



ArcGIS Server Performance and Scalability— Performance Factors and Optimization

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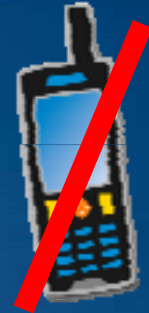


Introductions

- **Who are we?**
 - ArcGIS Server Product Development
 - Enterprise Implementation
- **Who are you?**
 - New to ArcGIS Server?
 - Currently deploying 9.3?
 - Currently deploying IMS?
- **Assumptions about you, our audience:**
 - Familiar with ArcGIS Desktop
 - Basic knowledge of ArcGIS Server Architecture and concepts
 - Comfortable with Web architectures

Schedule and Overview

Please!
Turn **OFF** cell phones
and paging devices



ArcGIS Server deployment and optimization strategies

- Case Study: Optimizing a Flex API web application
- Key performance factors in ArcGIS Server system components
- Optimizing components prior to deployment
- Recommended deployment architectures
- Primer: Tuning ArcGIS Server deployments in-situ

Question and answer period.

Please complete the session survey!

Case Study: Poorly performing a Flex API Application

Demo

Application code based on "Query result on Map" sample

The screenshot displays the ArcGIS Resource Centers website. The main content area features a map of the Portland Metro Area with a yellow boundary. The map includes a scale bar (0 to 20 km) and the ESRI logo. The map URL is http://andrew001/arcgis/rest/services/Portland_Good/MapServer. Below the map, there is a 'Submit' button and a list of sample code links, including 'Query result on Map', 'Query using GP result', 'Query that has information', 'Zoom to query result', 'Show points with tooltips', 'Get population for any area', 'Identify Tools (1)', 'Find Tools (2)', 'Geocoding Tools (2)', 'Geoprocessing Tools (1)', 'Geometry Service (1)', 'Toolbars (2)', and 'Host Functionality (4)'. The left sidebar contains a navigation menu with categories like 'Mapping (17)', 'Graphics (11)', 'Events (1)', 'Query Tools (8)', 'Identify Tools (1)', 'Find Tools (2)', 'Geocoding Tools (2)', 'Geoprocessing Tools (1)', 'Geometry Service (1)', 'Toolbars (2)', and 'Host Functionality (4)'. The top navigation bar includes 'Home', 'Samples', 'ArcGIS Server', 'Web Applications', and 'Flex API'.

Performance Factors in ArcGIS Server System Components

- Machine Architecture
- Data Sources
- ArcGIS Server Framework
- ArcGIS Server services
- Client applications and the ADF

Goal: Show how to optimize these components to deliver highly performing ArcGIS Server deployments.

Performance Factors: Machine Architecture

Select adequate hardware to support desired performance and load

- **Performance**
 - CPU Speed
 - Disk speed
 - Network latency

- **Capacity**
 - # CPU cores
 - Network bandwidth
 - # Disks and controllers

Performance Factors: System Architecture

Select fast CPU

- **Published benchmarks:**
<http://www.spec.org/cpu2006/results/cint2006.html>
- **Mapping: Select CPU with the highest Baseline CINT Rate/Core**
- **GP: Select CPU with highest Baseline CFP Rate/Core**

System	Result	Baseline	# Cores
Dell Precision 690 (Intel Xeon X5365, 3.00 GHz)	98.1	91.5	8
Dell Precision R5400 (Intel Xeon E5450, 3.00 GHz)	133	122	8
Dell Precision R5400 (Intel Xeon E5450, 3.00 GHz)	125	107	8
Dell Precision T7400 (Intel Xeon X5482, 3.20 GHz)	140	121	8
Dell Precision T7400 (Intel Xeon X5482, 3.20 GHz)	136	115	8
Dell Precision T7400 (Intel Xeon X5492, 3.40 GHz)	154	143	8
Dell Precision T7400 (Intel Xeon X5492, 3.40 GHz)	144	125	8
PowerEdge 1950 (Intel Xeon E5310, 1.60 GHz)	71.7	63.4	8
PowerEdge 1950 (Intel Xeon E5310, 1.60 GHz)	44.1	40.4	8

CPU performance may vary significantly between vendors and release

Performance Factors: Data Sources

Select data source that provide optimal performance

- **Vector**

- Data provider: DBMS, FileGDB, Shapefile, SDC
- Storage type: ESRI ST_Geometry, Oracle SDO, SQL Server Geometry

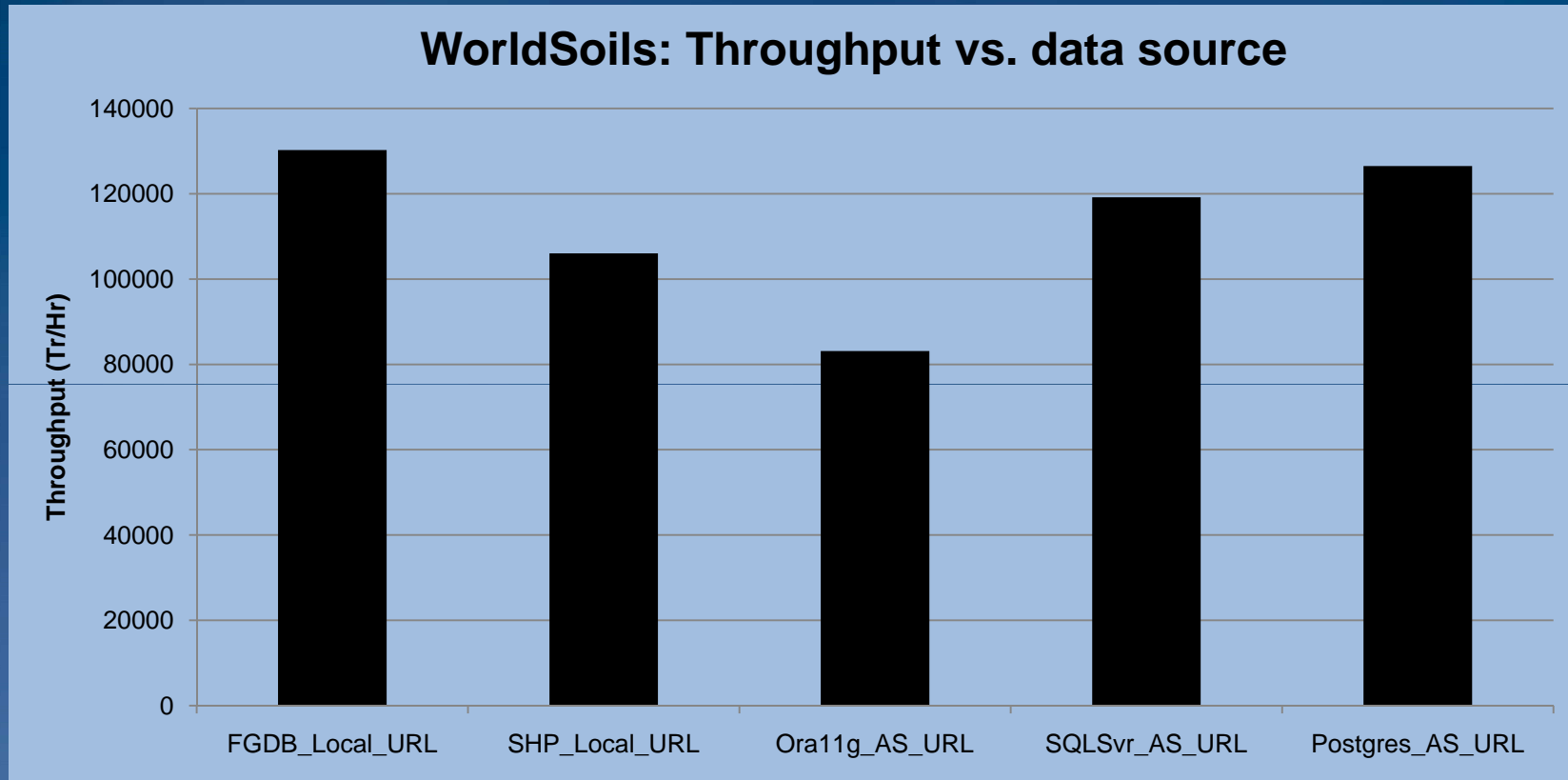
- **Raster**

- Data provider: Image Server, FileGDB, DBMS, SDC
- Compression: LZ77, JPEG, PNG

*Conduct a simple benchmark to select optimal data source format
Attend ArcGIS Server Performance and Scalability – Testing session*

Performance Factors: Data Sources

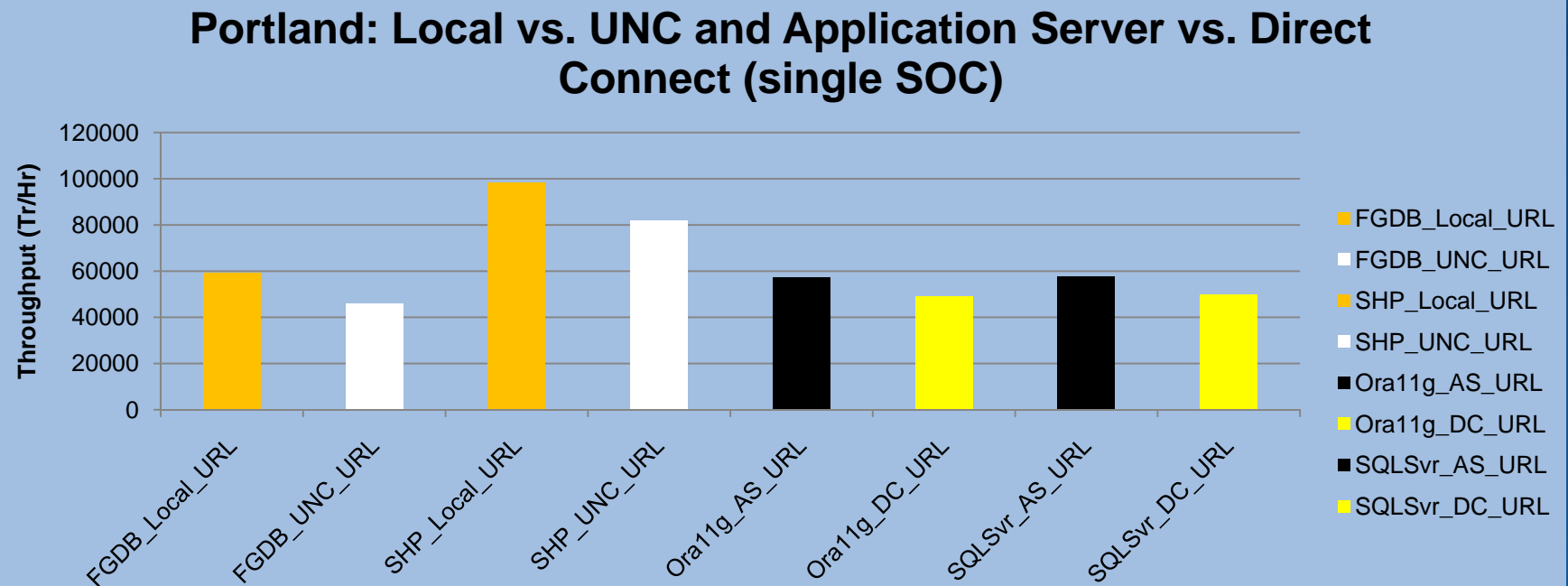
Representative comparison of throughput variances based on service source data.



Machine Specs: 4, 2.5GHz Dual-core CPU, 8GB RAM

Performance Factors: Data Sources

- **Local vs. UNC**
 - Locally sourced data always results in better throughput.
- **Application Server vs. Direct Connect**
 - Application Server is faster on a single SOC machine
 - Direct Connect scales better



Performance Factors: Data Sources

Optimize DBMS configuration and conduct maintenance

- **DBMS configuration**
- **Create and maintain (rebuild) attribute indexes**
- **Updating DBMS statistics**
- **Versioning management**
 - Reconcile and post
 - Compress

Non- optimal DBMS may be a source of significant performance degradation

Performance Factors: ArcGIS Server Framework

SOM

- 165 map draw requests/sec per core
- 60% CPU utilization on SOM machine
- 0.027 seconds average response time

Performance Factors: ArcGIS Server Framework

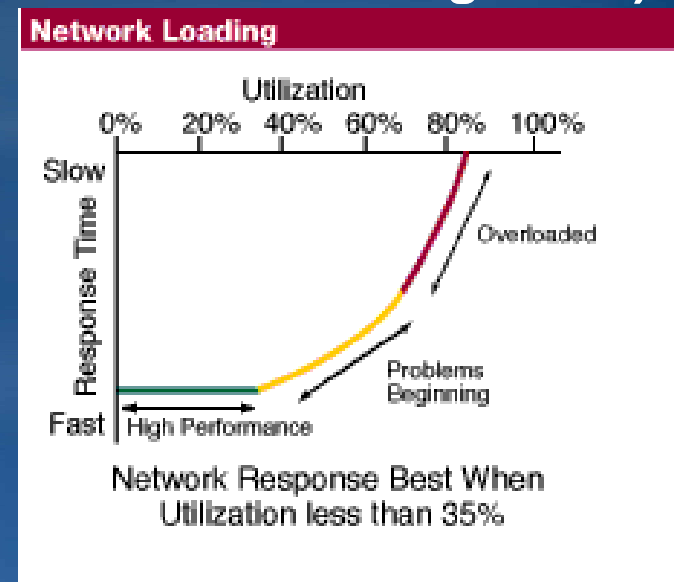
Web Service Components

- **Web service handlers**

- Easily overloaded by MIME data (REST/SOAP returning MIME)
 - Network I/O (full-duplex)
- Use multiple Web Instances

- **Virtual Directories**

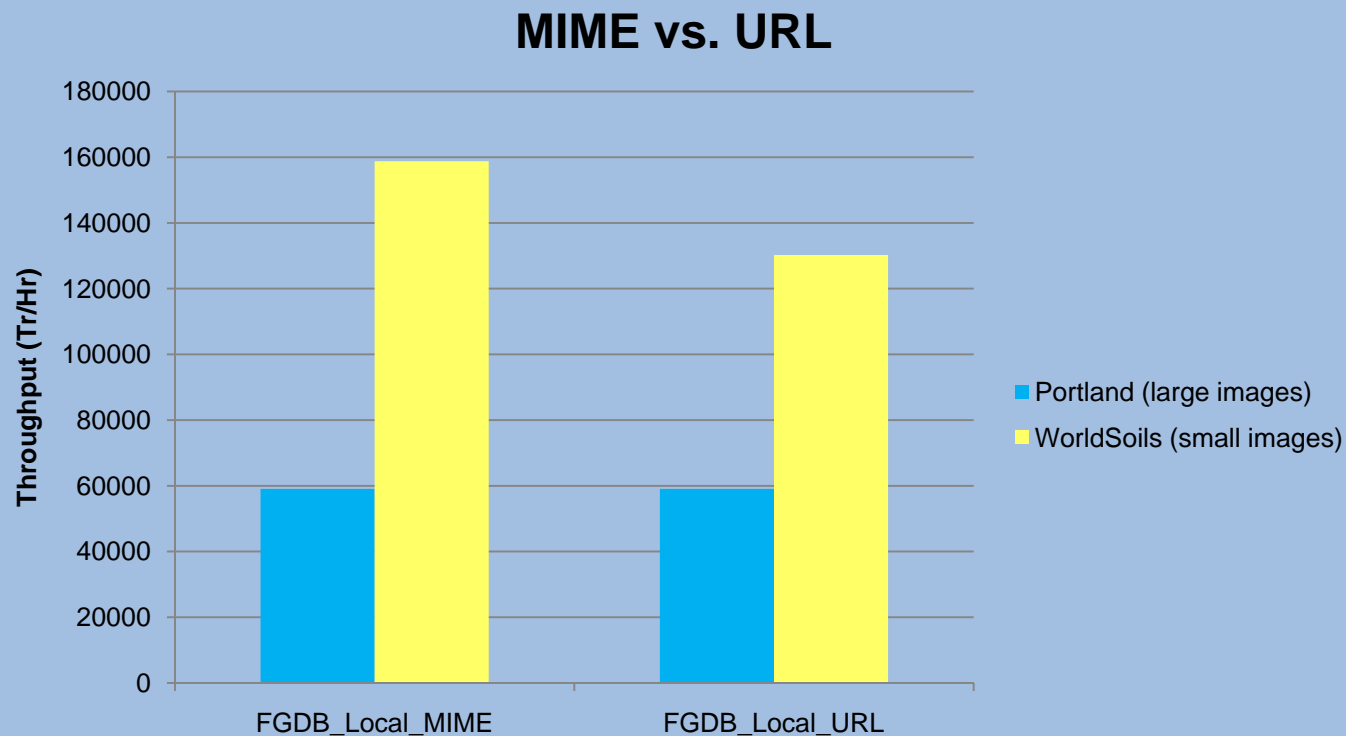
- Virtual output directory bottlenecks
 - Network I/O (full-duplex)
 - Disk performance
- Use multiple output directories on different machines.



Performance Factors: ArcGIS Server Framework

Web Service Components

- MIME vs URL return type
 - For serving maps, MIME can scale better than URL
 - Disk are often bottlenecks before network bandwidth
 - MIME performs better with smaller images



Performance Factors: ArcGIS Server Framework

Web Services

- Security

- SSL

- LSASS

- <http://support.esri.com/index.cfm?fa=knowledgebase.techarticles.articleShow&d=32620>

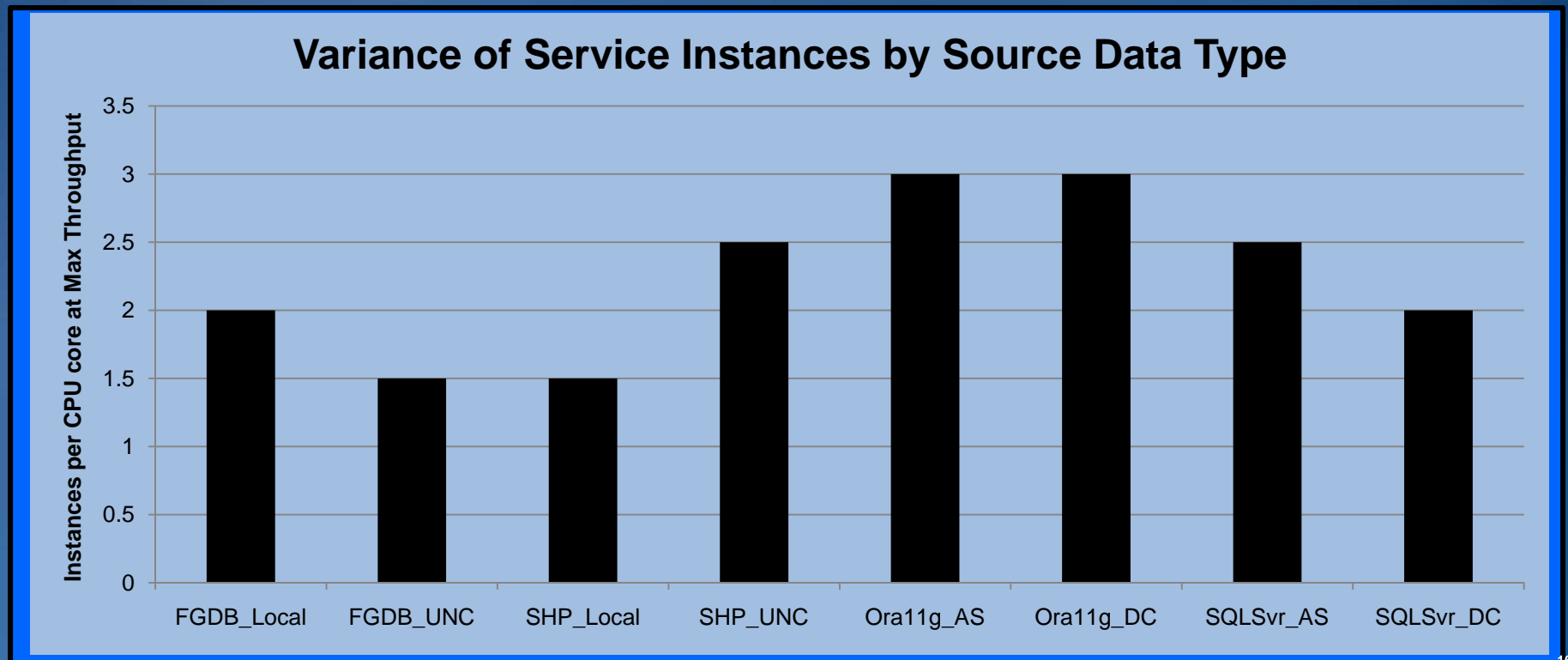
- Web Tier Security

- User/Role Stores
 - Token Server

Performance Factors: ArcGIS Server Framework

SOC

- Optimal number of instances does vary significantly by complexity of service (complex map or GP model) and choice of source data type.
- Varies in practice from 1 to 4 high-isolation instances per CPU core



Performance Factors: ArcGIS Server Services

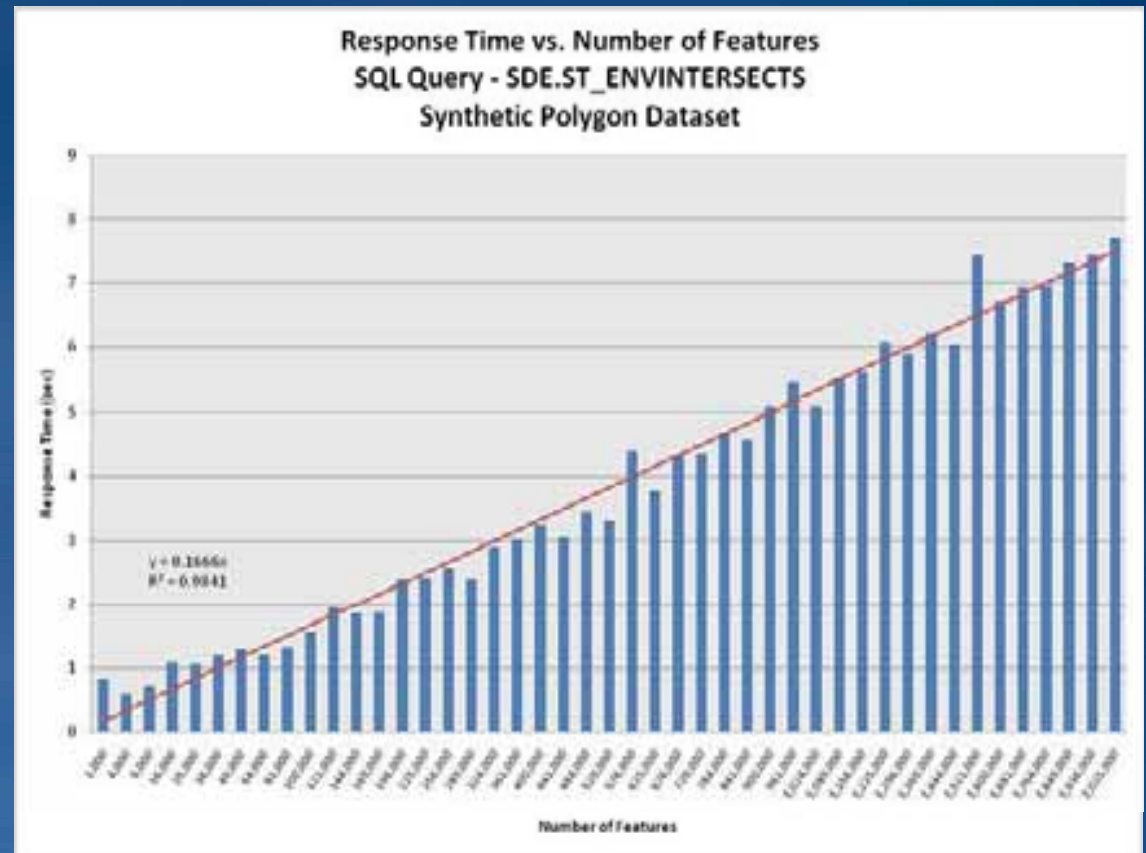
MapService

- Mxd
 - Optimizing map symbols for performance
 - Spatial index
 - Projecting on the fly
 - Optimizing map text and labels for performance
 - Use annotations
 - Avoid maplex
 - Use fast joins (no cross db joins)
 - Avoid wavelet compression-based raster types (MrSid,JPEG2000)

Performance Factors: ArcGIS Server Services

MapService

- Mxd
 - Simplify data
 - Set scale dependency
- Tuning Tools:
 - MxdPerfStat
 - ArcMap 9.3.1 Analyzer Tool



Performance Factors: ArcGIS Server Map Services

Optimizing mxd with MXDPerfStat

<http://arcscripts.esri.com/scripts.asp?eLang=&eProd=&perPage=10&eQuery=mxdperfstat>

C:>mxdperfstat -mxd Portland_Dev09_Bad.mxd -xy 7655029;652614 -scale 8000

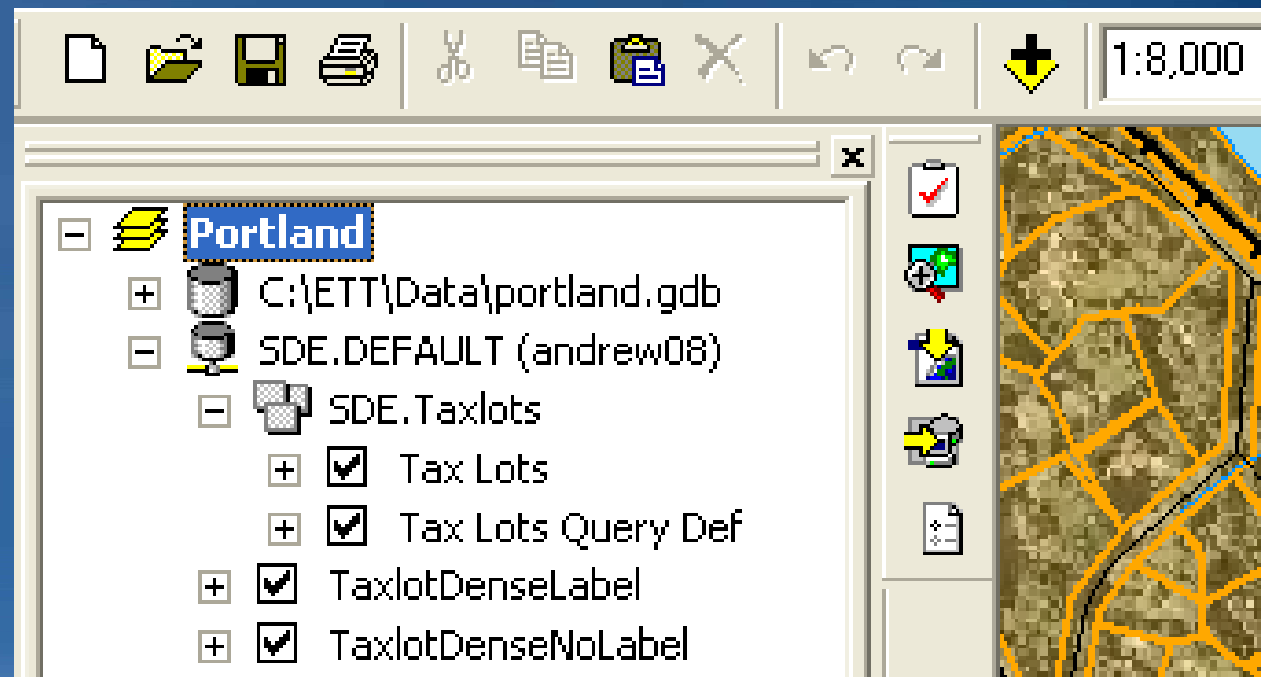
The screenshot shows the MXDPerfStat application interface. On the left is a layer list for 'Portland' with categories like Places, Transportation, Boundaries, Land Records, and Imagery. The main area displays a map of a city grid. Overlaid on the map is a table with performance data for various layers.

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
18	8,000	Tax Lots	1.04	Simplify labeling, symbology; GraphicsPhase= .83;	2,226	33,872	True	.14	.83	.20	.08	6,396
19	8,000	Tax Lots Query Def	.13		1	26	False	.03	.02	.06	.03	3,204
20	8,000	TaxdotDenseLabel	1.84	Simplify labeling, symbology; GraphicsPhase=1.03, simplify geometry and/or set label scale; convert polygon to polyline; vertices fetched=200001; simplify geometry and/or set label scale; vertices fetched=200001;	1	200,001	True	.73	1.03	.95	.01	266
21	8,000	TaxdotDenseNoLabel	.53	simplify geometry; vertices fetched=200001;	1	200,001	False	.47	.02	.97	.00	140

Performance Factors: ArcGIS Server Services

Demo: Optimizing mxd with MXDPerfStat

- Focus on performance impact of:
 - Scale dependency (SDE.Tax Lots)
 - Labeling on dense features (TaxlotDenseLabel)
 - Query Definition (Tax Lots Query Def)



Performance Factors: ArcGIS Server Services

Demo: Optimizing mxd with 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
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19	8,000	Tax Lots Query Def	.13		1	26	False	.03	.02	.06	.03	3,204
20	8,000	TaxlotDenseLabel	1.84	Simplify labeling, symbology: GraphicsPhase=1.03; simplify geometry and/or set label scale; convert polygon to polyline: vertices fetched=200001; simplify geometry and/or set label scale: vertices fetched=200001;	1	200,001	True	.73	1.03	.95	.01	266
21	8,000	TaxlotDenseNoLabel	.53	simplify geometry: vertices fetched=200001;	1	200,001	False	.47	.02	.97	.00	140

Performance Factors: ArcGIS Server Services

MapService

Optimizing mxd with new ArcMap 9.3.1 Analyze Tool

The screenshot shows the ArcMap 9.3.1 Analyze Tool interface. The main window displays a map of Portland, Oregon, with various features highlighted in yellow. The left pane shows the 'Portland' workspace with a tree view containing the following layers:

- Places
 - Schools
 - Cityhall
 - Fire Stations
 - Hospitals
 - Libraries
 - Airports
- Transportation

The bottom pane shows the 'Analyze' tool results, displaying a table of warnings:

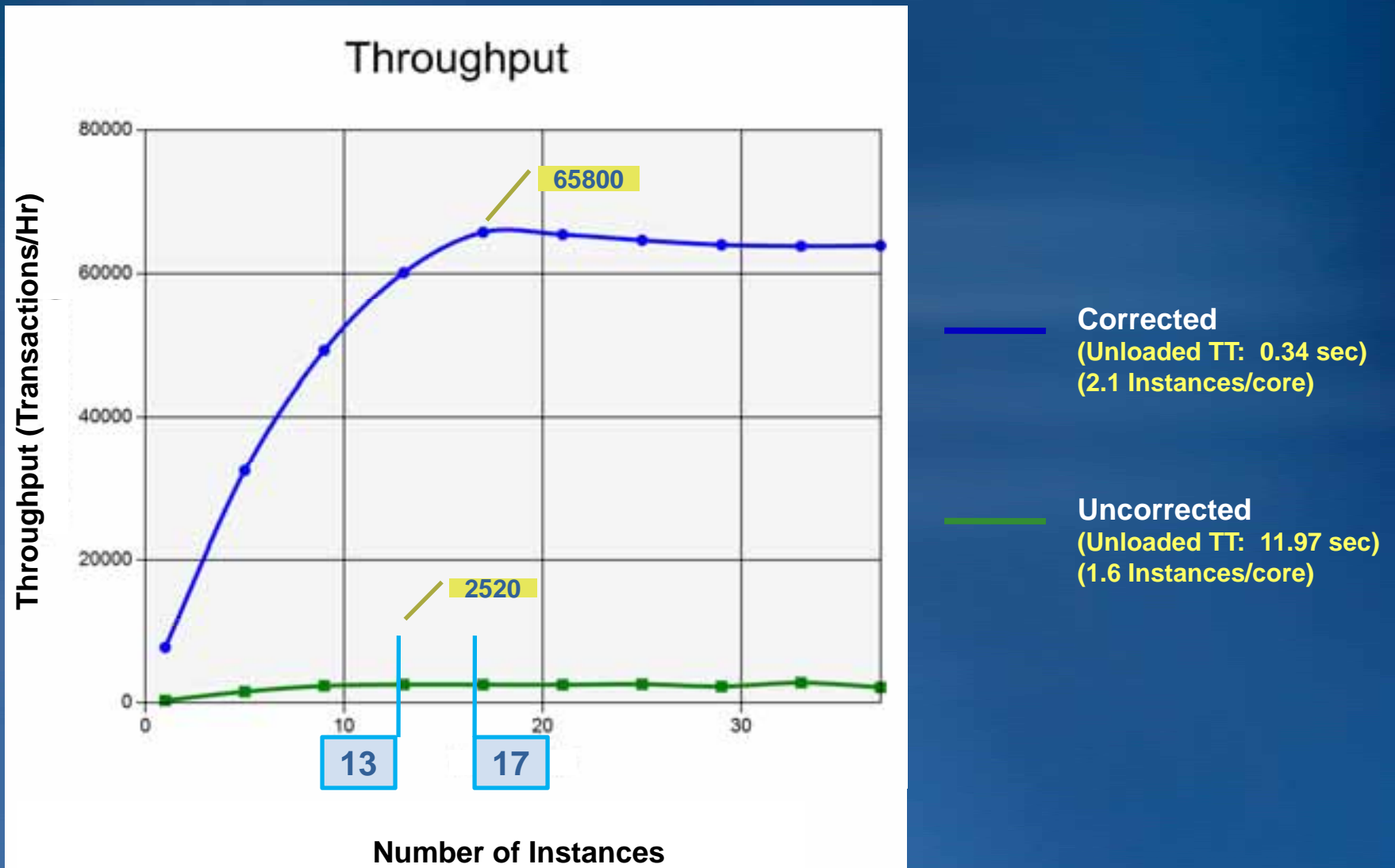
Severity	Status	Code	Description
Medium	Unresolved	20007	Layer contains a multilayer line symbol whose s
Medium	Unresolved	10009	Enabling the option to convert layer transpare
Medium	Unresolved	10009	Enabling the option to convert layer transpare
Medium	Unresolved	10010	Raster layer's data source does not have imag

Performance Factors: ArcGIS Server Services

MapService

- **Optimizing MXDs with the new ArcMap 9.3.1 Analyze Tool: DEMO**

Performance Factors: ArcGIS Server Services (MapService) Uncorrected vs. Corrected Source ArcMap Document



Performance Factors: ArcGIS Server Services

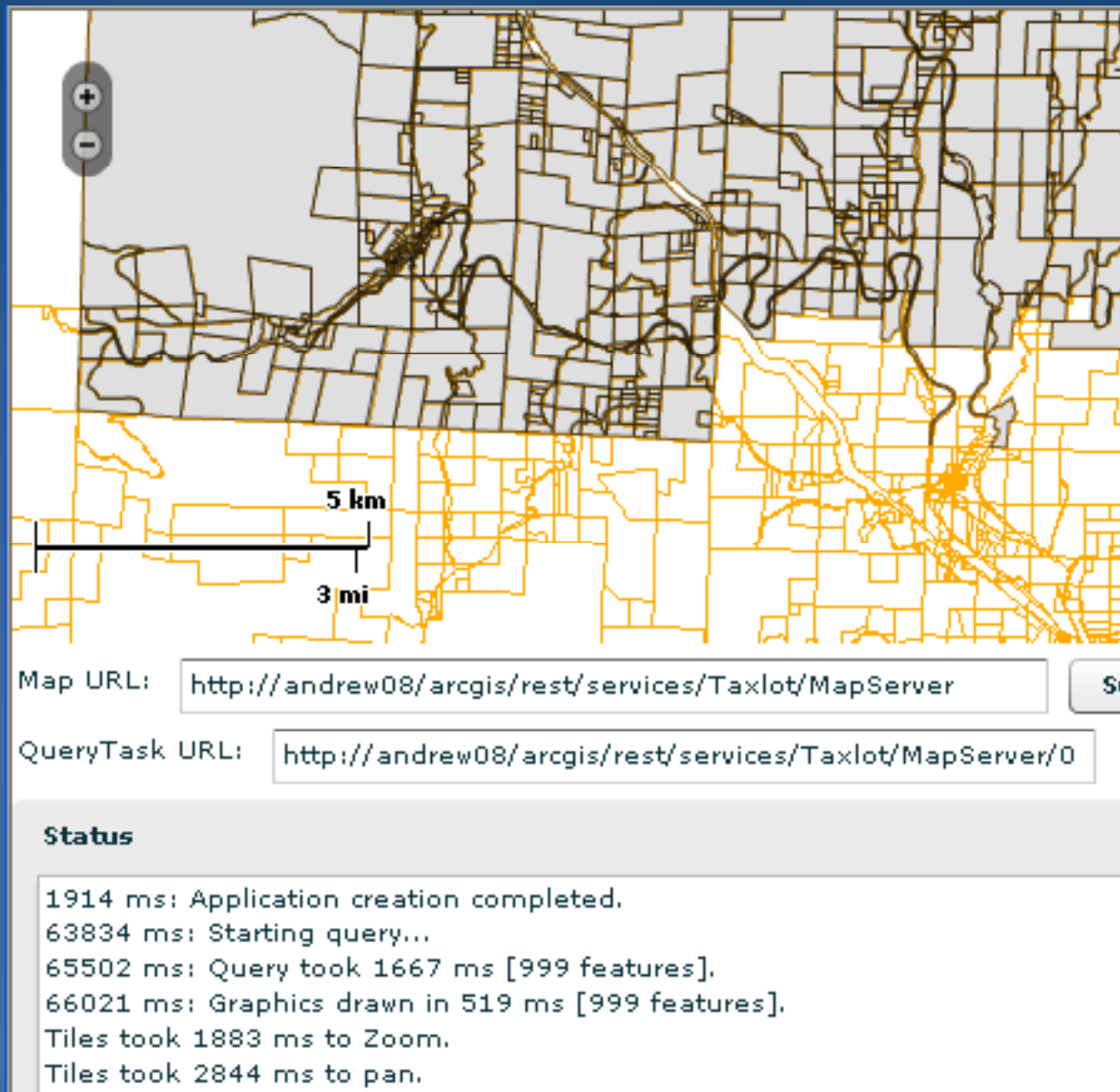
MapService

- Cache base map
- Display the operational layer as a cached map service
 - if your operational dataset changes infrequently
- Display the operational layer as client-side graphics
 - Do not fetch large amounts of features

Performance Factors: ArcGIS Server Services

MapService

Demo: Client-side graphics vs. dynamic map service



The screenshot displays a web-based map interface. At the top left, there are zoom controls with '+' and '-' buttons. The map itself shows a complex network of orange lines representing roads or boundaries over a light gray background. A scale bar is visible, indicating 5 km and 3 mi. Below the map, there are two input fields for URLs. The first is labeled 'Map URL:' and contains the text 'http://andrew08/arcgis/rest/services/Taxlot/MapServer'. The second is labeled 'QueryTask URL:' and contains 'http://andrew08/arcgis/rest/services/Taxlot/MapServer/0'. Below these fields is a 'Status' section with a list of performance metrics:

- 1914 ms: Application creation completed.
- 63834 ms: Starting query...
- 65502 ms: Query took 1667 ms [999 features].
- 66021 ms: Graphics drawn in 519 ms [999 features].
- Tiles took 1883 ms to Zoom.
- Tiles took 2844 ms to pan.

Performance factors: ArcGIS Server Services

MapService

Demo: Measuring map service

```
private function onCreationComplete():void
{
    logger.text += getTimer() + ' ms: Application creation completed.\n';
    myThematicLayer.addEventListener(Event.COMPLETE, onTilesLoaded)
    myMap.addEventListener(PanEvent.PAN_START, onPanStart);
    myMap.addEventListener(ZoomEvent.ZOOM_START, onZoomStart);
}

private function onTilesLoaded(event:Event):void
{
    if (panStartFlag){
        TimeTileComplete = getTimer() - TimeTileStart ;
        TimeTileStart = 0
        logger.text += "Tiles took " + TimeTileComplete + " ms to pan.\n";
        panStartFlag = false;
    }
    if (zoomStartFlag){
        TimeTileComplete = getTimer() - TimeTileStart ;
        TimeTileStart = 0
        logger.text += "Tiles took " + TimeTileComplete + " ms to Zoom.\n";
        zoomStartFlag= false;
    }
}
```

Performance Factors: ArcGIS Server Services

MapService

Demo: Measuring client-side graphics

```
private function doThematicQuery():void
{
    myGraphicsLayer.clear();
    queryTask.url = textQueryURL.text.toString();
    logger.text += getTimer() + " ms: Starting query...\n";
    TimeQueryStart = getTimer();
    queryTask.execute( query, new AsyncResponder( onResult, onFault ) );
    myGraphicsLayer.addEventListener(FlexEvent.UPDATE_COMPLETE,graphicsLayerUpdated);
    function onResult( featureSet : FeatureSet, token : Object = null ) : void
    {
        TimeQueryDone = getTimer();
        var TimeQueryDiff:uint = getTimer() - TimeQueryStart;
        logger.text += getTimer() + " ms: Query took " + TimeQueryDiff + " ms";
        logger.text += " [" + myGraphicsLayer.numGraphics + " features].\n";
    }
}
```

Performance Factors: ArcGIS Server Services

GPService

- **Use Local Jobs Directory**
 - Greatest single performance factor.
 - 9.3.1 allows simple deployment
- **Subset very large rasters**
- **Use native types like GRID**
- **Use Layers instead of raw data from db**
- **Use in-memory feature data sets**

Performance Factors: ArcGIS Server Services

GPService

- Pre-compute intermediate steps when possible
- Use local paths to data and resources
- Avoid unneeded coordinate transformations
- Add attribute indexes
- Simplify data

Detailed instructions on the [Resource Center](#) at:

http://webhelp.esri.com/arcgisdesktop/9.3/index.cfm?id=1061&pid=1044&to picname=Performance_tips_for_geoprocessing_services

Performance Factors: ArcGIS Server Services

Image Service

- JPEG compressed TIFF is the best performer by far (10-100x faster)
- Tiled rasters even faster than single TIFF

Performance Factors: ArcGIS Server Services

Geocode and Globe Services

- **Geocode Services**

- Use ArcSDE address locators for single address geocoding
- Use local locator files instead of UNC locator files for batch geocoding

- **Globe Services**

- Use Bill-boarded label annotations.

Performance Factors: ArcGIS Server Services

Mobile Service

- Document Preparation
 - Minimize operational layers
 - Cache basemap layers
- Service Configuration
 - Try to keep total service cache size under 250 MB to avoid network swapping.
 - Upload/Download size limits (200K upload/4MB download)
<http://www.banmanpro.com/support2/File Upload limits.asp>
- Usage considerations
 - Avoid batch postings in favor of frequent updates

Performance Factors: ArcGIS Server Services

Geodata Service

- Data Preparation

- Perform regular version maintenance (keep versioning tree small, compress, schedule synchronizations, etc)

<http://blogs.esri.com/Dev/blogs/geodatabase/archive/2008/11/25/Geodatabase-replication-and-compress.aspx>

- Use 1 way replicas over 2 way replicas when possible
- Consider 2 way replicas instead of check-out replicas
- Well-defined data model

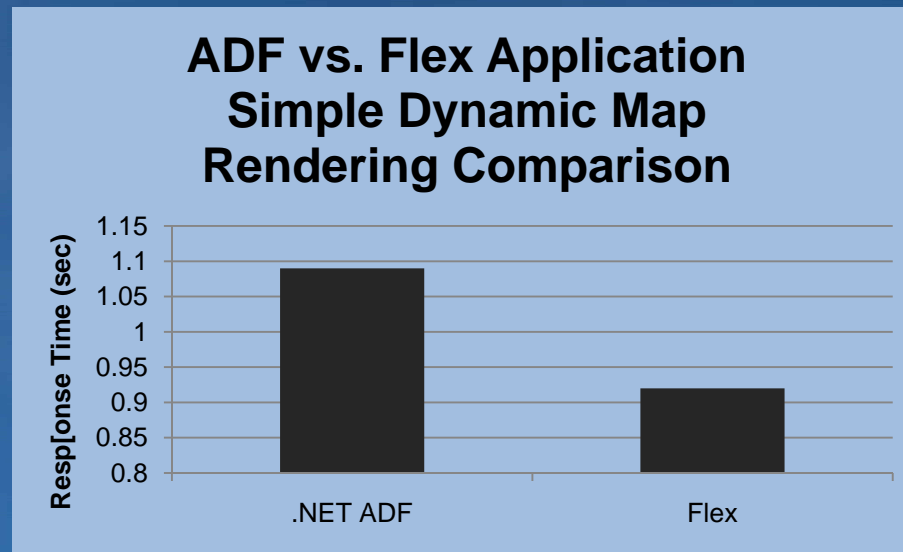
Performance Factors: ArcGIS Server Services

Geodata Service

- Service Configuration
 - Server Object usage timeout (set larger than 10 min default)
 - Upload/Download default IIS size limits (200K upload/4MB download)
- Usage considerations
 - Client HTTP timeout
<http://support.esri.com/index.cfm?fa=knowledgebase.techarticles.articleShow&d=35971>
 - <http://support.esri.com/index.cfm?fa=knowledgebase.techarticles.articleShow&d=35972>

Performance Factors: Client Applications and the ADF

- Meet functional requirements
- Ensure highest performance and scalability
- Leverage existing skills and standards
- Different API's have different performance and functionality profiles, e.g.
 - .Net ADF
 - Java ADF
 - JavaScript
 - Flex API
 - SilverLight



Conduct a simple benchmark to select optimal solution
Attend ArcGIS Server Performance and Scalability – Testing session

Deployment Architectures

Small Capacity Enterprise (Single Machine)

Clients



Reverse Proxy



ArcGIS Server

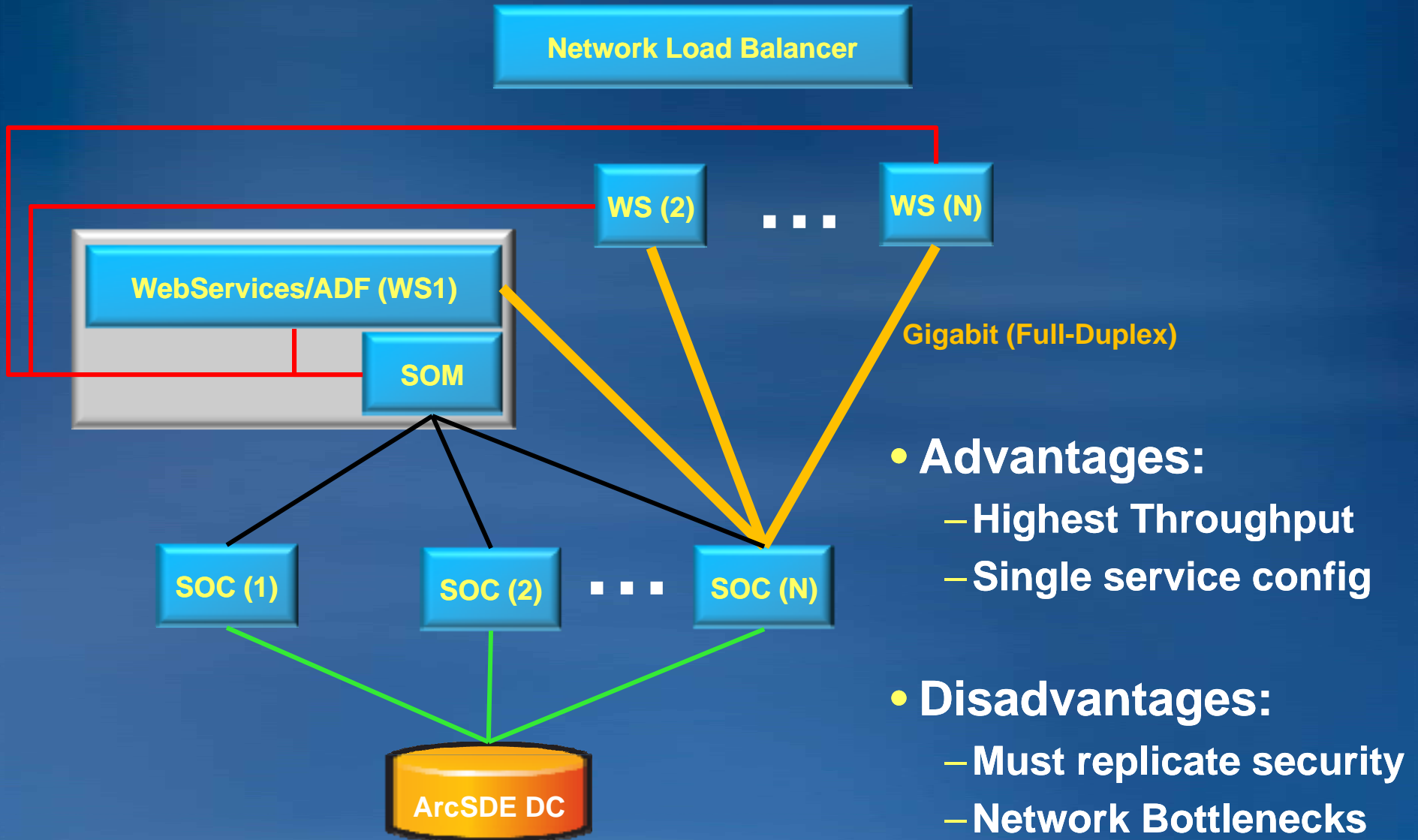


Comments:

- Simple Setup
- Use Application Server (AS) connections if RDBMS is dedicated.
- Use local drives for FGDB/SHP data and output directories

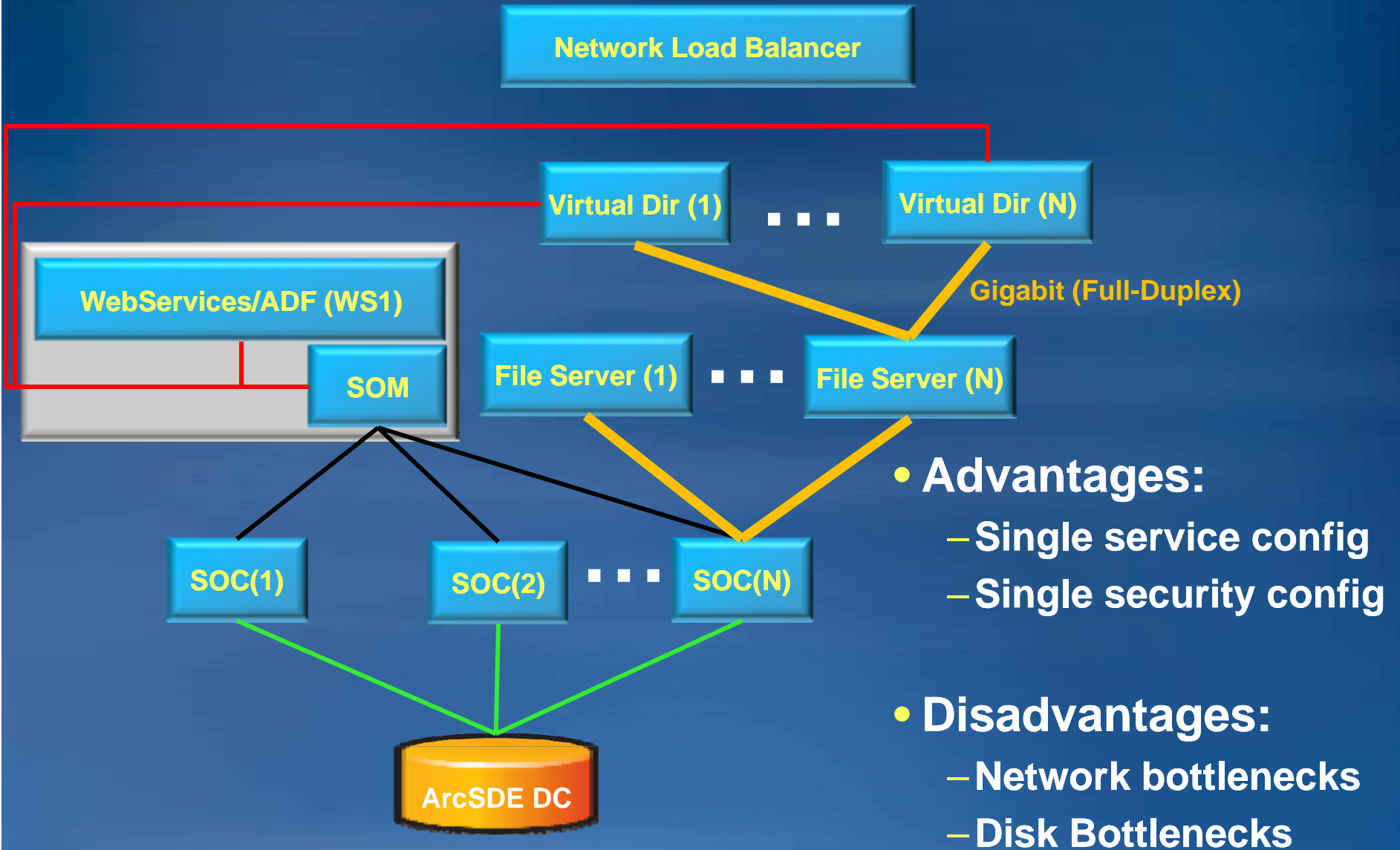
Deployment Architectures

Large Capacity Enterprise (Multiple Machine - MIME)



Deployment Architectures

Large Capacity Enterprise (Multiple Machine - URL)



Deployment Architectures

Large Capacity Enterprise (Multiple Machine – Simple)



- **Advantages:**

- Few bottlenecks
- Easy scaling

- **Disadvantages:**

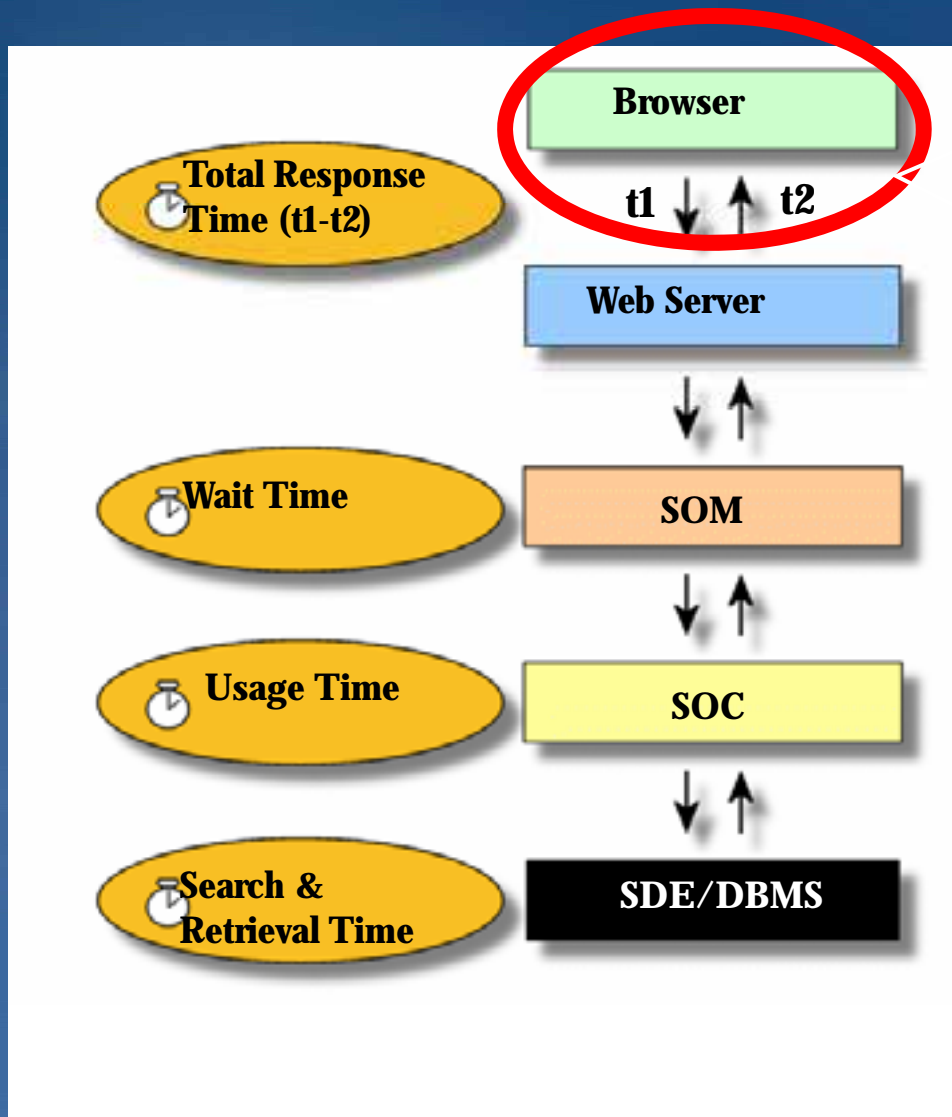
- Least throughput (SOCs burdened by other components)
- Must replicate configurations
- Must replicate Security
- Sticky sessions if state required

Tuning Primer

- **Profile and tune single user transaction response time**
- **Optimize ArcMap mxd document**
- **Create attribute indexes for query and search tasks**
- **Optimize services (cache, merge, image type)**
- **Optimize application requests**
 - Number of requests per transaction
 - Browser caching
 - Server caching
- **DBMS configuration**

Tuning Primer

Profile user transaction response time



A test is executed at the web browser.

It measures web browser call's elapsed time (roundtrip between browser and data source)

Tuning Primer

Web diagnostic tools: Fiddler2

The screenshot displays the Fiddler2 HTTP Debugging Proxy interface. The main window is titled "Fiddler - HTTP Debugging Proxy" and features a menu bar with "File", "Edit", "Rules", "Tools", "View", and "Help". Below the menu is a "Web Sessions" table with columns for "#", "Result", "Protocol", "Host", and "URL". Two sessions are listed, with the second one selected:

#	Result	Protocol	Host	URL
5	200	HTTP	marchena2k8	/ArcGIS/rest/services/Portland
6	200	HTTP	marchena2k8	/arcgisoutput/_ags_map2bf17617877f46e08df3df1a785e373a.png

The right-hand pane is divided into several sections. At the top, there are tabs for "Request Builder", "Filters", "Timeline", "Statistics", "Inspectors", and "AutoResponder". Below these are tabs for "Headers", "TextView", "WebForms", "HexView", "Auth", "Raw", and "XML". The "Request Headers" section is active, showing the following details:

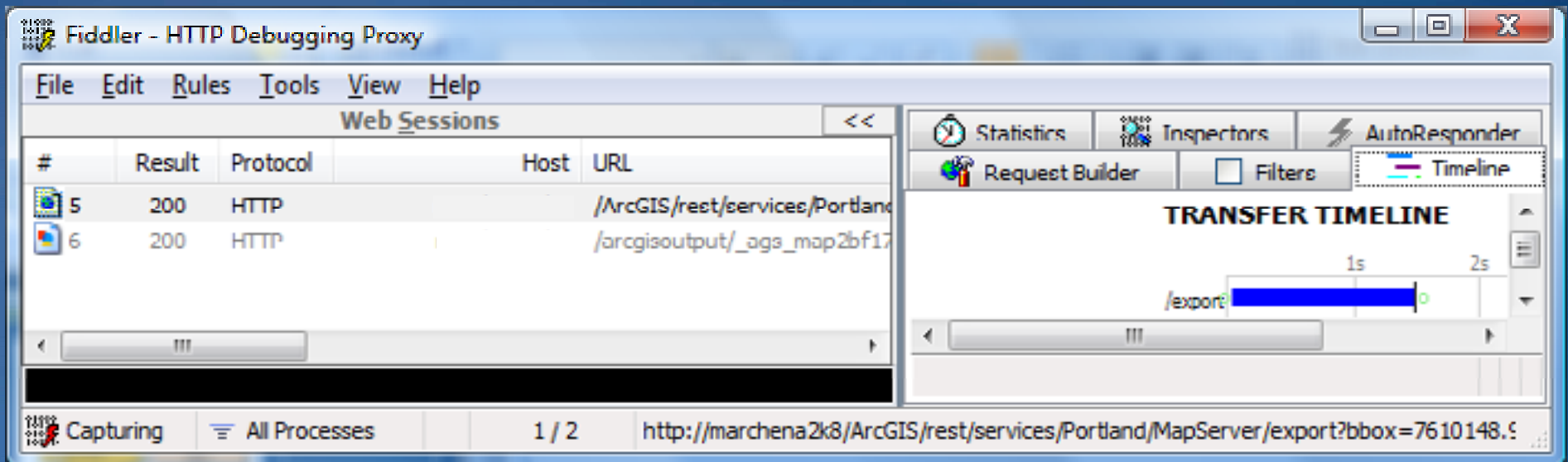
- Request: GET /arcgisoutput/_ags_map2bf17617877f46e08df3df1a785e373a.png HTTP/1.1
- Client**
 - Accept: */*
 - Accept-Encoding: gzip, deflate
 - Accept-Language: en-us
 - UA-CPU: x86
 - User-Agent: Mozilla/4.0 (compatible; MSIE 7.0; Windows NT 6.0; SLCC1; .NET CLR 2.0.50727)
- Miscellaneous**
 - Referer: http://marchena2k8/ArcGIS/rest/services/Portland/MapServer/export
- Transport**
 - Connection: Keep-Alive

Below the headers, there are tabs for "Transformer", "Headers", "TextView", "ImageView", "HexView", and "Auth". The "ImageView" tab is selected, showing a small thumbnail of a map with red and blue markers. The status bar at the bottom indicates "Capturing" is active, and the current session is "1 / 2" for the URL "http://marchena2k8/arcgisoutput/_ags_map2bf17617877f46e08df3df1a785e373a.png".

Tuning Primer

Web diagnostic tools: Fiddler2

- Understand each request URL
- Verify cache requests are from virtual directory, not dynamic map service
- Validate host origin (reverse proxy)
- Profile each transaction response time



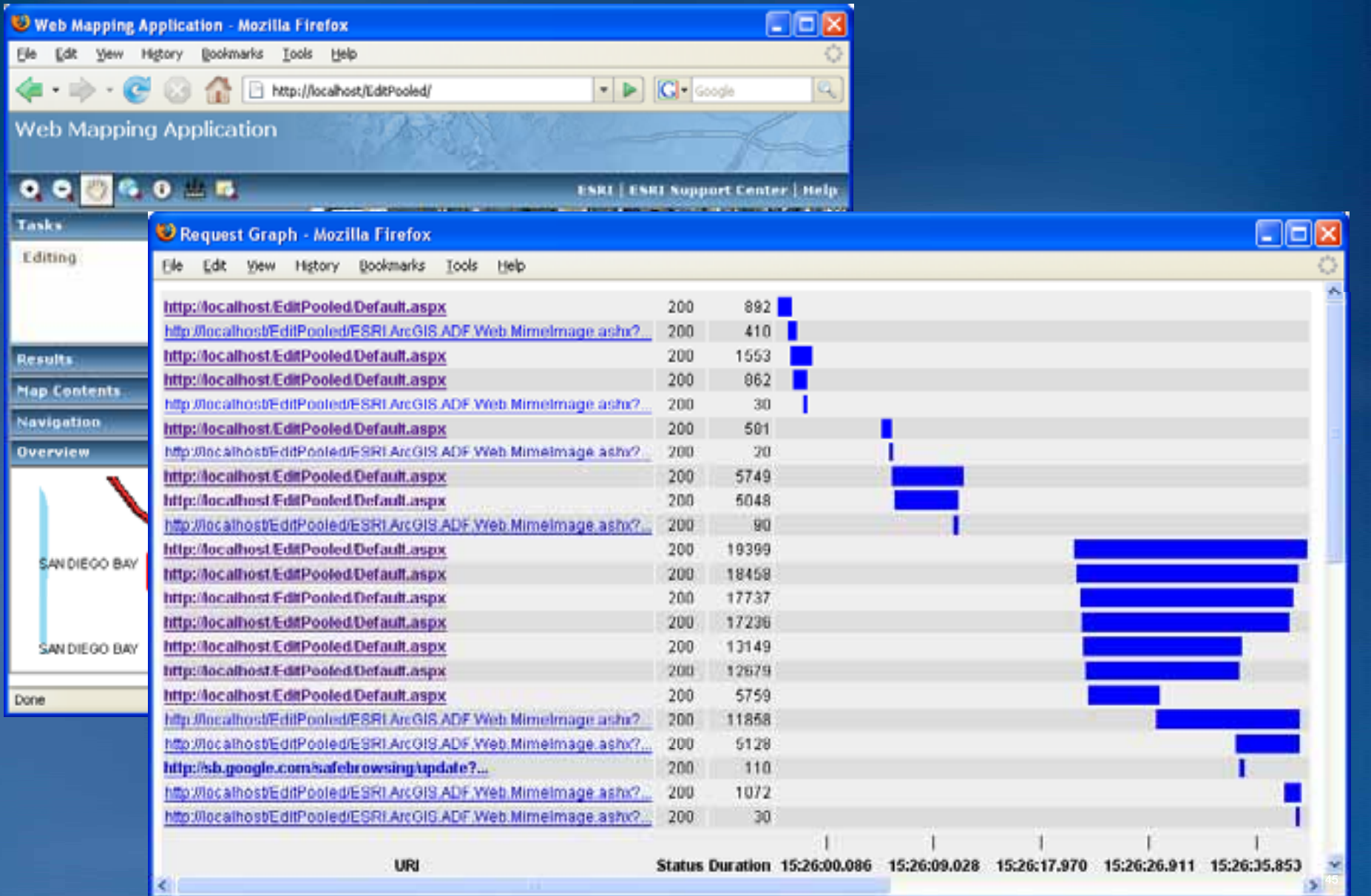
The screenshot displays the Fiddler - HTTP Debugging Proxy interface. The main window is titled "Fiddler - HTTP Debugging Proxy" and contains a menu bar (File, Edit, Rules, Tools, View, Help) and a toolbar. The "Web Sessions" pane on the left shows a table of captured requests:

#	Result	Protocol	Host	URL
5	200	HTTP		/ArcGIS/rest/services/Portland
6	200	HTTP		/arcgisoutput/_ags_map2bf17

The "Transfer Timeline" pane on the right shows a horizontal bar chart for the selected request, with a scale from 0 to 2 seconds. The bar for the "/export" request is blue and ends at approximately 1.5 seconds. The status bar at the bottom indicates "Capturing" is active, "All Processes" are selected, and the current session is "1 / 2" for the URL "http://marchena2k8/ArcGIS/rest/services/Portland/MapServer/export?bbox=7610148.5".

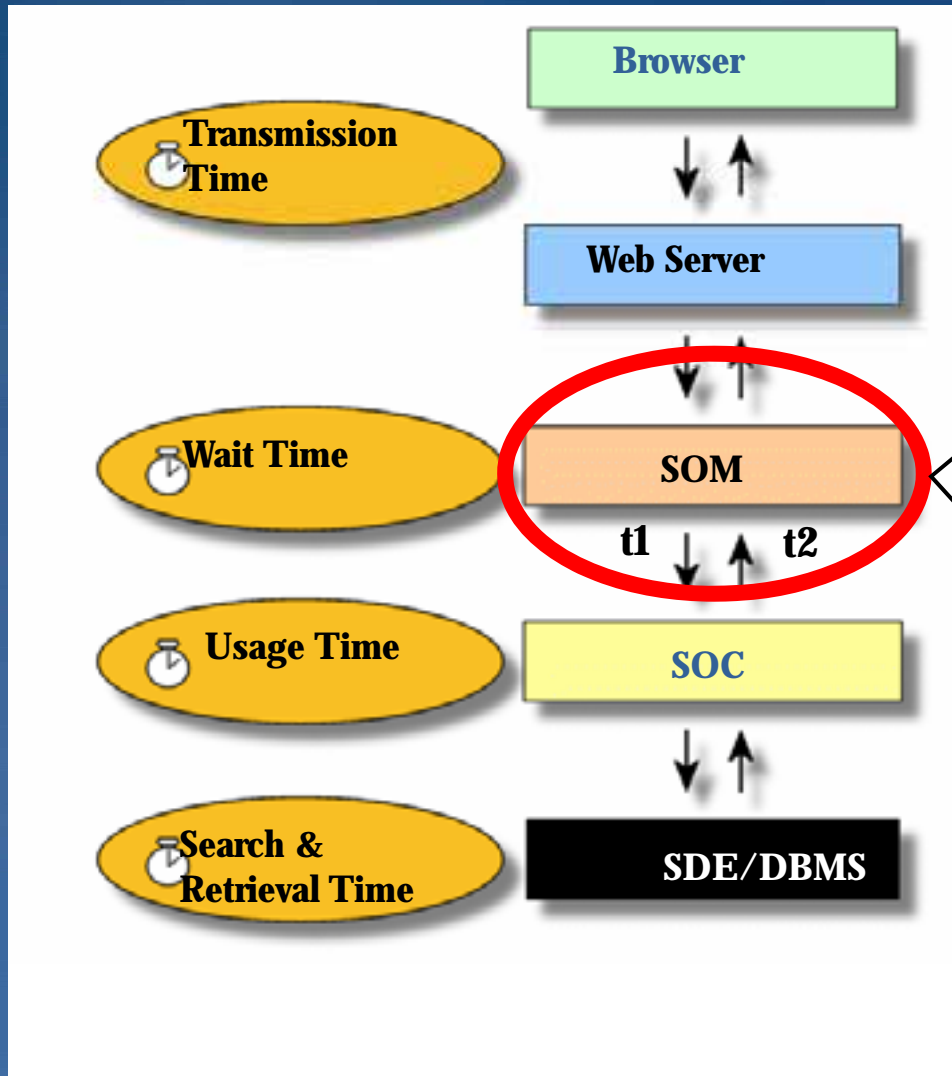
Tuning Primer

Web diagnostic tools: Tamperdata, Yslow, Visual Studio TT



Tuning Primer

Analyze SOM/SOC statistics

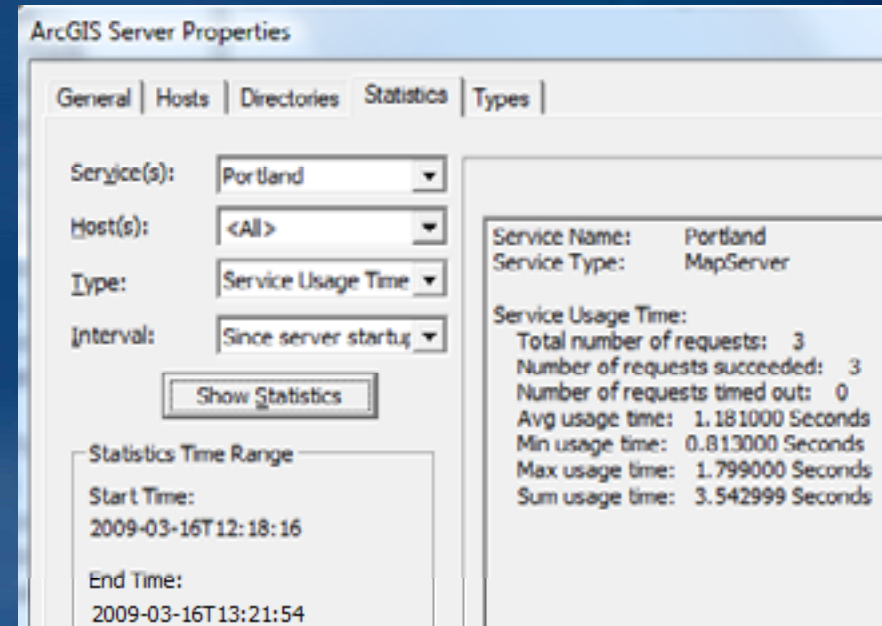


AGS context server statistics using ArcCatalog, Manager or logs provide aggregate and detailed information to help reveal the cause of the performance problem.

Tuning Primer

Analyze SOM/SOC statistics

- ArcCatalog



- New 9.3.1 detailed log - set to verbose

```
<Msg time="2009-03-16T12:23:22" type="INFO3" code="103021" target="Portland.MapServer" methodName="FeatureLayer.Draw" machine="myWebServer" process="2836" thread="3916" elapsed="0.05221">Executing query.</Msg>
```

```
<Msg time="2009-03-16T12:23:23" type="INFO3" code="103019" target="Portland.MapServer" methodName="SimpleRenderer.Draw" machine="myWebServer" process="2836" thread="3916">Feature count: 27590</Msg>
```

```
<Msg time="2009-03-16T12:23:23" type="INFO3" code="103001" target="Portland.MapServer" methodName="Map.Draw" machine="myWebServer" process="2836" thread="3916" elapsed="0.67125">End of layer draw: STREETS</Msg>
```

Tuning Mxd map document

New ArcMap 9.3.1 Analyze Tool

The screenshot displays the ArcMap 9.3.1 Analyze Tool interface. The main map area shows a geographic area with labels for 'CORAOPLIS' and 'GLENFIELD'. A 'Map Service Publish...' dialog box is open over the map. On the left, the 'Type 10' legend is visible, listing various map features like 'Annotations', 'Point Features', and 'Roads'. At the bottom, the 'Analyze' tool window is open, showing a table of warnings.

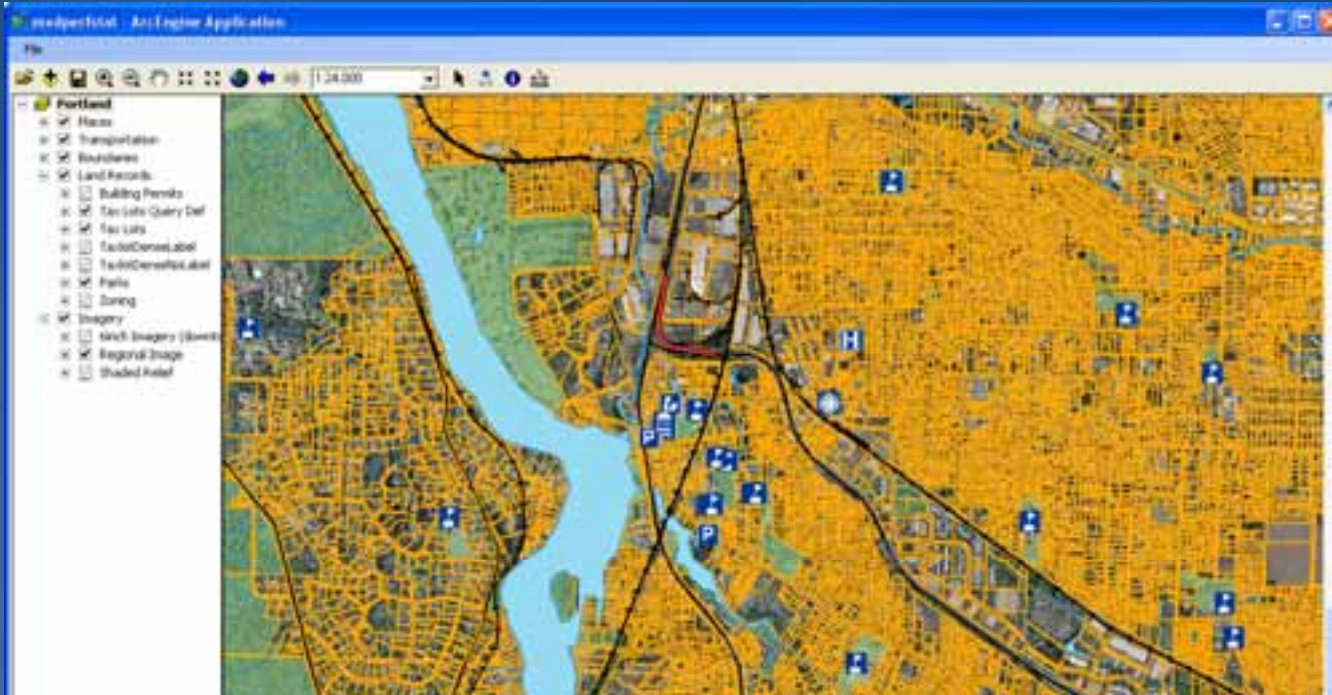
Severity	Status	Code	Description	Name	Type	Data Frame
High	Unresolved	10001	Layer data source's projection (Polyconic) is different th...	Hillshade	Layer	Type 10
Medium	Unresolved	20001	The style used contains an image in BMP format and the ...	Regions (Local scale)	Layer	Type 10
Medium	Unresolved	20000	Layer contains a multilayer line symbol whose symbol widt...	Roads Over	Layer	Type 10
Medium	Unresolved	20000	Layer contains a multilayer line symbol whose symbol widt...	Roads Over	Layer	Type 10
Medium	Unresolved	20008	Layer contains a multilayer line symbol whose symbol widt...	Roads Over	Layer	Type 10
Medium	Unresolved	20008	Layer contains a multilayer line symbol whose symbol widt...	Roads Over	Layer	Type 10
Medium	Unresolved	20000	Layer contains a multilayer line symbol whose symbol widt...	Roads Over	Layer	Type 10
Medium	Unresolved	20000	Layer contains a multilayer line symbol whose symbol widt...	Roads (Local scale)	Layer	Type 10
Medium	Unresolved	20000	Layer contains a multilayer line symbol whose symbol widt...	Roads (Local scale)	Layer	Type 10
Medium	Unresolved	20000	Layer contains a multilayer line symbol whose symbol widt...	Roads (Local scale)	Layer	Type 10
Medium	Unresolved	20000	Layer contains a multilayer line symbol whose symbol widt...	Roads (Local scale)	Layer	Type 10
Medium	Unresolved	20000	Layer contains a multilayer line symbol whose symbol widt...	Roads (Local scale)	Layer	Type 10

Status: Complete
14/14 Items
Show only unresolved items

Tuning Mxd map document

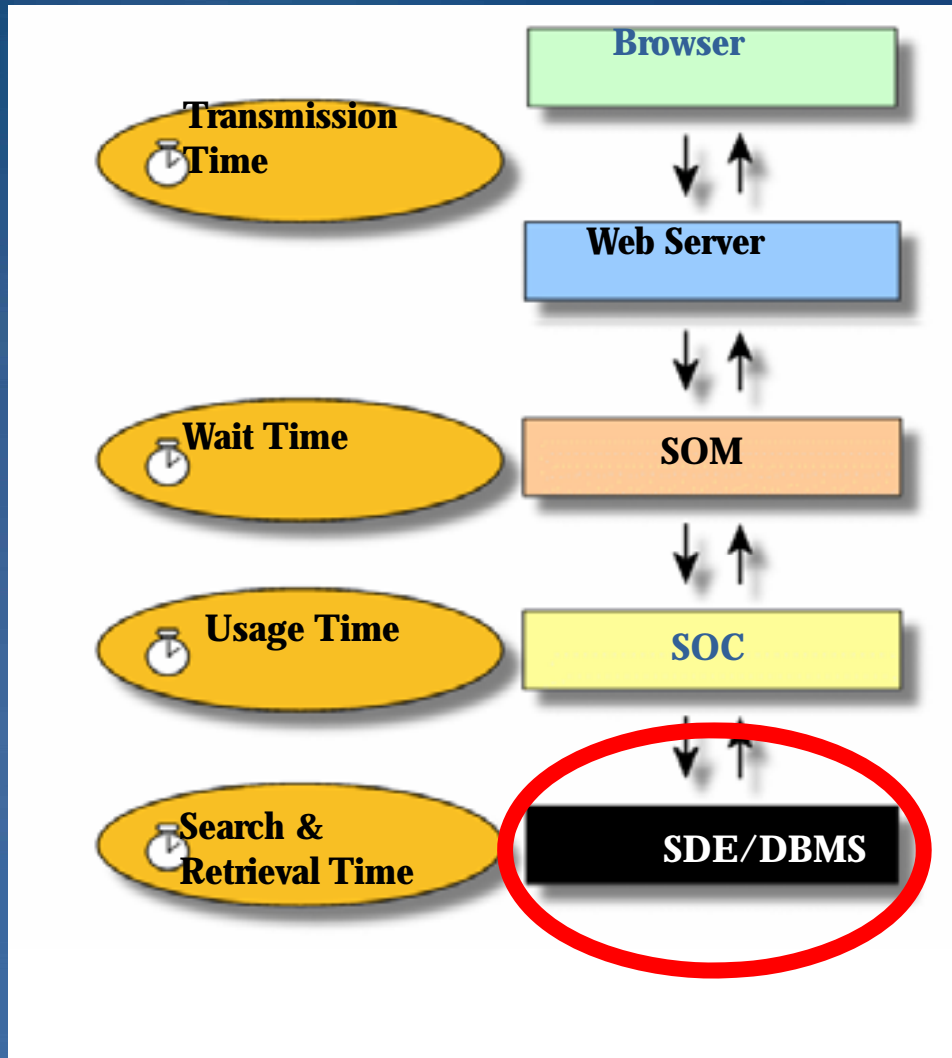
mxdperfstat

<http://arcscrips.esri.com/scripts.asp?eLang=&eProd=&perPage=10&eQuery=mxdperfstat>



Item	At Scale	Layer Name	Refresh Time (sec)	Recommendations	Features	Vertices	Labeling	Geograph y Phase (sec)	Graphics Phase (sec)	Cursor Phase (sec)	DBMS CPU	DBMS LIO
41	1,000	TaxlotDenseLabel	1.93	Simplify labeling, symbology: GraphicsPhase=1.42; simplify geometry and/or set label scale; convert polygon to polyline: vertices fetched=200001; simplify geometry and/or set label scale: vertices fetched=200001;	1	200,001	TRUE	0.45	1.42	1.04	0.02	266
42	1,000	TaxlotDenseNoLabel	0.53	simplify geometry: vertices fetched=200001;	1	200,001	FALSE	0.45	0.02	0.9	0.02	140

Tuning Data sources



Tuning Data Sources – Oracle Trace

```
select username, sid, serial#, program, logon_time  
from v$session where username='STUDENT';
```

USERNAME	SID	SERIAL#	PROGRAM	LOGON_TIM
STUDENT	132	31835	gsrvr.exe	23-OCT-06

```
SQL> connect sys@gis1_andrews as sysdba
```

```
Enter password:
```

```
Connected.
```

```
SQL> execute sys.dbms_system.set_ev(132,31835,10046,12,"");
```

```
PL/SQL procedure successfully completed.
```

DBMS trace is a very powerful diagnostic tool

Tuning Data Sources – Oracle Trace (continued)

Starting Oracle trace using a custom ArcMap UIControl

```
Private Sub OracleTrace_Click()  
    . . .  
    Set pFeatCls = pFeatLyr.FeatureClass  
    Set pDS = pFeatCls  
    Set pWS = pDS.Workspace  
    sTraceName = InputBox("Enter <test_name><email>")  
    pWS.ExecuteSQL ("alter session set tracefile_identifier = '" &  
    sTraceName & "'")  
    pWS.ExecuteSQL ("ALTER SESSION SET events '10046 trace name context  
    forever, level 12'")  
    . . .  
End Sub
```

Tuning Data Sources – Oracle Trace (continued)

SQL ID : 71py6481sj3xu

```
SELECT 1 SHAPE, TAXLOTS.OBJECTID, TAXLOTS.SHAPE.points,TAXLOTS.SHAPE.numpts,
TAXLOTS.SHAPE.entity,TAXLOTS.SHAPE.minx,TAXLOTS.SHAPE.miny,
TAXLOTS.SHAPE.maxx,TAXLOTS.SHAPE.maxy,TAXLOTS.rowid
FROM SDE.TAXLOTS TAXLOTS WHERE SDE.ST_EnvIntersects(TAXLOTS.SHAPE,:1,:2,:3,:4) = 1
```

call	count	cpu	elapsed	disk	query	current	rows
Parse	0	0.00	0.00	0	0	0	0
Execute	1	0.07	0.59	115	1734	0	0
Fetch	242	0.78	12.42	2291	26820	0	24175
total	243	0.85	13.02	2406	28554	0	24175

Elapsed times include waiting on following events:

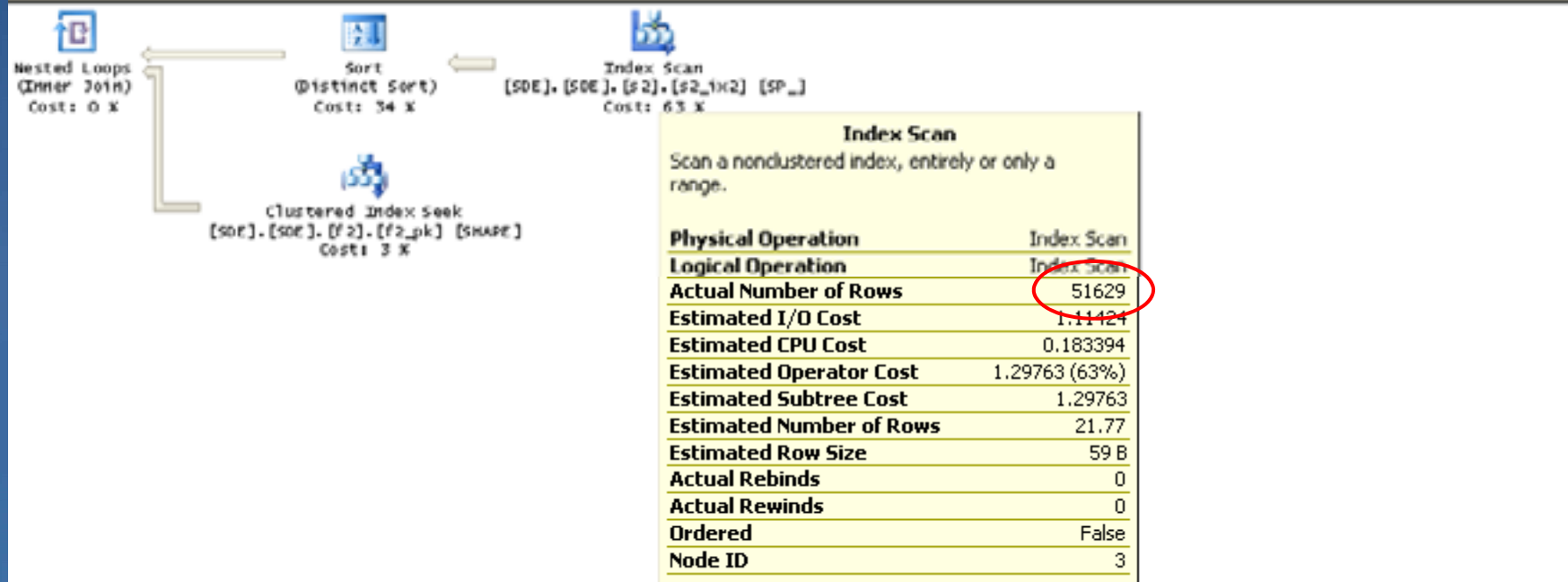
Event waited on	Times Waited	Max. Wait	Total Waited
SQL*Net message to client	242	0.00	0.00
db file sequential read	2291	0.39	11.69
SQL*Net more data to client	355	0.00	0.02
SQL*Net message from client	242	0.03	0.54

Tuning Data Sources – Oracle Trace (continued)

- **Analyze query**
 - Elapsed time [sec] (CPU + wait event)
 - CPU [sec]
 - Query (Oracle blocks e.g. 8K read from memory)
 - Disk (Oracle blocks read from disk)
 - Wait event [sec], e.g. db file sequential read
 - Rows fetched
- **Example (cost of physical reads):**
 - Elapsed time = 13.02 sec
 - CPU = 0.85 sec
 - Disk= 2291 blocks
 - Wait event (db file sequential read)=11.69 sec
 - Rows fetched = 24175

Tuning Data Sources – SQL Profiler

EventClass	Login...	Application...	TextData	CPU	Duration	RowCounts	Reads
Trace Start							
Showplan XML Statistics P...	sde	SDE:5932	<ShowPlanXML xmlns="http://schemas....				
SP:StmtCompleted	sde	SDE:5932	SELECT state_id,owner,creation_time...	10	0	1	2
Showplan XML Statistics P...	sde	SDE:5932	<ShowPlanXML xmlns="http://schemas....				
SP:StmtCompleted	sde	SDE:5932	SELECT lineage_name, time_last_modi...	0	0	1	2
Showplan XML Statistics P...	sde	SDE:5932	<ShowPlanXML xmlns="http://schemas....				
SP:StmtCompleted	sde	SDE:5932	SELECT S_.eml nx, S_.eml ny, S_.emaxx, S...	0	0	0	0
Showplan XML Statistics P...	sde	SDE:5932	<ShowPlanXML xmlns="http://schemas....				
SP:StmtCompleted	sde	SDE:5932	SELECT S_.eml nx, S_.eml ny, S_.emaxx, S...	521	2624	36251	11...



Summary

- **Today we covered:**
 - **Case Study: Optimizing a Flex API web application**
 - **Reviewed key performance factors in ArcGIS Server system components**
 - **Described strategies for component optimization**
 - **Recommended deployment architectures**
 - **Described methodology for tuning ArcGIS Server deployments in-situ**

Still have questions?

Additional Resources

Questions, answers and information...

- **Tech Talk**

- *Outside this room right now!*

- **Other sessions**

- **ArcGIS Server Performance and Scalability - Testing**

- **ESRI Resource Centers**

- PPTs, code and video



resources.esri.com

- **Social Networking**



[www.twitter.com/
ESRIDevSummit](http://www.twitter.com/ESRIDevSummit)

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