Agenda

Deployment options

- Introduction
- Application Architecture (Desktop, Web, Mobile)
- Infrastructure Architecture
  - Session/Application Virtualization
  - Hardware Virtualization
  - Cloud Computing and Deployments
- Quality Attributes
  - High Availability Patterns
  - Public-facing Application Security
  - Scalability
- Closing
Deployments

- Patterns of delivering GIS functionality
- The state of our knowledge
- Motivations and considerations
System Designer

1. GIS System/Solution Design
2. Calculate Capacity
Application Architectures
ArcGIS Desktop

• Rich Client Pattern: [http://resources.arcgis.com/content/enterprisegis/10.0/rich_client_architecture](http://resources.arcgis.com/content/enterprisegis/10.0/rich_client_architecture)

• Full range of GIS tools.

• Significant client system requirements (hardware, network, and platform).

• Significant system administration support (installs, upgrades, versioning, etc.)
Demonstration
Desktop Deployment
ArcGIS Server Web Applications

- Web Application Pattern: http://resources.arcgis.com/content/enterprisegis/10.0/web_app_architecture
- Server-powered mapping, analysis, editing, etc.
- Minimal client system requirements.
Mobile

• Mobile Application Patterns: [http://resources.arcgis.com/content/enterprisegegis/10.0/mobile_app_architecture](http://resources.arcgis.com/content/enterprisegegis/10.0/mobile_app_architecture)
• Enabling field-based data collection, situational awareness, and mobile GIS.
• A family of platform-specific solutions that leverage a common server-based infrastructure.

• Themes:
  1. Always vs. sometimes connected
  2. Sometimes connected:
     a. Getting data on to the devices
     b. Managing synchronization timing
Demonstration
ArcGIS Server and Mobile
Infrastructure Architectures
Session/Application Virtualization

• Allows Desktop application processing to execute on servers, exchanging graphics and commands with clients.
• Often motivated by easing system administration and support requirements for large deployments.
Customer Experiences and Motivations

- Simplified/Streamlined Administration
- Release control; Managing Upgrades
- WAN bandwidth and latency tolerance
- High availability for ArcGIS Desktop solutions
- Reduced client side requirements
- Specialized skill requirements for server administration and configurations to support printing, working with local data, etc.
Esri’s Testing and Experience

- Scope of Esri Support
- Session/Application vs. Desktop Virtualization and VDI
- Graphics, printing, and 3D

Resources:
- [http://resources.arcgis.com/content/white-papers?fa=viewPaper&PID=25&MetaID=389](http://resources.arcgis.com/content/white-papers?fa=viewPaper&PID=25&MetaID=389)
Demonstration
ArcGIS Desktop Application/Session Virtualization
Server Hardware Virtualization

• Allows the division and/or recombination of one or more physical machines into ‘virtual’ machines
• Often motivated by cost-savings (right-sizing, over-committing) and increased system administration flexibility.

Processors

Right-sizing

Over-commitment

Physical

Physical
Storage

Vol A
Unused Alloc
Data
Unused Alloc
Data
Vol B

Vol A
Unused Alloc
Data
Vol B

Vol A
Data
Available Stor
Savings
Data
Vol B
Storage Access
Networking

Hypervisor

VM1
VM2
VM3

NIC

Network
Esri’s Testing and Experience

- Scope of Esri Support
- Scalability and Virtual Cores
- Right-sizing is good; over-committing should be avoided
- Implementation Risks:
  - Storage I/O contention
  - Network Latency
- Resources:
Customer Experience and Motivations

- IT Standards
- Availability
- Disaster Recovery
- Simplified/Streamlined Administration
- Other
Demonstration

ArcGIS Server Hardware Virtualization
Staging Environment

Purposes and Uses:
- User Acceptance Testing (UAT)
- Production Deployment Procedure Development and Testing
- Service Staging
- Recovery Procedure Development and Validation

Provisioning Patterns:
- Hardware virtualization
- Staging licensing
- Training labs (for clients)
Development Environment

Purposes and Uses:
- Application development
- Functional/Unit testing

Provisioning Patterns:
- Developer machines
- EDN
Cloud Computing

- Provides hosted, usually off-premises, infrastructure, platform, and/or application services.
- Often motivated by scalability, deployment flexibility, and/or outsourcing objectives.

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, Google Apps, Force.com
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
Customer Experiences and Motivations

- Dynamic, rapid scalability
- Tends to be for public-facing applications
- Outsourcing IT
- Esri Managed Services
Esri Testing and Experience

• Scope of Esri Support
• Processor Per-Core Capacity
• Design Challenges:
  • Network (Internet)
    • Bandwidth
    • Availability
    • Latency
  • Data
    • Can it really all be in the cloud?
    • Synchronization
    • Caching
  • Amazon Availability
    • Elastic Load Balancer
    • Availability Zones
• Resources:
  • http://www.esri.com/amazon
Demonstration
ArcGIS Server on Amazon
Quality Attributes

a.k.a. “Non-Functional” Attributes
Server High Availability

- Provisioning systems to continue to operate in the case of component failure.
- Typical motivations are to avoid the loss of revenue (e.g. ecommerce), the loss productivity (e.g. idle workforce), or a mission-critical function (e.g. 911 service).
HA Objectives

Downtime: Planned and Unplanned

Hours of Operations
- Standard Business Hours
- 24x7x365
  - 37 days = 90% uptime
  - 18 days = 95% uptime
  - 7 days = 98% uptime
  - 4 days = 99% uptime
  - 1 day = 99.9% (aka “three nines”) uptime
  - 1 hour = 99.99% (aka “four nines”) uptime
Redundancy Strategies
ArcGIS Server HA Techniques

“Bow-tie”

“All-in-ones”
HA with Hardware Virtualization
State of Knowledge

- Esri’s Testing and Experience
  - Scope of Esri Support
  - Multi-faceted Solutions
- Customer Experiences and Patterns
  - Broad and Deep Range
  - Data tier: Active-Passive
  - Services tiers: Active-Active or Active-Passive
- Managing complexity
Server High Availability

- Resources:
Demonstration
ArcGIS Server High Availability
Securing Public Access to ArcGIS Server

- Providing solutions with appropriate access and reliability to the public without compromising internal systems.
- Many motivations including ecommerce, protecting private data, limiting public access, and/or protecting internal systems.
Reverse Proxy or DMZ placement
State of Knowledge with Esri Technology

- Esri’s Testing and Experience
  - Scope of Esri Support
- Customer Experiences and Patterns
  - Reverse-Proxy Solutions
  - Separation of Concerns & DMZ
  - Token or Custom Authentication w/ HTTPS
Securing Public Access to ArcGIS Server

- **Resources:**
  - [http://resources.arcgis.com/content/enterprisegis/10.0/security](http://resources.arcgis.com/content/enterprisegis/10.0/security)
Scalability

- Systems that perform at low throughputs and high throughputs
- Systems that have balanced resource allocation
Processor Bound

- Most well configured and tuned GIS systems are processor-bound in terms of performance and scalability.
State of Knowledge with Esri Technology

• Esri’s Testing and Experience
  • Product Team Tests
  • Esri Enterprise Testing Benchmarks
  • Many white papers and reference implementations

http://resources.arcgis.com/gallery/file/enterprise-gis
Demonstration

Balanced Hardware and Network
Closing
Enhancing Desktop Deployment -- Infrastructure

• App/Session Virtualization
  + High Availability
  + Simplified Administration
  + Network efficiency / WAN
  -3D
  -System admin skill level
  ~ User Experience
Enhancing Server Deployment -- Infrastructure

• Hardware Virtualization
  + High Availability
  + Disaster Recovery
  + Right sizing
  + Staging environment
- Performance risk
Quality Attributes

- Vectors
  - High Availability
  - Scalability
  - Security
- Considerations
  - Multi-factor
  - Simplicity -> Success
  - Requires verification testing and monitoring
Thank you

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