Course introduction

Introduction
Course goals
Additional resources

1 System design process

Lesson introduction
What is system architecture design?
Why is system architecture design important?
Why should you plan?
What questions are you trying to answer?
What demands does GIS place on the computing infrastructure?
Cost of a change
Integrated system design process
Building a GIS: Implementation strategy
System design strategies overview
System Design Strategies wiki site
System architecture design terminology
Pre-design efforts
Pre-design efforts using the CPT
System design process
System architecture design
Monitor performance compliance
Performance validation
Platform capacity calculator

Exercise 1: Use the Platform Capacity Calculator to identify the best platform selection
- Determine current hardware (X5270 4-core) throughput capacity (TPH)
- Find the throughput capacity (TPH) of the Esri hardware bundles
- Determine how many concurrent users the hardware candidates can support
- How does user productivity impact concurrent user capacity?
- What is your optimum deployment strategy if you choose to use virtual servers?

Lesson review

2 GIS software technology

Lesson introduction
GIS software evolution
What is ArcGIS?
Selecting the right computing architecture
Enterprise architecture deployment strategies
Federated architecture deployment strategies
Services-oriented architecture
GIS in a services-oriented architecture
Cloud deployment patterns
Esri product family: An architecture overview
Exercise 2: Use the CPT to explore GIS software technology

- What are your business requirements?
- Select your project workflow performance targets
- Complete your system architecture design

Lesson review

3 Software performance

Lesson introduction
Standard workflows
Custom workflow loads
CPT Calculator workflow recipe
Use optimized map service (MSD)
ArcGIS imagery access patterns
Data density makes a difference
Limit the number of dynamic display layers
Take advantage of caching (%DataCache)
CPT Calculator recipe
Classic dynamic mapping trade-off
Activity
GIS user performance expectations
Map display complexity
Defining display complexity
Map publishing Service Editor
Display complexity (MXDperfstat)
CPT Calculator display complexity
Selecting the best map resolution
Selecting the best output format
Selecting the best vector storage format
Selecting the best imagery storage format
Custom workflow processing loads
CPT Calculator image output and data source

Exercise 3: Use CPT to explore software performance

- Use the CPT Calculator to help select the appropriate software performance targets
- Will optimized map document (MSD) improve performance?
- What are the advantages in caching base layers and controlling display resolution?
- Add custom WebLite workflow to project workflows
Lesson review

4 Server software performance

Lesson introduction
ArcGIS for Server is changing
ArcGIS for Server terminology
ArcGIS for Server process configuration
Pooled and non-pooled processes
ArcGIS for Server processing and pooling settings
Web mapping service loads
Batch process loads
Optimum service instance configurations
Platform memory recommendations
Server host capacity
Cached map service
Generating the map cache
ArcGIS for Server host capacity and caching settings
Cache processing profile
Greek citizen declaration case study
Greek network architecture
Technical architecture alternatives
CPT Calculator
Caching advantage summary
Exercise 4: Use the CPT to evaluate server software performance
  Demonstrate batch process service instance loads on the CPT Design tab
  Demonstrate web mapping service instance loads on the CPT Design tab
Lesson review

5 GIS data administration

Lesson introduction
GIS feature data architecture
What is versioning?
Geodatabase versioning example
ArcSDE explicit state model
ArcSDE version state tuning
Versioned geodatabase view
Versioning managed by ArcSDE schema
ArcSDE schema has evolved
Geodatabase replication use-cases
Distributed enterprise architecture strategies
Mobile operations
Production/publication operations
Extract/transform/load operations
Distributed geodatabase operations
Hierarchical operations
Platform Capacity Calculator custom web map services
GIS imagery data architecture
What is a mosaic dataset?
ArcGIS image access patterns
Image service caching
GIS enterprise data architecture
Storage architecture options: Advent of the storage area network
Storage architecture options: Advent of network-attached storage
RAID (Redundant array of independent disks)
Ways to move GIS data: Traditional tape backup/disk copy
Ways to move GIS data: Database replication
Ways to move GIS data: Disk-level replication
Protect your GIS data resources
Platform Capacity Calculator custom imagery services
Exercise 5: Use the CPT to determine platform capacities and workflows

- How does data source selection impact web mapping platform capacity?
- How does data source selection impact web image service platform capacity?
- Use the CPT Calculator to generate custom imagery workflow performance targets
- Add the custom imagery workflow to project workflows on the CPT Workflow tab

Lesson review

6 Network communications

Lesson introduction
Why is GIS traffic-intensive?
Types of networks
What is network capacity?
What is data?
What is client/server communication?
What are network transport protocols?
GIS client/server protocols
What is network transport time?
Network transport time examples
What is network latency?
Network latency example
CPT network latency
Shared network performance
Performance modeling
Network design planning factors
Network traffic adjustments: Output format
Network traffic adjustments (data source format)
Workflow network performance
Enterprise network architecture
Enterprise network capacity
Network suitability analysis: Network utilization
Network suitability analysis: User productivity
User productivity adjustment
CPT Design network suitability analysis
Web performance
Exercise 6: Use the CPT to explore network communications
   Use the CPT Calculator to evaluate relative web mapping display performance for remote shared low-bandwidth sites
   How does network bandwidth contention impact user productivity?
   Configure the design to represent business requirements for local and remote site users
Lesson review

7 GIS product architecture

Lesson introduction
ArcGIS system technical architecture
ArcGIS product architecture: Software components
ArcGIS for Desktop software component architecture
ArcGIS for Desktop workstation clients
ArcGIS for Desktop workstation CPT configurations
ArcGIS for Desktop terminal server clients
ArcGIS for Desktop WTS CPT configurations
Legacy ArcGIS 10.0 for Server software component architecture
ArcGIS 10.1 for Server software component architecture
ArcGIS 10.1 for Server key site component functions
Web services platform tier structure
Single-tier platform configuration (Legacy ArcGIS 10)
Single-tier platform configuration (ArcGIS 10.1)
ArcGIS for Server single-tier CPT Design configuration
Two-tier platform configuration (ArcGIS 10 separate data servers)
Two-tier platform configuration (ArcGIS 10.1 separate data servers)
ArcGIS for Server two-tier CPT Design configuration
Three-tier platform configurations (ArcGIS 10 server object manager on web tier)
Three-tier platform configurations (ArcGIS 10 server object manager on container machine tier)
Three-tier platform configurations (ArcGIS 10 web services architecture)
Three-tier platform configurations (ArcGIS 10.1 separate web and data servers)
ArcGIS for Server three-tier CPT Design and Calculator configuration
Exercise 7: Use the CPT to explore GIS product architecture
   Use the CPT Calculator to identify the optimum ArcGIS for Server platform configuration
   Adjust the CPT Design to show an enterprise design solution with a three-tier ArcGIS for Server architecture
   Reduce ArcGIS for Server license cost by using a virtual server environment
Lesson review
8 Platform performance

Lesson introduction
Platform performance baseline
Baseline history compared with Moore’s law
How relative performance is measured
Time to produce a map
Platform performance resources
2012 technology changes
Platform identification
Vendor platform performance
Processing time drives throughput
2012 Intel processor performance
ArcGIS2012 platform best buy
What is the best buy?
Workstation platform recommendations
Windows terminal configurations
Windows terminal server platform capacity
Windows Terminal Server platform sizing
SDE geodatabase configurations for GIS vector data management
SDE geodatabase platform capacity
SDE geodatabase platform sizing
ArcGIS for Server configurations
ArcGIS for Server platform capacity
ArcGIS for Server platform sizing
Hardware vendor platform selection

Exercise 8: Use the CPT to evaluate platform performance

Use the CPT Calculator to identify how upgrading to current technology can reduce overall operating cost.
Use the CPT Calculator to evaluate performance and cost of available 2012 virtual server configurations.
Use the CPT Design to identify how upgrading to current technology can reduce overall Enterprise GIS operating cost.
Use the CPT Design tab to evaluate Enterprise performance and cost of 2012 virtual server configurations.

Lesson review

9 Information security

Lesson introduction
CIA security triad
Defense in depth
Esri security strategy parallels IT trends
Levels of security
Enterprise security strategy
10 Performance management

Lesson introduction
System performance factors
How is performance managed?
Six blind men and the elephant
User workflow terminology
System performance terminology
System workflow terminology
What is workflow productivity?
What is a valid user workflow?
User productivity adjustment
User productivity adjustment
What is a batch process?
Batch process productivity
Platform throughput and service time
Platform performance and response time
Platform queue time
Multi-core server performance
How to size the network
What is system performance?
CPT Test Validation
Exercise 10: Use the CPT to manage performance
  - Convert measured test results to generate a custom project workflow
  - Use the CPT Throughput/Utilization Test tool to generate workflow service times
  - Move the test workflow results to the Project Workflows list
  - Validate the new test workflow on the CPT Design tab
  - Use the validated test workflow to generate capacity of new 2012 servers
Lesson review
11 System implementation

Lesson introduction
Management committee
GIS planning team leadership
GIS implementation team leadership
GIS organizational structure
Key GIS staff functions
Phased system deployment
Virtual server deployments
Virtualization deployment options
Software technology life cycle
System testing
Performance testing
Have a schedule
Monitor performance compliance
System performance tuning
Managing technology change

12 City of Rome

Lesson introduction
GIS business planning
System architecture design
Maintain a current plan
City of Rome case study
Pre-design efforts
Enterprise vision
Existing business architecture: Platform and network environments
Existing business architecture: Governance and political landscape
Existing business architecture: Use the right language
Existing business architecture: Operational constraints and priorities
Existing business architecture: Funding constraints
User requirements analysis: User locations and connectivity
User requirements analysis: User workflow analysis
City of Rome, Year 1: User requirements analysis
System design process
Technical architecture strategy: Year 1
Workflow loads analysis: User needs summary, year 1
City of Rome, Year 1: Workflow configuration
Network recommendations: Year 1
Platform architecture selection: Year 1
Hardware price list
Minimum physical platform configuration: Year 1
Minimum physical platform solution: Year 1
High-availability physical platform configuration: Year 1
High-availability physical platform solution: Year 1
High-availability virtual platform configuration: Year 1
High-availability virtual platform solution: Year 1
High-availability virtual server platform configuration: Year 1
Technical architecture strategy: Year 2
Workflow loads analysis: User needs summary, Year 2
Workflow configuration: Year 2
Network recommendations: Year 2
Platform architecture selection: Year 2
High available virtual platform configuration: Year 2
High-availability virtual platform solution: Year 2
High-availability virtual platform configuration: Year 2
Data center without public web services
High-availability virtual platform solution without web public services
High-availability virtual platform configuration without web public: Year 2
Amazon pricing assumptions
Amazon Cloud Web Public services configuration
Amazon hosted public web services
Rome City Hall business case summary
Workflow configuration: Police network
Police virtual platform solution
Exercise 12: Use the CPT to design a system for the City of Portland
  Determine CPT workflows to complete the City of Portland design
  Determine projected network traffic for City Hall, year 1
  Evaluate the City Hall, year 1 network bandwidth requirements
  Recommended a City Hall hardware configuration
  Recommend a City Hall, year 1 software configuration
  Determine the hardware requirements for City Hall, year 1
  Evaluate the projected network traffic for the City Hall, year 2 design
  Determine the hardware requirements for City Hall, year 2

Appendixes

Appendix A: Esri data license agreement
Appendix B: Answers to lesson review questions
  Lesson 1: System design process
  Lesson 2: GIS software technology
  Lesson 3: Software performance
  Lesson 4: Server software performance
  Lesson 5: GIS data administration
  Lesson 6: Network communications
  Lesson 7: GIS product architecture
  Lesson 8: Platform performance
  Lesson 9: Information security
  Lesson 10: Performance management