach

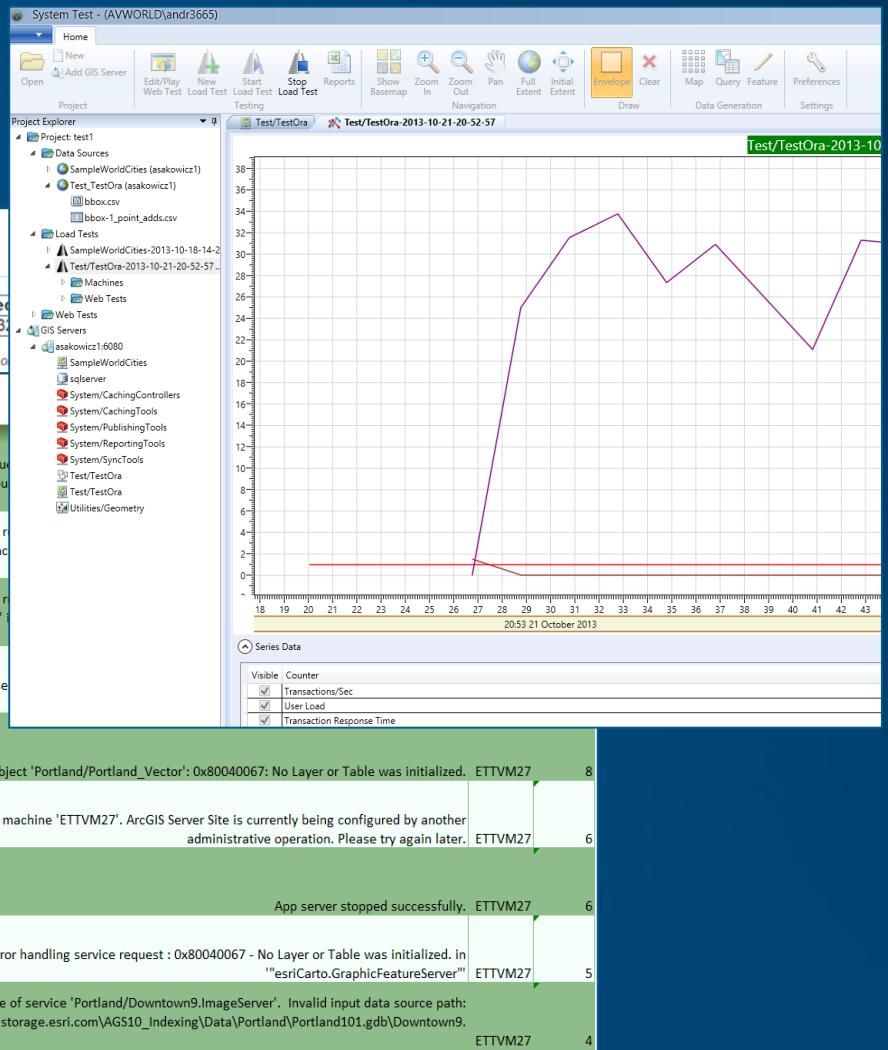
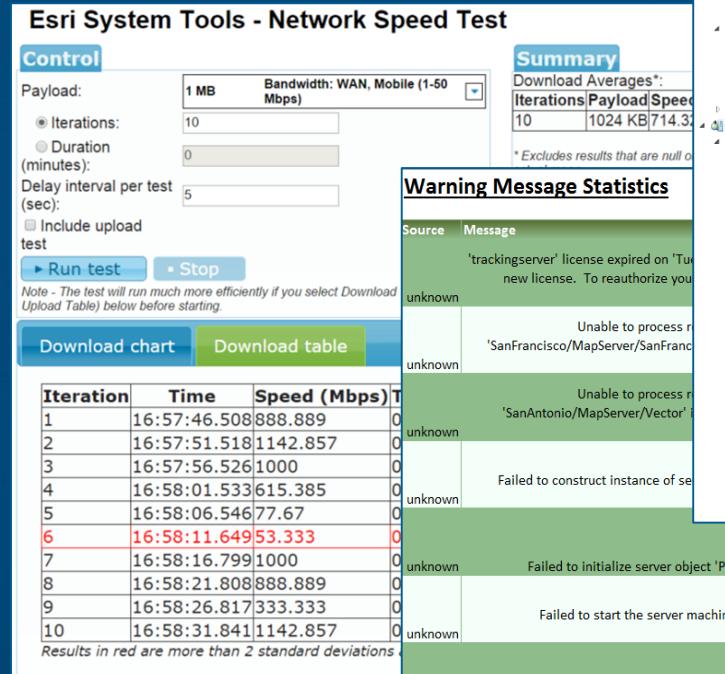


# Monitor and Track Performance



# System Testing, and Log Analysis

- ArcGIS Services Tests
  - Application Testing
  - Analyze System Logs



# Health Check Report

System Monitor   Dashboards   Alerts   System   Process   ArcGIS   DB   Http   RDP   Amazon

Mon Mar 10 12:03:22 PDT 2014 to Mon Mar 10 14:03:22 PDT 2014

Charts Data

● Throughput (Tr/sec)

● Busy Time per Tr (sec)

| Metric  | Value  |
|---|--------|
| eslsrv12 BufferTest Throughput (Tr/sec)         | 0.003  |
| eslsrv12 ModelDissolve Throughput (Tr/sec)      | 0.001  |
| eslsrv12 SampleWorldCities Throughput (Tr/sec)  | 0.017  |
| eslsrv12 Test1 Throughput (Tr/sec)              | 0.017  |
| eslsrv12 Test2 Throughput (Tr/sec)              | 0.017  |
| eslsrv12 Test3 Throughput (Tr/sec)              | 0.0129 |
| eslsrv12 Test4 Throughput (Tr/sec)              | 0.0124 |
| eslsrv12 Test5 Throughput (Tr/sec)              | 0.0125 |
| eslsrv12 CachingControllers Throughput (Tr/sec) | 0.043  |
| eslsrv12 PublishingTools Throughput (Tr/sec)    | 0.011  |

System Test - (AWORLD\andr3665)

Project Explorer

Project: test1

- SampleWorldCities (asakowicz1)
- Test/TestOra (asakowicz1)
  - bbox.csv
  - bbox\_1\_point\_adds.csv
- Load Tests
  - SampleWorldCities-2013-10-18-14-2
  - Test/TestOra-2013-10-21-20-52-57
    - Machines
    - Web Tests
- Web Tests
- GIS Servers
  - asakowicz1:6080
    - SampleWorldCities
    - spserver
    - System/CachingControllers
    - System/CachingTools
    - System/PublishingTools
    - System/ReportingTools
    - System/SyncTools
    - Test/TestOra
    - Test/TestOra
    - Utilities/Geometry

Test/TestOra - 2013-10-21-20-52-57

Test/TestOra-2013-10-21-20-52-57

| Type   | Name                    | Uptime | Performance | HighUtilization | LowUtilization | Alerts | Errors |
|--------|-------------------------|--------|-------------|-----------------|----------------|--------|--------|
| url    | Performance             | ■      | ■           |                 |                | ■      | ■      |
| url    | Performance Peak Hr     |        | ■           |                 |                |        |        |
| arcgis | Site                    | ■      |             |                 |                | ■      | ■      |
| arcgis | Cluster                 |        |             |                 |                |        |        |
| arcgis | Instances               | ■      |             | ■               |                | ■      |        |
| arcgis | Transactions            |        |             | ■               |                |        |        |
| arcgis | Transactions Peak Hour  |        |             | ■               |                |        |        |
| arcgis | Performance             |        | ■           |                 |                |        |        |
| arcgis | Performance Peak Hour   |        |             |                 |                |        |        |
| system | CPU                     | ■      |             | ■               | ■              | ■      | ■      |
| system | CPU Peak Hr             |        | ■           | ■               | ■              | ■      | ■      |
| system | Memory Physical         | ■      |             | ■               |                |        |        |
| system | Memory Physical Peak Hr |        |             | ■               |                |        |        |
| system | Memory Virtual          | ■      |             | ■               | ■              | ■      |        |
| system | Memory Virtual Peak Hr  |        |             | ■               |                |        |        |
| system | Disk IQ                 | ■      |             | ■               |                |        |        |
| system | Disk IO Peak Hr         |        | ■           | ■               |                | ■      |        |
| system | Disk Space              | ■      |             | ■               | ■              | ■      |        |

# Methodology

- Review of environments and system support roles/activities
- End-to-end monitoring
- ArcGIS Server and Portal log analysis
- WebGIS content analysis
- Web app analysis
- Of:
  - ArcGIS Platform Implementation
  - System Key Performance Indictors

## Review - Implementation

- ArcGIS Server site configuration:
  - Sites
  - Clusters
  - Services
- Infrastructure
- Data Sources
- High Availability and Disaster Requirements
- Security Requirements
- Applications

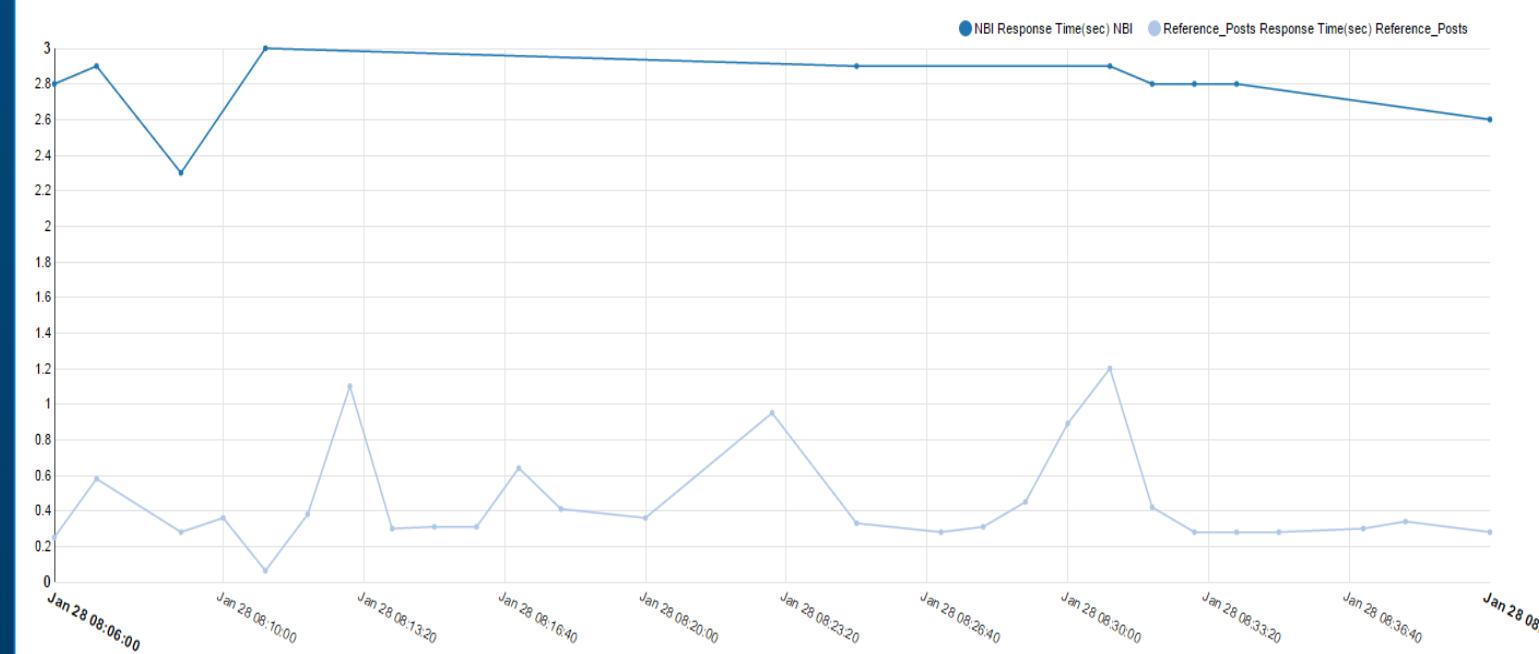


# System Key Performance Indicators

- Uptime
- Performance
- High Utilization
- Low Utilization
- Errors and Alerts

|  | Min(%) | Avg(%) | p95(%) | Uptime(%) | Samples | Date       | Hour | Weekday   |
|--|--------|--------|--------|-----------|---------|------------|------|-----------|
|  | 0      | 20.39  | 100    | 116.67    | 70      | 2016-01-27 | 0    | Wednesday |
|  | 0      | 79.56  | 100    | 113.33    | 68      | 2016-01-27 | 1    | Wednesday |
|  | 25     | 40.79  | 87     | 31.67     | 19      | 2016-01-26 | 15   | Tuesday   |
|  | 0      | 26.68  | 85     | 118.33    | 71      | 2016-01-27 | 5    | Wednesday |
|  | 3      | 45.16  | 84     | 116.67    | 70      | 2016-01-26 | 20   | Tuesday   |
|  | 0      | 48.22  | 82     | 120       | 72      | 2016-01-26 | 13   | Tuesday   |

| Type   | Code | Machine | Count | Message String   |
|--------|------|---------|-------|--|
| SEVERE | 9016 | AGS3    | 2907  | Error getting service.   |
| SEVERE | 9016 | AGS4    | 2250  | Error getting service.   |
| SEVERE | 9016 | AGS5    | 2159  | Error getting service.   |
| SEVERE | 9527 | AGS3    | 1339  | Error handling request to service 'B/XYZ.MapServer'. The service |



# Findings and Recommendations

- **Executive Summary**
  - **High Level Recommendations**
  - **Detailed Metrics**

## 5.2 ArcGIS Platform

### 5.2.1 ArcGIS for Server

[ ] hosts a single ArcGIS for Server site that supports the needs of internal and external users. The public-facing URL for this server is [http://\[ \]/rest/services/](http://[ ]/rest/services/) and the internal URL is the same, though it resolves the DMZ servers via internal virtual IPs, not the public-facing [ ] 63.20 DNS entry. The ArcGIS Server configuration currently supports HTTP and HTTPS traffic internally but only supports HTTP traffic through the firewall. Currently the installed ArcGIS for Server software is the 10.3.1 release. A separate Portal for ArcGIS install on AC [ ] SRV is at version 10.4.

External access to the GIS services is routed through a Cisco ASDM Firewall to two virtual web servers running a single ArcGIS Web Adaptor on each server, all in the [ ]'s DMZ network. These Web Adaptors forward traffic to ArcGIS Server over port 6080, with port 6443 traffic currently blocked by the firewall or a switch limitation (ongoing work continues on this issue).

Internal access to ArcGIS Server is available via the shared public-facing URLs, via direct access to the GIS Server host over ports 6080 and 6443, or via an internal-facing web adaptor installed on the ArcGIS Server machine in IIS on ports 80 and 443. All access points are secured with built-in ArcGIS Server accounts for publishing purposes. Administrative access is disabled for the public-facing Web Adaptor(s) and endpoints.

### 5.2.1.1 Site and Clusters

The ArcGIS for Server site is composed of one cluster containing one ArcGIS for Server machine.

This primary ArcGIS Server machine hosts (approximately) 2 geocoding services, 8 geoprocessing services and 46 map and/or feature services, with 121 maximum service instances as configured.

The site's configuration store and directories are stored on the server's local file system and appear to be functioning effectively.

<https://esri.box.com/v/ehc-fedgc>

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## Example 1



- **Case: A state government suspects some practices may be attuned to prior generations of Esri technology.**
  - Long time Esri customer
  - Many legacy systems
  - Questions about why certain problems occur

**Value: Validate / update current approaches:**

Are the current GIS technologies being used in the best ways?

Is the system design related to specific problems?

How have other organizations approached similar challenges?

Exonerated some configuration / technologies

Altered the deployment patterns for other technologies

## Example 2

- Case: A federal agency's local office is preparing to launch Portal for ArcGIS.
  - Esri is assisting with the Portal implementation.
  - ArcGIS Enterprise will get more utilization and visibility



**Value: Identify higher risk implementation practices and “dormant” risks:**

**Review ArcGIS Server's system design and configuration**

**Identify risk factors for nationally distributed systems**

**Look for evidence of capacity bottlenecks or latent problems**

**Review IT's systems and operating procedures**

**Proceeded with confidence and awareness of specific risks**

## Example 3

- Case: A navigation systems company migrated their GIS to Esri 3 years ago.
  - Implementing on an Esri System Design
  - 3<sup>rd</sup> party, custom application
  - Many successes; some problems



**Value: Validate / improve:**

**IT's approach to provisioning RDBMS and Citrix server roles**

**DBA's work to configure/tune the eGDB**

**3<sup>rd</sup> party's application follows best practices**

**Understand likely causes of select, recurring issues**

**Validated expert contributions and holistic integrity**

**Resolved recurring performance problem**

## **Key Takeaways**

- **Perform proactive operations and maintenance**
- **Continually assessing performance**
- **Review configuration and operations with any change**
- **Early detection prevents critical issues**

## Our approach to “Performance” and “Health”

- How do we define these terms?

**Stability** means that the system is available when you expect it to be, and all the software components run consistently.

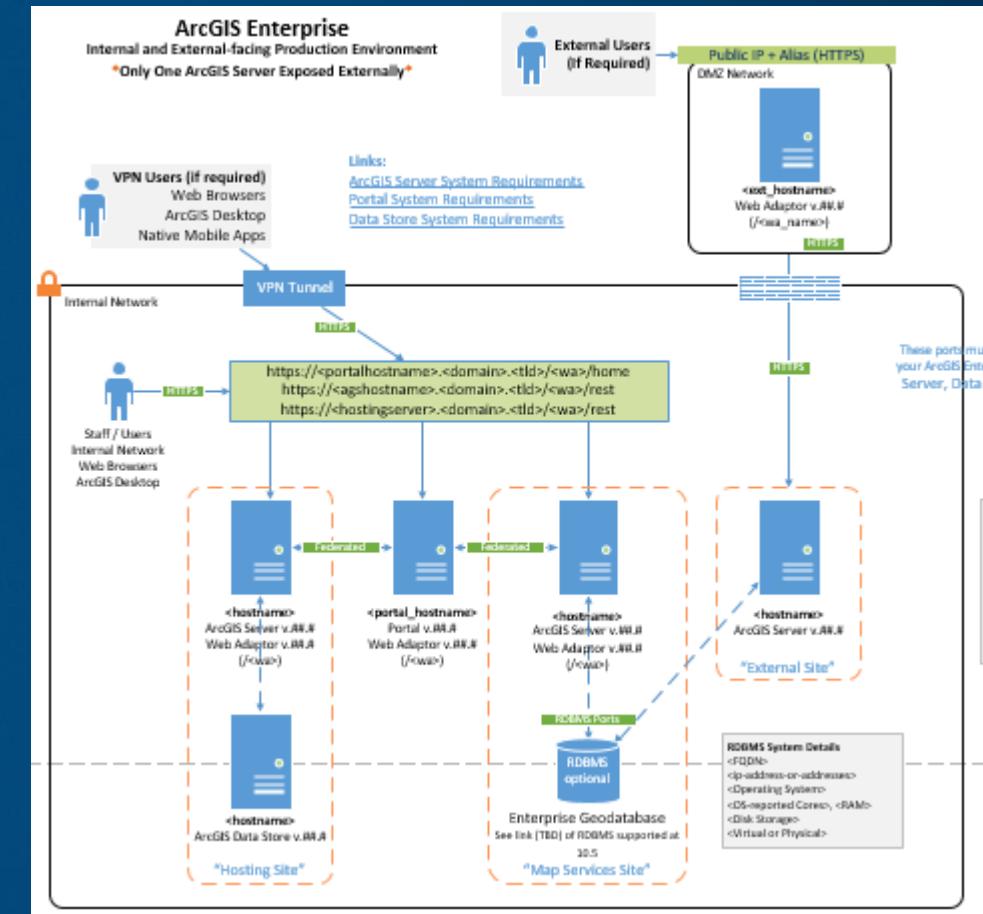
When your system is stable, you trust that it's working well.

**Performance** is a relative term, but it means that users of your infrastructure see loading times and performance that they expect.

When your system is performant, you see and feel that it's working well.

# How do we define the boundaries of Enterprise GIS?

- Based on what impacts performance and stability:
  - VM Infrastructure
  - Network Architecture
  - Database Configuration
  - Client Environment/Location
  - Storage Performance
  - Esri Software
  - Operating System software
  - 3<sup>rd</sup> Party Components
  - User workflows

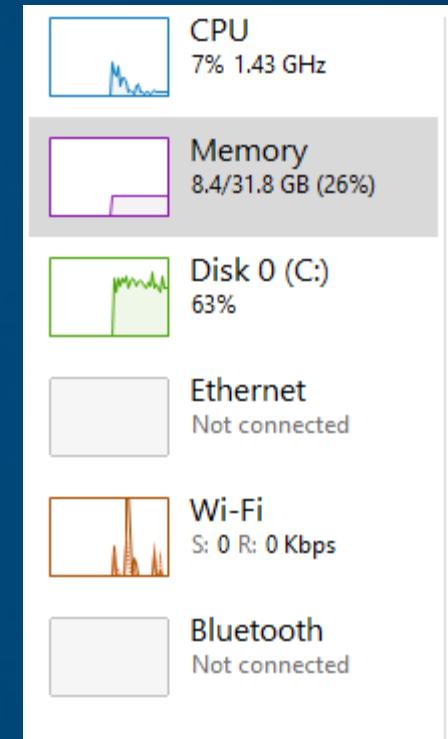


*Everything that affects your system is relevant to System Health*

# How do you know when your system is stable?

...and how do I keep it that way?

- Understand what a stable system looks like
  - Javaw.exe, ArcGISServer.exe, Memory Usage, etc.
- Monitor CPU and Memory usage from ArcGIS-related processes
- Operate under 75% RAM Utilization
- Maintain CPU utilization below 75% (spikes are OK)
- Stable systems can respond smoothly to increased load
  - Normal or greater than normal



# How do you know when your system is FAST (**enough**)?

...and how do I validate performance?

- **Performance is relative**
  - How long does it take me to do the thing I want to do
- **Performance is complicated**
  - Client network speed, web server, GIS Server, database, disk, local network
- **Performance metrics can only be generated after a baseline is established**
- **Performance testing can have multiple strategies**
  - What is the maximum load we can sustain?
  - What is the experience of an average user?

## Common Issues and Themes found during EHCs

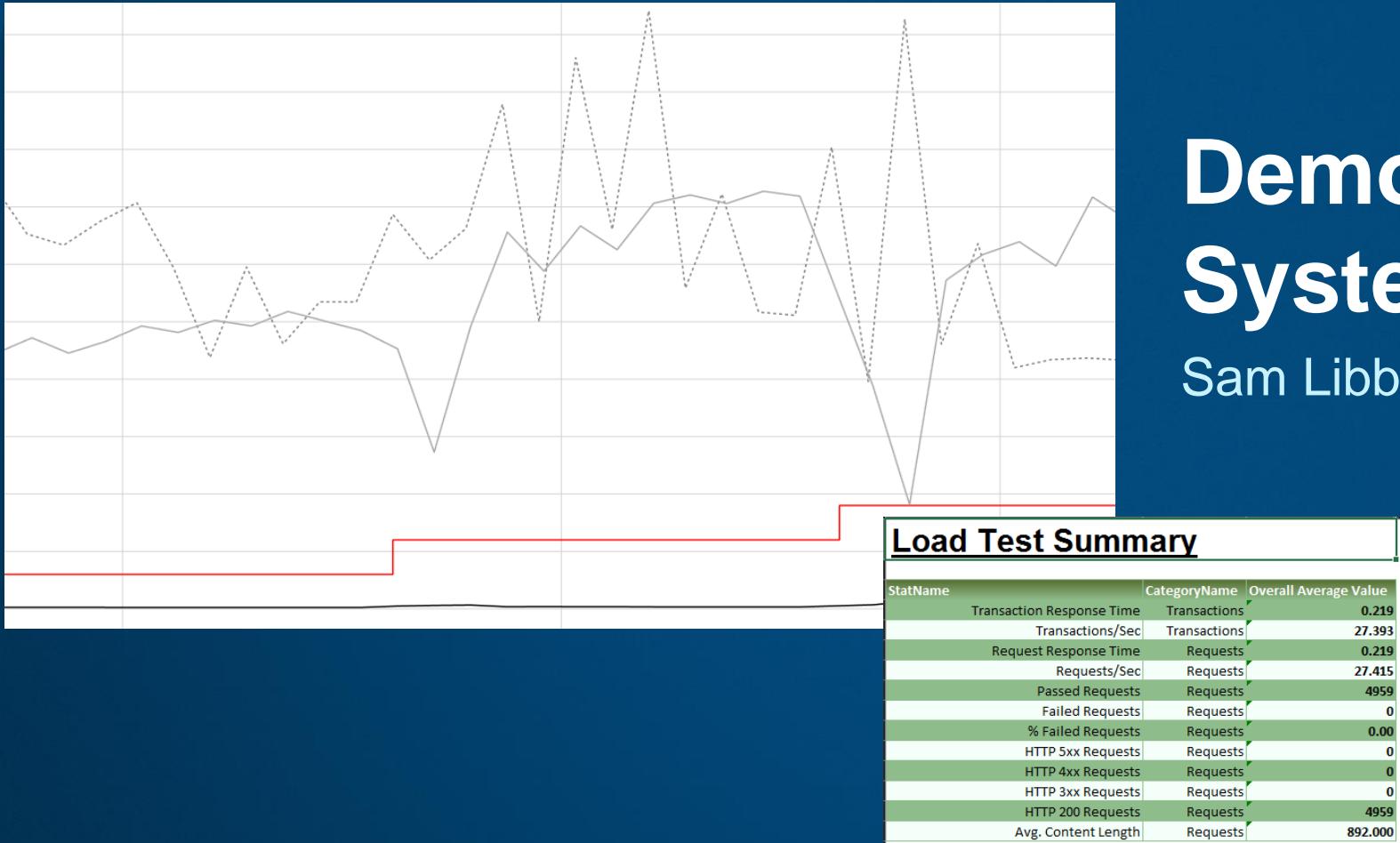
- Not using ArcGIS Server instance settings properly
  - Too many max SOCs, not enough, too many min SOCs, improper use of pooling, min 1
- Clustering and Single Cluster Mode
- Pagefile and Memory usage
- Competing workflows running on a single machine (GP + Maps etc.)
- VM over-allocation
- Disk performance
- Access to remote file shares and databases
- Indexing on frequently-updated or replaced data
- Data center organization

## Tips for Common Issues and Misconfigurations

- Monitor system performance over time
  - get to know what “normal” looks like, so you can identify variances
- A few consolidated, well-tuned services  $\geq$  many small, poorly configured services
- Keep your software up to date – security and bug fixes but also performance improvements
- Keep your VMs fresh – re-create instances with updated OS versions periodically
- Get to know your database and how to monitor it

# Demonstration: System Test

Sam Libby



# How System Health and Performance has Changed over Time

- Traditional GIS performance assessment:
  - Desktop -> Enterprise Geodatabase: multi-user editing and viewing
  - Desktop to Server: drawing maps in map services
- Modern Web GIS:
  - Hosted feature services
  - JSAPI-based web map queries
  - GP, geocoding, Portal and Data Store, web app performance, browser considerations

## How to plan for the near future

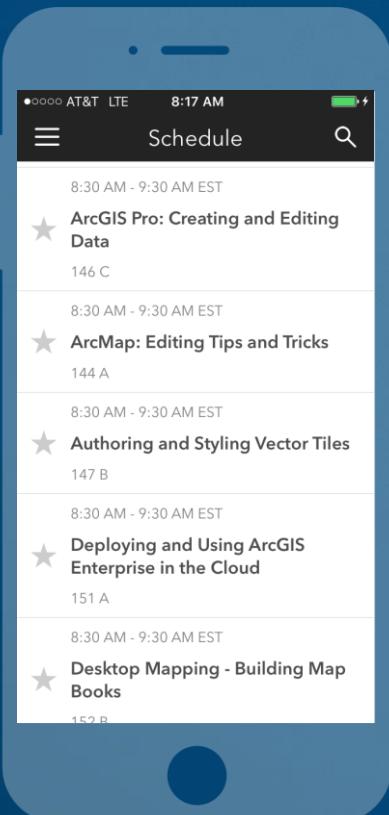
- If your system is stable and performs within your expected baseline:
  - That's great, but it's not enough
- Modern Web GIS grows consistently, more services, apps, web maps, users, etc.
- Have a hardware and IT plan for how you will update your env't in the next 1-3 years
- Plan for the growth in usage you hope to see

# Please Take Our Survey on the Esri Events App!

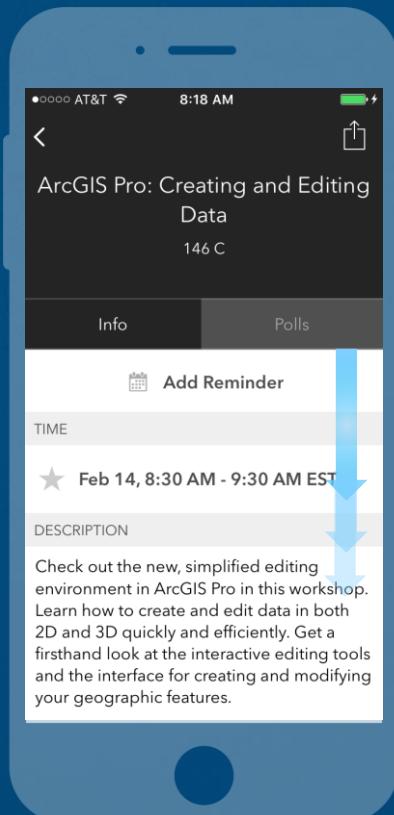
Download the Esri Events app and find your event



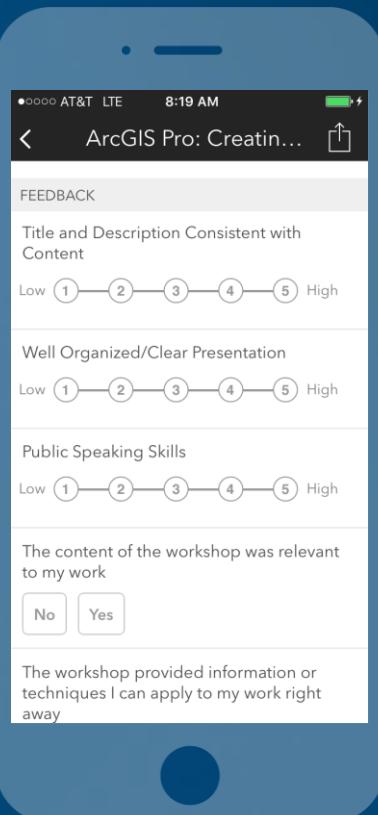
Select the session you attended



Scroll down to find the survey



Complete Answers and Select "Submit"



# Thanks!

Feel free to contact us:

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**Sample Report**  
<https://esri.box.com/v/ehc-fedgc>

