ArcGIS for Server: Enterprise Strategy, Cloud and Tuning
Introduction

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Audience

- Architects
- Developers
- Administrators
- Project Managers

Level:
- Beginner / Intermediate
Agenda

- Enterprise Strategy
- Centralized vs. distributed architecture
- Cloud overview
- Esri cloud programs
- Performance factors
- Tuning
- Using test results as input for capacity planning
- System Designer – overview and demo
Enterprise Strategy
Real Business Challenges. . .

GIS can help make a difference
Real Business Challenges...

GIS can help make a difference

- Coastal Protection & Marine
- Agriculture
- Port Security
- Defense
- Rescue
- Facility Management
- Public Works
- Land Records
- Education
- Telecommunication
- Parks & Recreation
- Hospital
- Museum
- Aeronautical
- Retail
- Banking
- Refuge Collection
- Landscape Planning
- Sign Inventory
- Electric/Gas
- Security
- Tourism
- Economic Development
- Government
- Lighting
- Parks & Recreation
Need for Discovery

…so now what?
ArcGIS 10 — A Complete System

Easier
More Powerful
and Everywhere

Web
Mobile
Desktop

• Discover
• Create
• Manage
• Visualize
• Analyze
• Collaborate

Cloud
Enterprise
Local
Strategy & Technology Alignment

Data Management
- Collect, Organize, & Exchange Data

Planning & Analysis
- Transform Data Into Actionable Information

Field Mobility
- Get Information Into and Out of the Field

Operational Awareness
- Disseminate Information Where and When it is Needed

Constituent Engagement
- Get Feedback and Make Informed Decisions

A Complete Integrated System

Geodatabase
- Desktop

Geoprocessing
- Server

Mobile
- Online
Centralized vs. Distributed Architecture
Centralized Architecture

User
Regional Office
Field Office
Program Office
Lab
Field User

Data Center
Application
- Citrix Server Farm
- Web Servers

Data
Oracle ArcSDE

Performance depends on network bandwidth and latency

Keep data and application close
Centralized Architecture

Attributes

• Pros:
  - Typically lower cost (central server)
  - Can provide data in real time

• Cons
  - Performance dependent on a good network bandwidth and low latency

Recommendation: Cache static data and compress map size
Distributed Architecture

- Master Database
- File Server
- Data Center
- Region
- Field/Regional Offices
- Field User
- Local Server
- User & App.

Data Center:
- Data ("Master")
  - Master Database
  - File Server

Region:
- Data ("Replica")
  - Replicate Deltas Only
  - User & App.

Local Server:
- User & App.

Field/Regional Offices:
- User & App.

User & Application

Field User
Distributed Architecture

Attributes

• Pros:
  - Independent of network bandwidth
  - Users, applications and data near

• Cons
  - Higher costs
  - Multiple data centers
  - Complex replication and synchronization process
Data Architecture
Data architecture

- Confidential vs. public data
- Static vs. dynamic
- Refresh data
- Real time requirements
- Integration with non-Esri vendors
## Data replication considerations

<table>
<thead>
<tr>
<th>Requirements</th>
<th>GDB Replication</th>
<th>FGDB copy/paste</th>
<th>RDBMS Replication</th>
<th>RDBMS clone</th>
<th>Disk Block-level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Geopgraphic area and selected layers</td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Mixed DBMS</td>
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<tr>
<td>Geodatabase aware</td>
<td></td>
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<td></td>
<td></td>
<td></td>
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<tr>
<td>Many to Many</td>
<td></td>
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<tr>
<td>Incremental Edits</td>
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<td></td>
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<tr>
<td>Large Truncate/Reload</td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Near Time</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Downtime: 0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Downtime: 5-60 min</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1. 3rd party product integrated through Esri API
2. Consider disconnected synchronization if network has high latency
Cloud Overview
Cloud Deployment Options

Private Cloud
On-Premises/Internal

Public Cloud
Off-Premises/External

Hybrid

SaaS
PaaS
IaaS

SaaS
IaaS
PaaS

Bing Map Services
ArcGIS Online Services

ArcGIS Mobile
ArcGIS Server
ArcGIS Explorer
Web Maps
ArcGIS Desktop
MapIt
What is Cloud: IaaS?

Infrastructure-as-a-Service (IaaS)

- Provides virtual server instances
  - Configure virtual servers
  - Configure storage
  - Manage instances
- Examples:
  - Amazon Web Services
What is Cloud: PaaS?

Platform-as-a-service (PaaS)

- Set of APIs, services, and product development tools hosted on the provider's infrastructure.
- Developers create applications on the provider's platform over the Internet.
- Examples:
  - Microsoft Azure, GoogleApps, Force.com, CloudFoundry
What is Cloud: SaaS?

Software-as-a-service (SaaS)

- Vendor supplies the hardware and software infrastructure ... whole applications
- Broad market
- Examples:
  - ArcGIS.com, bao.esri.com, Crimemapping.com, Salesforce.com
Cloud - Benefits

Business Case

• Elasticity
• Time to Market
• Risk Aversion
• Budgetary
What is ArcGIS Server on Amazon EC2?

- ArcGIS Server that runs on Amazon's hardware
- Administer through Web services
- Includes:
  - Windows 2008 64 bit
  - ArcGIS Server 10 .Net
  - ArcGIS Desktop
  - 100G EBS
  - Automation scripts
  - PostgreSQL 8.3 (Enterprise)
ArcGIS Server on Amazon EC2

Advantages

- No installation required—preconfigured Amazon Machine Image (AMI) with ArcGIS Server
- Scalable on demand—Creating new instances can even be done programmatically in response to usage statistics
- No hardware infrastructure to maintain
ArcGIS Server on Amazon EC2

Transferring data to the cloud

- Remote Desktop copy/paste
- S3 client utilities
- Your own web server
- FTP (use SSL for security)
- Ship the data

On premise

Amazon EC2

ArcGIS Desktop

ArcGIS Server
ArcGIS Server on Amazon EC2

Replicating data – connected (<4 Mb) or disconnected

On-Premise

Parent Replica

1-way replication

Geodata Service

ArcGIS Server 1..n

Map Service

Child Replica

Amazon EC2

editing
Esri cloud programs
ArcGIS Online

Tailor ArcGIS Online to Your Organization

- Tile services
- Feature services
- Content sharing
- Subscriptions
- Online vs. on-premise

Esri Managed Services

Cloud Based ArcGIS Infrastructure and Support

- Data Management
- Hardware
- Change Management
- System Monitoring
- Archive
- Network
- Disaster Recovery
- Deployment
- Security
- System Availability
- Scalability
- Bandwidth
- Reporting
- Redundancy

Many Successful Customers

Program Benefits...

- Scalability
- Rapid Deployment
- Enterprise GIS Expertise
- Affordable, Flexible Packages

Scalable, reliable, secure hosting environment for GIS systems
## Cloud Hosting Comparison

<table>
<thead>
<tr>
<th>Includes…</th>
<th>Self-Service Cloud Hosting</th>
<th>Basic</th>
<th>Standard</th>
<th>Advanced</th>
<th>Advanced Plus</th>
</tr>
</thead>
<tbody>
<tr>
<td>Provisioning</td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Monitoring</td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
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<tr>
<td>Image Backups</td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
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<tr>
<td>System Design Support</td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Application/DB Deployment</td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
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<tr>
<td>Application/DB Management</td>
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<td>X</td>
<td>X</td>
<td>X</td>
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<tr>
<td>Application/Data Updates</td>
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<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
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<tr>
<td>Auto Scale-up/down</td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Redundancy</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Geographic Redundancy</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>System Availability</td>
<td>N/A</td>
<td>N/A</td>
<td>95%</td>
<td>99%</td>
<td>99.9%</td>
</tr>
<tr>
<td>Incident Response Time</td>
<td>N/A</td>
<td>N/A</td>
<td>1 hour</td>
<td>1 hour</td>
<td>1 hour</td>
</tr>
</tbody>
</table>
Performance factors
GIS Services

Map service

- Performance related to number of features and vertices

![Graph showing response time vs. number of features](image)
Most well-configured and tuned GIS systems are processor-bound.
Virtualization overhead

10% to 30%
Network transport time

1. Distance

2. Payload

3. Infrastructure
Performance factors

Network transport time

- Required bandwidth:
  - Response size
  - Number of transactions

- Network transport time:
  - Response size
  - Effective bandwidth

\[ Mbsp = \frac{TH \times Mbits \, / \, req}{3600} \]

\[ Transport(\sec) = \frac{Mbits \, / \, req}{Mbsp - Mbsp_{used}} \]
## Network transport time

- Impact of service and return type on network transport time
  - Compression
  - Content, e.g., Vector vs. Raster
  - Return type, e.g., JPEG vs. PNG

### Network Traffic Transport Time (sec)

<table>
<thead>
<tr>
<th>Application Type</th>
<th>Service/Op</th>
<th>Content</th>
<th>Return Type</th>
<th>Mb/Tr</th>
<th>56 kbps</th>
<th>1.54 Mbps</th>
<th>10 Mbps</th>
<th>45 Mbps</th>
<th>100 Mbps</th>
<th>1 Gbps</th>
</tr>
</thead>
<tbody>
<tr>
<td>ArcGIS Desktop</td>
<td>Map</td>
<td>Vector</td>
<td>ICA Comp</td>
<td>10</td>
<td>0.056</td>
<td>1.540</td>
<td>10.000</td>
<td>45.000</td>
<td>100.000</td>
<td>1000.000</td>
</tr>
<tr>
<td>Citrix/ArcGIS</td>
<td>Map</td>
<td>Vector+Image</td>
<td>ICA Comp</td>
<td>1</td>
<td>0.064</td>
<td>0.649</td>
<td>0.100</td>
<td>0.022</td>
<td>0.010</td>
<td>0.001</td>
</tr>
<tr>
<td>Citrix/ArcGIS</td>
<td>Map</td>
<td>Vector</td>
<td>ICA Comp</td>
<td>0.3</td>
<td>0.056</td>
<td>0.195</td>
<td>0.030</td>
<td>0.007</td>
<td>0.003</td>
<td>0.000</td>
</tr>
<tr>
<td>ArcGIS Server</td>
<td>Map</td>
<td>Vector</td>
<td>PNG</td>
<td>1.5</td>
<td>0.056</td>
<td>0.195</td>
<td>0.030</td>
<td>0.007</td>
<td>0.003</td>
<td>0.000</td>
</tr>
<tr>
<td>ArcGIS Server</td>
<td>Image</td>
<td>JPG</td>
<td></td>
<td>0.3</td>
<td>0.056</td>
<td>0.195</td>
<td>0.030</td>
<td>0.007</td>
<td>0.003</td>
<td>0.000</td>
</tr>
<tr>
<td>ArcGIS Server</td>
<td>Map Cache</td>
<td>Vector</td>
<td>PNG</td>
<td>0.1</td>
<td>0.056</td>
<td>0.195</td>
<td>0.030</td>
<td>0.007</td>
<td>0.003</td>
<td>0.000</td>
</tr>
<tr>
<td>ArcGIS Server</td>
<td>Map Cache</td>
<td>Vector+Image</td>
<td>JPG</td>
<td>0.3</td>
<td>0.056</td>
<td>0.195</td>
<td>0.030</td>
<td>0.007</td>
<td>0.003</td>
<td>0.000</td>
</tr>
</tbody>
</table>
Demo: Network speed test

**Esri System Tools - Network Speed Test**

### Control
- **Payload:**
  - Iterations: 10
  - Duration (minutes): 0
  - Delay interval per test (sec): 5
- Include upload test
- **Run test**
- **Stop**

*Note - The test will run much more efficiently if you select Download Table (or Upload Table) below before starting.*

### Download chart

### Download table

<table>
<thead>
<tr>
<th>Iteration</th>
<th>Time (UTC)</th>
<th>Speed (Mbps)</th>
<th>Transport time (s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>19:23:23.293</td>
<td>4.296</td>
<td>1.862</td>
</tr>
<tr>
<td>2</td>
<td>19:23:30.159</td>
<td>4.665</td>
<td>1.715</td>
</tr>
<tr>
<td>3</td>
<td>19:23:36.867</td>
<td>4.706</td>
<td>1.7</td>
</tr>
<tr>
<td>4</td>
<td>19:23:43.575</td>
<td>4.67</td>
<td>1.713</td>
</tr>
<tr>
<td>5</td>
<td>19:23:50.283</td>
<td>4.611</td>
<td>1.735</td>
</tr>
<tr>
<td>6</td>
<td>19:23:57.022</td>
<td>4.706</td>
<td>1.7</td>
</tr>
<tr>
<td>7</td>
<td>19:24:03.730</td>
<td>4.684</td>
<td>1.708</td>
</tr>
<tr>
<td><strong>8</strong></td>
<td><strong>19:24:10.437</strong></td>
<td><strong>2.588</strong></td>
<td><strong>3.091</strong></td>
</tr>
<tr>
<td>9</td>
<td>19:24:18.534</td>
<td>4.31</td>
<td>1.856</td>
</tr>
<tr>
<td>10</td>
<td>19:24:25.398</td>
<td>4.703</td>
<td>1.701</td>
</tr>
</tbody>
</table>

*Results in red are more than 2 standard deviations away from the mean.*
# Memory

<table>
<thead>
<tr>
<th>Item</th>
<th>Low</th>
<th>High</th>
<th>Delta</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dynamic Map</td>
<td>50 MB</td>
<td>500 MB</td>
<td>900%</td>
</tr>
<tr>
<td>Image Service</td>
<td>20 MB</td>
<td>1,024 MB</td>
<td>5,020%</td>
</tr>
<tr>
<td>Geoprocessing</td>
<td>100 MB</td>
<td>2,000 MB</td>
<td>1,900%</td>
</tr>
<tr>
<td>SOM</td>
<td>30 MB</td>
<td>70 MB</td>
<td>133%</td>
</tr>
<tr>
<td>XenApp Session</td>
<td>500 MB</td>
<td>1.2 GB</td>
<td>140%</td>
</tr>
<tr>
<td>DBMS Session</td>
<td>10 MB</td>
<td>75 MB</td>
<td>650%</td>
</tr>
<tr>
<td>DBMS Cache</td>
<td>200 MB</td>
<td>200 GB</td>
<td>99,900%</td>
</tr>
</tbody>
</table>
User load

User has the highest uncertainty
Estimating user load from web server log

Log Parser

d06b-abf8-4c25-91b2-f8d975cf8c07&displaylang=en)

Logparser "SELECT date, QUANTIZE(time, 3600) as Hour, cs-uri-stem, count(*) as Req/hr FROM C:\inetpub\logs\LogFiles\W3SVC1\u_ex120308.log WHERE cs-uri-stem like '%/arcgis/rest/services/World_S
treet_Map_MapServer1/MapServer/export%' group by date, Hour, cs-uri-stem order by Hour"
Tuning and Monitoring
Tuning process

1. Profile and measure response time at the client application
2. Conduct measurements at software stack below
3. Correlate and account measurements between tiers
4. Identify root cause

Do not misdiagnose “victims for culprits”
A test is executed at the web browser. It measures web browser call’s elapsed time (roundtrip between browser and data source).
Demo: Profile web application

Fiddler http://www.fiddler2.com/
Analyze ArcGIS Server statistics

- Total Response Time (t1-t2)
- Wait Time
- Usage Time
- Search & Retrieval Time

Analyze ArcGIS Server statistics using Arc Catalog, Manager or logs.
Analyze ArcGIS Server statistics

Correlate and account measurements between tiers

<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>


ArcGIS Server log

ASLog

Identify root cause

Analyze Map Tool
### Identify root cause

**Mxdperfstat on** [http://resources.arcgis.com](http://resources.arcgis.com)

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

<table>
<thead>
<tr>
<th>Item</th>
<th>At Scale</th>
<th>Layer Name</th>
<th>Refresh Time (sec)</th>
<th>Recommendations</th>
<th>Features</th>
<th>Vertices</th>
<th>Labeling</th>
<th>Geography Phase (sec)</th>
<th>Graphics Phase (sec)</th>
<th>Cursor Phase (sec)</th>
<th>DBMS CPU</th>
<th>DBMS LIO</th>
</tr>
</thead>
<tbody>
<tr>
<td>18</td>
<td>8,000</td>
<td>Tax Lots</td>
<td>1.05</td>
<td>Simplify labeling; symbology; GraphicsPhase=.83;</td>
<td>2,226</td>
<td>33,872</td>
<td>True</td>
<td>.14</td>
<td>.83</td>
<td>.20</td>
<td>.08</td>
<td>6,396</td>
</tr>
<tr>
<td>19</td>
<td>8,000</td>
<td>Tax Lots Query</td>
<td>.13</td>
<td></td>
<td>1</td>
<td>26</td>
<td>False</td>
<td>.03</td>
<td>.02</td>
<td>.06</td>
<td>.03</td>
<td>3,204</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Def</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>8,000</td>
<td>TaxlotDenseLabel</td>
<td>1.84</td>
<td>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;</td>
<td>1</td>
<td>200,001</td>
<td>True</td>
<td>.73</td>
<td>1.03</td>
<td>.95</td>
<td>.01</td>
<td>266</td>
</tr>
<tr>
<td>21</td>
<td>8,000</td>
<td>TaxlotDenseNoLabel</td>
<td>.53</td>
<td>simplify geometry; vertices fetched=200001;</td>
<td>1</td>
<td>200,001</td>
<td>False</td>
<td>.47</td>
<td>.02</td>
<td>.97</td>
<td>.00</td>
<td>140</td>
</tr>
</tbody>
</table>
Analyze database statistics

Correlate and account measurements between tiers

Browser
Web Server
SOM
SOC
SDE/DBMS

Total Response Time (t1-t2)
Wait Time
Usage Time
Search & Retrieval Time
Analyze database statistics

Oracle Trace

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

<table>
<thead>
<tr>
<th>USERNAME</th>
<th>SID</th>
<th>SERIAL#</th>
<th>PROGRAM</th>
<th>LOGON_TIME</th>
</tr>
</thead>
<tbody>
<tr>
<td>--------</td>
<td>132</td>
<td>31835</td>
<td>gsrvr.exe</td>
<td>23-OCT-06</td>
</tr>
</tbody>
</table>

SQL> connect sys@gis1_andrews as sysdba

Enter password:

Connected.

SQL> execute
    syd.dbms_system.set_ev(132,31835,10046,12,'');
```

DBMS trace is a very powerful diagnostic tool.
Analyze database statistics

SQL Profiler
Using test results as input for capacity planning
Test Results as Input into Capacity Planning

Load Test Results – input into capacity models

- Average throughput over the test duration
  - 3.89 request/sec ~ 14,004 request/hour
- Average response time over the test duration
  - .25 seconds
- Average CPU Utilization
  - 20.8%
  - Mb/request = 1.25 Mb
Test Results as Input into Capacity Planning

Load Test Results – input into CPU capacity model

• Input from testing
  - #CPUs = 4 cores
  - %CPU = 20.8
  - TH = 14,004 requests/hour
  - SPEC per Core of machine tested = 35

• $ST = \frac{#\, CPUs \times 3600 \times \%CPU}{TH \times 100}$ = 0.2138 sec
  - Note* very close to Average response time of .25
Test Results as Input into Capacity Planning

Target values

1. **Server SpecRate/core=10.1**

   ![SPEC® CINT2006 Result]

   - Dell Inc.
   - PowerEdge 2950 (Intel Xeon processor X5355, 2.66 GHz)

2. **User load=30,000 req/hr**

3. **Network=45 Mbps**
Test Results as Input into Capacity Planning

Target CPU cores calculation

• Input to Capacity Planning:
  - $ST = \text{Service Time} = .2138 \text{ sec}$
  - $TH = \text{Throughput desired} = 30,000 \text{ request/hour}$
  - $\%CPU = \text{Max CPU Utilization} = 80\%$
  - $\text{SpecRatePerCpuBase} = 35$
  - $\text{SpecRatePerCpuTarget} = 10.1$

• Output
  - $\#CPU \text{ required} = \left( \frac{.2138 \times 30,000 \times 100}{3600 \times 80} \right) \times \frac{35}{10.1}$
  - $\#CPU \text{ required} = 7.7 \text{ cores} \sim 8 \text{ cores}$
Target network calculation

- Input to Capacity Planning:
  - Mb/req=1.25
  - TH = 30,000 request/hour

- Output
  - Network bandwidth required = \( \frac{30000 \times 1.25}{3600} \) Mbps
  - =10.4 Mbps < 45 Mbps available
  - Transport=\( \frac{1.25}{45-10.4} \)=0.036 sec
Test Results as Input into Capacity Planning

System Designer

- **Input:**
  - Throughput=30000
  - ST=0.21
  - Mb/tr=1.25
  - Hardware=80.9 Spec
Test Results as Input into Capacity Planning

System Designer

- Input
  - Hardware=80.9 Spec
Test Results as Input into Capacity Planning

System Designer

- Review results
System Designer – Overview

Helping Create Your GIS Technology Strategy and Design
Our System Design Framework

- Tool
- Patterns
- Discipline
What is System Designer?

Solution Architecture design tool

• Gathering requirements
• Designing
• Capacity: CPU, Network, Memory
• Reporting
System Design Framework

“Loosely” Aligns with TOGAF framework

- **Architecture Vision**
  - Strategy

- **Business Architecture**
  - GIS Domain
  - Business Processes
  - Requirements

- **Application Architecture**
  - Application Technology
  - User Workflows

- **Data Architecture**
  - Data Management
  - Data Storage

- **Technology Architecture**
  - Infrastructure
  - IT Constraints
System Design Process: Inputs, Design, Output

**Requirements and SME**

**Business**
- GIS Management

**Application**
- GIS Management
- GIS Staff
- GIS Developers

**Data**
- GIS Management/Staff
- DBA

**Technology**
- GIS Management
- IT Manager
- IT Architects
- IT Admins

**System Designer**

**Sites and Business Drivers**

**Functional and non-Functional**

**Data Sources and Flows**

**Hardware, OS, Network**

**Architecture**

**Business Arch.**
- Sites
- User workflows

**Application Arch.**
- Logical design
- Software list
- License
- Performance

**Data Arch.**
- Data Sources Types
- Databases
- Data location

**Technology Arch.**
- Hardware List
- Resource Utilization
- Physical Design
System Design Process: Inputs

**Requirements**

*(Step)*

**Business**
- Sites location, types, connectivity (1)
- Business Drivers (2,3)

**Application**
- Functional (3,4,5)
- Non-Functional (SLA)
  - Availability (5)
  - Performance (3)

**Data**
- Data Sources (4,5)
- Data Flows (8)

**Technology**
- Hardware (7)
- OS (7)
- Network (6)
The Value of System Designer

- Communicates design effectively
  - Provides quality and interactive presentation
- Reduces design costs
  - Standards
  - Automation
  - Samples
- Clearly defines requirements and assumptions
- Connects Proposals and Projects
  - Makes proposal ideas clearer to implementers
  - The proposal can be elaborated/revised in implementation
Demo: System Designer use case
Contacts

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Trying System Designer

• Download trial version (limited to one project):
  - Open Windows Explorer (not browser)
  - In the Address Bar enter: ftp://ftp.esri.com/
  - Right click and select Login As (or click Alt F and select Login As from the File)
  - Enter your username and password:
    - User name: eist
    - Password: eXwJkh9N
  - Click "Log On"
  - Follow Installation Guide

• Report bugs and provide feedback:
  - SystemDesigner@esri.com
Questions?