ArcGIS Enterprise: Tuning and Scaling

David Cordes
Philip Heede
## Related sessions

<table>
<thead>
<tr>
<th>WORKSHOP</th>
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<tbody>
<tr>
<td>• ArcGIS Enterprise: Architecting Your Deployment</td>
<td>• SDCC – Ballroom 06C</td>
<td>• Tuesday, 10:00-11:00 am</td>
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<td>• SDCC – Ballroom 06C</td>
<td>• Wednesday, 4:00-5:00 pm</td>
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<tr>
<td>• ArcGIS Enterprise: Best Practices for Layers and Service Types</td>
<td>• SDCC – Ballroom 06B</td>
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<td>• SDCC – Room 33 A/B</td>
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<tr>
<td>• Real-Time and Big Data GIS: Best Practices</td>
<td>• SDCC – Room 07 A/B</td>
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<td>• SDCC – Room 01 A/B</td>
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<tr>
<td>• Many, many geodatabase sessions..</td>
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- SDCC – Ballroom 06C
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Agenda

Session will cover all components and tiers of ArcGIS Enterprise:

• ArcGIS Server
  - Service authoring and tuning
  - Optimizing individual services
  - Tuning the system for many overall services
• Portal for ArcGIS
  - Operational aspects like backup models
• ArcGIS Data Store
  - Understanding the three types of data stores provided with the system
• Outside the scope of this session: enterprise geodatabases
Service fundamentals
Map authoring: tuning individual services

- Desktop maps don't always make good map services
- Scale dependencies
- Focus your map
  - Definition queries
  - Remove unneeded layers
  - Hide fields you aren't using
  - Annotations over labeling
- Use same coordinate system for data frame as data
- Pro tip: cacheControlMaxAge
General Data Considerations

- Match resolution of your feature class to the accuracy of the data.
  - If your data is accurate to the meter, then no need for millimeter resolution

- For file and enterprise geodatabases remember to index your data appropriately

- For enterprise geodatabases use the recommended spatial type for your RDBMS
  (st_geometry, native spatial type, ..)
File Geodatabase

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

- Fast
- Live data
- Requires database expert
- Traditional Versioning
  - Fine for desktop editing, may be problematic for server applications
- 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
Tuning
Tuning ArcGIS Server - instance tuning

- Two models that services run under: hosted and traditional.

- Any service that references user-managed data in place – like file geodatabase or enterprise geodatabase – is run under the traditional model.

- Traditional model has concept of *service instances* (also known as SOCs).

- **BIG** new feature in ArcGIS Server 10.7+: *shared instances*
Tuning ArcGIS Server- instance tuning

• The number of instances impacts:
  - memory usage at rest (and during use)
  - determines number of concurrent requests that can be serviced

• Shared instances completely changes this dynamic. Game changing!

• Traditional model is called using dedicated instances. New option for 10.7+ is shared instances.
The Over Allocation Problem

- Air Conditioning Business
  - 1 routing service for routing and figuring out guaranteed response times during sales visits. CRITICAL
  - 6 map services for 6 counties sales figures. SECONDARY
- Sales figures come out at the end of the month and suddenly you have 6 map services consuming all 4 CPUs and making your Network Analysis service slow which is unacceptable.

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<td>1</td>
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<tr>
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<tr>
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<tr>
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<td>0</td>
<td>1</td>
</tr>
<tr>
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https://gis.acme.com
Has 4 cores
Shared Instances and Allocation

- If I change my county sales services to be shared instances and I set my shared instances to use 2 instances then I will never be overallocated.

- Note that my NetworkAnalysis service (and all other services) benefit even though they aren’t shared instances.

- We could add new counties and still be ok, scales as you add services.

- Shared instances also use considerably less memory at peak times which may have a performance benefit as well.

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Has 4 cores
Tuning ArcGIS Server- instance tuning for ArcGIS Server prior to 10.7 and when shared instances are not possible

- For predictable performance use $min = max$
- Default is $min = 1$, $max = 2$. Consider changing this!
- Swap space/page file is not a dirty word
- Cached service: set $max = 1$ to conserve memory. Individual tile requests not serviced by the SOC process.
Tuning ArcGIS Server- instance tuning for dedicated instances

- Avoid overload!
- Realize that concurrent *users* does not equal concurrent *requests*.

**Tradeoff:**
- Services with many layers vs. many services with few layers.

- Services with fewer layers have many advantages, but compete for resources.

*min = 0* can be an option for rarely used services.. but should be an option of last resort.
Tuning ArcGIS Server: instance tuning for shared instances

• Avoid \( \text{min} = 0 \) when shared instances are available - much better option!

• Use *shared instances* for all compatible services
  - Requires publishing from ArcGIS Pro (not supported for ArcMap-based services)
  - Supports map services using Feature Access, WMS, WFS, and KML capabilities.
  - Not supported for map services using other capabilities or with SOEs and SOIs attached.

• For other service types and services published from ArcMap: use the advice for dedicated instances
Tuning your Web Map

- **Hosted feature service considerations**
  - Read-only feature services are smaller, use generalized data.
  - If you need some people to edit and some to only read, then use views.

- **Reduce clicks** - pick your default extent carefully

- **Cache (tiles) may reduce the amount of traffic**

- **Large amounts of data can be slow and overwhelming**
  - Aggregate data using smart mapping
  - Latest releases (10.6.1 and higher) has new features for on-the-fly generalization and smaller data transfer (quantization)
Tuning your Web Map

- **Common setup today:**

  ![Diagram showing connections between Enterprise portal, GIS Server, and Data Store]

  - Enterprise portal
  - Web Layer
  - Web Layer
  - Web Layer
  - GIS Server
  - GIS Service
  - GIS Service
  - GIS Service
  - Data Store
  - Dataset
Tuning your Web Map

- More efficient: consolidate layers with like security into a single service
Tuning your Web Map

Enterprise portal
- Active Wells
- Proposed Wells
- Wells by Status

GIS Server
- Wells

Data Store
- Wells
Tuning your Enterprise portal

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)

- Backups – choose the right combination of full and incremental
  - Pro tip: after you run the first full backup the portal will begin to allow its database to grow unbounded. Be sure to continue to perform backups on a regular basis to keep the size under control.
Tuning ArcGIS Data Store

- Understand the three types of data stores powered by the ArcGIS Data Store components:

  - **Relational data store**
    - Powers most hosted feature layers

  - **Tile Cache data store**
    - Powers 3D scene layers and services

  - **Spatiotemporal big data store**
    - Powers high volume archiving from GeoEvent Server, large result data from GeoAnalytics Server, and track information from Tracker for ArcGIS.
Tuning ArcGIS Data Store

- Many command-line tools for managing and tuning ArcGIS Data Store
  - changedatastoremode (relational data store)
    - go to/from read-only mode
  - changedbproperties (all types)
    - disk space thresholds, RAM heap size for spatiotemporal big data store
  - changeloglocation (all types)
  - changebackuplocation (all types)
  - updatebackupretaindays (all types)
  - updatebackupschedule (all types)
  - etc.

- The `describedatastore` command gives insights into configuration on current machine.
Tuning ArcGIS Data Store

ArcGIS Data Store command utility reference

ArcGIS 10.6 (Windows) | Other versions

Command utilities, installed with ArcGIS Data Store, provide the data store administrator tools to manage data stores. This topic describes the utilities and provides syntax and examples.

All utilities must be run on the ArcGIS Data Store machine. You can find the utilities in the...
Tuning ArcGIS Server- an aside..

• Two models that services run under: hosted and traditional.

• For background and more information on the hosted model, how it relates to the traditional model, where data is stored, and why:
Scaling
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
The Enterprise portal: Portal for ArcGIS

- When do you need to scale out the Portal for ArcGIS tier?
  - Rarely!
  - Provide more resources for your existing machine(s)
    - Note: Use two machines with Portal for ArcGIS for high availability purposes *not* for scaling
    - Monitor CPU and memory usage to see if you need more resources
ArcGIS Server sites

Adding additional GIS 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, ...

Scaling existing sites:
- Vertically- adding resources to existing machines
- Horizontally- adding additional machines to existing site

OR
Scaling ArcGIS Server may also require:

- Scaling file servers
  - Config-store
  - Data
- Scaling databases
- Scaling your network infrastructure
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