

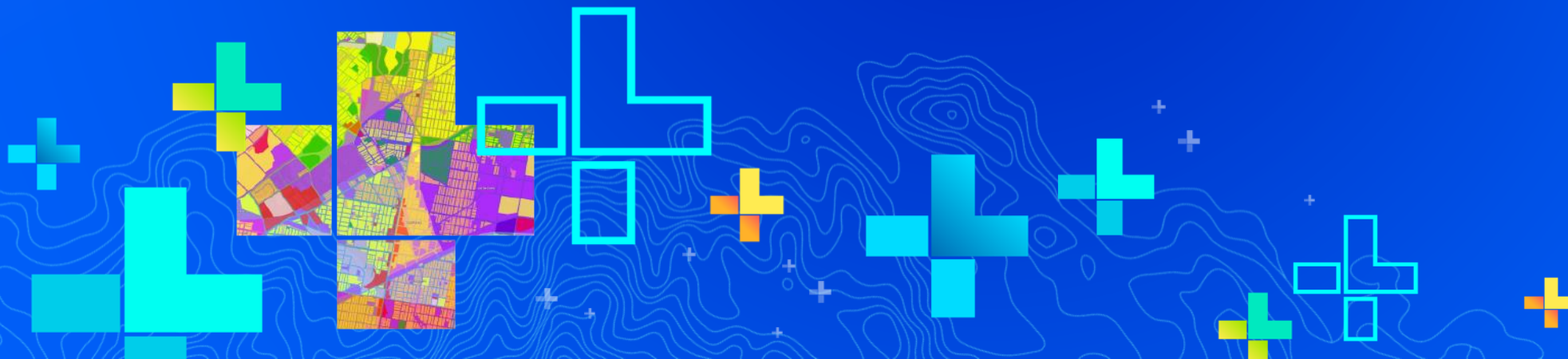


Esri Best Practices: Tuning, Testing, and Monitoring

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SEE
WHAT
OTHERS
CAN'T



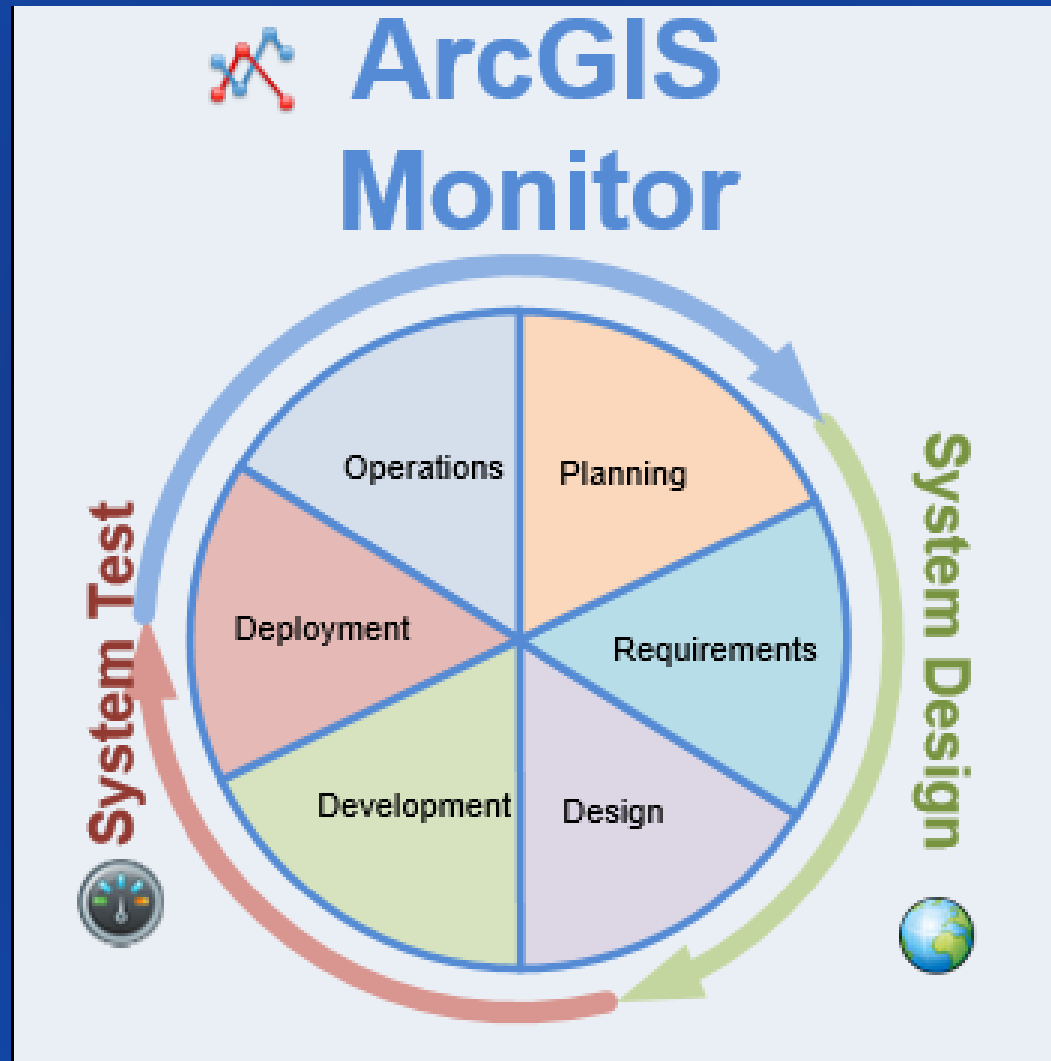
Process and tools

Section Subhead



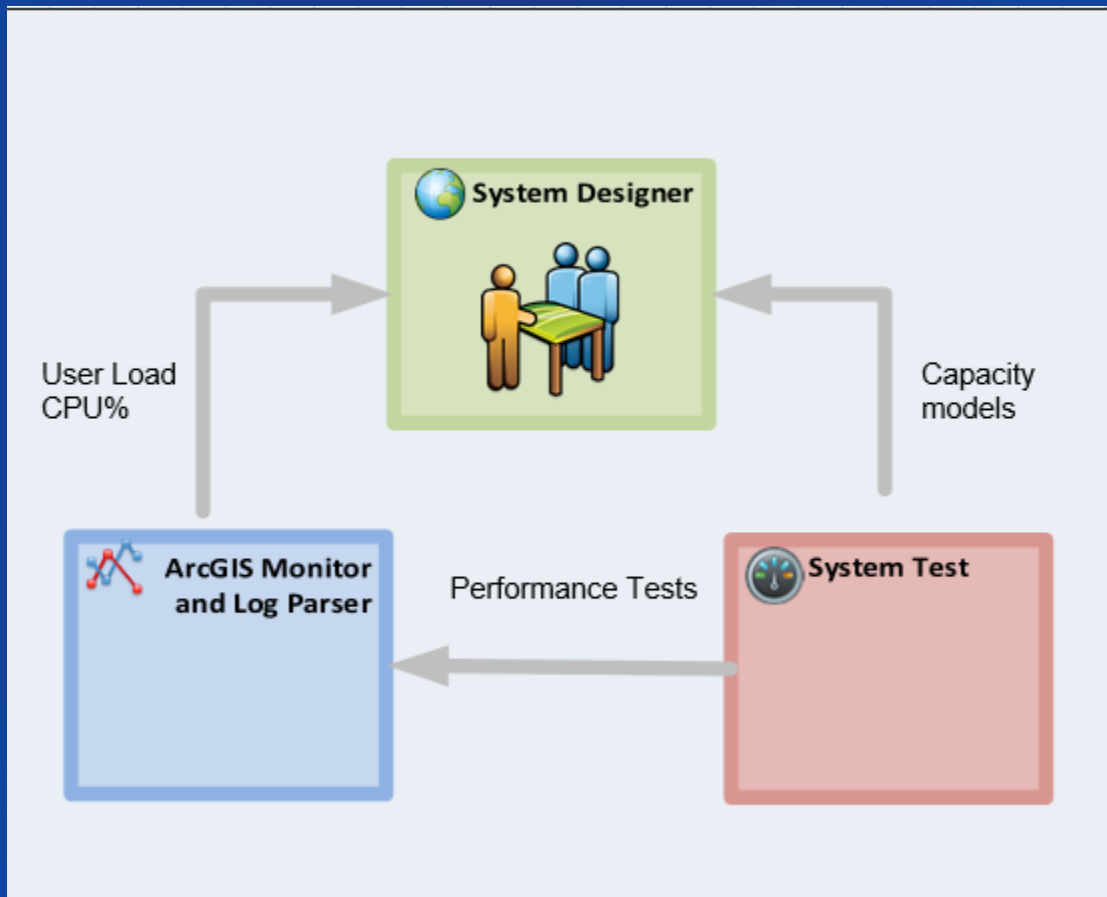
Process and tools

Esri tools



Process and tools

Esri tools



Tools download location

- **ArcGIS Monitor**

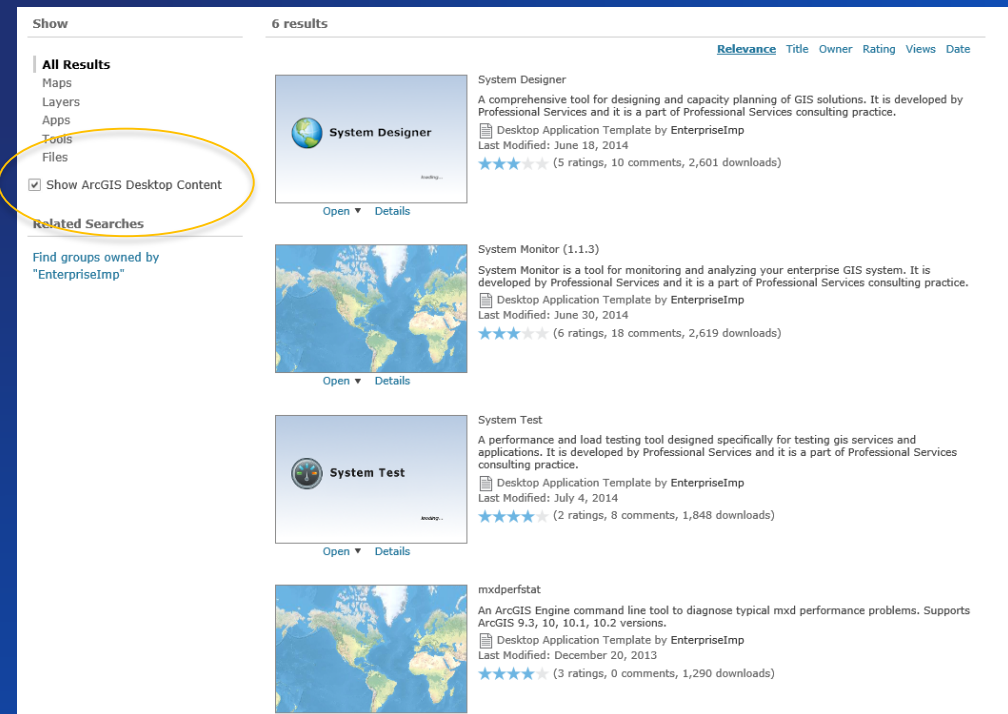
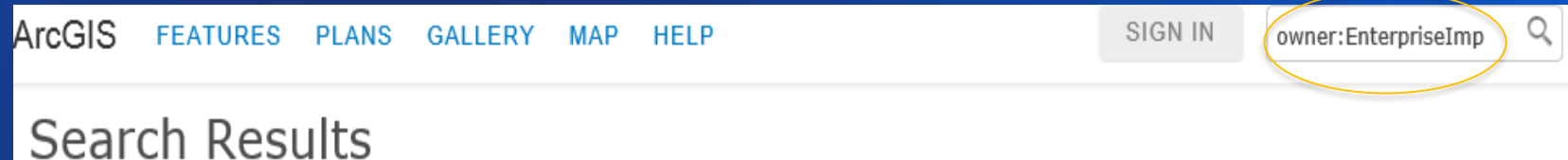
- <https://my.esri.com/>

- **Others**

- <http://www.arcgis.com>

- **owner:EnterpriseImp**

- **Show ArcGIS Desktop Content**



Enterprise Implementation Maturity Model

Level	Architectural Design and Capacity Planning	Performance and Scalability Testing	Monitoring	Trend Analysis and Quantification
0	No	No	No	No
1	Yes	No	No	No
2	Yes	Yes	No	No
3	Yes	Yes	Yes	No
4	Yes	Yes	Yes	Yes

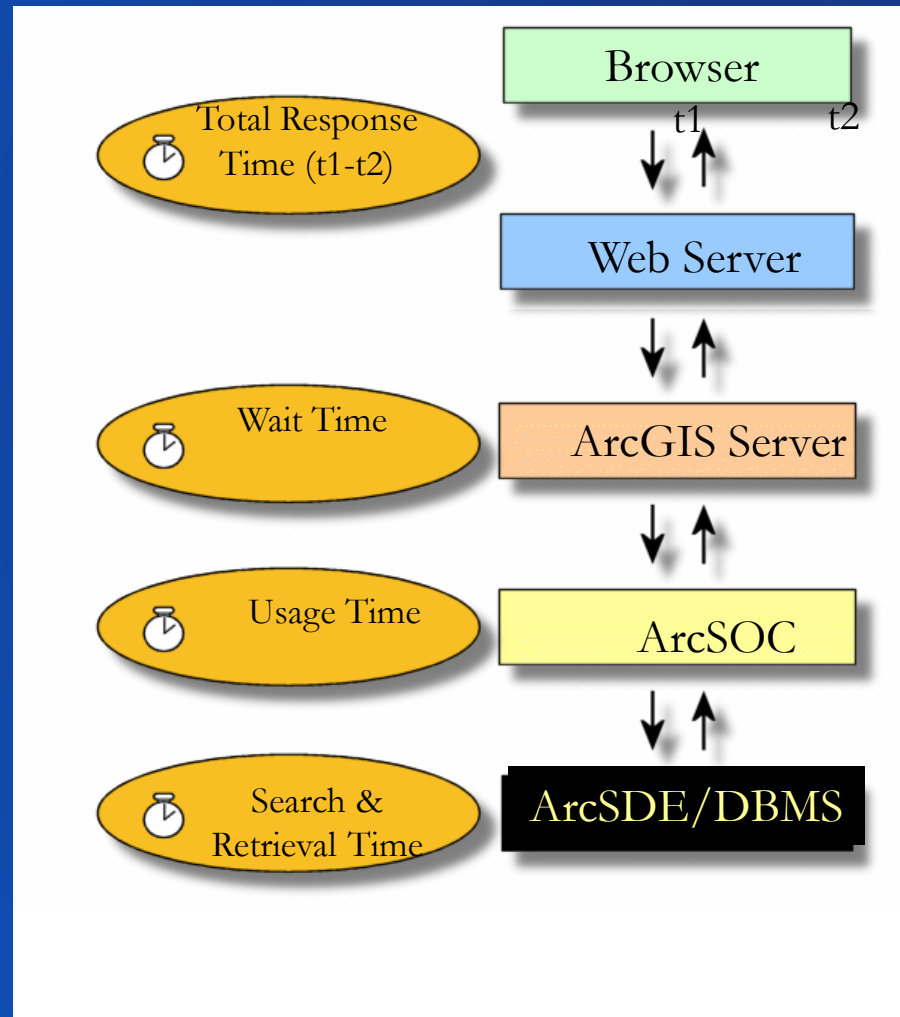
Tuning

Section Subhead



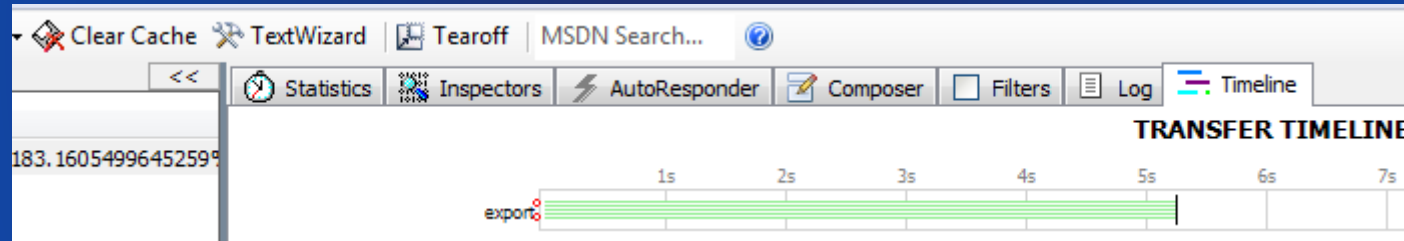
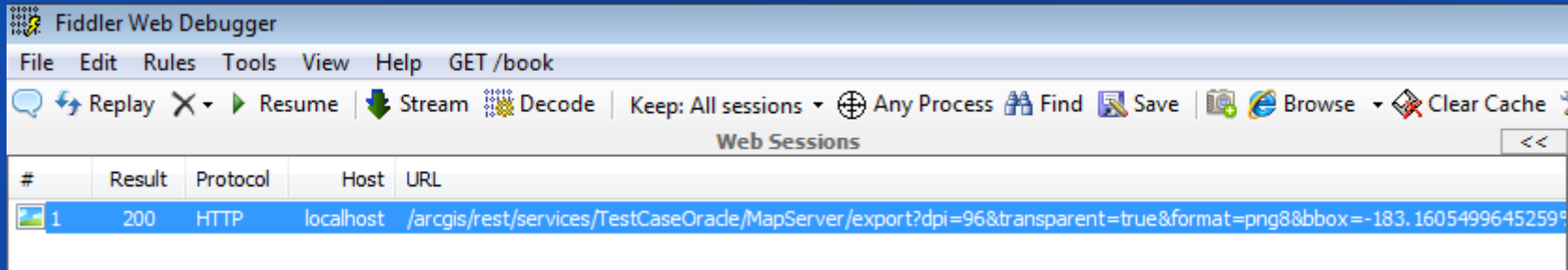
Tuning methodology

Profile each tier starting from the top



Profile application

Fiddler measurement approximately 5.2 seconds

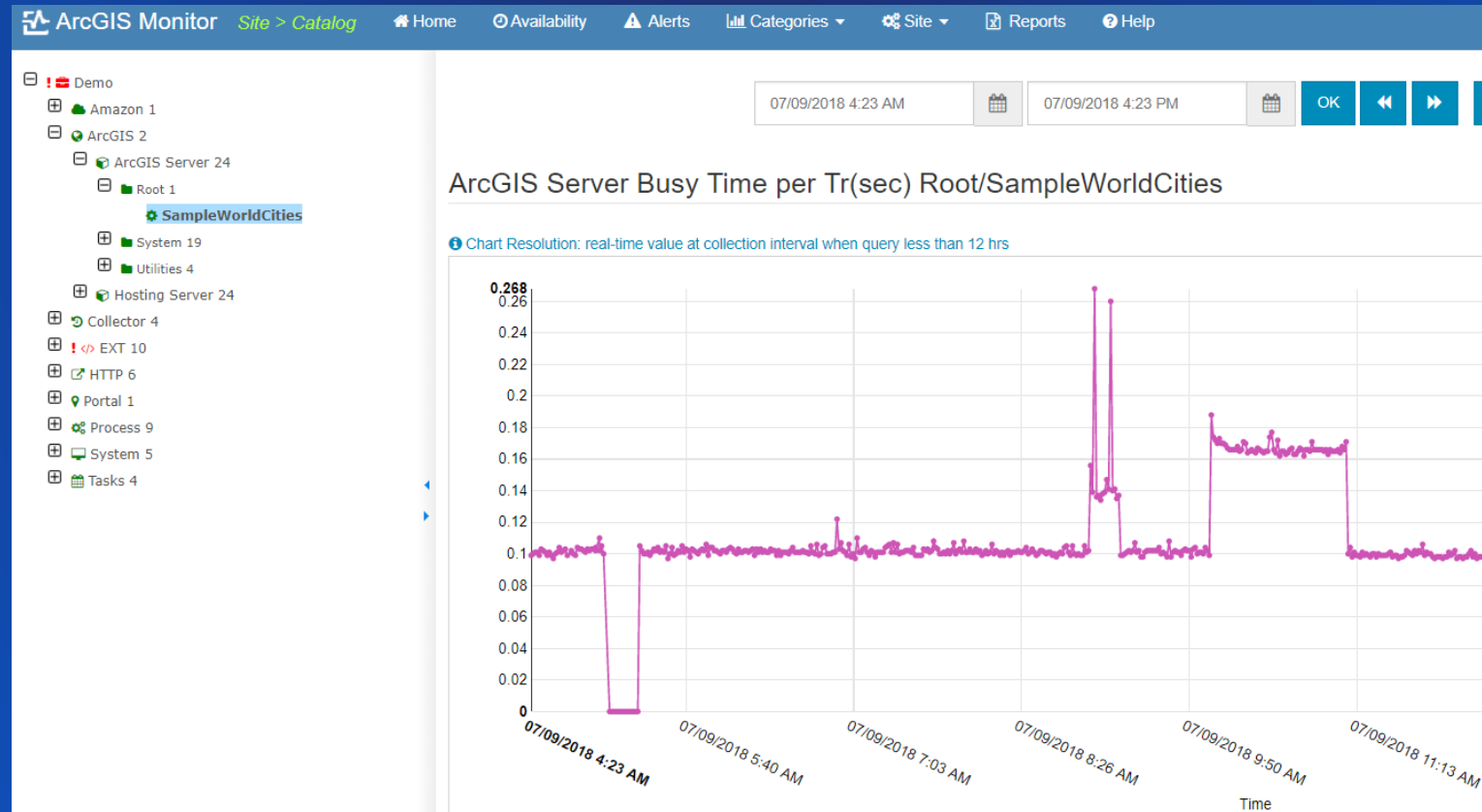


Application performance narrowed down to specific request and map service

Review historical stats of the culprit service

ArcGIS Monitor

- <https://enterprise.arcgis.com/en/monitor/>
- <https://arcgismonitor.esri.com>



Profile mxd of the culprit map service

Mxdperfstat

Item	At Scale	Layer Name	Refresh Time (sec)	Recommendations	Features	Vertices	Labeling	Geography Phase (sec)	Graphics Phase (sec)	Cursor Phase (sec)	DBMS CPU	DBMS LIO
1	167,935,665	SDE.GridPoint	4.75	run DBMS trace: oraCPU=4.74; run DBMS trace, check oracle execution plan: oraLIO=130936; check if index exist for query def attributes;	1,998		False	4.74	.00	4.56	4.74	130,936

DBMS LIO	DBMS PIO	Source	LayerType	Layer Spatial Reference	LayerQueryDef
130,936		esriDBMS_Oracle,asakowicz,sde:oracle\$asakowicz:1521/gis2,sde	esriGeometryPoint	GCS_WGS_1984	ID<1000

Oracle Trace

Compare elapsed time

```
SQL ID: 6p20xrg10fw4n Plan Hash: 569628948
```

```
SELECT U_45.st_SHAPE$, U_45.OID, U_45.st_points,U_45.st_numpts,  
       U_45.st_entity,U_45.st_minx,U_45.st_miny,U_45.st_maxx,U_45.st_maxy,  
       U_45.st_minz,U_45.st_maxz,U_45.st_minm,U_45.st_maxm,U_45.st_area$,  
       U_45.st_len$,U_45.st_rowid  
FROM  
(SELECT b.OID,b.GX,b.GY,b.ID,1 st_SHAPE$,b.SHAPE.points as st_points,  
       b.SHAPE.numpts as st_numpts,b.SHAPE.entity as st_entity,b.SHAPE.minx as  
       st_minx,b.SHAPE.miny as st_miny,b.SHAPE.maxx as st_maxx,b.SHAPE.maxy as  
       st_maxy,b.SHAPE.minz as st_minz,b.SHAPE.maxz as st_maxz,b.SHAPE.minm as  
       st_minm,b.SHAPE.maxm as st_maxm,b.SHAPE.area as st_area$,b.SHAPE.len as  
       st_len$,b.rowid as st_rowid FROM SDE.GridPoint b WHERE  
       SDE.ST_EnvIntersects(b.SHAPE,:1,:2,:3,:4) = 1 AND b.OID NOT IN (SELECT /*+  
       HASH_AJ */ SDE.DELETES_ROW_ID FROM SDE.D45 WHERE DELETED_AT IN (SELECT  
       l.lineage_id FROM SDE.state_lineages l WHERE l.lineage_name =  
       :lineage_name1 AND l.lineage_id <= :state_id1) AND SDE.STATE_ID = 0) UNION  
       ALL SELECT a.OID,a.GX,a.GY,a.ID,2 st_SHAPE$,a.SHAPE.points as st_points,  
       a.SHAPE.numpts as st_numpts,a.SHAPE.entity as st_entity,a.SHAPE.minx as  
       st_minx,a.SHAPE.miny as st_miny,a.SHAPE.maxx as st_maxx,a.SHAPE.maxy as  
       st_maxy,a.SHAPE.minz as st_minz,a.SHAPE.maxz as st_maxz,a.SHAPE.minm as  
       st_minm,a.SHAPE.maxm as st_maxm,a.SHAPE.area as st_area$,a.SHAPE.len as  
       st_len$,a.rowid as st_rowid FROM SDE.A45 a,SDE.state_lineages SL WHERE  
       SDE.ST_EnvIntersects(a.SHAPE,:5,:6,:7,:8) = 1 AND (a.OID, a.SDE.STATE_ID)  
       NOT IN (SELECT /*+ HASH_AJ */ SDE.DELETES_ROW_ID, SDE.STATE_ID FROM SDE.D45  
       WHERE DELETED_AT IN (SELECT l.lineage_id FROM SDE.state_lineages l WHERE  
       l.lineage_name = :lineage_name2 AND l.lineage_id <= :state_id2) AND  
       SDE.STATE_ID > 0) AND a.SDE.STATE_ID = SL.lineage_id AND SL.lineage_name =  
       :lineage_name3 AND SL.lineage_id <= :state_id3) U_45 WHERE (ID<1000)
```

call	count	cpu	elapsed	disk	query	current	rows
Parse	0	0.00	0.00	0	0	0	0
Execute	1	0.03	0.02	0	0	0	0
Fetch	20	9.67	9.64	0	129581	0	1998
total	21	9.70	9.66	0	129581	0	1998

Elapsed time slightly changed due to different test runs

Oracle Execution plan

```
Misses in library cache during parse: 1
Misses in library cache during execute: 1
Optimizer mode: ALL_ROWS
Parsing user id: 84
Number of plan statistics captured: 1
```

Rows <1st>	Rows <avg>	Rows <max>	Row Source Operation
1998	1998	1998	VIEW <cr=131605 pr=0 pw=0 time=512477 us cost=8 size=45906 card=21>
1998	1998	1998	UNION-ALL <cr=131605 pr=0 pw=0 time=511602 us>
1998	1998	1998	FILTER <cr=131451 pr=0 pw=0 time=508349 us>
1998	1998	1998	TABLE ACCESS BY INDEX ROWID GRIDPOINT <cr=131451 pr=0 pw=0 time=4456 us cost=0 size=44 card=1>
129600	129600	129600	DOMAIN INDEX <Sel: Default - Undefined> A29_IX1 <cr=2017 pr=0 pw=0 time=0 us cost=0 size=0 card=0>
0	0	0	NESTED LOOPS <cr=0 pr=0 pw=0 time=4456 us cost=0 size=44 card=1>
0	0	0	INDEX RANGE SCAN D45_PK <cr=0 pr=0 pw=0 time=2101 us cost=0 size=0 card=0>
0	0	0	INDEX UNIQUE SCAN LINEAGES_PK <cr=0 pr=0 pw=0 time=0 us cost=0 size=0 card=0>
0	0	0	NESTED LOOPS ANTI <cr=154 pr=0 pw=0 time=2247 us cost=5 size=2367 card=0>
0	0	0	NESTED LOOPS <cr=154 pr=0 pw=0 time=2243 us cost=5 size=2367 card=0>
0	0	0	TABLE ACCESS BY INDEX ROWID A45 <cr=154 pr=0 pw=0 time=2242 us cost=0 size=0 card=0>
0	0	0	BITMAP CONVERSION TO ROWIDS <cr=154 pr=0 pw=0 time=2236 us>
0	0	0	BITMAP AND <cr=154 pr=0 pw=0 time=2232 us>
0	0	0	BITMAP CONVERSION FROM ROWIDS <cr=147 pr=0 pw=0 time=455 us>
0	0	0	SORT ORDER BY <cr=147 pr=0 pw=0 time=454 us>
0	0	0	INDEX RANGE SCAN A45_STATEID_IX1 <cr=147 pr=0 pw=0 time=439 us cost=0 size=0 card=0>
0	0	0	BITMAP CONVERSION FROM ROWIDS <cr=7 pr=0 pw=0 time=1768 us>
0	0	0	SORT ORDER BY <cr=7 pr=0 pw=0 time=1768 us>
0	0	0	DOMAIN INDEX <Sel: Default - Undefined> A29_IX1_A <cr=7 pr=0 pw=0 time=0 us cost=0 size=0 card=0>
0	0	0	INDEX UNIQUE SCAN LINEAGES_PK <cr=0 pr=0 pw=0 time=0 us cost=0 size=0 card=0>
0	0	0	VIEW PUSHED PREDICATE UW_NSO_1 <cr=0 pr=0 pw=0 time=0 us cost=0 size=0 card=0>
0	0	0	FILTER <cr=0 pr=0 pw=0 time=0 us>
0	0	0	NESTED LOOPS <cr=0 pr=0 pw=0 time=0 us cost=0 size=44 card=1>
0	0	0	INDEX RANGE SCAN D45_PK <cr=0 pr=0 pw=0 time=0 us cost=0 size=0 card=0>
0	0	0	INDEX UNIQUE SCAN LINEAGES_PK <cr=0 pr=0 pw=0 time=0 us cost=0 size=0 card=0>

Inefficient spatial index

Testing

Section Subhead



Performance

- Speed, e.g. response time (seconds)



Scalability

- The ability to increase output and maintain acceptable performance



Capacity

- The maximum level of output the system can produce, e.g.
- X cars/sec
- X maps/sec



At capacity



Over capacity

Bottleneck

- Resource(s) limiting the performance or capacity



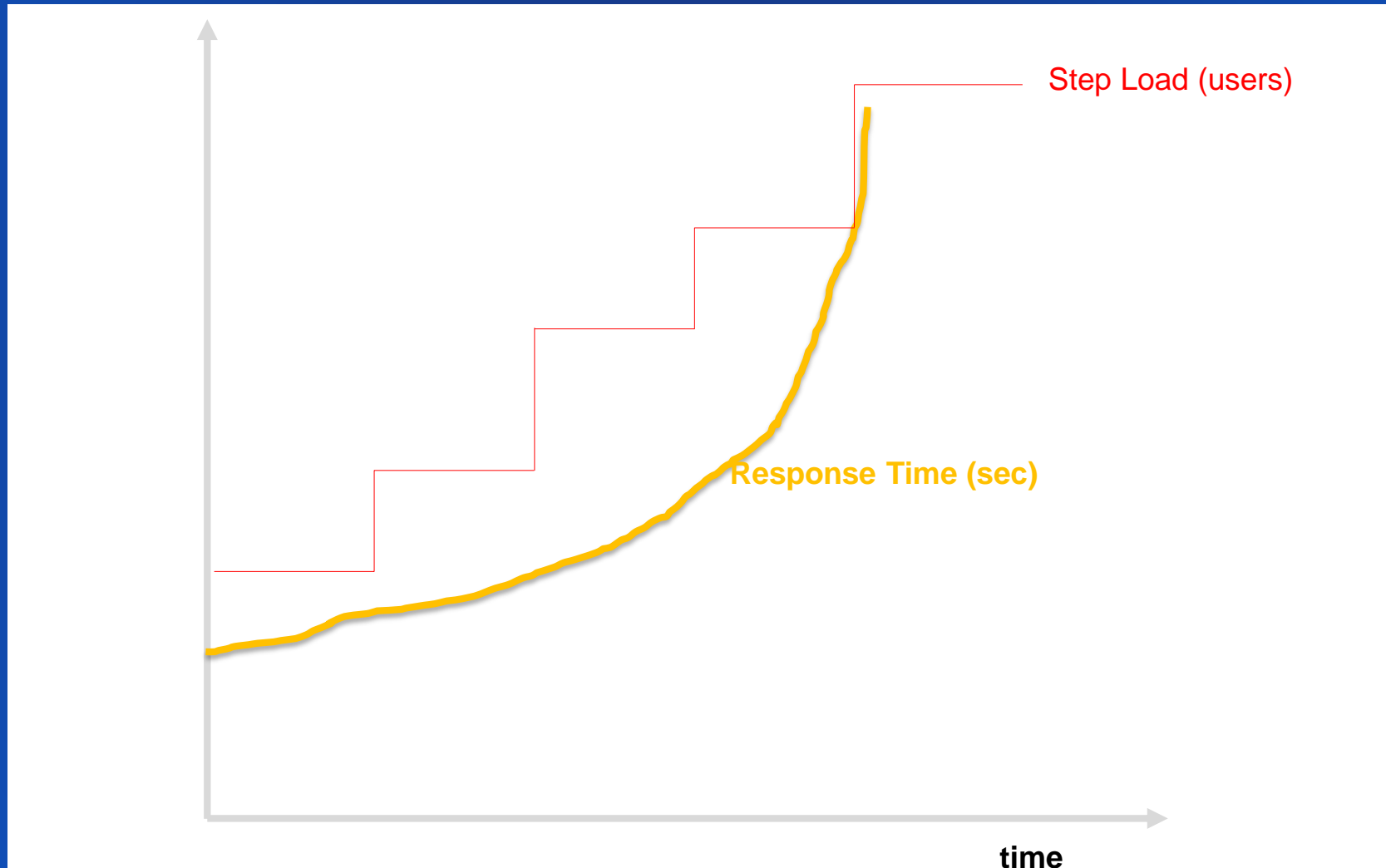
Not bottleneck



bottleneck

Think of :
Lanes -as CPU processor
Toll -as ArcGIS Server instances
Cars -as map requests

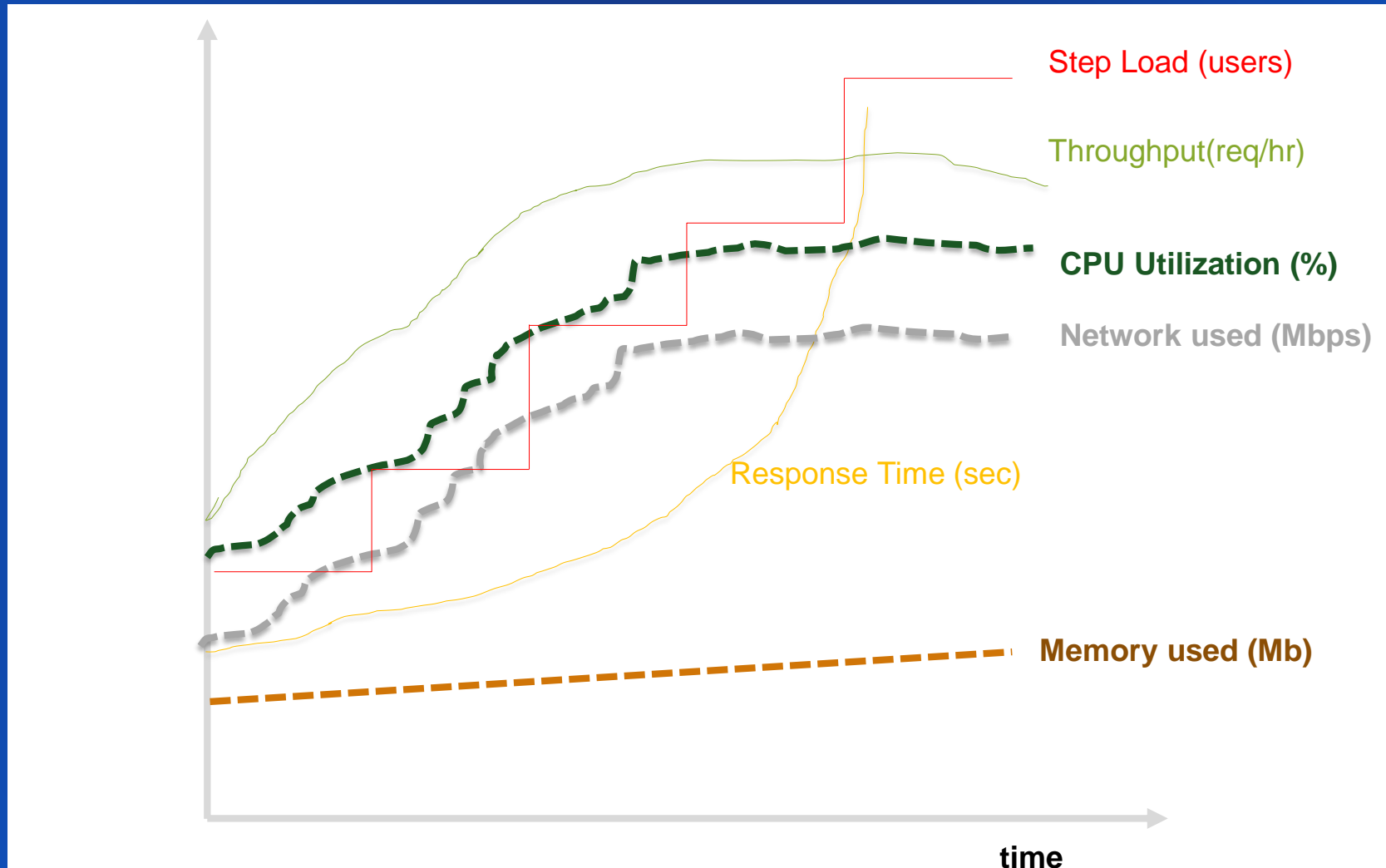
Step Load and Response Time



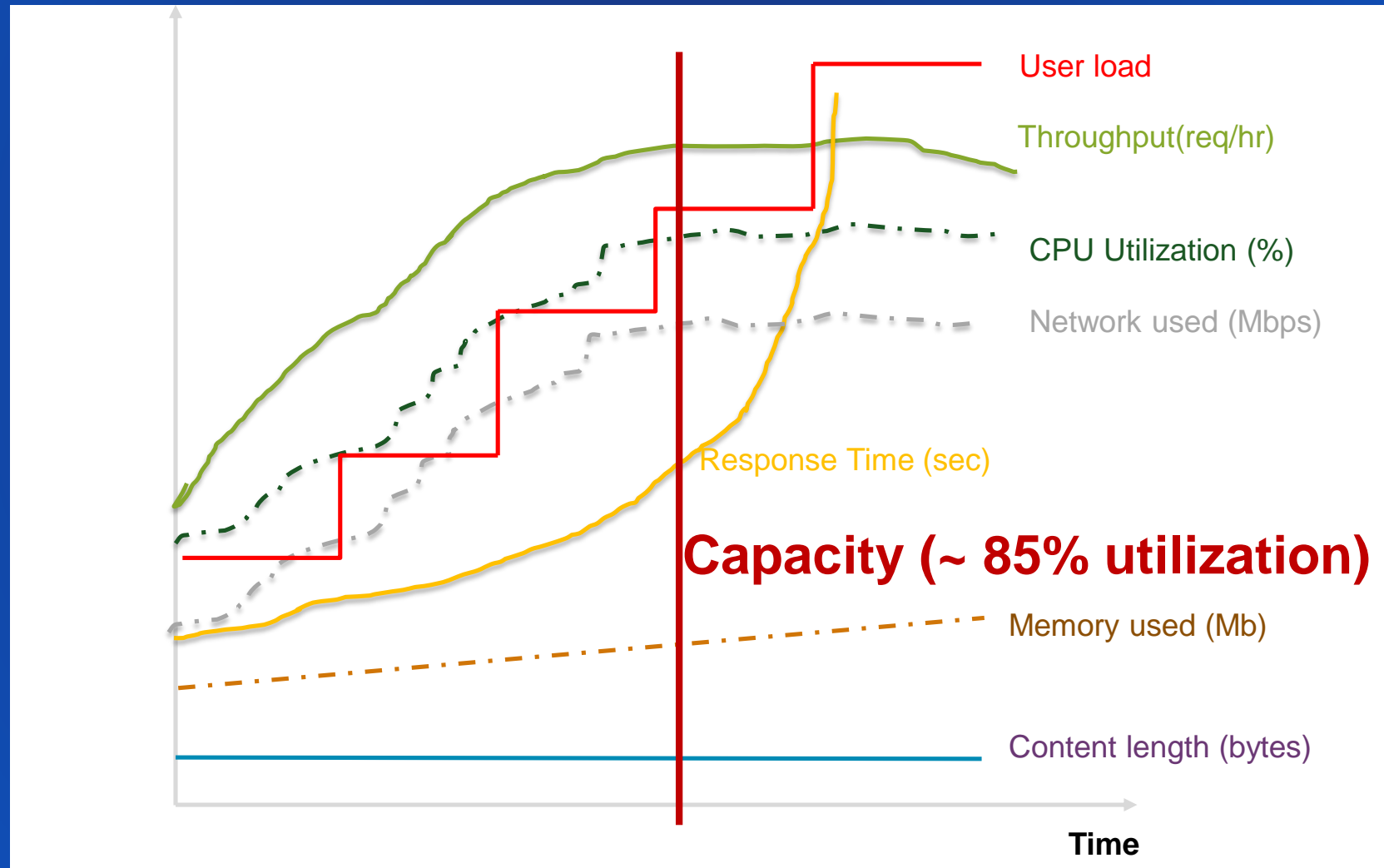
Throughput (request/hr)



Resource utilization: CPU, Memory, Network



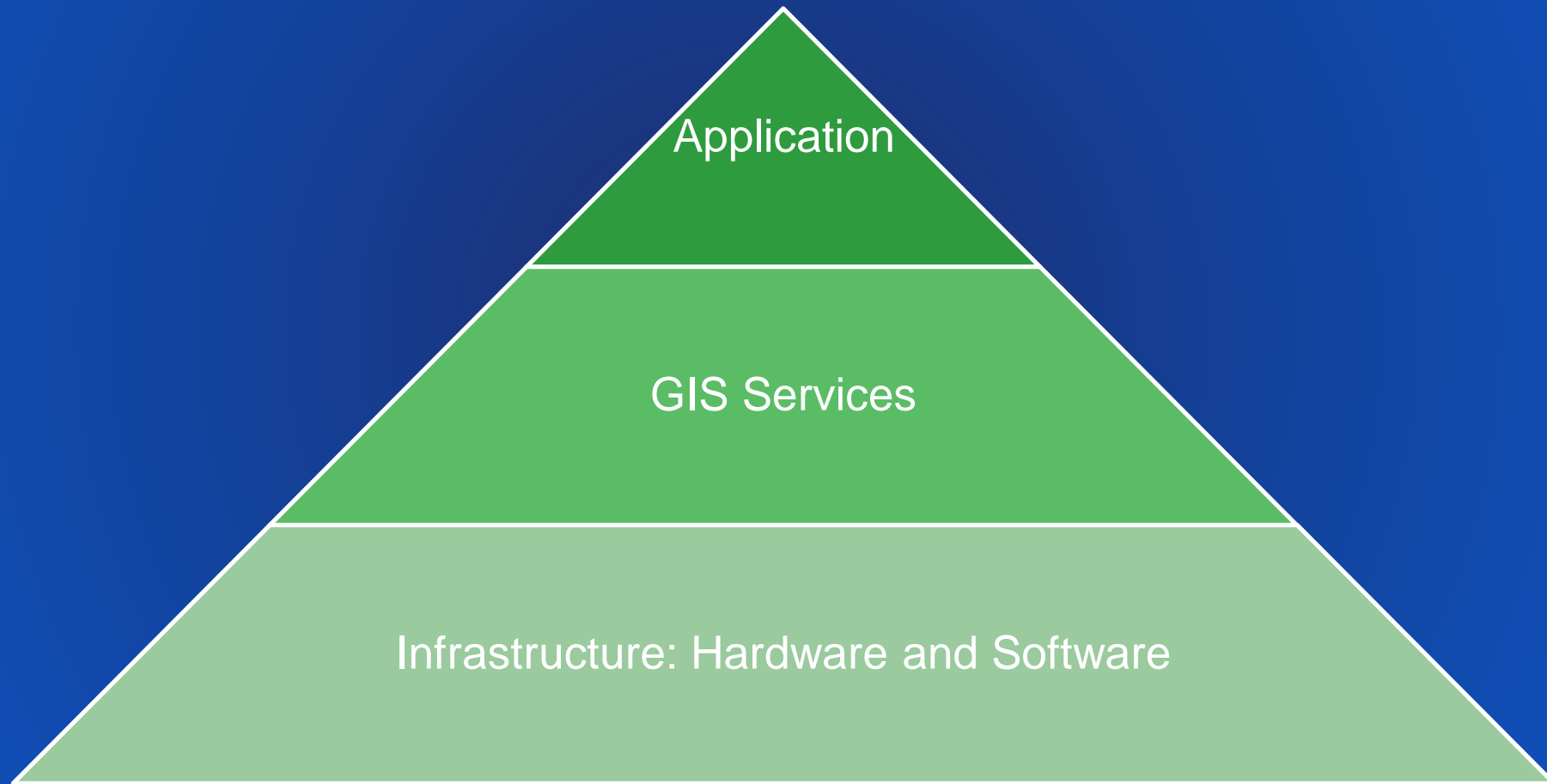
Capacity



Testing Objectives

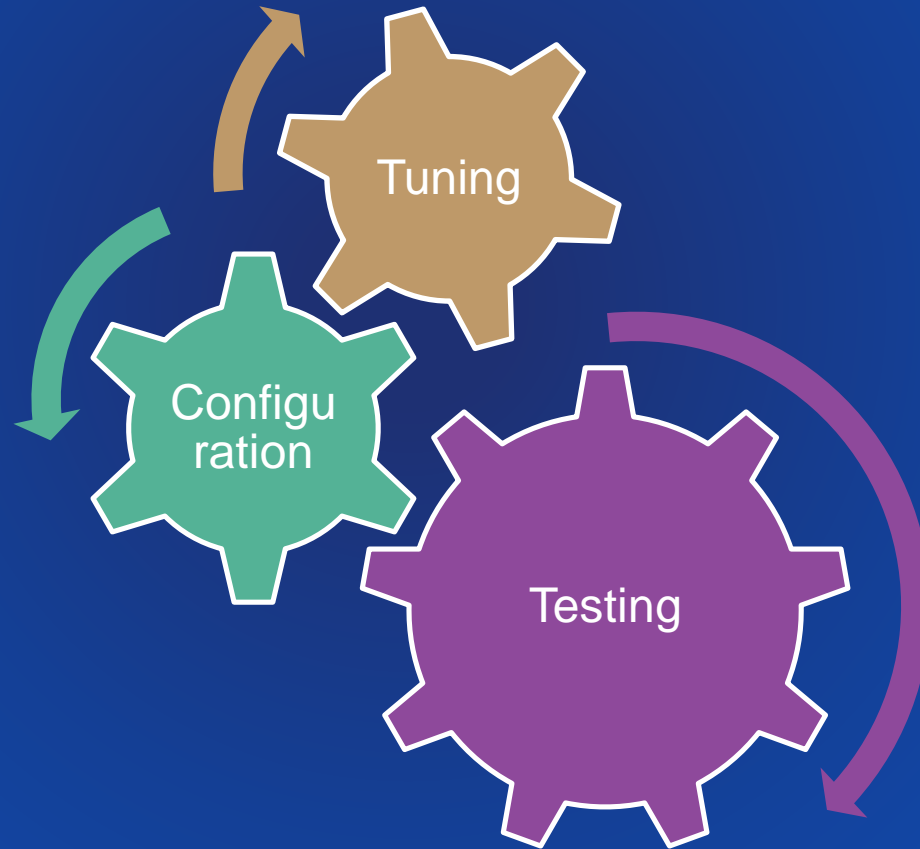
- **Meet Service-Level Agreement (SLA)**
- **Bottlenecks analysis**
- **Capacity planning**
- **Benchmarking different alternatives**

Testing process



Required skill set

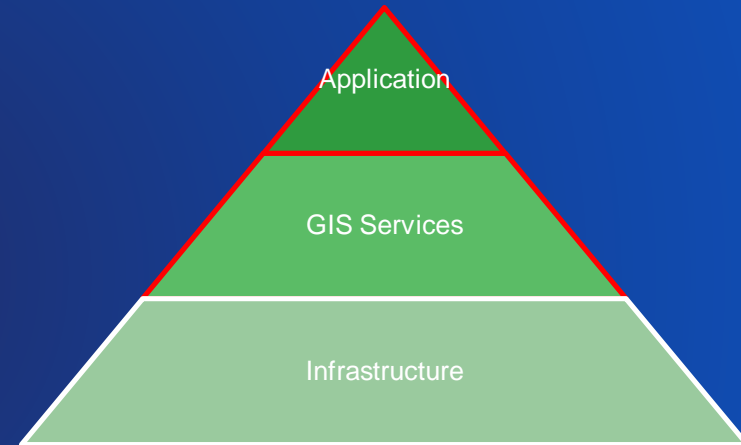
Configuration, Tuning, Testing



System Test for Web

GIS Test Automation

- **ArcGIS Services**
 - Mapping
 - Feature Service
 - OGC
 - Geocoding
 - Image Service
 - Network Analyst
 - Geoprocessing
 - Tile Cache
- **Application Testing**
- **Discipline relevant report**

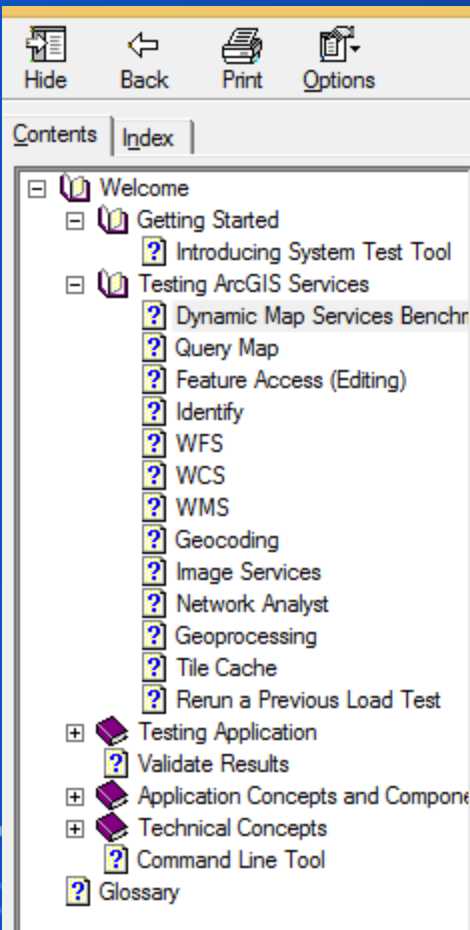


Web test tools feature comparison

Tool	Cost	Learning Curve	OS Metrics	GIS Data Generation	GIS Test Automation
Load Runner	High	High	Windows/Linux	No	No
Visual Studio	Medium	High	Windows	No	No
JMeter	Free	High	Requires additional plugin	No	No
System Test	Free	Low	Windows/Linux	Yes	Yes

System Test for Web

Dynamic Map Service



Dynamic Map Services Benchmark: Performance

A load test is defined by a given map service and during this type of test:

1. Learn how to add ArcGIS Server services and a data to test.
2. Create a web test and a load test.
3. Run test and validate results.

In this tutorial, you locate a map service that is sourced to the SampleWorldCities dataset that comes included with ArcGIS Server. You identify the service and then you create a web test and a load test to be able to run the load test.

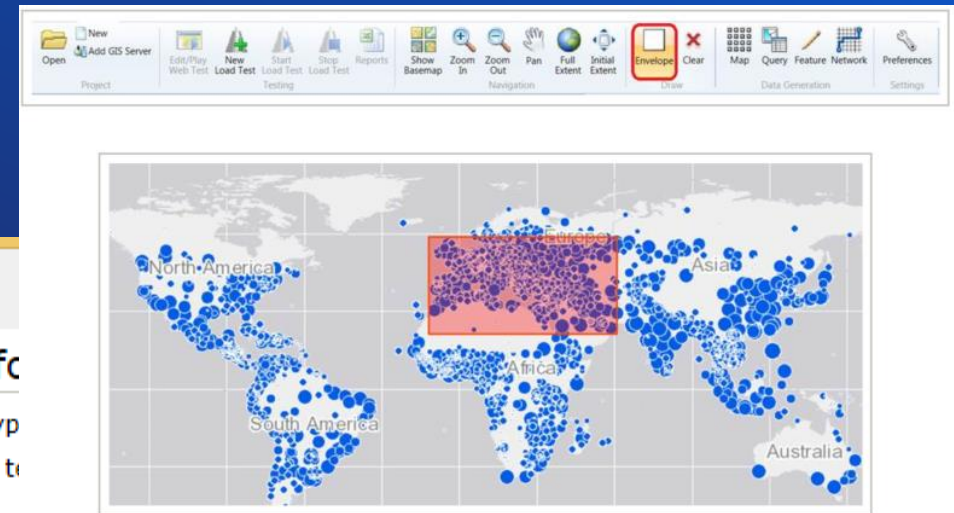
Important: ArcGIS Server 10.1 or higher is required. Make sure the SampleWorldCities default map service that comes with ArcGIS Server is running.

Scenario

Your supervisor is planning to publish a world map that allows users to view cities. They would like to know what performance metrics to expect and how to test the map service.

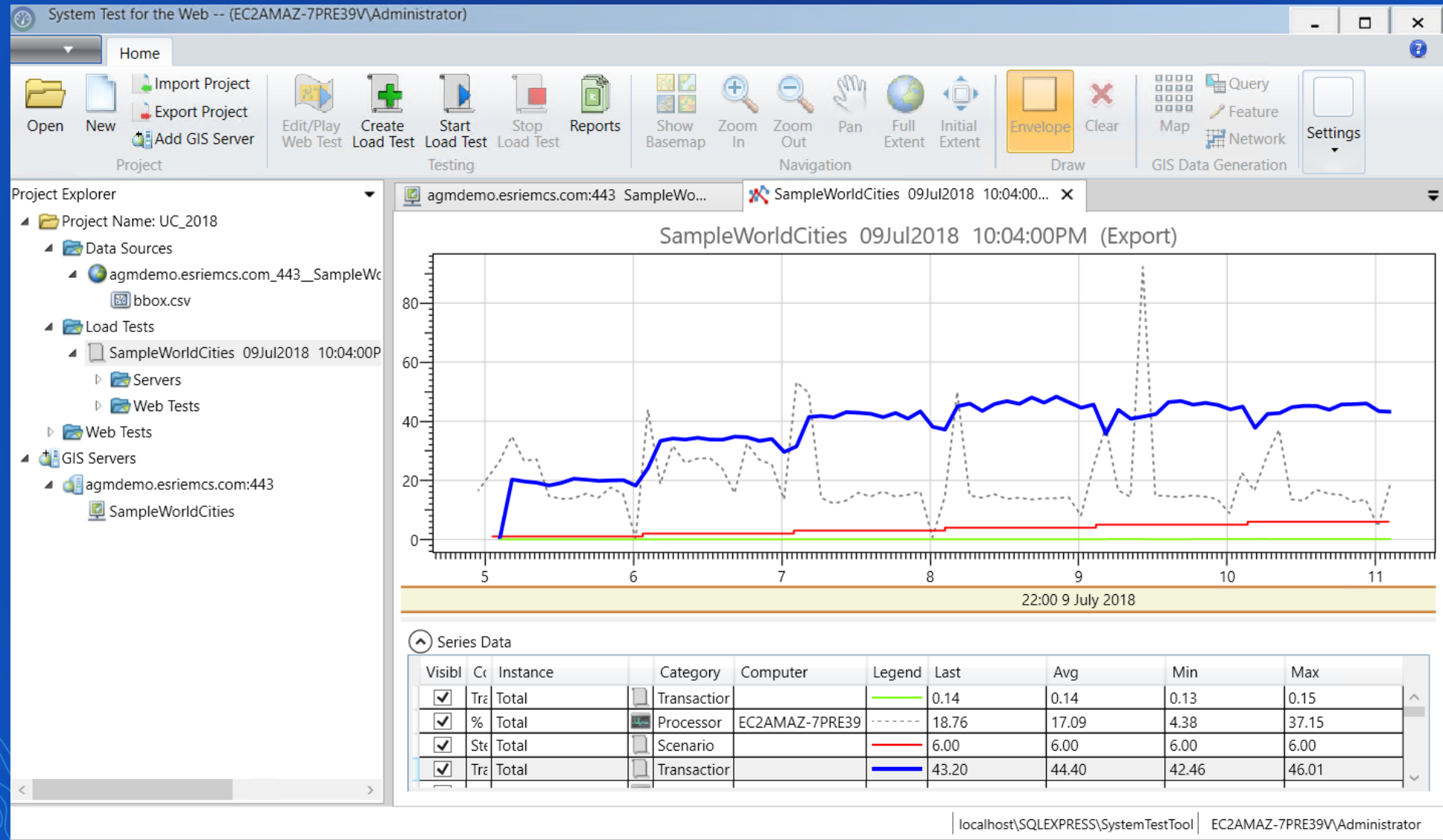
High Level Steps:

1. Create a project.
2. Add ArcGIS Server services.
3. Create test data.
4. Create web test.
5. Start load test.
6. Validate results.



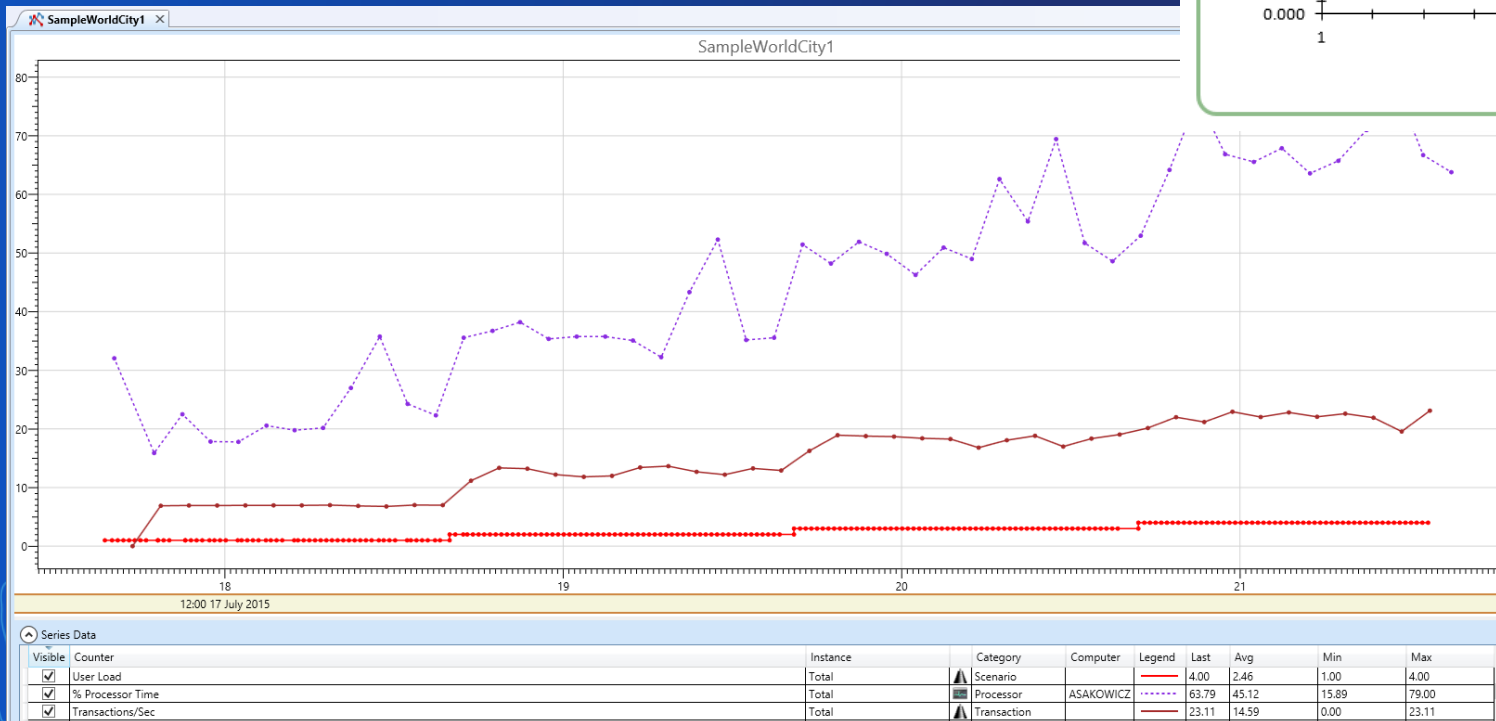
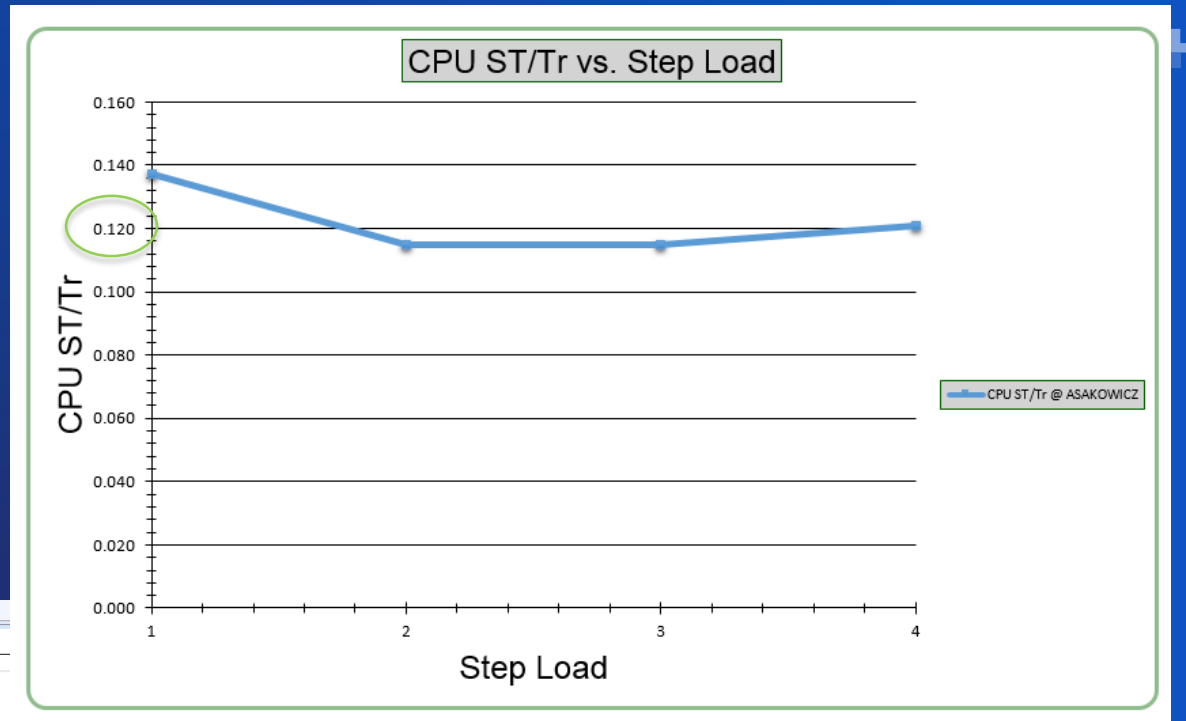
System Test for Web

Real time dashboard



System Test for Web

Excel Report



Test Results as Input into Capacity Planning

Service time and Mb/tr models as input into capacity planning

$$ST = \frac{\#CPU \times 3600 \times \%CPU}{TH \times 100}$$

$$TH = \frac{Users}{ResponseTime + ThinkTime}$$

ST - CPU service time (sec)

#CPU – number of physical CPU cores

%CPU - percent CPU

TH – throughput (tr/sec)

CPU capacity

1. User load: Concurrent users or throughput
2. Operation CPU service time (model)—**performance**
3. CPU SpecRate

$$\# CPU_t = \frac{ST_b \times TH_t \times 100}{3600 \times \%CPU_t} \times \frac{SpecRatePerCPU_b}{SpecRatePerCPU_t}$$

subscript t = target

subscript b = benchmark

ST = CPU service time

TH = throughput

%CPU = percent CPU

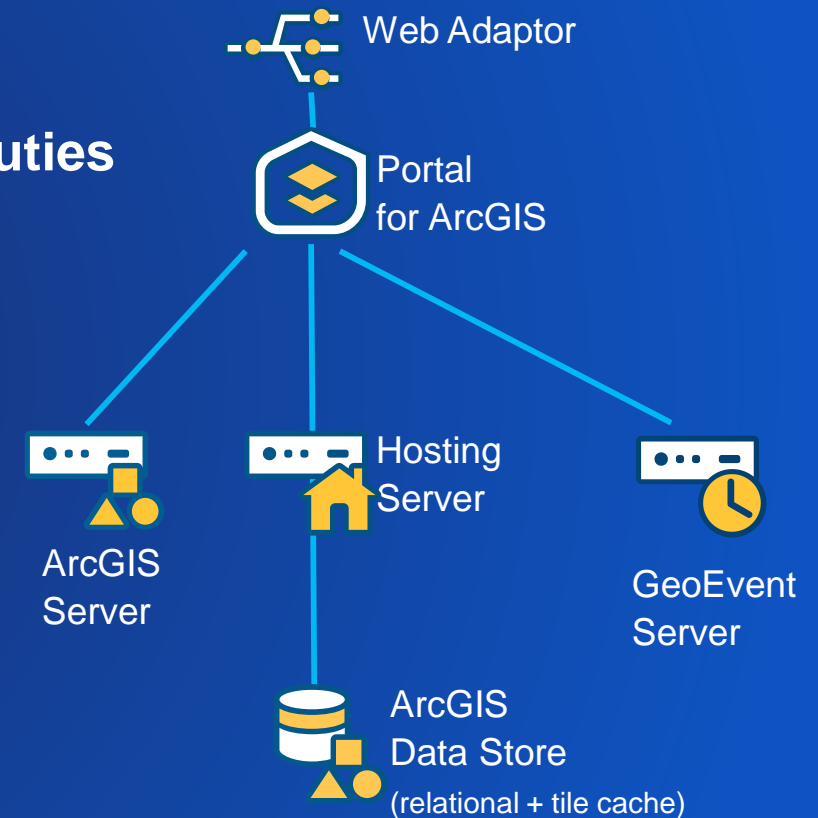
This method is used in capacity planning tools like System Designer or CPT

Workload separation

Section Subhead

ArcGIS Server sites

- **Pre-planning is important**
- **Isolate hosting server site from traditional GIS Server duties**
- **Have dedicated GIS Server sites for various purposes:**
- **heavily used map services, geoprocessing services, ...**



Provide adequate infrastructure capacity

Section Subhead

Provide sufficient hardware resources

Most systems are CPU bound

GIS Systems are bound by:

1. CPU - typically
2. Memory – when large number of services
3. Disk – Image Service, Synchronization
4. Network – low bandwidth deployment
5. Poorly configured virtualization can result in 30% or higher performance degradation

Most well-configured and tuned GIS systems are CPU bound.

Infrastructure

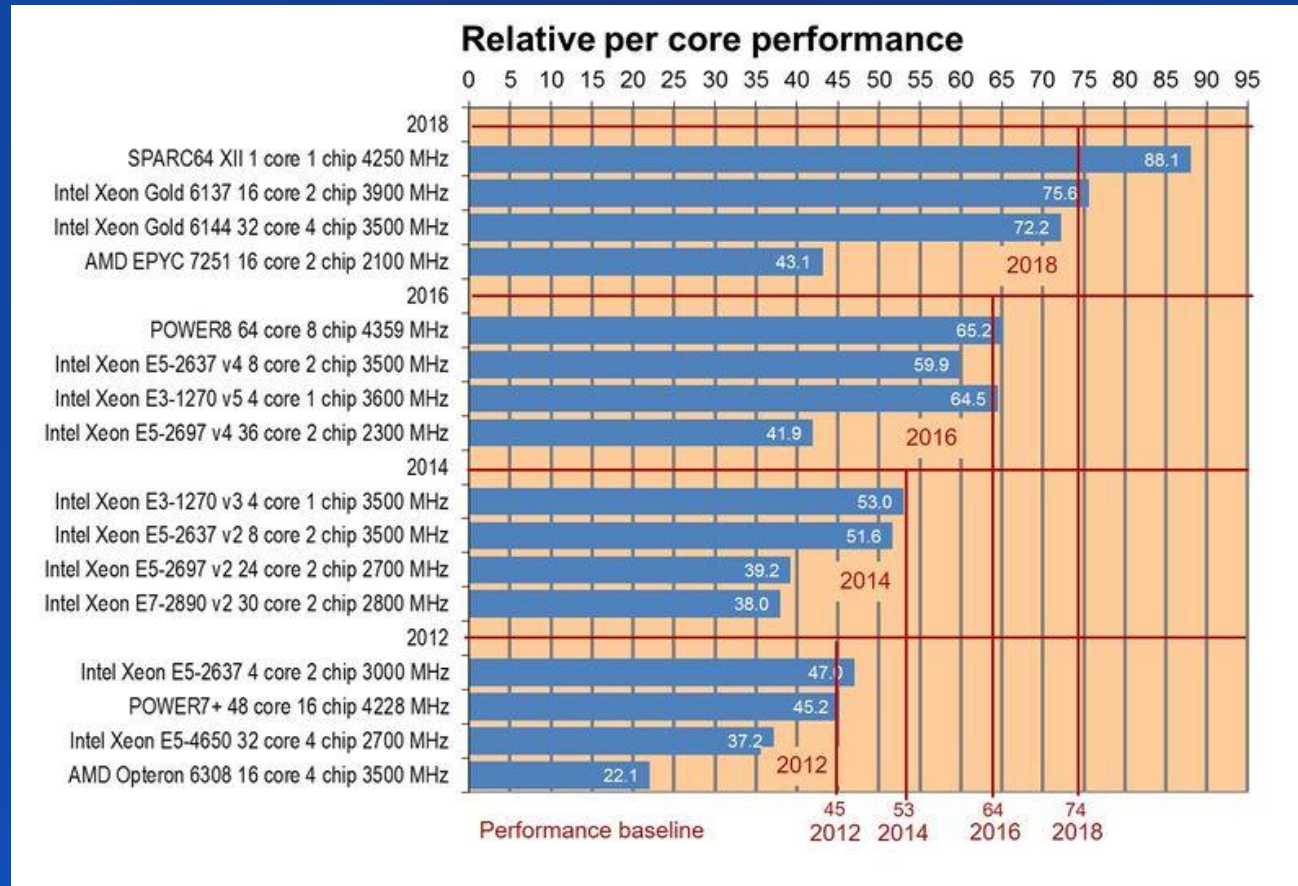
Memory requirements

Item	Low	High
ArcSOC Map	50 MB	500 MB
ArcSOC Image	20 MB	1,024 MB
ArcSOC GP	100 MB	2,000 MB
XenApp Session	500 MB	1.2 GB
Database Session	10 MB	75 MB
Database Cache	200 MB	200 GB

Wide ranges of memory consumptions

Server CPU Spec

- Performance is impacted by SPEC Rate Per Core
- Scalability is impacted by number of cores and SPEC Rate Per Core



Network Planning

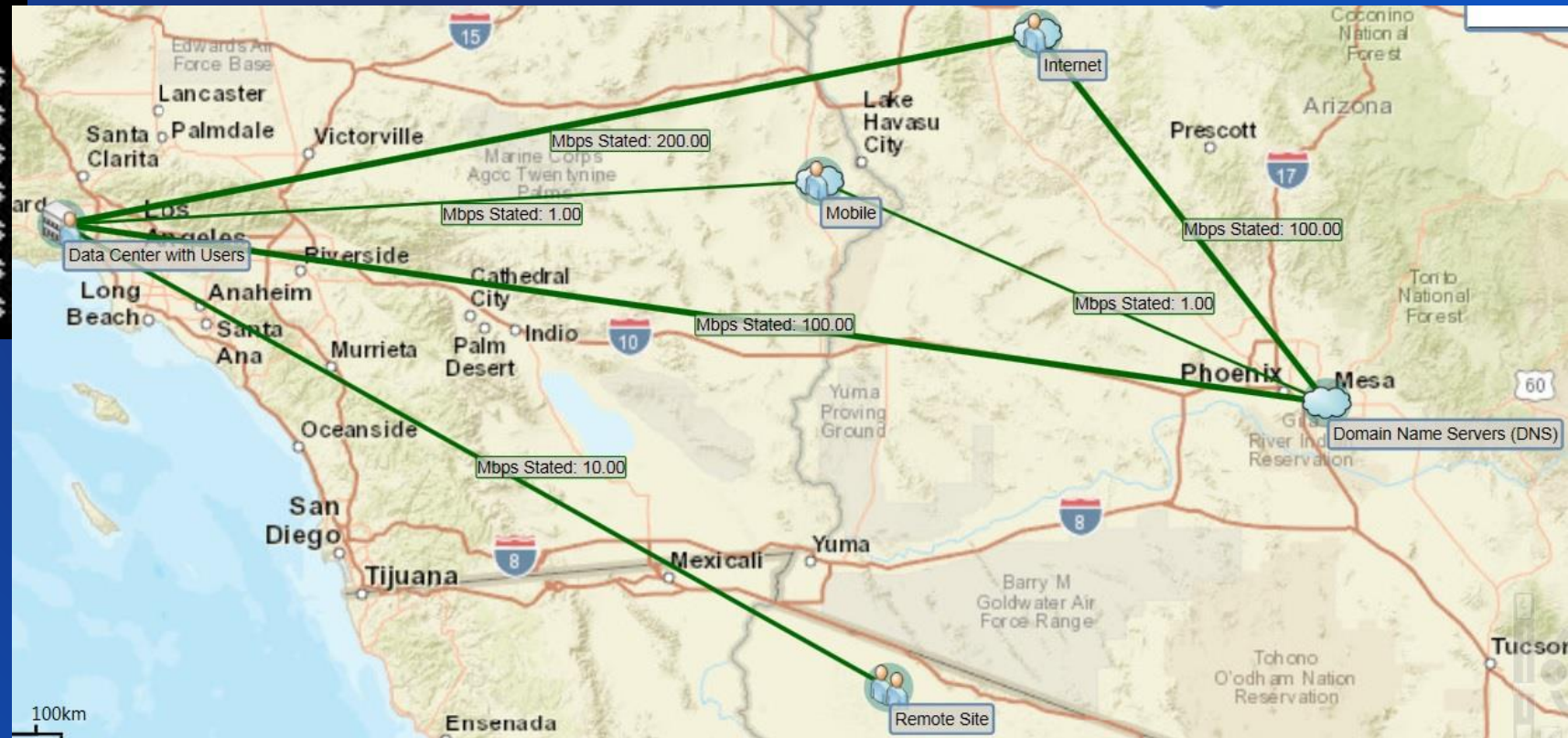
Establish and Configure DNS Appropriately!

```
C:\Users\ >tracert

Tracing route to
over a maximum of 30 hops:

  1    55 ms    55 ms    55 ms
  2    55 ms    55 ms    55 ms
  3   115 ms    58 ms    62 ms
  4   111 ms   111 ms   112 ms
  5   110 ms   109 ms   110 ms
  6   110 ms   113 ms   110 ms
  7   109 ms   109 ms   109 ms
```

Trace Route: LA Workstation → Phoenix DNS
LA Database Server ←



VM – watch out for overallocations

Getting Started Summary Virtual Machines Hosts DRS Resource	
General	
vSphere DRS:	On
vSphere HA:	On
VMware EVC Mode:	Intel® "Sandy Bridge" Generation
Total CPU Resources:	227 GHz
Total Memory:	1.87 TB
Total Storage:	103.92 TB
Number of Hosts:	4
Total Processors:	88
Number of Datastore Clusters:	0
Total Datastores:	42
Virtual Machines and Templates:	314
Total Migrations using vMotion:	3928

$88/314=0.28$ cpu/vm

Getting Started Summary Virtual Machines Hosts DRS Resource	
General	
vSphere DRS:	On
vSphere HA:	On
VMware EVC Mode:	Intel® "Westmere" Generation
Total CPU Resources:	184 GHz
Total Memory:	2.16 TB
Total Storage:	61.06 TB
Number of Hosts:	5
Total Processors:	92
Number of Datastore Clusters:	0
Total Datastores:	37
Virtual Machines and Templates:	176
Total Migrations using vMotion:	2747

$92/176=0.52$ cpu/vm

Cluster1	
Getting Started Summary Monitor Configure Permissions	
Cluster1	
Total Processors:	196
Total vMotion Migrations:	119722

119722 vMotion Migrations

Scaling Direction

- **Scaling up**
 - Adding resources to your existing machine
 - Usually RAM
 - Commonly, due to lots of service instances
- **Scaling out**
 - Add more machines
 - Usually to get more compute power, sometimes for high availability
 - Commonly, due to increased user demand



Configure

File Geodatabase



- **Local file geodatabase data**
 - Better than shapefiles
 - Fastest
 - Scales with hardware
 - Best with static data
 - Make your FGDB read-only

Enterprise Geodatabase



Enterprise Geodatabase

- Fast
- Live data
- Requires database expert
- Traditional Versioning
 - fine for desktop editing, may be problematic for server
- Branch Versioning
 - New with Pro 2.1 and Enterprise 10.6. Not supported with ArcMap.
 - Designed for better scalability with many concurrent users and a web editing model

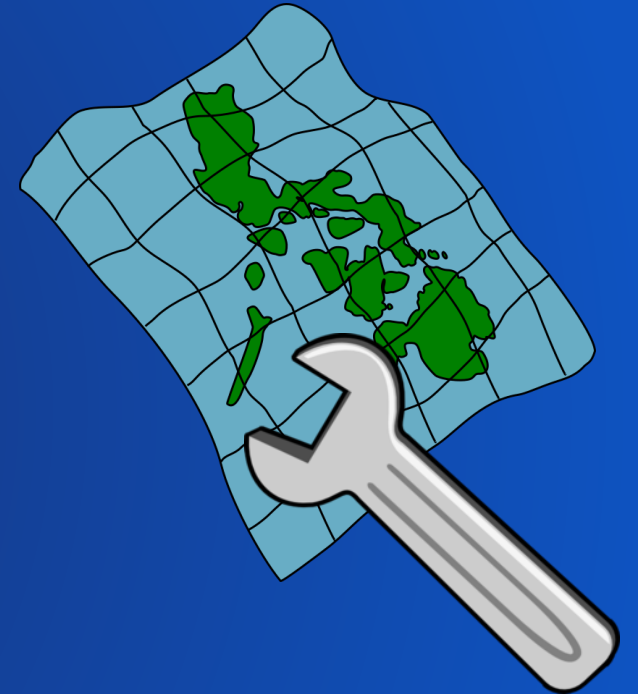
Keep statistics up-to-date

Index fields that will be queried

Configure Web Map

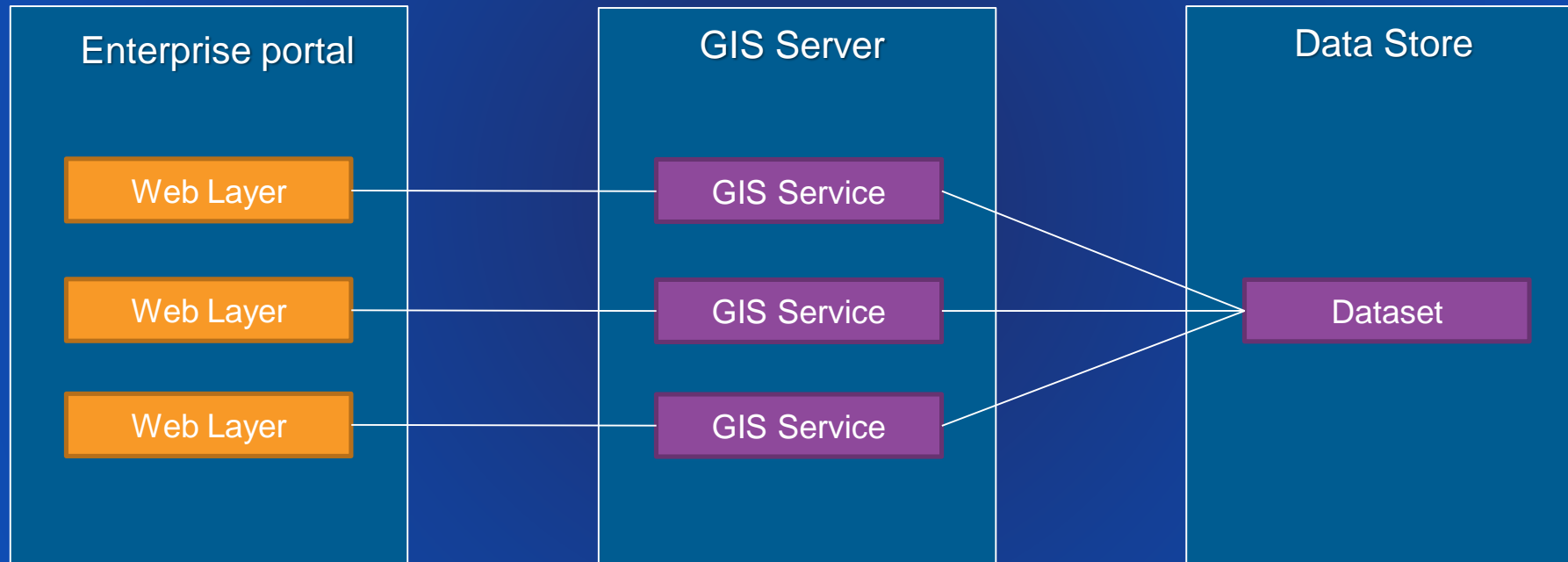
Cache and generalize data

- Use **generalized data** if applicable
- Cache (tiles) may reduce the amount of traffic
- Large amounts of data can be slow and overwhelming
 - Aggregate data using smart mapping
 - **on-the-fly generalization** and smaller data transfer (quantization)



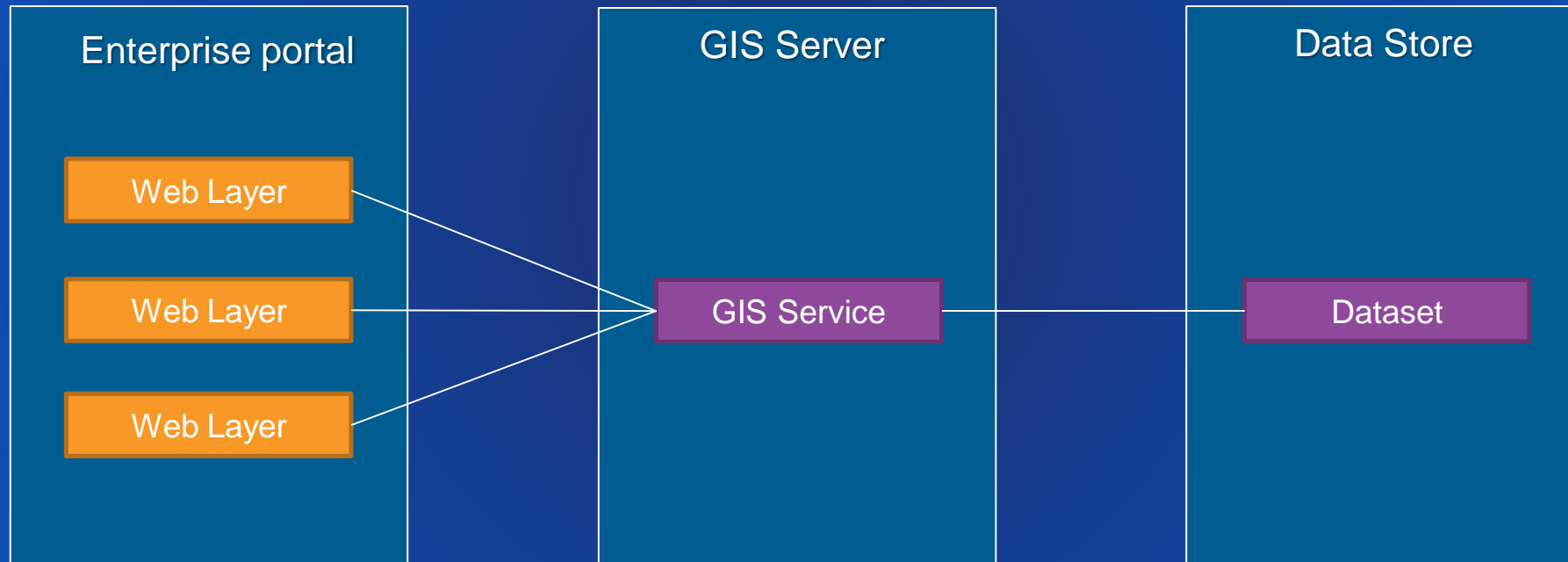
Consolidate and reduce number of services

- Common setup today:

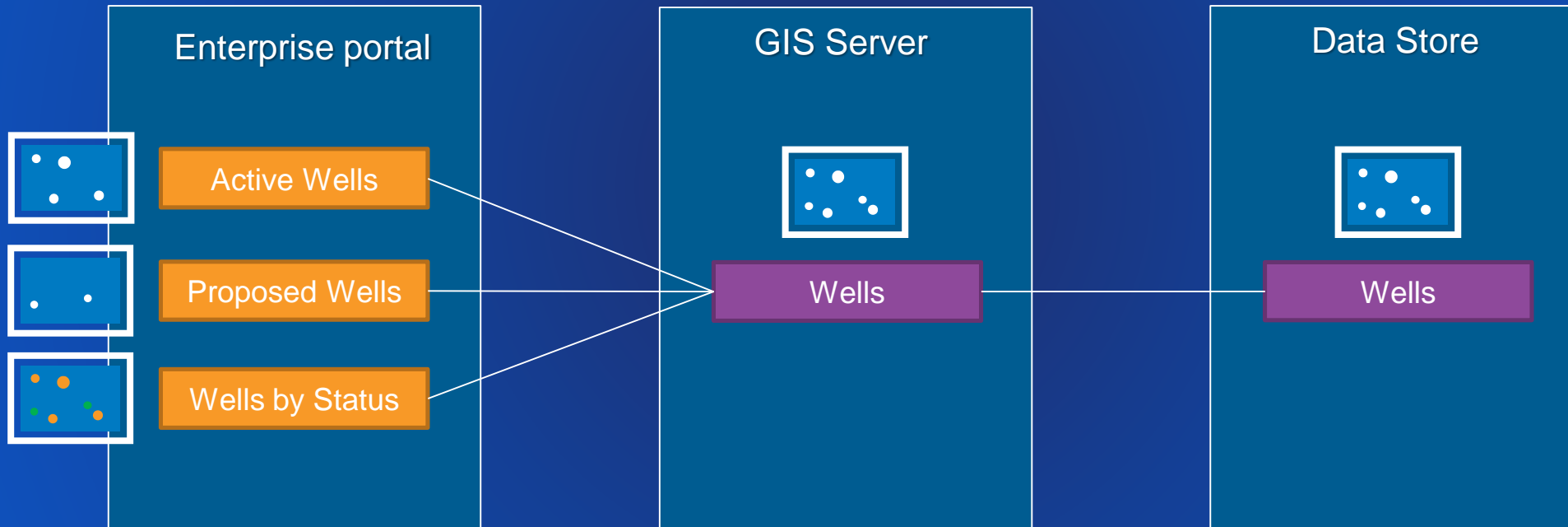


Consolidate and reduce number of services

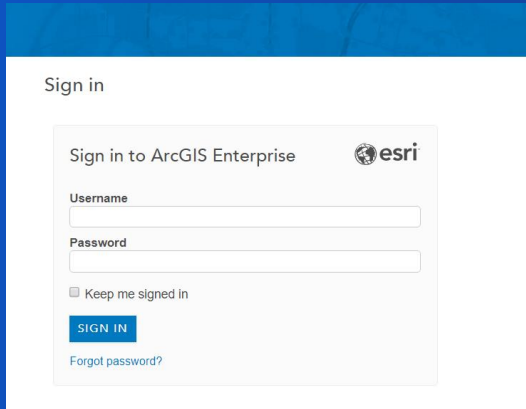
- More efficient: consolidate layers with like security into a single service




Consolidate and reduce number of services



Configure login for your Enterprise portal

A screenshot of the ArcGIS Enterprise sign-in page. The page has a white background with a blue header. The sign-in form is titled "Sign in to ArcGIS Enterprise" and includes the Esri logo. It features input fields for "Username" and "Password", a checkbox for "Keep me signed in", a blue "SIGN IN" button, and a link for "Forgot password?".

Sign in

Sign in to ArcGIS Enterprise 

Username

Password

☐ Keep me signed in

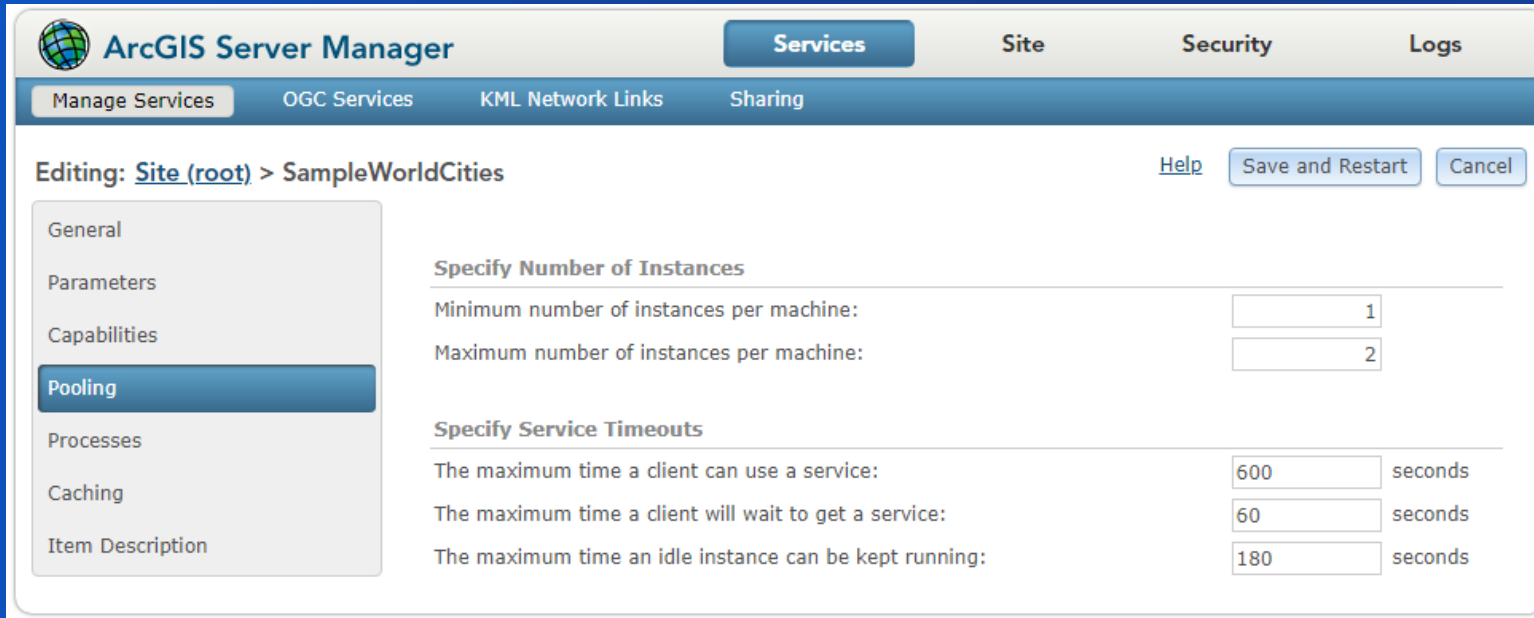
[SIGN IN](#)

[Forgot password?](#)

Login settings

- Identity and group stores can affect login performance significantly
- Example: Active Directory where users are in many groups can affect performance (newer releases handle this better)

Configure ArcGIS Server- instance tuning



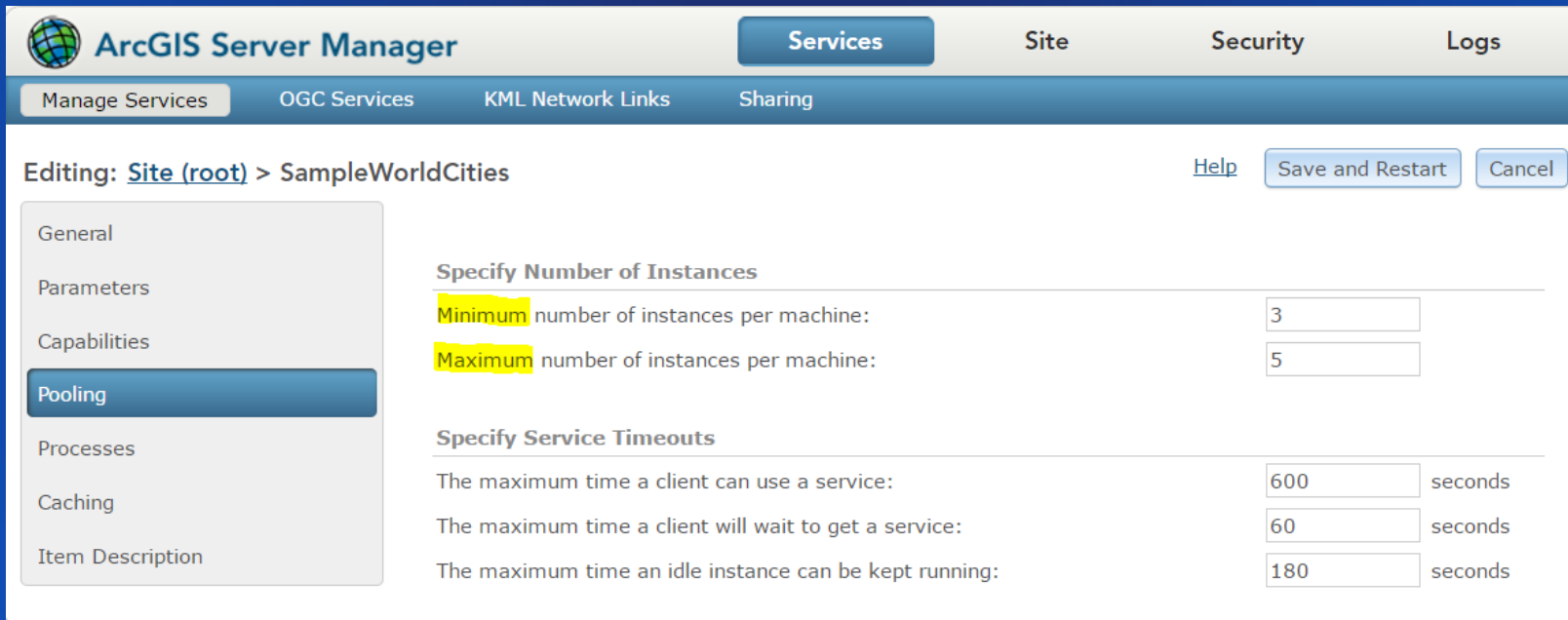
The screenshot shows the ArcGIS Server Manager web interface. The top navigation bar includes 'Services', 'Site', 'Security', and 'Logs'. Below this, a sub-navigation bar shows 'Manage Services', 'OGC Services', 'KML Network Links', and 'Sharing'. The main content area is titled 'Editing: Site (root) > SampleWorldCities'. On the left, a sidebar lists configuration categories: General, Parameters, Capabilities, Pooling (selected), Processes, Caching, and Item Description. The 'Pooling' section is active, displaying two sub-sections: 'Specify Number of Instances' and 'Specify Service Timeouts'. The first sub-section has two input fields: 'Minimum number of instances per machine:' set to 1 and 'Maximum number of instances per machine:' set to 2. The second sub-section has three input fields: 'The maximum time a client can use a service:' set to 600 seconds, 'The maximum time a client will wait to get a service:' set to 60 seconds, and 'The maximum time an idle instance can be kept running:' set to 180 seconds. At the top right of the configuration area, there are links for 'Help', 'Save and Restart', and 'Cancel'.

Section	Property	Value	Unit
Specify Number of Instances	Minimum number of instances per machine:	1	
	Maximum number of instances per machine:	2	
Specify Service Timeouts	The maximum time a client can use a service:	600	seconds
	The maximum time a client will wait to get a service:	60	seconds
	The maximum time an idle instance can be kept running:	180	seconds

- For predictable performance use *min* = *max*
- Default is *min* = 1, *max* = 2. Consider changing this!
- Allocate required swap space/page file
- Cached service : set *max* = 1 to conserve memory. Individual tile requests not serviced by the SOC process.

ArcSOC Optimizer

- Decrease or increase instances, based on:
 - 1. historical usage
 - 2. available memory and process count



The screenshot displays the ArcGIS Server Manager web interface. The top navigation bar includes tabs for 'Services', 'Site', 'Security', and 'Logs'. Below this, a secondary bar shows 'Manage Services', 'OGC Services', 'KML Network Links', and 'Sharing'. The main content area is titled 'Editing: Site (root) > SampleWorldCities' and includes 'Help', 'Save and Restart', and 'Cancel' buttons. On the left, a sidebar lists configuration categories: General, Parameters, Capabilities, Pooling (selected), Processes, Caching, and Item Description. The 'Pooling' section is active, showing two sub-sections: 'Specify Number of Instances' and 'Specify Service Timeouts'. The first sub-section contains two input fields: 'Minimum number of instances per machine' with a value of 3, and 'Maximum number of instances per machine' with a value of 5. The second sub-section contains three input fields for timeouts: 'The maximum time a client can use a service' (600 seconds), 'The maximum time a client will wait to get a service' (60 seconds), and 'The maximum time an idle instance can be kept running' (180 seconds).

Specify Number of Instances	
Minimum number of instances per machine:	3
Maximum number of instances per machine:	5

Specify Service Timeouts	
The maximum time a client can use a service:	600 seconds
The maximum time a client will wait to get a service:	60 seconds
The maximum time an idle instance can be kept running:	180 seconds

New ArcGIS Server 10.7 shared instances

- Recommended for services that receive infrequent requests, particularly when the server site hosts many services
- Pool of processes supporting multiple services
- Conserves memory

*Currently supports only **map services** published from **ArcGIS Pro***

Geonet series

<https://community.esri.com/thread/231451-arcgis-architecture-series-tools-of-an-architect>

Architecture & Security

Geodata Engineering

Configuration & Integration

Workforce Development

Operational Support

clear selected

VIEW THE BLOG

Implementing ArcGIS

Type to filter by text

Filter by tag

Sort by latest activity: newest first

Engineering ArcGIS Series: Tools of an Engineer

The Managed Cloud Services team in Professional Services is pleased to announce a new series that will be highlighting various tools and best practices for implementing ArcGIS Enterprise using modern methodologies. &...

last modified by skarra-esristaff

2 0 0

Infrastructure as Code (IaC) with Terraform

What is Infrastructure as Code? What is Terraform? Resources Providers State Infrastructure Life-cycle Creation Decommission What is Infrastructure as Code? Taken directly from M...

created by MHatcher-esristaff

0 0 0

Options for Deploying Desktops in the Cloud

As cloud adoption evolves from Web GIS to full GIS deployments, questions continue to be raised such as, "What about the desktops?". That is, when moving desktops to the cloud, what technologies should be ...

last modified by jdeweese-esristaff

0 0 2

ArcGIS Server/Portal Security

Now more than ever, there's an increasing need to secure our IT infrastructure. Practicing good security hygiene should be top of our list as administrators. ArcGIS Server, Portal and the various applications de...

last modified by SAustin-esristaff

1 0 0

Is Your System Architecture Ready for ArcGIS 10.7.1 and...

As the Esri platform continues to evolve, it is critical that organizations maintain a capable GIS system architecture that will support new GIS/IT capabilities and scale to support growing user demand. There are fur...

last modified by jdeweese-esristaff

2 0 0

Implementing ArcGIS Track at User Conference 2019

Implementing ArcGIS Track at UC The User Conference has many presentations and events with hundreds of topics covered. To help you find your way to all the sessions and events about implementing ArcGIS successfu...

last modified by cschroeder-esristaff

3 0 0

Find us at UC - Guiding Your Geospatial Journey

Guiding Your Geospatial Journey Area Expo Area Ground Level Exhibit Hall A, SDCC Tuesday, July 9 &...

last modified by cschroeder-esristaff

3 0 0

WFS or not DFS

I have a question about implementing a highly available ArcGIS Enterprise architecture. The documentation states that Windows DFS is NOT supported as a NAS/SAN. I understand why multiple target DFSR wouldn't be suppor...

last modified by pbatley

0 0 0

Architecture & Security - Events & Activities at UC 2019

Implementing ArcGIS Architecture & Security: Sessions & Activities The User Conference has many presentations and events with hundreds of topics covered. To help you find your way to all...

last modified by cschroeder-esristaff

0 0 0

2019 Esri International User Conference Suggested Eve...

Are you a GIS manager, leader or other executive headed to the 2019 Esri International User Conference (UC)? I know it can be a challenge creating your personal agenda for the world's largest GIS conference, so ...

last modified by acanow-esristaff

3 0 0

ArcGIS Architecture Series: Moving to the Cloud

The Architecture Practice team in Professional Services is pleased to announce this new series. The ArcGIS platform is supported on both on-premises or in a cloud environment like Microsoft Azure or Amazon W...

last modified by Ahmad_Abdallah-esristaff

6 0 2

2019 Esri International User Conference GIS Manag...

If you're headed to the 2019 Esri International User Conference and are interested in sessions for GIS Managers, here is a link to the GIS Manager Track: <https://userconference2019.schedule.f...>

last modified by acanow-esristaff

0 0 0

How ccan i download Prerelease License Manag...

Prerelease License Manager Download

Considerations before moving your GIS to the Cloud

ArcGIS Architecture Series: Tools of an Architect

ArcGIS Architecture Series: Tools of an Architect

Discussion created by [JBoyle-esristaff](#) on Apr 1, 2019
Latest reply on May 22, 2019 by [JBoyle-esristaff](#)

Like • 17 Comment • 9

The Architecture Practice team in Professional Services is pleased to announce a new series leading up to the Esri User Conference. We will be highlighting various tools and best practices for ArcGIS Enterprise implementation and tuning.

System design and architecture can some times feel daunting. As an ArcGIS Enterprise or ArcGIS Server administrator, you may occasionally be faced with decisions for how to best optimize the services within your site for performance, reduce wait-times, and eliminate service down times.

- [ArcGIS Server Tuning and Optimization with System Log Parser](#) - Outlines configuring ArcGIS Server for System Log Parser analysis and setting up System Log Parser.
- [System Log Parser - Statistics and Service Optimization](#) - Outlines what specific fields to focus on for service optimization and ways to tune services and the underlying data to optimize performance.
- [What is eGDB Health](#) - Egdbhealth is a tool for reporting on various characteristics of Enterprise Geodatabases (eGDBes).
- [Using Egdbhealth to Evaluate a Geodatabase](#) - This article discusses how to use the outputs of egdbhealth to evaluate the health of an eGDB.
- ****New**** [Using Egdbhealth in System Design](#) - The primary purpose of the tool is to evaluate the "health" of eGDBes. However, the output can also be used in a system design context. This article addresses the system design use case.

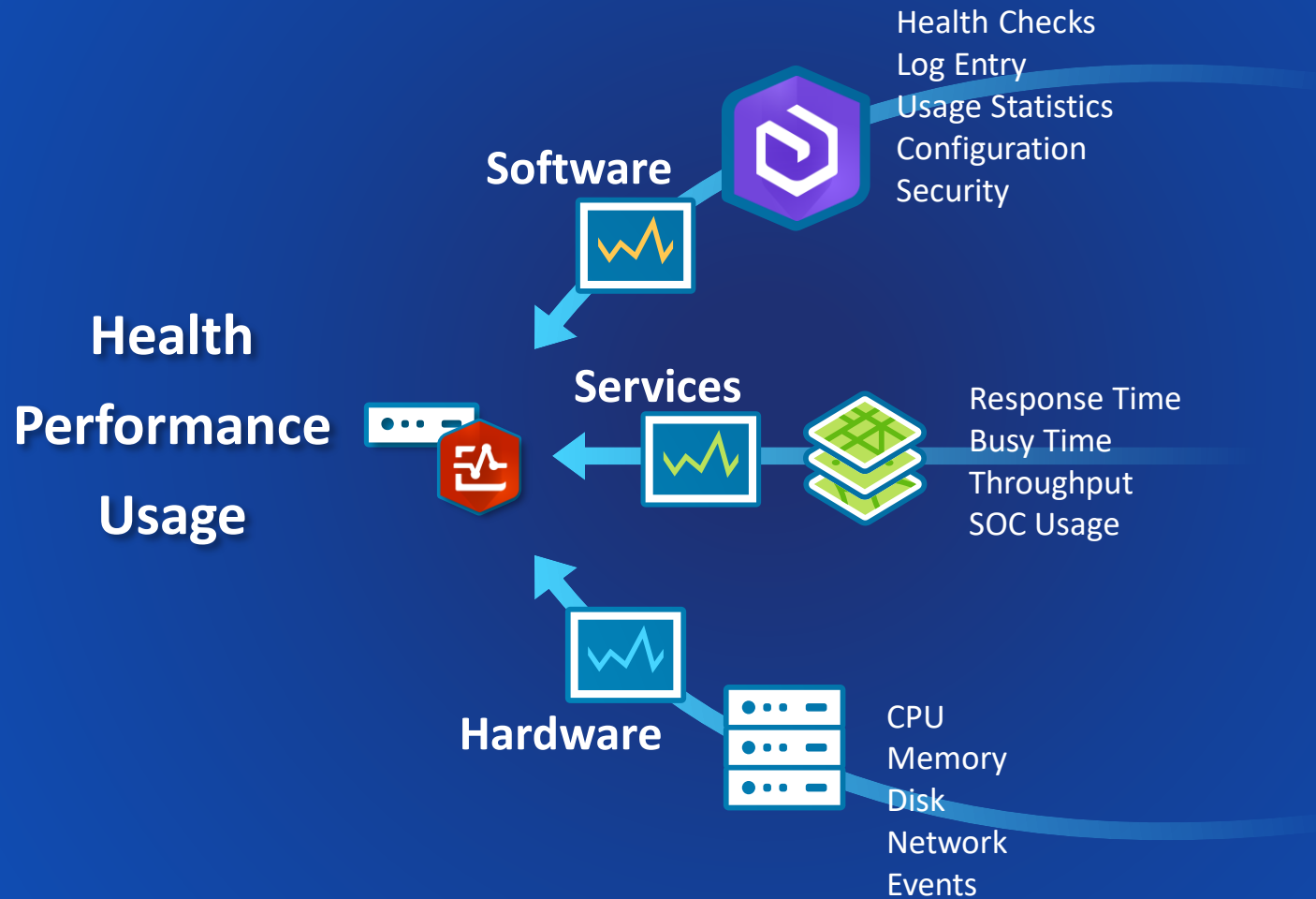
<https://community.esri.com/community/implementing-arcgis/content?filterID=contentstatus%5Bpublished%5D~category%5Barchitecture-security%5D&itemView=thumbnail>

Monitoring

Section Subhead



What is monitored?

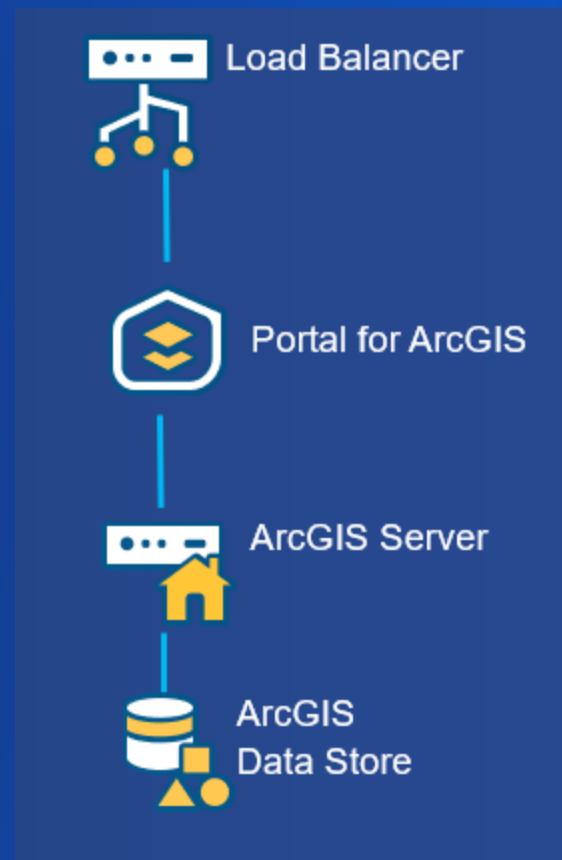


Usage



Usage

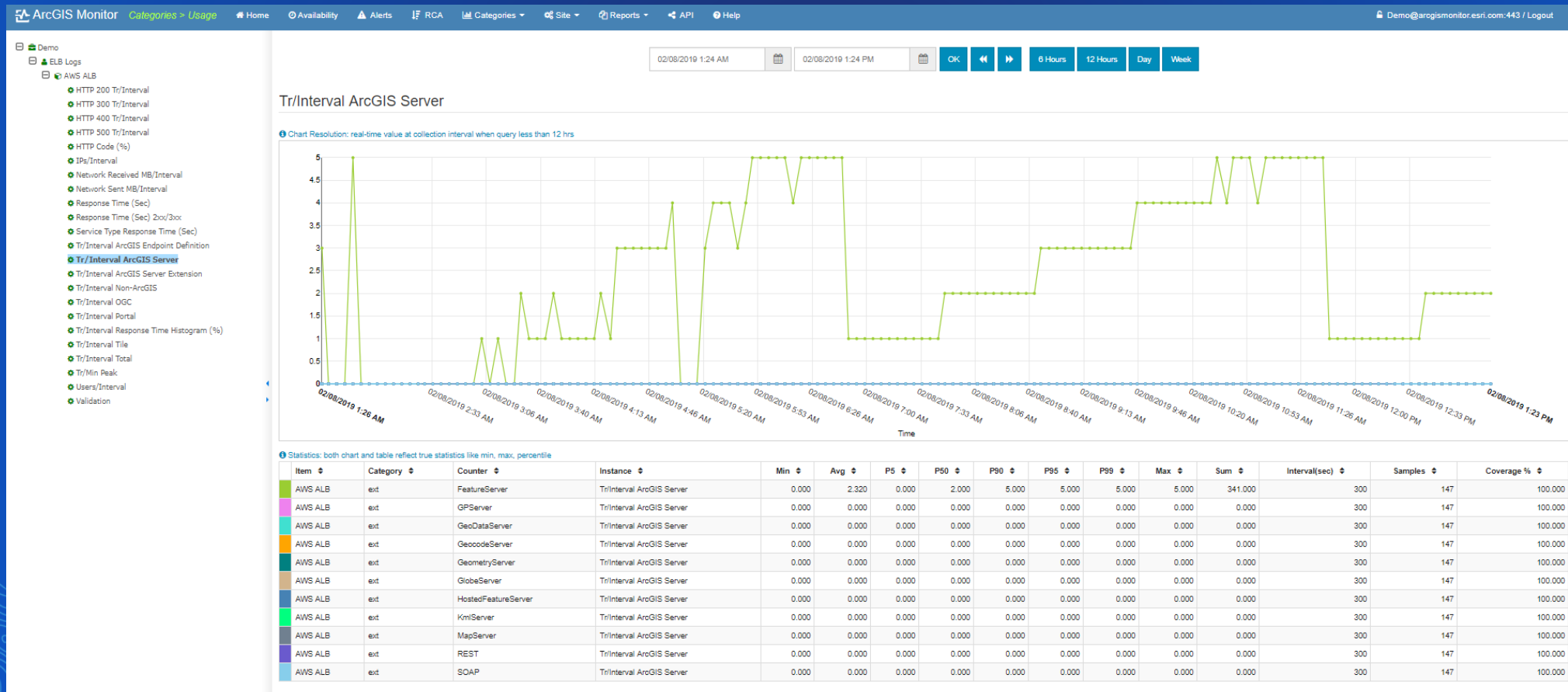
- Usage (or user load) is typically measured using:
 - Transactions or requests per time, e.g. per seconds, 5 min, day.
 - User IP per time, e.g. per seconds, 5 min, day.
 - Users per time, e.g. per seconds, 5 min, day.
- Measured at:
 - **Load balancer (LB)**
 - Web server
 - **ArcGIS Server**
 - Database
- Format:
 - Chart time series
 - Table
 - Map



Usage at LB: transactions (or requests)

Categories > Usage > Tr/Interval

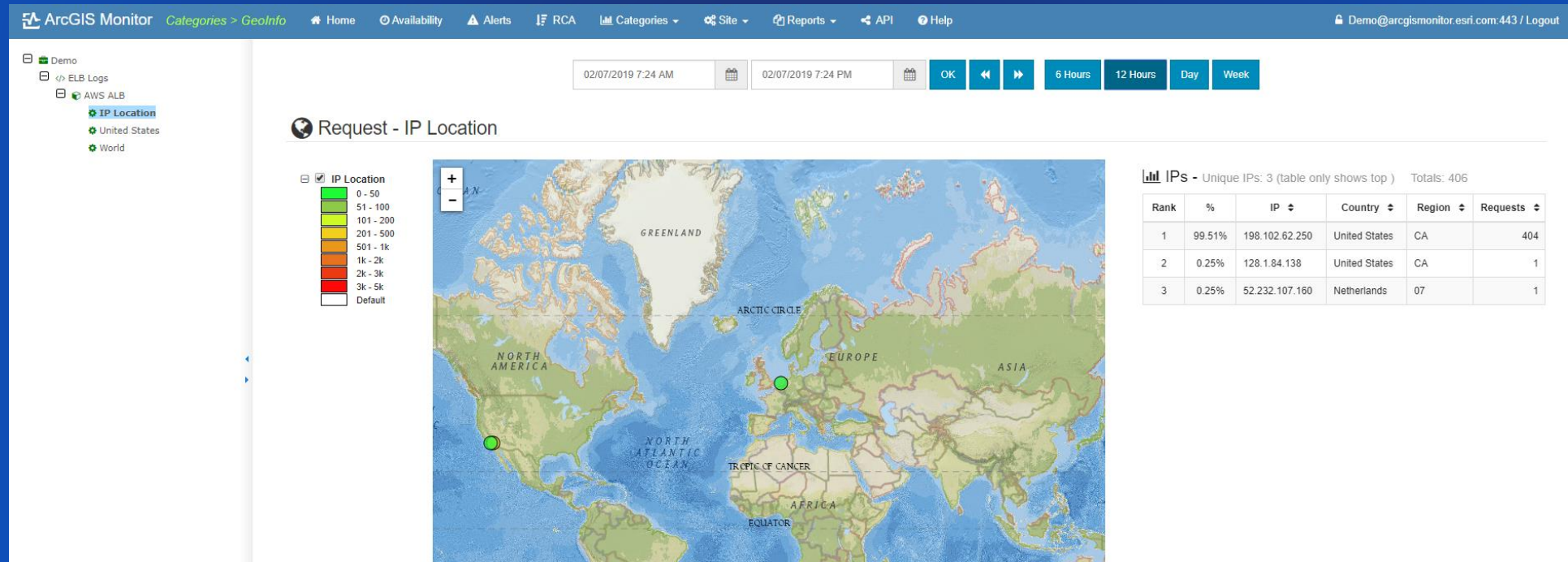
- Chart format



Usage at LB : users and transactions

Categories > GeoInfo > IP Location

- Map format



Usage at LB : users

Categories > Usage > IP / Interval

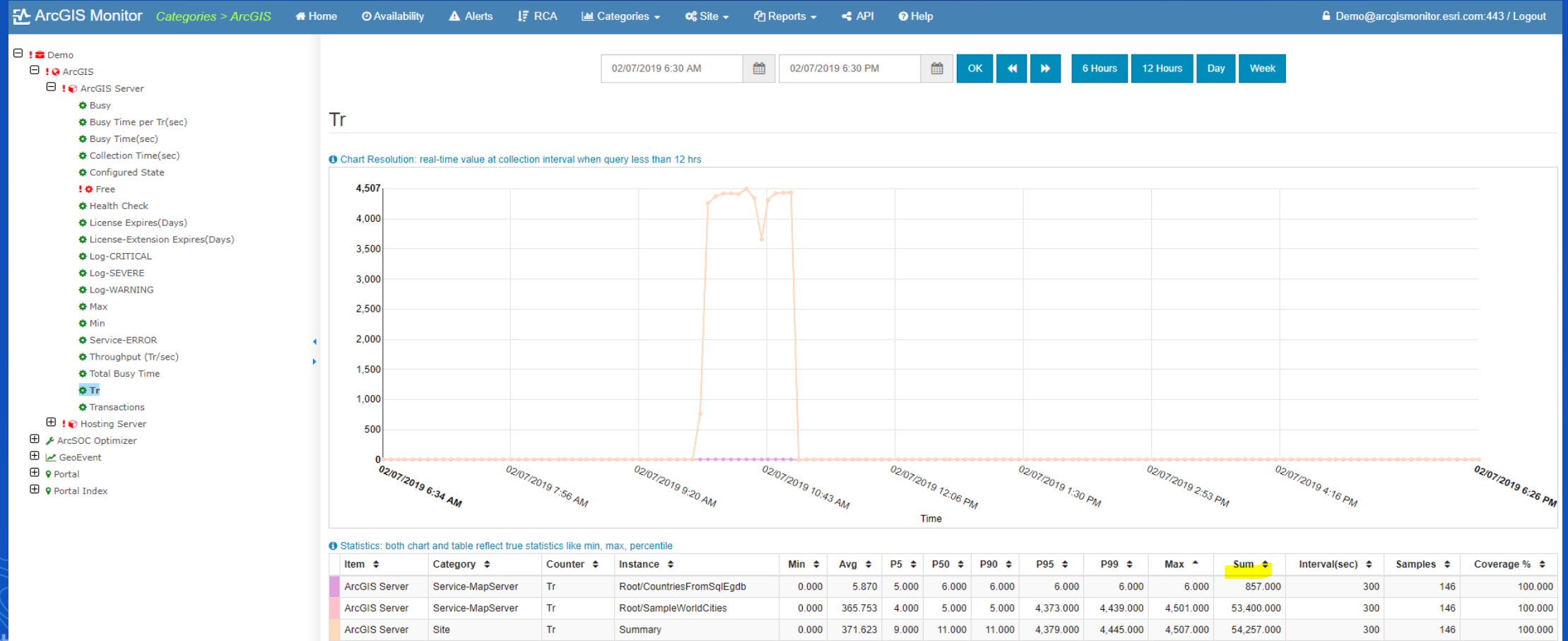
- Chart format



Usage at ArcGIS Server: transactions

Categories > ArcGIS > Tr

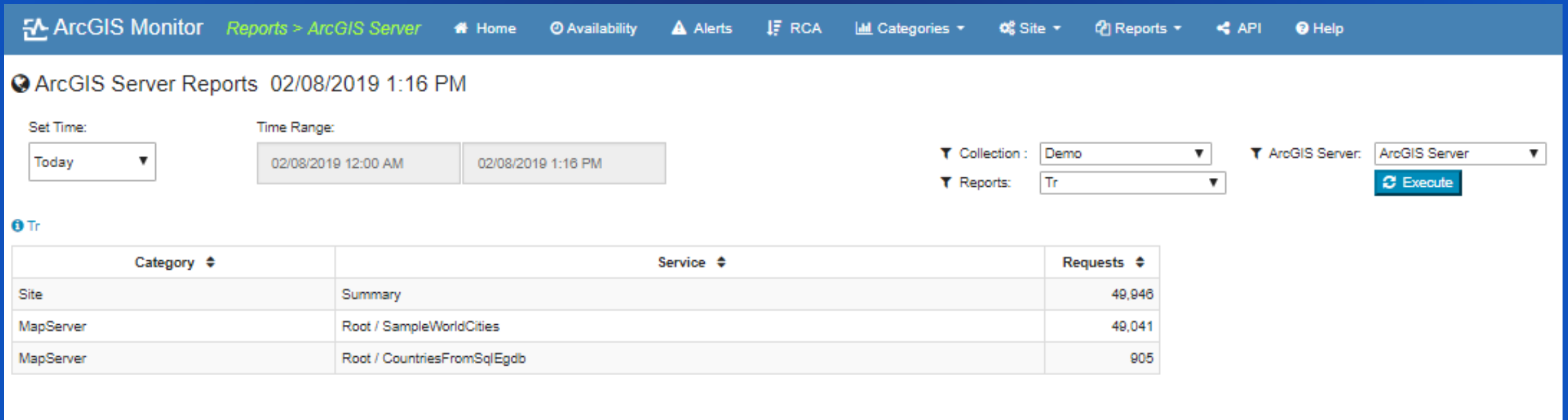
• Chart format



Usage at ArcGIS Server : transactions

Reports > ArcGIS > Tr

- Table format



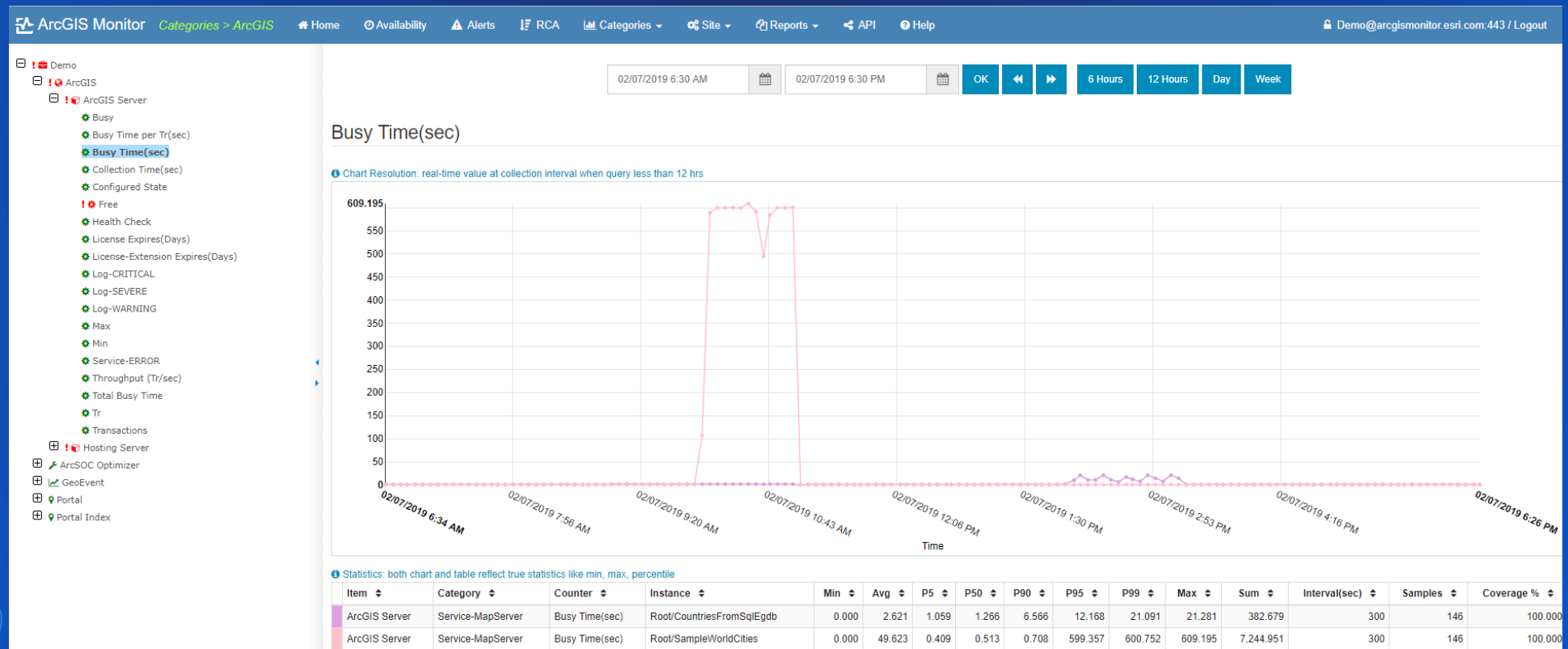
The screenshot displays the ArcGIS Monitor interface. The top navigation bar includes links for Home, Availability, Alerts, RCA, Categories, Site, Reports, API, and Help. The main heading is 'ArcGIS Server Reports 02/08/2019 1:16 PM'. Below this, there are filters for 'Set Time' (Today), 'Time Range' (02/08/2019 12:00 AM to 02/08/2019 1:16 PM), 'Collection' (Demo), 'ArcGIS Server' (ArcGIS Server), and 'Reports' (Tr). An 'Execute' button is present. The data is presented in a table with columns for Category, Service, and Requests.

Category	Service	Requests
Site	Summary	49,948
MapServer	Root / SampleWorldCities	49,041
MapServer	Root / CountriesFromSqlEgdb	905

Usage at ArcGIS Server: CPU time

Categories > ArcGIS > Busy Time (sec)

- CPU time a given service took at ArcGIS Server level.
- Use to identify top cpu consumers at ArcGIS Server.

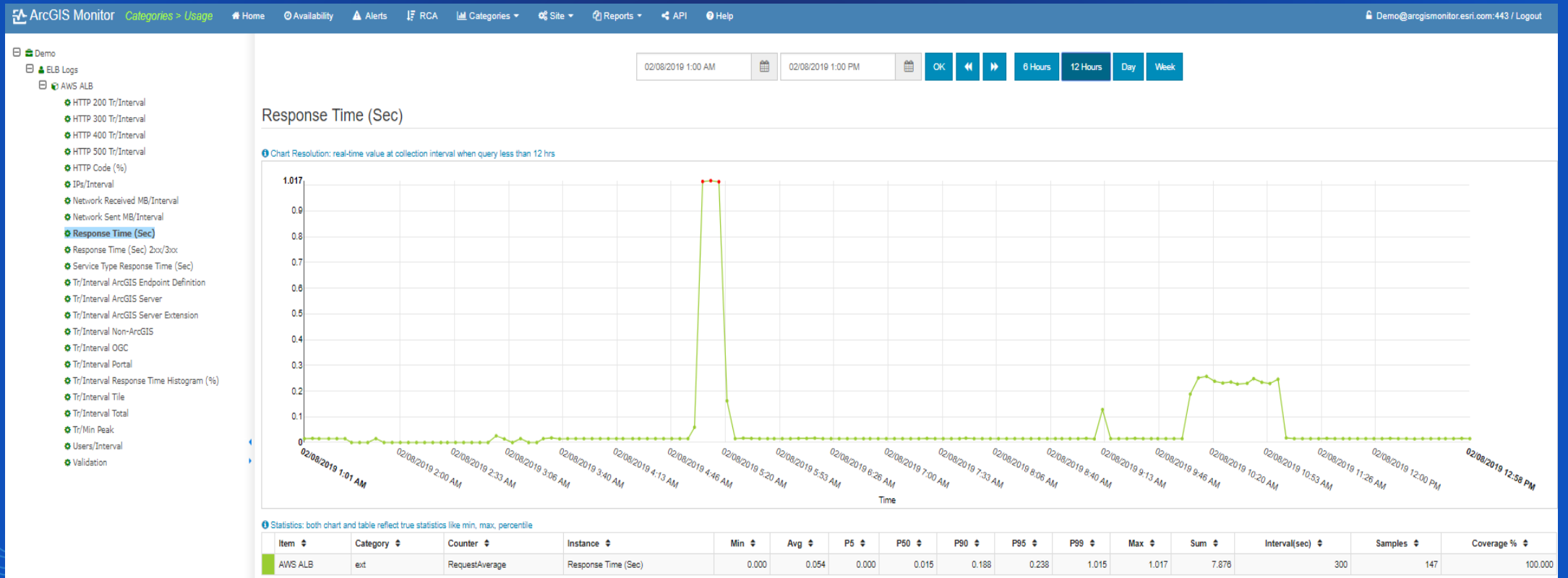


Performance



Performance at LB

Reports > Usage > Response Time (sec)



Performance at ArcGIS Server

Categories > ArcGIS > Busy Time per Tr (sec)

- **Busy Time per Tr (sec)** is the total time (seconds) per transaction consumed by ArcGIS Server service.



Performance at ArcGIS Server

Categories > ArcGIS > Busy Time per Tr (sec)

- Table format

ArcGIS Monitor

Reports > ArcGIS Server

Home

Availability

Alerts

RCA

Categories

Site

Reports

API

Help

ArcGIS Server Reports

02/08/2019 1:16 PM

Set Time:

Time Range:

Today

02/08/2019 12:00 AM02/08/2019 1:16 PM

Collection : Demo

ArcGIS Server: ArcGIS Server

Reports: Busy Time per Tr(sec)

Execute

Busy Time per Tr(sec)

Category	Service	Min(sec)	Avg(sec)	P50(sec)	P95(sec)	P99(sec)	Max(sec)	Samples where CPU Time > 0	Samples
MapServer	Root / CountriesFromSqlEgdb	0.21	0.43	0.21	0.32	12.45	13.77	153	158
MapServer	Root / SampleWorldCities	0.10	0.11	0.10	0.14	0.14	0.16	150	158

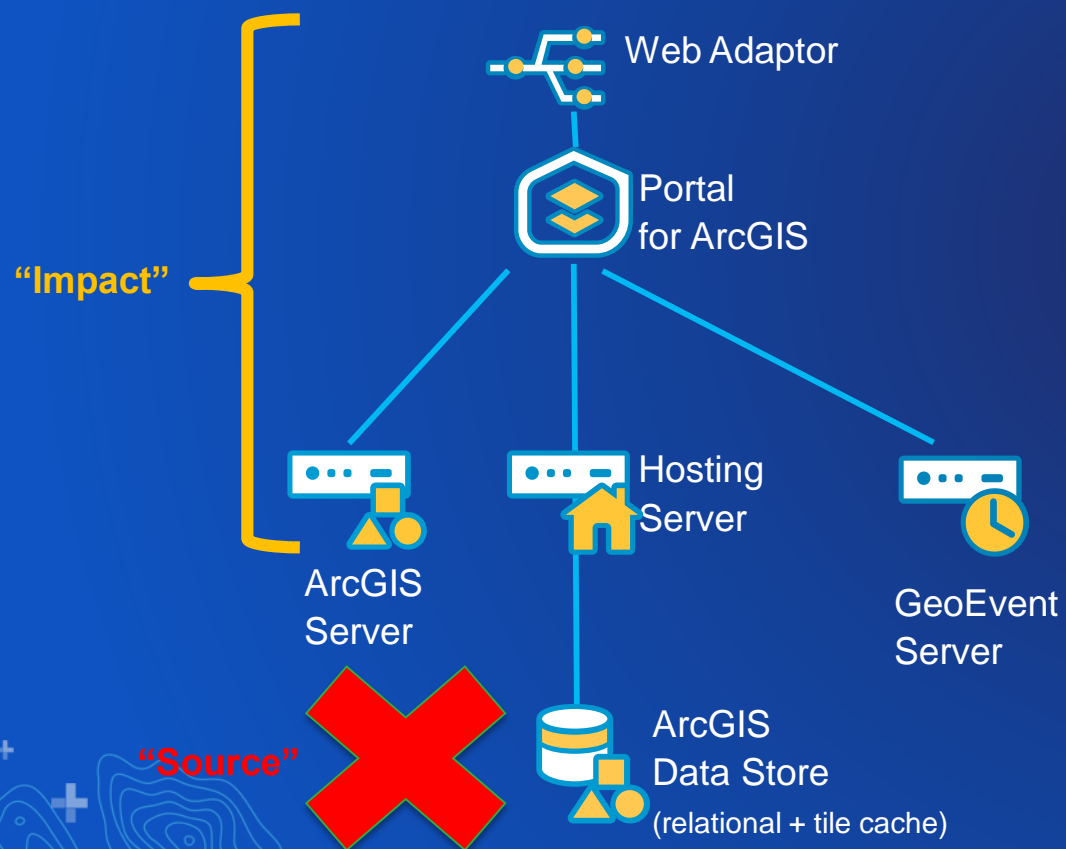
Typical cases and Root Cause Analysis (RCA)



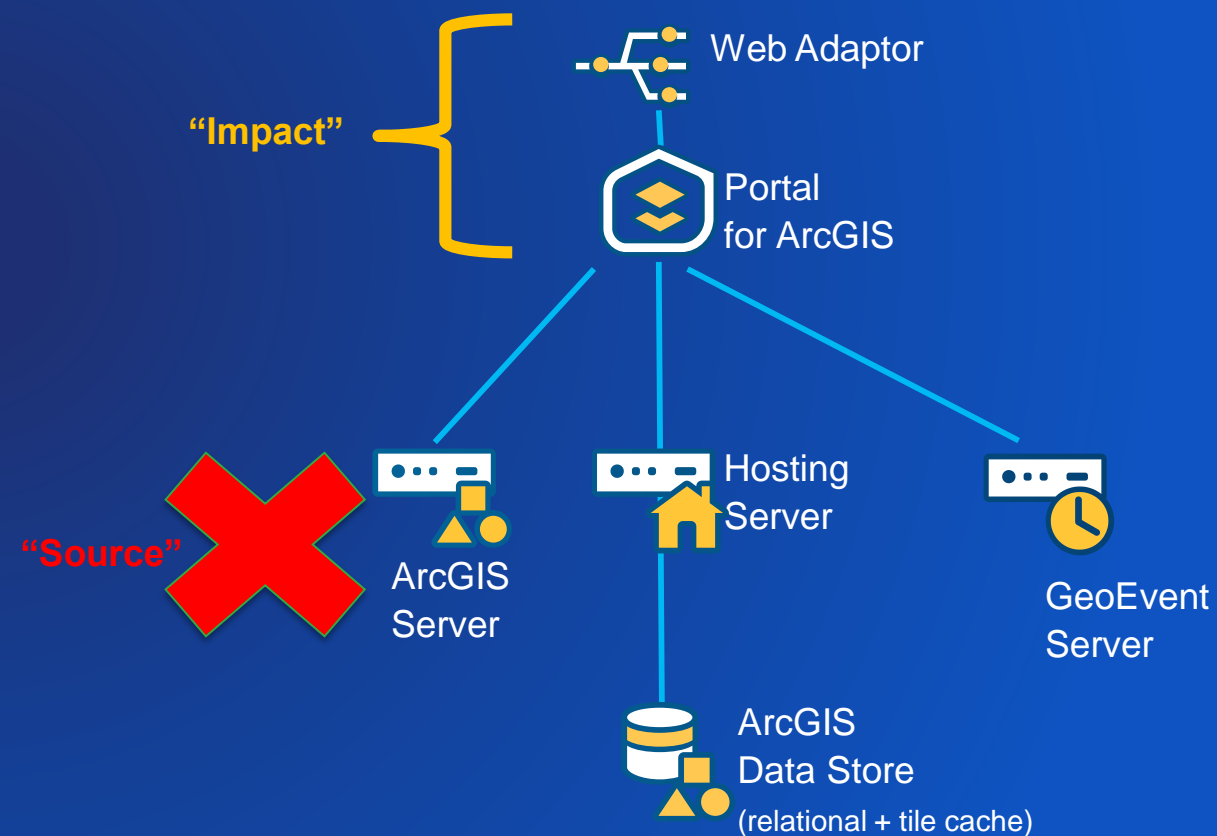
Root Cause Analysis (RCA)

“Source” - the most downstream failing component

“Impact” – all upstream failing components



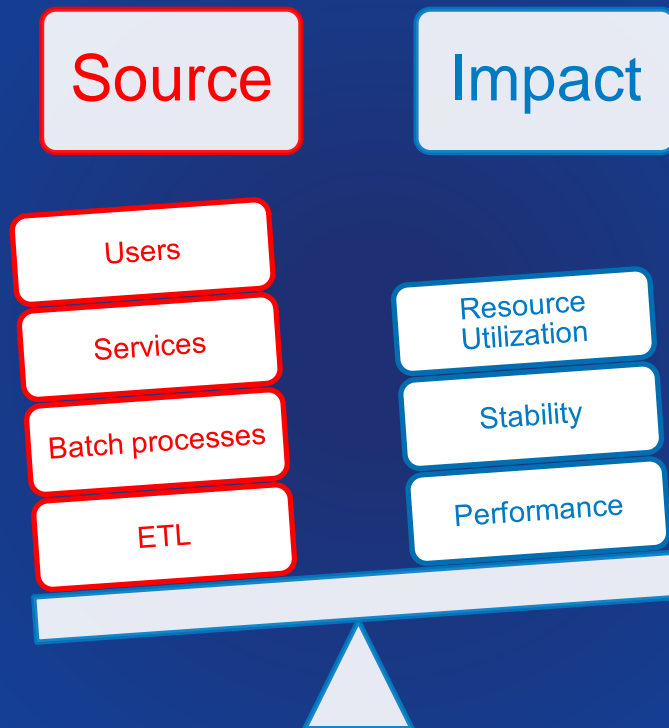
Example 1



Example 2

Overloaded system

Load exceeds the designed capacity



RCA: Usage spike

Throughput (tr/s)

Root Cause Analysis Reports 01/29/2019 7:04 AM

Set Time: Yesterday Time Range: 01/28/2019 12:00 AM 01/28/2019 11:59 PM

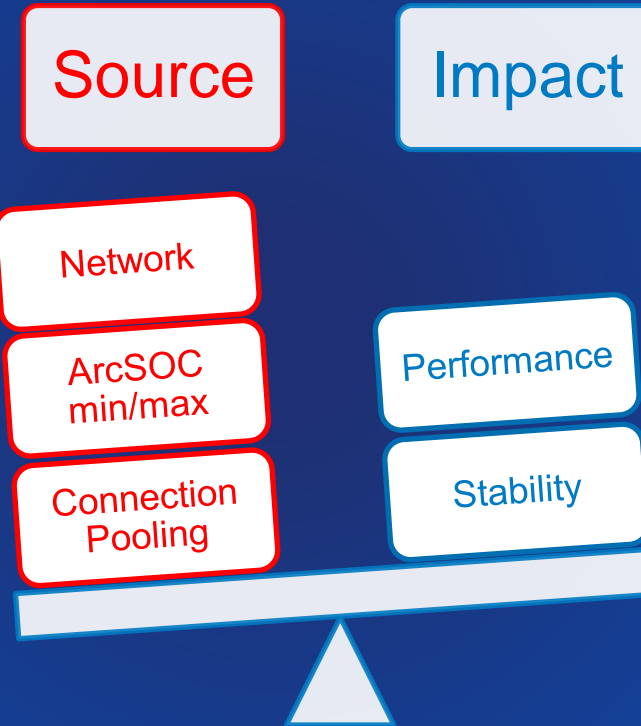
Collection: Demo Reports: Sources & Impacts by Time Execute

Bins: 82 - 01/28/2019 10:10 AM

Use this root cause analysis report to categorize alerts into impacts and sources

Bin	Type	Tier	Start Time	End Time	Min	Level	Counter Name	Rule	Counter Instance	Name	Counter Type	Comments
82	Impact	ArcGIS	01/28/2019 10:10 AM	01/28/2019 10:20 AM	10	Warning	Free	= 0	Root<~>SampleWorldCities	ArcGIS Server	ArcGIS	Increase min/max to reduce wait time
	Impact	Infrastructure		01/28/2019 10:20 AM	10	Warning	Error	> 0	10.0.3.154	WinEvent: AGS	</> Ext - WinEvent	Check windows event logs
	Impact	Infrastructure		01/28/2019 10:20 AM	10	Warning	% Processor Time	> 85	_Total	10.0.3.154	System	Check for: 1. usage spikes; 2. degraded performance; 3. unexp consuming CPU
	Impact	Infrastructure		01/28/2019 10:20 AM	10	Warning	% Processor Time	> 85	agmdemo-PRD-AGS02-i-0ce4a9bff1788a034-us-east-1	AWS	Amazon	Check for: 1. usage spikes; 2. degraded performance; 3. unexp consuming CPU
	Impact	na		01/28/2019 10:20 AM	10	Warning	seconds	> 0.1	EC2AMAZ-NI76OEE	CPUBenchmark_EC2AMAZ-NI76OEE	</> Ext - CPUBenchmark	Investigate potential CPU wait time
	Source	ArcGIS		01/28/2019 10:20 AM	10	Warning	Throughput (Tr/sec)	>= 5	Root<~>SampleWorldCities	ArcGIS Server	ArcGIS	Usage spike. Check resource utilization and settings.
	Source	ArcGIS		01/28/2019 10:20 AM	10	Warning	Throughput (Tr/sec)	>= 10	Summary	ArcGIS Server	ArcGIS	Usage spike. Check resource utilization and settings.

Bottleneck



RCA: Free instances = 0

Bottleneck are often created by increased load

ArcGIS Monitor RCA Home Availability Alerts Categories Site Reports API Help Demo@arcgismonitor.e

Root Cause Analysis Reports 01/29/2019 7:04 AM

Set Time: Yesterday Time Range: 01/28/2019 12:00 AM 01/28/2019 11:59 PM

Collection: Demo Reports: Sources & Impacts by Time Execute

Bins: 82 - 01/28/2019 10:10 AM

Use this root cause analysis report to categorize alerts into impacts and sources

Bin	Type	Tier	Start Time	End Time	Min	Level	Counter Name	Rule	Counter Instance	Name	Counter Type	Comments
82	Impact	ArcGIS	01/28/2019 10:10 AM	01/28/2019 10:20 AM	10	Warning	Free	= 0	Root<~>SampleWorldCities	ArcGIS Server	ArcGIS	Increase min/max to reduce wait time
	Impact	Infrastructure		01/28/2019 10:20 AM	10	Warning	Error	> 0	10.0.3.154	WinEvent: AGS	</> Ext - WinEvent	Check windows event logs
	Impact	Infrastructure		01/28/2019 10:20 AM	10	Warning	% Processor Time	> 85	_Total	10.0.3.154	System	Check for: 1. usage spikes; 2. degraded performance; 3. unexp consuming CPU
	Impact	Infrastructure		01/28/2019 10:20 AM	10	Warning	% Processor Time	> 85	agmdemo-PRD-AGS02-i-0ce4a9bff1788a034-us-east-1	AWS	Amazon	Check for: 1. usage spikes; 2. degraded performance; 3. unexp consuming CPU
	Impact	na		01/28/2019 10:20 AM	10	Warning	seconds	> 0.1	EC2AMAZ-NI76OEE	CPUBenchmark_EC2AMAZ-NI76OEE	</> Ext - CPUBenchmark	Investigate potential CPU wait time
	Source	ArcGIS		01/28/2019 10:20 AM	10	Warning	Throughput (Tr/sec)	>= 5	Root<~>SampleWorldCities	ArcGIS Server	ArcGIS	Usage spike. Check resource utilization and settings.
	Source	ArcGIS		01/28/2019 10:20 AM	10	Warning	Throughput (Tr/sec)	>= 10	Summary	ArcGIS Server	ArcGIS	Usage spike. Check resource utilization and settings.

Unstable Infrastructure

Interruption to the underlying resources



Source

Impact

Restarting

Overallocation

Permissions

VMotion

Stability

Performance



RCA: CPU spike by unexpected process, e.g. viroous scan

ArcGIS Monitor RCA Home Availability Alerts Categories Site Reports API Help Demo@arcgismonitor.esri.com:443

Root Cause Analysis Reports 01/29/2019 7:04 AM

Set Time: Last Hour Time Range: 01/29/2019 6:35 AM 01/29/2019 7:35 AM

Collection: Demo Reports: Sources & Impacts by Time Execute

Bins: All

Use this root cause analysis report to categorize alerts into impacts and sources

Bin	Type	Tier	Start Time	End Time	Min	Level	Counter Name	Rule	Counter Instance	Name	Counter Type	Comments
0	Impact	Web	01/29/2019 7:25 AM	01/29/2019 7:35 AM	10	Warning	HTTP500	>= 5	HTTP Code (%)	AWS ALB	<> Ext - System Log Parser for ELB	1. check web and app logs for urls; 2. Reproduce with web debugger;
	Impact	ArcGIS		01/29/2019 7:35 AM	10	Warning	Service-ERROR	> 0	Validation	ArcGIS GeoEvent Server	<> Ext - ArcGIS GeoEvent Extension	Check ArcGIS Enterprise logs
	Source	Infrastructure		01/29/2019 7:35 AM	10	Warning	% Processor Time	> 85	_Total	10.0.3.154	System	Check for: 1. usage spikes; 2. degraded performance; 3. unexpected process consuming CPU

RCA: Portal for ArcGIS Server service stopped

ArcGIS Monitor RCA Home Availability Alerts Categories Site Reports API Help Demo@arcgismonitor.esri.com

Root Cause Analysis Reports 01/28/2019 6:29 PM

Set Time: Today Time Range: 01/28/2019 12:00 AM 01/28/2019 6:29 PM

Collection: Demo Reports: Sources & Impacts by Time Execute

Bins: 80 - 01/28/2019 5:00 AM

Use this root cause analysis report to categorize alerts into impacts and sources

Bin	Type	Tier	Start Time	End Time	Min	Level	Counter Name	Rule	Counter Instance	Name	Counter Type	Comments
80	Impact	Web	01/28/2019 5:00 AM	01/28/2019 5:10 AM	10	Warning	Find String	= 0	Portal for ArcGIS Health	Portal for ArcGIS Health	Http	1. Reproduce with web debugger; 2. check app and other logs
	Impact	Web		01/28/2019 5:10 AM	10	Warning	Find String NOT	= 1	Portal for ArcGIS Health	Portal for ArcGIS Health	Http	1. Reproduce with web debugger; 2. check app and other logs
	Impact	Web		01/28/2019 5:10 AM	10	Warning	JSON Error Code	> 0	Countries_Sql_Egdb_Draw	Countries_Sql_Egdb_Draw	Http	1. Reproduce with web debugger; 2. check app and other logs
	Impact	Web		01/28/2019 5:10 AM	10	Warning	Find String	= 0	Countries_Sql_Egdb_Draw	Countries_Sql_Egdb_Draw	Http	1. Reproduce with web debugger; 2. check app and other logs
	Impact	Web		01/28/2019 5:10 AM	10	Warning	JSON Error Code	> 0	Countries_Sql_Egdb_Test	Countries_Sql_Egdb_Test	Http	1. Reproduce with web debugger; 2. check app and other logs
	Impact	Web		01/28/2019 5:10 AM	10	Warning	RequestAverage	> 1	Response Time (Sec)	AWS ALB	Ext - System Log Parser for ELB	Check resource utilization and settings.
	Impact	Web		01/28/2019 5:10 AM	10	Warning	Find String NOT	= 1	Countries_Sql_Egdb_Test	Countries_Sql_Egdb_Test	Http	1. Reproduce with web debugger; 2. check app and other logs
	Impact	Infrastructure		01/28/2019 5:10 AM	10	Warning	Error	> 0	10.0.3.154	WinEvent: AGS	Ext - WinEvent	Check windows event logs
	Impact	Infrastructure		01/28/2019 5:10 AM	10	Warning	Error	> 0	10.0.3.27	WinEvent: AGS	Ext - WinEvent	Check windows event logs
	Impact	Infrastructure		01/28/2019 5:10 AM	10	Warning	Count Total	= 0	ArcGISPortal	10.0.3.184-ArcGISPortal	Process	Check ArcGIS Enterprise and OS logs.
	Impact	Infrastructure		01/28/2019 5:10 AM	10	Warning	Count Total	= 0	postgres	10.0.3.184-postgres	Process	Check ArcGIS Enterprise and OS logs.
	Impact	Infrastructure		01/28/2019 5:10 AM	10	Warning	Warning	> 0	10.0.3.232	WinEvent: AGM	Ext - WinEvent	Check windows event logs
	Source	ArcGIS		01/28/2019 5:10 AM	10	Critical	Portal for ArcGIS	= 0	10.0.3.184	WinService: Portal	Ext - WinService	Check ArcGIS Enterprise and OS logs.

RCA: ArcGIS Server machine rebooted

Root Cause Analysis Reports 01/28/2019 6:29 PM

Set Time: Today Time Range: 01/28/2019 12:00 AM 01/28/2019 6:29 PM

Collection: Demo Reports: Sources & Impacts by Time Execute

Bins: 45 - 01/28/2019 10:50 AM

Use this root cause analysis report to categorize alerts into impacts and sources

Bin	Type	Tier	Start Time	End Time	Min	Level	Counter Name	Rule	Counter Instance	Name	Counter Type	Comments
45	Impact	Web	01/28/2019 10:50 AM	01/28/2019 11:00 AM	10	Warning	Response Time(sec)	> 3	Countries_Sql_Egdb_Draw	Countries_Sql_Egdb_Draw	Http	Check: 1. CPU; 2. Which tier(s) are responsible (e.g. check ArcGIS, DB count logs)?
	Impact	Web		01/28/2019 11:00 AM	10	Warning	Find String	= 0	Countries_Sql_Egdb_Draw	Countries_Sql_Egdb_Draw	Http	1. Reproduce with web debugger; 2. check app and other logs
	Impact	Web		01/28/2019 11:00 AM	10	Warning	Find String	= 0	SampleWorldCities	SampleWorldCities	Http	1. Reproduce with web debugger; 2. check app and other logs
	Impact	Web		01/28/2019 11:00 AM	10	Warning	Find String NOT	= 1	SampleWorldCities	SampleWorldCities	Http	1. Reproduce with web debugger; 2. check app and other logs
	Impact	ArcGIS		01/28/2019 11:00 AM	10	Warning	Throughput (Tr/sec)	>= 5	Root<->SampleWorldCities	ArcGIS Server	ArcGIS	Usage spike. Check resource utilization and settings.
	Impact	ArcGIS		01/28/2019 11:00 AM	10	Warning	Throughput (Tr/sec)	>= 10	Summary	ArcGIS Server	ArcGIS	Usage spike. Check resource utilization and settings.
	Impact	ArcGIS		01/28/2019 11:00 AM	10	Warning	Free	= 0	Root<->SampleWorldCities	ArcGIS Server	ArcGIS	Increase min/max to reduce wait time
	Impact	Infrastructure		01/28/2019 11:00 AM	10	Warning	Error	> 0	10.0.3.154	WinEvent: AGS	Ext - WinEvent	Check windows event logs
	Impact	Infrastructure		01/28/2019 11:00 AM	10	Warning	% Processor Time	> 85	_Total	10.0.3.154	System	Check for: 1. usage spikes; 2. degraded performance; 3. unexpected process consuming CPU
	Impact	Infrastructure		01/28/2019 11:00 AM	10	Warning	% Processor Time	> 85	agmdemo-PRD-AGS02-i-0ce4a9bff1788a034-us-east-1	AWS	Amazon	Check for: 1. usage spikes; 2. degraded performance; 3. unexpected process consuming CPU
	Source	Infrastructure		01/28/2019 11:00 AM	10	Critical	Reboot	> 0	_Total	10.0.3.154	System	If reboot not planned, check OS event logs for details

RCA: Database not running

Root Cause Analysis Reports 01/28/2019 6:29 PM

Set Time: Today Time Range: 01/28/2019 12:00 AM 01/28/2019 6:29 PM

Collection: Demo Reports: Sources & Impacts by Time Execute

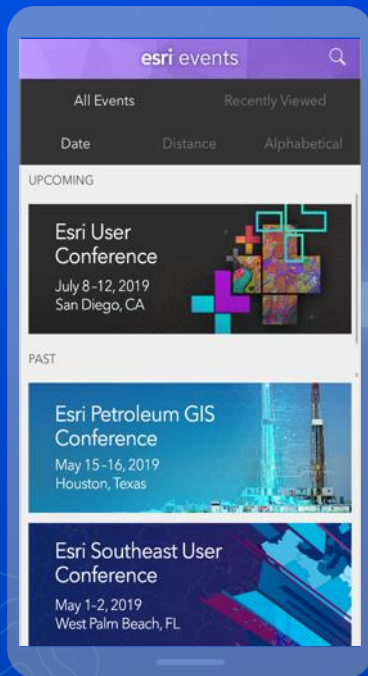
Bins: 103 - 01/28/2019 1:10 AM

Use this root cause analysis report to categorize alerts into impacts and sources

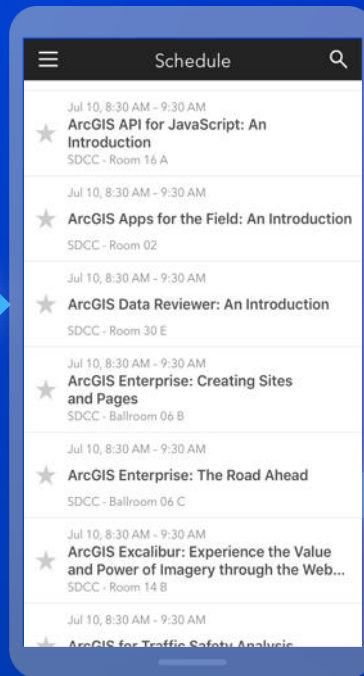
Bin	Type	Tier	Start Time	End Time	Min	Level	Counter Name	Rule	Counter Instance	Name	Counter Type	Comments
103	Impact	Web	01/28/2019 1:10 AM	01/28/2019 1:20 AM	10	Warning	Response Time(sec)	> 3	Countries_Sql_Egdb_Draw	Countries_Sql_Egdb_Draw	Http	Check: 1. CPU; 2. Which tier(s) are responsible (e.g.check ArcGIS, DB o
	Impact	Web		01/28/2019 1:20 AM	10	Warning	Response Time(sec)	> 3	Countries_Sql_Egdb_Test	Countries_Sql_Egdb_Test	Http	Check: 1. CPU; 2. Which tier(s) are responsible (e.g.check ArcGIS, DB o
	Impact	Infrastructure		01/28/2019 1:20 AM	10	Warning	Error	> 0	10.0.3.154	WinEvent: AGS	Ext - WinEvent	Check windows event logs
	Source	Database		01/28/2019 1:20 AM	10	Critical	Code	> 0	Validation	eGDB Activity	Ext - EgdbSQL	Check if database is running

Please Share Your Feedback in the App

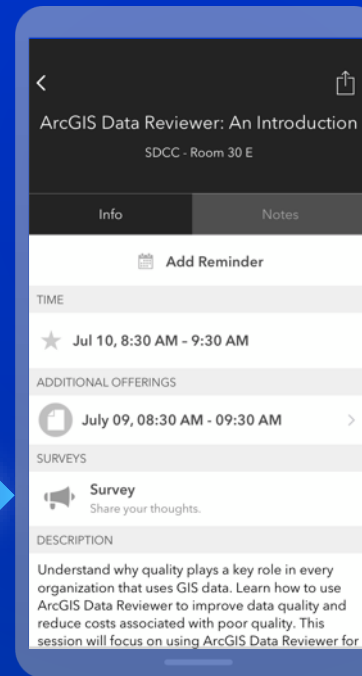
Download the Esri Events app and find your event



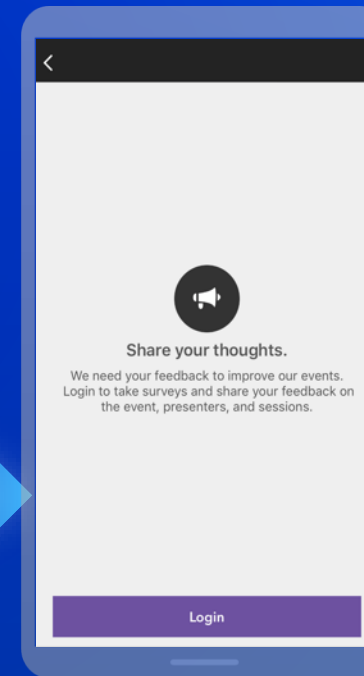
Select the session you attended



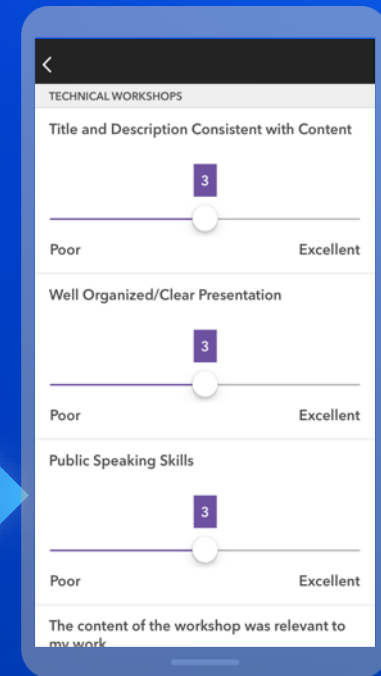
Scroll down to "Survey"



Log in to access the survey

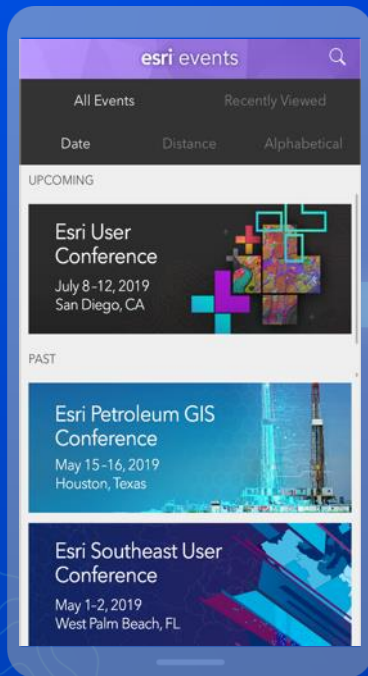


Complete the survey and select "Submit"

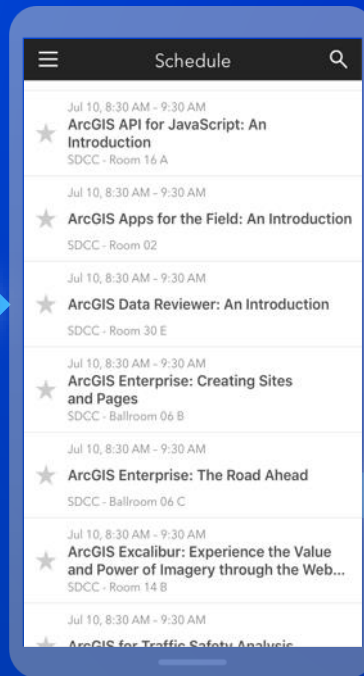


Please Share Your Feedback in the App

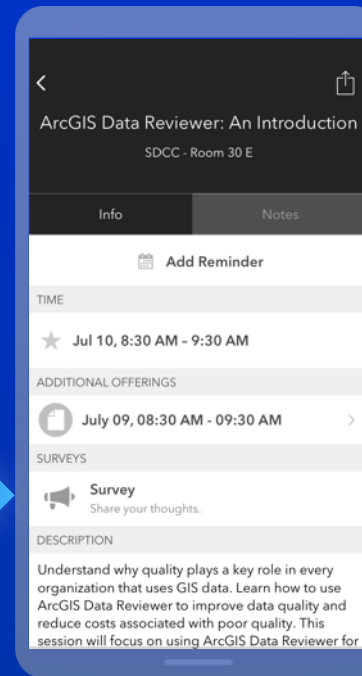
Download the Esri Events app and find your event



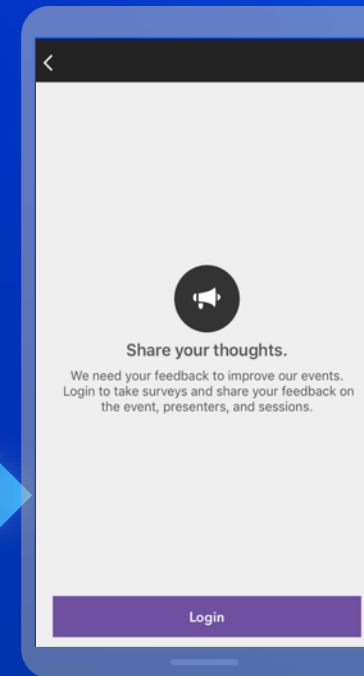
Select the session you attended



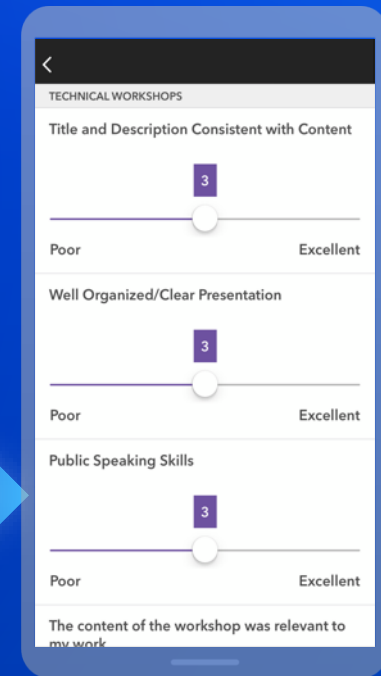
Scroll down to "Survey"



Log in to access the survey



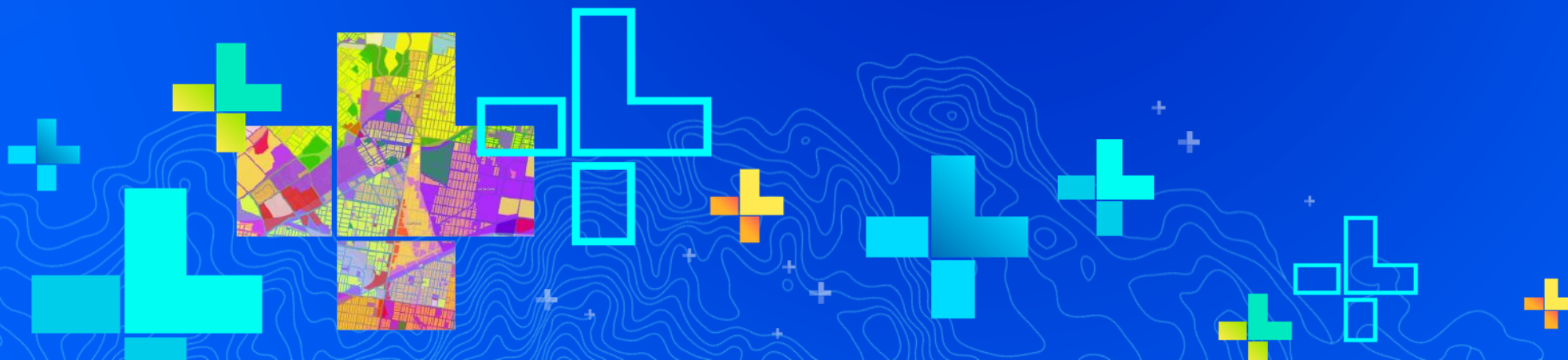
Complete the survey and select "Submit"





Presentation Title

Presenter Names



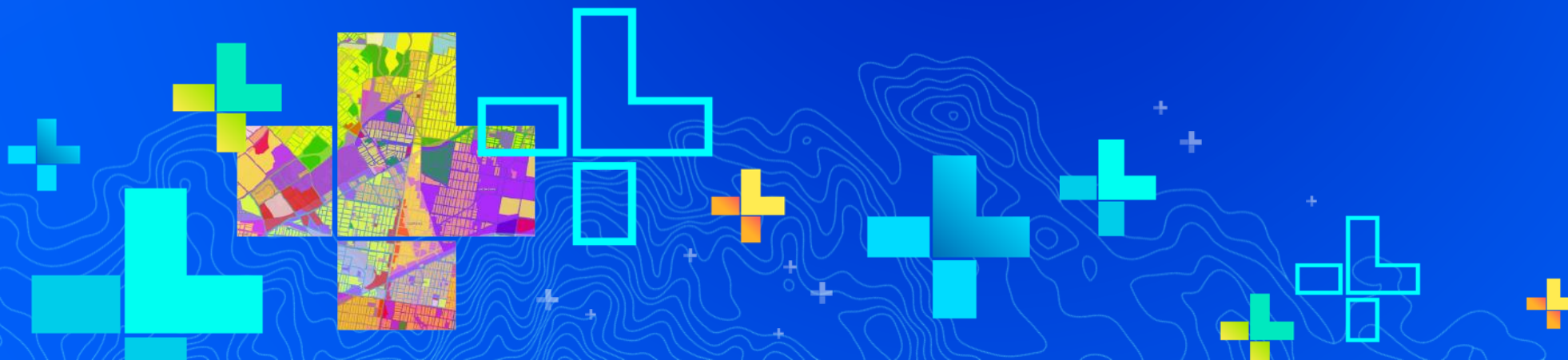
SEE
WHAT
OTHERS
CAN'T





Presentation Title

Presenter Names



SEE
WHAT
OTHERS
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Section Header

Section Subhead



Demo Title

Presenter(s)

