Introduction

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Audience

- Architects
- Developers
- Administrators
- Project Managers

Level:
- Beginner / Intermediate
Agenda

Enterprise GIS Architecture Deployment Options

- Design process
- Deployment options
- Resources
ArcGIS – A complete integrated system

- Discover
- Create
- Manage
- Visualize
- Analyze
- Collaborate

Cloud

Enterprise

Local

Web

Mobile

Desktop
Choosing the option that's right for you
Architecture design process
The Open Group Architecture Framework

http://www.opengroup.org/togaf/
Phase A: Architecture Vision
Phase B: Business Architecture

- Business Objectives
- GIS-Supported Operations
- Time horizon
- Real-time data
- Security
- Business continuity

<table>
<thead>
<tr>
<th>Percentage Uptime</th>
<th>95%</th>
<th>99%</th>
<th>99.50%</th>
<th>99.90%</th>
<th>99.99%</th>
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<td>Tolerable Hours of Downtime Per Year</td>
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<td>Tolerable Days of Downtime Per Year</td>
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<td>1.3</td>
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</table>
Phase C: Application Architecture

- Application Patterns
- Real-time data
- Security
- Performance SLA
- Data confidentiality
Phase C: Application Architecture

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
- Geoprocessing
- Mobile
- Web api
  - Geodatabase

Desktop
Server
Online
Phase C: Data Architecture

- Data updates
  - Static vs. dynamic
  - Incremental vs. replace
- Confidentiality
- Recovery Objectives

Standby node configuration allows 15 minute Recovery Point Objective. 2 hour Recovery Time Objective (from time of outage notice).
Phase D: Technology Architecture

- Physical infrastructure
- IT standards
- Hardware capacity
- Hardware redundancy
Architecture topology options
Centralized Architecture

Single data center = lower cost

Performance depends on network: good bandwidth and low latency
Performance factors

Network transport time

- **Required bandwidth:**
  - Response size (Mb)
  - Throughput (req/hr)

- **Network transport time:**
  - Response size (Mb)
  - Effective bandwidth

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

\[
Transport(sec) = \frac{Mbits / req}{Mbps - Mbps_{used}}
\]

*No need to calculate it manually, System Designer Tool does it for you*
## Performance Factors

### 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

<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>
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<tbody>
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<td>Vector</td>
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<td>0.056</td>
<td>1.540</td>
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<td>Citrix/ArcGIS</td>
<td>Map</td>
<td>Vector+Image</td>
<td>ICA Comp</td>
<td>1</td>
<td>0.056</td>
<td>1.540</td>
<td>10.000</td>
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<tr>
<td>ArcGIS Server</td>
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<td>Vector</td>
<td>PNG</td>
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<tr>
<td>ArcGIS Server</td>
<td>Image</td>
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<td>JPG</td>
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<td>Vector</td>
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<td>10.000</td>
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<td>10.000</td>
<td>45.000</td>
<td>100.000</td>
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</table>
Distributed Architecture

- Good performance to local application and data
- Might require complex replication and synchronization process
- Multiple datacenters = higher costs
## Data replication considerations

<table>
<thead>
<tr>
<th>Requirements</th>
<th>GDB Replication&lt;sup&gt;1&lt;/sup&gt;</th>
<th>FGDB copy/paste</th>
<th>RDBMS Replication</th>
<th>RDBMS clone</th>
<th>Disk Block-level</th>
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</thead>
<tbody>
<tr>
<td>Geopgraphic area and selected layers</td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>Mixed DBMS</td>
<td></td>
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<tr>
<td>Geodatabase aware</td>
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<tr>
<td>Many to Many</td>
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<tr>
<td>Incremental Edits</td>
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<tr>
<td>Large Truncate/Reload</td>
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<tr>
<td>Near Time</td>
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<tr>
<td>Downtime: 0</td>
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<tr>
<td>Downtime: 5-60 min</td>
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</table>

1- 3rd party product integrated through Esri API

2- Consider disconnected synchronization if network has high latency
Application architecture deployment options
ArcGIS Desktop

- Design considerations

- Overview:
    - Full range of GIS tools

- Design Considerations:
  - Desktop processing requirements
  - User location relative to the data
  - Available network bandwidth
  - System Administration (installs, upgrades)
ArcGIS Desktop deployment options

LAN – standard deployment
ArcGIS Desktop deployment options

WAN – Citrix compression

Performance depends on image compression and bandwidth.
ArcGIS Server Web Applications

- ArcGIS API for Silverlight
- ArcGIS API for Flex
- ArcGIS API for JavaScript
ArcGIS Server Web Applications

API Choice

• Development Expertise
  - Flex aligns with Java developers
  - Silverlight aligns with .NET developers
  - JavaScript aligns with HTML/JavaScript developers

• Plug in requirements
  - Flex and Silverlight require plug-in installation
  - Need to consider policies for plug-in usage

• Download for API
  - JavaScript requires connectivity to Esri for API download
    (method is available to establish locally)
Smartphones and Tables

Feature Service

iOS  Microsoft Windows Phone  Android
Mobile devices

Mobile data service

- **Design considerations**
  - Always vs. sometimes connected
  - Getting data on to the devices
  - Managing synchronization timing

ArcGIS for Windows Mobile

ArcPad

Rugged Devices
ArcGIS Server deployment options
ArcGIS Server
Single ArcGIS Server machine
ArcGIS Server
High availability configuration
Geodatabase deployment options
Which database to select?
Follow your IT standards, expertise and cost

- DBMS impact on overall performance is typically low
  - < 20% of total response time
Geodatabase editing

Production and Publication

• **Pros:**
  - Better security
  - Improved performance
  - Additional hardware capacity

• **Cons:**
  - Requires replication
  - Additional hardware
Geodatabase editing
Internal and external web editing

• **Pros:**
  - Better security
  - Improved performance
  - Additional hardware capacity

• **Cons:**
  - Requires replication
  - Additional hardware
Virtualization options
Virtualization Methods

• **Server Virtualization**
  - abstraction of the underlying physical system: storage, processors and memory and operating systems

• **Session Virtualization**
  - multiple users share a single operating system and set of installed applications.

• **Desktop Virtualization**
  - centralized remote desktop computing architecture leveraging server virtualization as the back-end computing infrastructure.
Server Virtualization Benefits

- An effective mechanism to reduce server counts
- Faster deployment
- Better resource utilization
Cloud deployment options
Cloud deployment options
Cloud deployment options

- Internal site
  - VPN
  - Esri Managed Services
    - ArcGIS Server
    - Geodatabase
  - ArcGISOnline
    - Portal for ArcGIS
    - Tile and Feature Services

- Private Virtual Cloud
  - VPN

- External users
  - VPN

- Public users
  - iCloud
Environment options
System Environment Types

- **Development**
  - EDN License
  - Development Systems
  - Reflect Production as closely as possible but without full scalability

- **Staging**
  - Staging License
  - Staging Systems

- **Production**
  - Production License
  - Production Systems
  - Network Load Balancer

- Network Load Balancer
System Designer tool
System Designer

- Solution Architecture design tool
- Gathering requirements
- Designing
- Capacity: CPU, Network, Memory
- Reporting
System Designer

Provides solution templates for quick analysis
Demo: System Designer
Download Tools

• 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 user name and password:
  • User name: eist
  • Password: eXwJkh9N

• Click Log On.

• Follow Installation Guide.

• Report bugs and provide feedback:
  - SystemDesigner@esri.com
• Thank you for attending
• Have fun at UC2012
• Open for Questions

• Please fill out the evaluation:

  www.esri.com/ucsessionsurveys

Offering ID: 978