GIS
The Geographic Approach for the Nation

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ESRI Mobile GIS Solutions

Bonnie Stayer
Tom Swanson
Outline

- Mobile GIS overview
- Considerations for mobile GIS
- ESRI Mobile GIS solutions
  - ArcPad
  - ArcGIS Mobile
  - ArcLogistics Navigator
  - ArcGIS Engine
  - ArcGIS Server Web API
- What is coming next
- Q & A
Mobile GIS Overview
ArcGIS addresses common organizational needs

Using ESRI technology with partner solutions

A Complete Integrated System

Data Management
Store, manage, & maintain accurate asset records

Planning & Analysis
Transform data into actionable intelligence

Field Mobility
Get information into & out of the field

Operational Awareness
Disseminate knowledge where & when it’s needed

Reducing the time, cost, and complexity of implementing GIS solutions across an enterprise
Why use mobile GIS?

- **Improve field productivity**
  - Use maps to make decisions
  - View location of real-time information
  - Route and navigate using maps

- **Maintain operational data**
  - Inspect assets
  - Collect accurate locations
  - Capture observations
  - Record events

- **Facilitate accurate operational awareness**
  - Real-time locations
  - Wireless synchronization
What is a mobile GIS?

- Technology for deploying GIS to mobile devices
  - Make decisions using maps
  - Navigate to map locations
  - Collect new map features
  - Inspect and maintain data
Mobile GIS Challenges

• Take information in and out of the field
• Many different mobile GIS applications
• Each with unique requirements
• Rapidly developing technology

• Trade-offs
  – Capabilities
  – Price
  – Size
  – Ruggedness
  – Weight
  – Battery life

One size does not fit all
Considerations for mobile GIS
Considerations for mobile GIS

- What do my field workers need to do?
- How many field workers do I have?
- What existing technology do I have?
- What are my existing business systems?
- What capabilities/resources do I have?
What do my field workers need to do?

- **Accurately locate new assets**
  - Submeter or subfoot post-processing solution

- **Inspect the condition of existing assets**
  - Mobile mapping tool for non-GIS trained field workers

- **Sketch out a plan or design on site**
  - Tablet experience with a set of geographic design tools

- **Access maps online from anywhere**
  - Location-based service application for mobile devices

- **Deliver packages to customers**
  - In-cab navigation system for truck drivers
How many field workers do I have?

- **GIS Analysts or designers in the field**
  - Individuals or small workgroups
  - Small numbers; pre-loaded

- **Inspectors or delivery staff in the field**
  - Large fleets or teams part of operations
  - Large numbers; wireless

- **Consumers, citizens, or executives**
  - Potentially very large
  - Unknown numbers
  - Location-base access
What existing technology do I have?

- Do I have existing devices? What types are in use?
  - Windows-based devices used in enterprise
  - Come in many shapes and sizes

- Windows laptops and tablets
  - Powerful, but heavy devices
  - External power source is critical
  - Ideal for vehicle-based deployments

- Windows handheld devices/phones
  - Lightweight, but limited in capability
  - Longer battery life
  - Can be rugged for outdoors
  - Ideal for foot-based deployments
What are my existing business systems?

• Paper or tablet-based systems
  – Forms, cards, map books, spreadsheets, etc.
  – Improve on them with intuitive forms and digital maps

• Geodatabase systems
  – Shapefiles or full geodatabase models
  – Geo-centric/Geo-enabled mobile applications

• Other enterprise systems
  – ERP, CRM, CAD, EAM, etc.
  – Requires custom integration and workflows
  – Build custom geo-enabled applications
What capabilities/resources do I have?

Understand your organization's capabilities

Do I have operations staff to plan and manage the system?

Do I have trained GIS analysts to configure and setup maps?

Do I have field support staff to resolve any issues?

Do I have developers to make customizations or build what I need?

Once operational, do I have processes in place to use data, make decisions, and improve the system?
ESRI solutions for Mobile GIS
ESRI solutions for Mobile GIS

ArcGIS Mobile
Smartphone, Pocket PC, & Tablet PC

ArcPad
Pocket PC & Tablet PC

ArcGIS Desktop & ArcGIS Engine
Tablet PC

ArcLogistics Navigator
Pocket PC & Tablet PC
## Ideal use case - ArcPad

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ArcPad

• Standalone out-of-the-box mobile GIS application for field mapping and GPS/GIS data collection

• Used by GIS Analysts
  – Familiar ArcGIS user experience
  – Extensive GIS and GPS tools for analysis and editing
  – Partners provide subfoot GPS solutions

• Target platforms
  – Windows Mobile
  – Windows XP, Vista, and 7

• Over 100,000 users worldwide
ArcPad GIS and GPS Tools

- View and navigate GIS data
  - Vector, raster, StreetMap, photos, graphics
- Collect new GIS features
- Update and edit existing GIS features
- Edit inspection data (related tables)
- Search for GIS features
- Use data capture devices
  - GPS, rangefinders, cameras
- Geocode and route using StreetMap
- Use GPS for basic navigation
- Synchronize with geodatabase via ArcGIS Desktop or ArcGIS Server
ArcPad Studio

- Development environment for customizing ArcPad
- A desktop application that is included with ArcPad 8

ArcPad Customization Spectrum

No programming skills required

Simple Toolbars, Basic data capture forms, Query forms

Scripted Forms & Applets

Extensions

Increasing Skill

Sub OnForward
    Dim E, T
    Set E = Extensions("TIME")
    T = E.Escape("gettime")
    T = T + 10950
    Call E.Escape("settime", T)
    Applet.Forms("frmMain").Pages("pagMain").Controls("lblTime").Value = Now
End Sub
GeoCollector

- An end-to-end GIS and Professional GPS solution from ESRI and Trimble (U.S. and international)
- Bundle includes a Trimble GeoExplorer 2008 Series professional GPS handheld device in a choice of 3 accuracies:
  - 1 to 3 meter
  - Submeter
  - Subfoot
- Device is pre-loaded with:
  - ArcPad
  - Trimble’s GPScorrect extension for ArcPad
- Optionally includes a license of GPS Analyst extension for ArcGIS Desktop
ArcPad Resources

- Product information page
  http://www.esri.com/arcpad
- ArcPad Team Blog
  http://arcpadteam.blogspot.com/
- ArcPad Support Center
  http://support.esri.com
- ArcPad Web-based Help:
  http://webhelp.esri.com
Demonstration
ArcPad
## Ideal use case – ArcGIS Mobile

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ArcGIS Mobile

• Workforce automation solution

• Ideal for field inspectors and observers
  – Task-based user experience
  – Requires minimal training
  – Access projects remotely

• Target platforms
  – Out-of-the-box for Windows Mobile
  – SDK for Windows XP, Vista, and 7
ArcGIS Mobile

• **ArcGIS Mobile compliments ArcGIS Server**
  – Included with ArcGIS Server Advanced
  – Deploy maps and GIS tasks to mobile workers
  – Rapid data collection and inspection workflows

• **ArcGIS Mobile consists of:**
  – Windows Mobile Application
  – .NET 2.0 & Compact Framework Runtime
  – ArcGIS Server mobile data web service
  – Visual Studio Software Development Kit
ArcGIS Mobile Out-of-the-Box Application

• Task-driven user experience
  – Configurable using Server Manager
  – Locally cached mobile maps
  – Collect, inspect, & delete features
  – Wireless synchronization

• Target Operating Systems
  – Windows Mobile 5
    • Pocket PC & Smartphone
  – Windows Mobile 6
    • Professional, Classic, & Standard
ArcGIS Mobile Application Tasks

- View and navigate maps
- Collect new GIS features
- Update existing GIS features
- Synchronize with GIS Server
- Use Global Positioning System
- Search for GIS features
- Manage a work list
- Check device status
ArcGIS Server Manager

• Use ArcGIS Server Manager to
  – Serve mobile maps
  – Create and configure mobile projects

• Server Manager is a host for
  – Deploying mobile projects
  – Deploying mobile applications
  – Serving mobile maps
ArcGIS Mobile Geoprocessing tools

• **Create Mobile Base Map Tool**
  - Creates a Base Map Data Set to be provisioned on mobile devices as base map layers
  - Support large base map datasets

• **Generate Mobile Service Cache Tool**
  - Creates a mobile service cache for all operational layers
  - Uses published mobile web service as input and extracts layers
ArcGIS Mobile SDK and Runtime

- Build mobile GIS applications for ArcGIS Server
- Coarse-grained set of components
- Ideal for mobile mapping and workforce automation
- SDK part of ArcGIS Server and EDN
- Windows Mobile 5/6 and Windows XP/Vista
- .NET 2.0 & Compact Framework
ArcGIS Mobile SDK: Core Components

- Geoprocessing Service
- Network Analysis Service
- GeoData Service
- Mobile Service

ArcGIS Server

Mobile Service URL

Mobile Service Cache

MapActions

- Feature Layer
- Annotation Layer
- Raster Layer
Real world ArcGIS Mobile Applications

- Oakland County → Animal License inspection
- City of Dover → NASCAR event situational awareness and field inspections
- Loma Linda University Medical → Professional Services developed mobile solution for Medical Center providing Advanced Emergency GIS to field staff
- City of Buffalo → Fire safety teams using maps in vehicle for observations
- Broward County → Sign inspections by infrastructure team
- BaySF Germany → Forestry observation and mapping for Bavarian Forestry
- Charlotte-Mecklenburg Utilities → Water Utility redlining application designed for on-demand secure access of maps and designs
- PIDPA, Netherlands → Utilities data collection and inspection workflow
- LA Dept of Transportation → Traffic Event Data Management: Collect Parking Sign, Parking Meter, and Curb Zone location, attributes, and photographs
- Miner & Miner → Utilities response application for Tablet PCs
Demonstration
ArcGIS Mobile Application
ArcGIS Mobile SDK
ArcGIS Mobile Workflow - Recap

1. Build Mobile GDB
2. Author Mobile Map
3. Publish Mobile Service
4. Secure Service/Transmission/Device/Data
5. Design Mobile Application
6. Build Data Deployment Packages
7. Deploy Mobile Solution
8. Synchronize Mobile Solution
# Ideal use case – ArcLogistics Navigator

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ArcLogistics Navigator

- Logistics and navigation solution
  - Download stops from ArcLogistics Desktop

- Ideal for fleet operators and staff
  - Pre-loaded with street datasets
  - Familiar in-car navigation experience
  - Includes voices for audible turn-by-turn directions

- Target platforms
  - Windows XP, Vista, or 7 laptops
  - Windows Mobile handhelds and phones
ArcLogistics Navigator Workflow

• Send optimized stops, route path, barriers and restrictions from ArcLogistics desktop

• Provide drivers with door-to-door directions while honoring logistics-specific road attributes
Demonstration
ArcLogistics Navigator
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ArcGIS Engine

- **ArcView, ArcEditor, ArcInfo capabilities**
  - Advanced editing and mapping
  - Full geodatabase support
  - Network and spatial analysis tasks
  - Routing, network trace, buffer
  - Connect with ArcGIS Server
  - NMEA GPS for map navigation
  - Tablet support for digital pen and ink

- **Comprehensive development options**
  - Build mobile GIS enabled applications
  - COM, .NET, Java, and C++
  - Laptops and Tablet PCs
ArcGIS Engine Applications

- Gas Pipeline Maintenance
- Land Records/Mapping
- Public Works Management
- Mapping/Sketching
- Fleet Management
- Utility Work Orders
- Service Technician Routing
- Water/Waste Water
# Ideal use case – ArcGIS Server Web API

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ArcGIS Server Web Mapping APIs

- Location-based services
- Ideal for application developers
  - Cover many types of devices
  - Target your consumers/citizens
- Target platforms – many!
  - Native applications for devices
    - REST and SOAP services
  - Web applications for browsers
    - JavaScript, Flex, and Silverlight APIs
What’s Coming in ArcGIS 10
ArcGIS Mobile for Windows

Application for a new platform

- Task-centric application
- Designed for Windows “Touch” devices
- Consolidated Settings menu
  - Day/Night skin
  - Application Brightness
- Integrated keyboard
Mobile Project Center

Centralized project management

- Application for Field Managers to create and manage mobile projects
  - Replaces Server Manager Wizard

- Projects contain mobile maps, tasks and capabilities
  - Add Operational and Base Map layers
Deploying Mobile Projects

- Projects are stored in Catalogs inside of a Project Library
- Project Libraries located on a web server or a file system
ArcGIS Mobile Geoprocessing Tools

Prepare and provision data packages

- Extract Mobile Cache
  - Creates a mobile cache from an input map document

- Check In Mobile Cache
  - Uploads edits from a cache to your geodatabase via a map document
Working with Maps

View Map task

• Maps consist of:
  – Operational Map Layers
  – Base Map Layers
    • Street Map
    • ArcGIS Server Map Cache
    • ArcGIS Online Map Service
    • ArcGIS Server Cached Map Service

• Map Navigation
• Layer Visibility
• Browse map features
• Identify Map Features
• Measure distance, area, features
• Dim Base Map
Collect Features

• Collect objects
  – Feature Types

• Guided workflow
  – Collect Shape
  – Collect Attributes

• Shape collection methods:
  – Using Map
  – Using GPS (Averaging/Streaming)
  – Using XY

• Attribute collection:
  – Field captions
  – Edit controls
  – Photo Capture
  – Field validation
  – Repeat attributes
Query/Search Data and work lists

- Search based upon feature types or layers
- Define search criteria
- Manage results in work lists
- Save searches
- Deploy searches to field workers
Field Crew Management

• Field Crew Logging
  – Log at set time or distance interval
  – Uses GPS positions to log
  – Logged location includes date/time stamp
  – Silent/Invisible to field worker

• Field Crew Task
  – View crew by distance/time
  – Browse their location on map
  – Call, SMS, email crew members

• Sign In
  – Set user identity
  – Create new user identity
Synchronizing Data

- Post data
- Get data
  - Choose layer(s)
  - Choose extent

Posting Changes to Server:
- Post auto-sync options
  - When data changes
  - When cradled/connected
  - When features change
Extend ArcGIS Mobile Field Applications

- **Create New Tasks**
  - Embed business logic and workflows
  - Your tasks appear on the Task List Page
  - Deployed within Projects via MPC

- **Add/Change Capabilities of Existing Tasks**
  - Customize existing task workflows using extensible points of tasks

- **Extend the Application**
  - Advanced development
  - Ex. GPS capabilities

![Task workflow diagram]
Key Mobile SDK Improvements

- Improved map display (anti-aliasing)
- Improved indexing and cache performance
- Local support for Tiled Map Caches
- Tiled Map service support
- Export/Import a diff gram from a cache
- Improved projection/transformations support
- Robust serial port GPS implementation
- Improved Synchronization
- WPF Namespace
- Much more...
ArcGIS for iPhone

- Out-of-the-box application available from App Store
- SDK built on Objective C/Cocoa
- Integrates with ArcGIS Server services
- View cached basemaps and dynamic data
- Create new data to be shared
Resource Center

ArcGIS Resource Centers

ArcGIS Server
ArcGIS Server allows you to publish geospatial services and tasks.

Products
- ArcGIS Desktop
- ArcGIS Server
- ArcGIS Engine
- ArcGIS Explorer
- ArcGIS Mobile
- ArcIMS
- MapIt

Functions
- ArcGIS Online
- Geoprocessing
- Geodatabase & ArcSDE
- Image Management
- CAD Integration
- Mapping & Visualization
- Map Templates
- Enterprise GIS
- SharePoint

User Communities
- Water Utilities
- Java
- Public Safety
- Land Records
- Arc Hydro
- Public Works

Solutions
- Business Analyst Suite

resources.esri.com
Questions?