ESRI Business GeoInfo Summit

Best Practices for Implementing a Successful GIS Project

Gerry Clancy, Manager
Federal Civilian and Commercial Services, ESRI
Agenda

- Review of Session Goals
- Overview of the Implementation Process
- Step-by-Step Discussion of the Implementation Process and Recommended Best Practices
Goals for This Session

1. Provide a road map for planning a GIS project
2. Describe best practices for implementing a successful project
3. Help you plan for risks and avoid common mistakes
4. Provide information on available project planning resources
Scope of This Session

**Includes**

- Project Management perspective
- Best Practices for project lifecycle planning
- Lessons Learned from past Enterprise GIS implementations

**Does Not Include**

- Specific Geodatabase planning advice
- Specific systems architecture sizing guidelines
- Specific product advice
- Programming advice
What is Enterprise GIS?

“Enterprise” has several meanings:

• **Organizational**
  – Multiple Departments, Multiple Business Processes and Many Systems Involved in GIS Applications

• **Deployment and Licensing**
  – Software Licensing and Purchasing Agreements
  – Large Scale Deployments of Software

• **Enterprise IT Architecture**
  – A Technology Strategy and Architectural Decisions that are Organizing Principles for Design
  – Broad-based Applications, Data, and Systems Design For Business-critical Systems
What is Enterprise GIS?

An enterprise GIS is an **integrated, multi-departmental** system of components used to collect, organize, analyze, visualize, and disseminate geographic information.

The goal of an enterprise GIS is to implement **interoperable technologies, standards, and methods** so that GIS data and services can support core business needs more efficiently and more effectively.

Requires a Higher Level of Planning, Integration, Testing and Support
Strategy & Planning

Operations & Maintenance

Analysis

Deployment

Design

Ongoing Planning

flow of tasks starting point

ArcGIS
## Project Lifecycle Phases & Activities

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### Business Process Analysis
- Visioning & Strategic Planning
- Business Case Development
- Implementation Planning
- Organizational Planning
- Risk Management

### Requirements Analysis
- Business Process Analysis
- Requirements Analysis
- Use Case Analysis
- Database Design
- System Architecture Design
- Application Design

### Database Development
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- Use Case Analysis
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- System Architecture Design
- Application Design

### Application Development
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- Use Case Analysis
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- System Architecture Design
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### Systems Integration
- Business Process Analysis
- Requirements Analysis
- Use Case Analysis
- Database Design
- System Architecture Design
- Application Design

### Quality Assurance Testing
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### Configuration Management
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### System Installation
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### Acceptance Testing
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### Performance Validation, Testing & Tuning
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### Performance Monitoring
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### Systems Maintenance
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### Software Maintenance
- Business Process Analysis
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- Use Case Analysis
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- System Architecture Design
- Application Design
ESRI Project Center

Project Center

The Project Center provides an information portal to a wide range of GIS information, resources, and ESRI services for planning, designing, implementing, and maintaining a successful GIS project lifecycle. ESRI believes that understanding the importance of each project phase and the associated key objectives is vital to successful enterprise implementations. The ESRI Project Center has been established to so that you may quickly find available resources and services to support your specific GIS needs.

http://support.esri.com/projectcenter
# Project Lifecycle Phases & Activities

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Strategy and Planning Activities: Process Overview

1. Develop Project Vision Statement
2. Develop Business Case
3. Define Scope of Work
4. Procurement (Optional)
5. Develop Project Charter
6. Develop Project Management Plans
   - Develop Initial Project Schedule
   - Develop Staffing Plan
   - Develop Quality Assurance Plan
   - Develop Change Control Plan
   - Develop Communication Plan
   - Develop Risk Management Plan
Strategy and Planning Activities: Developing the Vision

- What Is the Business Problem Being Solved?
- What Is the Proposed Solution?
- Who Are the Target Users?
- How Does This Solution Integrate With Other Existing or Planned Systems?
- How Will This Solution Benefit the Organization?
- What Are the Criteria for Success?

*Template for Creating a Project Vision Statement Available on the Project Center*
Strategy and Planning Activities: Developing the Business Case

- What Are the Benefits of the Project? How Does It Support the Mission of the Organization?
- What Are the Estimated Costs?
- What Is the Expected Return On Investment (ROI)?
- How Does the Project Relate to Other Efforts Within the Enterprise?

ESRI Press:
- *Measuring Up* - Outlines a Number of Case Studies and General Methodology for Doing Cost Benefit Analysis
- *Thinking About GIS* – Roger Tomlinson
- New ROI book coming from ESRI
Strategy and Planning Activities: Activity Planning

• Define the Initial Work Breakdown Structure (WBS)
  – By Project Phase
  – By Component

• Define the Activities

• Assign Resources

• Define Dependencies Between Activities

• Assign Durations
Strategy and Planning Activities: Identifying & Monitoring Project Risks

• **Internal**
  – Staff
  – Budget
  – Schedule
  – User Expectations

• **External**
  – Hardware Failure
  – “3rd Party” Software Release Schedules
  – “3rd Party” Contractors
  – Integration Issues
  – Natural Disaster

*Risk Monitoring Should Be Done Throughout the Project Lifecycle*
Strategy and Planning Activities: Managing Change

• Managing Change Is Essential to Managing Scope, Schedule and Budget
• Clearly Identify Procedures for Identifying, Documenting, and Approving Change Requests
• Assess Schedule and Budget Impact of Proposed Changes
• Set Up a Project Change Management Board, if Necessary
• Many Changes Have Contractual Implications and Must Be Handled Accordingly

.....This May Be Your Most Important Job As a Project Manager!
Strategy and Planning Activities: Summary of Best Practices

- Identify Project Stakeholders and Understand their Criteria for Success

- A Well Defined Vision Will Help Avoid Scope Creep at All Stages of the Implementation

- Quality Planning Needs to Start at the Beginning of the Project Lifecycle

- The Project Manager’s Primary Job is to Effectively Manage Change

- Good Communicators ensure that the Message is Successfully Transmitted AND Received
## Analysis & Design Phase

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Business Process, Requirements, & Use Case Analyses: Overview of Activities

Analysis Activities

- Review Existing Systems, Information Products & Documentation
- Interview Users
- Document As-Is Business Processes
- Document Functional Requirements
- Document Non-Functional Requirements
- Document Initial Use Cases
- Update Requirements
- Develop Domain Model
- Sign-off on Requirements
Business Process, Requirements, & Use Case Analyses: Key Outputs/Products

• Processes and Services
  – As-Is business processes documented
  – New services defined

• Requirements
  – Includes Functional and Non-Functional

• Use Cases
  – Actors
  – Workflows
  – To-Be Business Processes documented in detail

• External Systems and Services With Which GIS Integrates/Interfaces Have Been Identified
  – ERP, EDMS, CRM, CAMA, etc.

• Glossary Established
Business Process Analysis

• Document the As-Is business processes, if applicable
  – User interviews
  – Application walkthroughs
  – Review user documentation from existing systems
• Identify pain points in the current workflows
• Identify opportunities for process improvement

Interviews

Flow Diagrams

Swimlane Diagrams
Requirements Analysis

• Requirements Should
  – Describe WHAT not HOW
  – Only Contain One Requirement
  – Be Unambiguous, Measurable, And Achievable
  – Be “Testable”
  – Map Back to the SOW

• Requirements Form the Basis For
  – Software Design and Application Development Activities
  – Testing and Acceptance Activities
Requirements Analysis: Non-Functional Requirements

- User Interface Requirements
- Performance Requirements
- Integration/Interoperability Requirements
- Operational Requirements e.g. 24 x 7 uptime
- Security Requirements
- Audit Requirements e.g. Sarbanes Oxley
- Accessibility/Section 508 Compliance Requirements
- Maintenance and System Administration Requirements
- Documentation Requirements
Requirements Analysis: Lessons Learned

- Define and Maintain a Common Vocabulary
- Define Requirements in Terms of the Business Need, NOT the Technical Solution
- Find out best way to communicate within all team members
- Do Not Assume Anything; Express All Requirements In Explicit Terms
- Manage User Expectations; Communicate the Constraints of the Project
Use Case Analysis: Overview

- Following From The Functional Requirements…
- Use Cases Seek To:
  - Clearly Document the To-Be Business Processes
    - I.E. Workflows And Associated Business Rules
  - Clearly Document the User Interaction With the (New) System
    - Involves Technique Of “Scenarios”
  - Clearly Identify the “Actors” Using the System
    - Can Be Mapped Directly To “Groups” Or “Roles” In an LDAP Or Active Directory
  - As Mentioned, Functional Requirements Should Be Mapped Onto Use Cases For Traceability
Use Case Analysis: Documentation

- **Use Case Overview/Interaction**
  - Show System Overview and Interaction
  - Updated On An Ongoing Basis During Design

- **Use Case Scenarios**
  - Language Appropriate For a User Guide
  - User And System Interaction To Complete Specific Tasks
  - Include Primary and Alternate Scenarios
  - Cross-reference Functional Requirements
  - Updated on an Ongoing Basis During Design
Business Process, Requirements, & Use Case Analyses: Enterprise Considerations

• Enterprise GIS Are Always Transactional
  – Use Cases Are a Good Time to Start Thinking About What Functions/Apps Involve GIS Data Edits
    • Should Come Out of the Workflow Processes in the Use Cases
    • Need To Clearly Identify Data “Ownership”

• Consider the Role Of Versioning and Versioning Strategy
  – “Classic” GIS Workflow Model Where “Jobs” Are Tied To Versions
  – Certain Constructs Require Versioning (E.G. Multiple Editors, Replication, Etc.)

• Enterprise GIS Is Typically an Integration Point (Or “Glue”) Between Multiple Systems
  – What Systems (And Information) Must the GIS Interact With?
    • Again, the Use Cases and Workflows Help Us Identify this
Business Process, Requirements, & Use Case Analyses: Best Practices

• End Users May Need to Be Trained in GIS Capabilities at the Beginning of the Analysis Phase

• Requirements Should Describe What the System Needs to Do, Not How to Do It

• Use Cases/To Be Business Processes Should Be Developed Based on Available COTS Technology, Where Possible

• User Expectations Need To Be Carefully Managed During the Analysis Phase
Database Considerations: Process Overview

Database Design and Preparation

Data Requirements Gathering and Analysis → Conceptual Database Design and Review → Logical Database Design and Review → Physical Database Creation → Data Migration / Conversion Procedures Development

Migration and Implementation

Data Migration / Conversion Pilot and Review → Database Design and Procedures Refinement → Full Data Migration / Conversion → Quality Control → Deployment
Database Considerations: Information Products

Maps

Data Requirements Matrix

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<th>Hydro</th>
<th>Parcels</th>
<th>Elevation</th>
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Analyses

Tools

Web Services

Enterprise Geocoding/Location Validation Service
Database Considerations: Database Design

- **Database Design Is a Part of the Overall Data Management Strategy**
  - Requires Analysis of Requirements for Data Access, Data Distribution, Security, and Replication
  - Data Management Strategy is Addressed Through the System Architecture Design Process
  - Enterprise GIS Project Should Include a System Architecture Design Workshop and Development of a System Architecture Design Strategic Plan
  - Multiple Databases May Be Appropriate
    - Distributed Organization With Regional Business Units
    - Security Factors
    - Controlled Redundancy
    - Other Reasons
Database Considerations: Database Design Process

Conceptual Design

Logical Design

Physical Design

GDB Reporter

GDB Diagrammer
Database Considerations: Database Design

- Consider Use of ESRI Data Model Templates
- Crosswalk With FGDC Guidelines and Other Published Models If Appropriate
- Avoid Analysis Paralysis – Model May Not Be Perfect But Should Not Prevent Progress
- Case Tools (UML) Are Helpful, but Not Essential
- Only Model Data and Metadata that Can Realistically Be Maintained
  - Tendency to be Inclusive Often Results in More Attributes Being Modeled than Can Be Maintained Effectively
- Avoid Over-Complication – Simpler Is Usually Better
Database Considerations: Data Migration and Conversion

- Pilot Project is Always Valuable, Usually Essential
- Expect to Make Refinements to Database Design and Migration Process Based On Pilot
- Document Procedures for Repeatability and Record
- Select Appropriate Migration Tools, Possibly More Than One

- Careful Planning of Cutover to New System is Crucial
- Ensure That the Data Maintenance Environment is Ready Prior to Completion of Data Migration or Conversion
- Users Must Be Trained in the Use of the New Database and the Maintenance Tools Prior to Going Live
Database Considerations: Quality Assurance

• Quality Assurance Plan Should Be Developed in Advance of the Migration or Conversion and Should Address:
  – Quality Assurance Workflow
  – Types of Validation to be Applied to Each Type of Data:
  – Specific Checks to Be Performed
  – Allowable Error Tolerances, if Any
  – Quality Assurance Records

• Data Migration Is Not Always As Straightforward As It Might Seem
  – Don’t Assume Migration Process is Foolproof – Some Level of QA is Essential
What is System Architecture Design?

System Architecture Design Evaluates the Following Inputs:

- User Requirements
- Data Requirements
- Application Resource Requirements
- Available Hardware Technology

To Provide Hardware Specifications For:

- Client Systems
- Servers, and
- Network Resources
System Architecture Design Activities: Process Overview

- Review Existing Requirements Documentation
- Gather User Counts, Network Diagrams, IT Standards, etc.
- Analyze Data Storage Needs
- Analyze Concurrent Usage and Network Capacity
- Analyze Application Load Requirements
- Develop System Architecture Alternatives
- Review Alternatives
- Select Initial System Architecture Design
- Finalize Application Design
- Update System Architecture Design
- Procure Hardware
GIS Can Be Implemented in Many Ways: GIS Architecture Alternatives

- Workgroup
- Department
- Organization
- Business to Business
- Standalone
- Point to Point
- Centralized
- Services Oriented Architecture
- Community
System Architecture: Recommended Environments

Depending on the Size of the Project, You May Need Multiple Environments
System Architecture Design: Summary of Best Practices

- Start With Well Defined User Requirements
- Choose System Architecture Deployable In 6 Months
- Use a Phased Approach
- Leverage Existing Infrastructure If It Meets Requirements
- Purchase Hardware When You Need It (To Support 3+ Years)
- Utilize Existing IT Established Practices
- Use Industry Standards – OGC, Security, Database
- Plan for Business Continuance (Protect Your Investment)
- Plan for Technology Changes
- Establish Clear Roles and Responsibilities For Operations Support Staff
Application Design:
Enterprise Design Considerations

• What is? – some Enterprise ‘buzzword’ definitions
  – a Service?
  – a Web Service
  – Service Oriented Architecture (SOA)?
  – an Enterprise Application Framework?
  – Enterprise Service Bus (ESB)
Application Design:
Enterprise Application Framework Overview

Web Server
(Users)

Application Server
(Business Logic)

Directory Services:
LDAP, Active Directory

Business Data

Database Servers

GIS Data Services

More Services
Logging
Data Access
GIS Services

AF Security

AF Services

Custom Business Logic

Users

Mobile Applications

Desktop Applications
Application Design: Enterprise Architecture Design Considerations

- **Which Services System Architecture Is Best Suited For Your Enterprise?**
  - Consider A Mix:
    - Client/Server For ‘Department’ GIS/Tabular Editing Applications (Best Support For Transactions)
    - N-tier For Intra/Internet Web Sites
    - SOA For ‘Inter-departmental’ Service / Data Access
    - SOA For ‘Legacy’ Encapsulation
  - For Scalability
    - N-Tier: Database Access Scales Best When Using ‘Impersonation’
  - For Fast Transactions
    - Client / Server
Application Design:
Enterprise Architecture Design Considerations (cont’d)

• GIS – Security In The Enterprise
  – ArcSDE Security - use ‘Direct Connect’
  – Configure ArcSDE Using ‘Role-based’ Security
    • Note: Use Case ‘Actors’ Are Mapped To Security Roles
  – Web Applications:
    • Consider ‘Impersonation’ For Scalability (Aka ‘Pooled’ And ‘Non-pooled’ ArcGIS Server Objects)

• ArcSDE Database Architecture
  – Split Departmental Spatial Data Into Different Databases Or Database Instances
    • Geodatabase Features Are Best Maintained On A Department Level
  – Split Vector And Raster Data Into Separate Databases
    • Vector Data Is Transactional, Raster Data Is Not
    • Backup, Maintenance, And Performance Tuning Easier In Separate DB’s
Security Planning: Best Practices

- Leverage Your Existing IT Security Architecture

- Design A Flexible, Scalable Security Solution that allows for Frequent Updates

- If You Derive Your Security From Your Business Requirements Your Risk Level Will Be Appropriate

ESRI Whitepaper: 
**ArcGIS Enterprise Security: Delivering Secure Solutions**

Application Design: Lessons Learned

✓ SOA Versus N-tier:
  – SOA can have performance impacts that need to be evaluated

✓ Reduce ‘Moving Requirements’
  – Avoid A Process Which Lets You Change Anything On the Basis that "Change Is Free"

✓ Promote Communication Between Design Team And Customer
  – Involve Design Team Early (Even During Requirements Phase)
Application Design: Best Practices

- Use Or Build An Enterprise Application Framework
- System Architecture:
  - Use SOA For Legacy System Encapsulation and Inter-departmental Services
  - Use N-tier Or Client/Server for Transactional Processing and Authoring
- Web Services
  - Start Out With Secure Web Services – WS-security
  - Encapsulate Legacy Systems And External Systems
- GIS / ArcSDE Security
  - Use ‘Direct Connect’
  - Use ‘Role-based’ Security Configuration
- Use A Structured Methodology
- Avoid Analysis Paralysis
  - Endless Debate About Whether to Use includes or extends In Your UML
- Hold Regular Design Reviews With the Users
- Design Must Trace Back To Requirements
### Enterprise Application Development Activities

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This table outlines the various activities involved in enterprise application development, categorized into strategy, analysis, design, development, deployment, and operations and maintenance.
Enterprise Application Development: Overview of Activities

Development Activities

- Establish Teams
- Establish Automated Build and Install
- Establish Source Code Control
- Establish Bug Tracking
- Test
- Code, Build, Install
- Release
- Produce Documentation
- Implement Guidelines and Standards
- Load Test Data
- Configure Test Databases and Servers
- Establish Enterprise Application Framework
- Configure Development Environment
- Establish Source Code Control
- Load Test Data
- Implement Guidelines and Standards
Enterprise Application Development: What is Special About Enterprise Development?

- Enterprise Systems are Large and Often Complex
  - Leads to Large Development Teams
- Will Interact with Existing Production Systems
  - Must be Rugged and Reliable
  - Must be Secure
- Will Be Maintained Over Multiple COTS Releases
  - Must Stand the Test of Time
- Rigorous and Formal Development Processes Required
Enterprise Application Development: Establishing the Development Process – Essentials (Before Coding)

Focus Is On Core Processes First:
• Establish Fully Automated Builds and Install
• Establish Source Code Control
• Establish Bug Tracking System

• Consult Joel on SW
  http://www.joelonsoftware.com/articles/fog0000000043.html
  • (The Joel Test, 12 Steps to Better Code)
Enterprise Application Development:
Establishing the Development Process – Essentials (Before Coding)

• Configure the Development Environment:
  – I.D.E. and 3rd Party Components
    • Special Controls, Reporting and Charting Tools, etc
    • Can Be Organizational Issue (i.e. a Standard Toolset already in place)
  – Target O.S., COTS Software
    • Developing on Beta or Release?
  – Web Server, Servlet Engine, RDBMS, RDBMS Client installs

• Recommendation:
  – Establish a Project Website and/or WIKI
  – Document Development Set-up Instructions
  – Document Tricky Configuration Procedures
  – Document/Explain Special Coding Tips/Techniques
  – ……

Best Practices
Enterprise Application Development: Summary and Best Practices

- Develop a Team Structure that Can Support and Sustain the Coding Effort
  - Avoid Overloading Your Developers

- Invest in Automation Of Processes
  - Build, Install, Database Loading, Etc.

- Establish a Project Website And/Or Wiki For Documentation Of:
  - Configuration Info, Development Set-up, Tips, Etc.

- Minimize Interruptions to Your Development Team

- Use An Enterprise Application Framework for Implementation
## Deployment Activities

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Deployment Activities: Overview

Deployment Activities

- Develop SW Configuration Mgmt Plan
- Develop Detailed Deployment Plan
- Procure Hardware
- Develop Detailed Test Plans
- Test Data & Applications in Test Environment
- Install SW and Data in Test Environment
- Fix Defects
- Develop Technical Support Plan & Materials
- Develop Training Plan & Materials
- Install & Test Released SW & Data in Staging Env.
- Install Released SW & Data to Production Env.
- Deploy Training
- Deploy User Support
- Conduct Site Acceptance Testing
- Go Live
Deployment Activities: Configuration Management

• A Set of Procedures to Control Changes to the Project During All Phases of the Software Lifecycle
• Typical Activities Include:
  – Identification of Deliverables Subject to Configuration Management
  – Creation of A Source Code Repository and Documentation Library
  – Identification of Change Request Procedures
  – Definition of Problem Report Procedures
  – Identification of Variances Between Development and Deployment Environments
  – Write It Down > Software Configuration Management Plan

Change Control is Especially Important if Working with Multiple Development Teams – Must Have a Single “Gatekeeper” to Approve CM Changes During Deployment
Deployment Activities: Configuration Management

- Software Upgrade Requests Should Be Documented
- Installation Packages Should Be Developed Early In the Project Lifecycle
- Data Model Must Be the Same In Each Environment
  - Restrict Data Model Access and Track Changes For Each Release
    - Consolidate Data Model Updates To Designated Team Member(s)
    - Review Data Model Plans/Changes To Ensure Consistency, Performance And Integration
    - Track Requested Data Model Updates To Verify Changes Were Implemented Correctly
    - Update Data Management Plan Documentation For Each Software Release
Deployment Activities: Quality Assurance

• 2002 Study\(^1\) by the National Institute of Standards & Technology found:

Software bugs, or errors, are so prevalent and so detrimental that they cost the U.S. economy an estimated $59.5 billion annually.

Although all errors cannot be removed, more than a third of these costs, could be eliminated by an improved testing infrastructure that enables earlier and more effective identification and removal of software defects.

\(^1\) NIST Planning Report O2-3, The Economic Impacts of Inadequate Infrastructure for Software Testing
Deployment Activities: Deploy and Test Incremental Releases

- Start deployment and testing early on, re-test after fixes or changes, plan for adequate testing and bug fixes
- Early testing ideally includes unit testing by developers and built-in testing and diagnostic capabilities

**Benefits**

- Early deployment planning and implementation
- Early code integration
- Staged and smart regression testing
- Functional prioritization
- Mitigates impact of schedule creep

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Deployment Activities: Summary of Best Practices

- Recognize that Deployment is Harder than It Looks
- Use a Source Control System
- Implement a Quality Assurance Review Program
- Regularly Deploy and Test Incremental Releases
- Create and Test Installation Packages
- Well Tested Software is Easier to Deploy
- Start Planning Early
- Develop a Deployment Checklist
- Know Your End User Audience and Target Training and Supporting Documentation To Meet Their Needs
# Operations & Maintenance

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*The Project Lifecycle Does Not End With Deployment!*
Operations & Maintenance Activities:
User Support Considerations

• How Many People Are You Supporting?
• What Are Their Geographic Parameters?
  - Domestic or International?
  - What Time Zones Are They In?
• Will You Provide 24/7 Support?
• How Do You Select Your Support Staff?
  - From Internal Personnel?
  - Use Outsourced Professionals?
  - A Combination of The Two?
• What Applications Do You Support?
  - Commercial Off The Shelf?
  - Custom Applications?
  - Third-party Configurations?
• What Support Infrastructure Already Exists in Your Organization?
Operations & Maintenance Activities: User Support

• Tiered Support Model
  – Tier 1: Help Desk
    • Solves Issues Internally
    • Directs Issues To Tier 2 Or Tier 3
  – Tier 2: Domain/Technical Knowledge
    • Internal Expertise
    • External Expertise
    • Directs Issues To Tier 3
  – Tier 3: Vendor Support
    • Standard Level Support
    • Extended Level Support
Operations & Maintenance Activities: Performance Monitoring & Tuning

- Establish a Performance Baseline
- Define and Measure Performance Metrics Based on Business Processes Not Button Clicks
- Plan For System Tuning After Each Installation
- Develop Administrative Procedures to Automate System Tuning
Operations & Maintenance: System Administration

• Regular Geodatabase Maintenance is Required
  – Monitor Statistics
  – Manage Your Versions
    • Reconcile and Post Edits as Frequently as Possible
    • Delete Unnecessary When Possible
    • Compress the Database on a Regular Schedule
  – Use SQL Scripts to Perform Nightly Tuning of an ArcSDE Database
    • Rebuilds All Indexes Owned By Any User That Owns SDE Data

• Treat Your GIS As You Would Any Other IT System In Terms Of Disaster Recovery and Business Continuity Planning
Operations & Maintenance: Software Maintenance

• Enhancement Requests
  – Need to Be Prioritized and Approved By the Change Management Board
  – Regression Test After New Capabilities Are Added
  – Plan For Beta Releases and Hands-on User Review – Before Going Live
  – Allow Time to Implement Required Changes After Beta Reviews
  – Train the Users to Use New Capabilities
  – Provide Refresher Training in Key Problem Areas
  – Allow Enough Time Between Releases
    ~6 Months For Major Releases

• COTS SW Upgrades
  – Evaluate New Releases to Determine If There Is a Business Need to Upgrade
  – Consider the Impact of Upgrading Your Geodatabase Before Upgrading
  – Evaluate Compatibility Of Upgrades To 3rd Party SW Before Implementing i.e. Do Not Upgrade Your RDBMS Without Evaluating the Impact On ArcSDE
  – Regression Test New Releases Within Your Test/Development Environment First

Best Practices
Summary
Summary of Best Practices for Planning and Managing a GIS

- Communication, communication, communication
- Start With a Clearly Defined Vision and Success Criteria
- Identify and Monitor Risks
- Use a Phased Approach
- Involve the Users and Key Stakeholders Early and Often
- Manage Change
- Pilot your Geodatabase Migration
Summary of Best Practices for Planning and Managing a GIS

- Use a Structured Development Methodology
- Don’t get too focused on technology and cool stuff – make it business relevant
- Assign a Dedicated Configuration Management Team to Manage the Development, Test, and Staging Environments
- Hire or Train a Skilled Geodatabase Administrator
- Plan for Post-Deployment User Support
- Communication, communication, communication
Additional Resources

- ESRI Project Center Website
  - http://support.esri.com/projectcenter
- ESRI Enterprise Advantage Program
- ESRI Systems Integration Web Site
- ESRI Developer Network
  - http://edn.esri.com
- ESRI Professional Services
- Project Management Institute
  - http://www.pmi.org
Additional Resources

• Doug Rosenberg (primary author)
  – Use Case Driven Object Modeling with UML
  – Agile Development with Iconix Process

• Grady Booch
  – Managing an Object Oriented project
Questions?

Please Fill Out Your Evaluation Forms

Thank You!