Implementing Geographic Workflow Assignment for State and Local Government

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Abstract

Geography plays an essential role in assigning people to tasks in many government agencies. Who does building inspections in the Wilburton neighborhood? Who gets assigned to fix a water meter at 2815 Second Avenue? Paper maps used to be the answer, sometimes created by GIS. Recently, agencies have begun to automate staff assignments by linking ArcIMS with their permit, inspection, and workflow automation systems. Inspection requests get assigned immediately. Citizen complaints received overnight are assigned and waiting for staff in the morning. And agencies provide more responsive customer service by making GIS part of their workflow.

Introduction and Problem Statement

As a planner, software developer, and consultant to city, county, and state agencies for more than 20 years, I’ve been perplexed about the slow integration of GIS into the fabric of agency business processes. While many jurisdictions have GIS, it’s used primarily as a set of on-line maps. For example, a planner typically determines who must review and sign off a new subdivision application by looking at GIS maps of floodplains, steep slopes, earthquake fault zones, soil conditions, etc. But it’s rare for the GIS to perform such determinations automatically, while the application is being entered into the permit system. Ideally, when GIS is an automatic part of workflow, the system could make the necessary determinations automatically, and route the application to Surface Water Management for floodplain review, require a slope density analysis for the steep slopes, and require a geotechnical study for the fault zones.

In another context, a large city or county typically fields dozens of inspectors, performing hundreds of inspection requests daily. It’s a constant juggling act to assign people, balance workloads, and deal with problems that crop up during the day (vehicles break down, inspectors get sick, contractors are late, etc.). But at the end of each day, you’ve promised these customers that their requests will have been completed. Ideally, GIS should give supervisors and managers the tools they need to assign inspections and other field work geographically, and to help them manage visually the completion of each day’s work roster.

The Move Toward Integration

In the last 3-4 years, GIS has become an increasingly important part of automated workflow processes, for several reasons:
The tools provided with ArcIMS, particularly its ability to communicate with other applications via XML, have made it much easier to link GIS with permit management, work order, and other workflow systems.

Integration can help avoid problems caused by staff forgetting to check maps or misinterpreting map data in deciding what kinds of reviews are needed. For example, if a planner forgets to check maps to see that a proposed industrial park in an old coal mine subsidence hazard area – and buildings are subsequently damaged by subsidence – the jurisdiction could incur substantial liability. But if an automated system could sift through many layers of geographic data and alert staff to the need for the review, potential problems could be dealt with early in the review process.

Integration can reduce time and travel costs for inspectors and other field workers who must make multiple stops each day. Supervisors and dispatchers who can visualize a full day’s workload can assign staff in a more efficient manner.

Integration can provide dispatchers, supervisors, and managers with better oversight of fast-changing processes (such as daily inspection requests), and allow them to adjust quickly when problems occur.

Integration can improve the ability of a jurisdiction to cope with major natural disasters that require coordinating large groups of people to deal with the event.

Example Solutions

The following examples highlight four solutions built by Accela, that implement geographic workflow in different ways using ESRI products.

Automatic Enforcing of Geographic Business Rules

Figure 1 illustrates how the automatic, “silent mode” capability of Accela GIS, working with the Accela Automation permit system, can help enforce an agency’s business rules. In this instance, a clerk at the permit counter is taking in a zoning application for a new halfway house. The jurisdiction’s zoning code places special restrictions on halfway houses located within 1000 feet of a school or daycare center. Normally, a clerk or planner would have to check the proximity manually on a paper map or GIS screen. But the system automatically performs the 1000 foot buffer operation, determines that one or more schools or daycare centers are within 1000 feet, and automatically places a hold on the application for further review.
Geographic Staff Assignment

Figure 2 below illustrates an ArcView extension that assigns inspections and other geographic-district-dependent activities with the Accela Tidemark Advantage permit system. Green dots mark the locations of new building permits, yellow - business licenses, and red - code violations. Superimposed is a series of inspection district layers. An inspection supervisor can pull up the GIS to visualize the locations of the day’s inspection requests, assign them based on the default districts, and make individual reassignments to balance work load. By adding the appropriate geographic district layers, the same program can be used to assign new applications to planners, work orders to repair crews, or any other types of activities that might be assigned by geographic district.
Broadcast Assignment of Work Activities

Figure 3 below illustrates how GIS tied to workflow can be used to initiate new work orders, field inspections, and other activities that do not already exist in the permit system. For example, a large city has just experienced an earthquake. Preliminary reports suggest significant damage in one neighborhood located on old landfill along the shore of a lake. Using Accela GIS in conjunction with the Accela Emergency Management System (ERS), an emergency dispatcher can highlight the neighborhood in GIS, and automatically create inspection work orders for every address in the neighborhood. Inspectors can receive the work orders using field computers equipped with Accela Wireless inspection software. Inspection results are submitted back to ERS, and are displayed in real time in GIS.

The same principals can be applied to the geographic distribution of other work tasks. For example, a supervisor could select all the fire hydrants in an area that have not had fire flow tests in the last two years, and initiate work orders for crews to perform the tests. Or a code enforcement supervisor could select specific areas in a neighborhood for graffiti-control inspections.

Neighborhood Feedback

Effective zoning, land use, and policy decisions depend on soliciting feedback from neighborhood groups and citizens. Figure 4 shows the “What’s Happening In My Neighborhood” part of the Web site for the City of Overland Park, Kansas (http://gis.opkansas.org/website/what_haps/). Built on ArcIMS and Accela Tidemark Advantage and eConnect, the site lets users enter their home address and desired search radius, to retrieve listings of all active Planning Commission cases, special event permits, building permits, and Public Works projects. Users can click on each case number for more detail from the permit system, and click further to send email and comments directly to the project manager for the
Users are thrilled when automated links between GIS and the permit system can reduce the time it takes to perform difficult tasks, provide more insight into how geography affects the activities they perform, and help them avoid mistakes. But they sometimes assume the system will be all-seeing and all-knowing, obviating the need for a knowledgeable person to make a well-reasoned decision. Systems and data are always imperfect. Below are some design considerations that can help an automated system perform as an ally in the review process, not as a replacement for informed human judgment.

- When using GIS to make automatic determinations that could affect major zoning, land use, or policy decisions, use the system as a safeguard, not the final decision-maker. Use the geographic workflow to set warnings or holds and to notify key people to take more specific action – not to make the final denial.
- Design the permit system to keep a record of the date and time the automated system made its determination, in the same way that you would record when a human employee made a decision. For example, in the halfway house example, let’s say there were no schools or day care centers within 1000 feet at the time the determination was made. Subsequently, a day care center opened two blocks away from the halfway house. Angry neighbors demand to know why the city approved the halfway house, but the record in the permit system would clearly show that the correct determination was made at the time of the original approval.
- When using buffer distances to do workflow determinations, be aware of the details of what the law, ordinance, or regulation requires. Is the buffer distance measured from the property line of
the lot on which the activity will take place? From the outline of the building envelope? From the entrance to the building? From the boundaries of all contiguous parcels owned by the applicant? It’s important to be procedurally correct.

- Be aware of the implications of false negatives in automated workflow determinations. For example, a new building is damaged by settlement, but was not required to undergo geotechnical review, because the soil map layers in GIS were inaccurate. One idea to help prevent such false negatives is to build in an extra buffer distance around potentially inaccurate hazard features. In such cases, the system could advise that a review is needed, but a qualified staff person would make the final determination.

- Allow for user override – but keep a record of any overrides. For example, the automated system could set a hold to require special engineering of a septic system, based on problem soils identified in GIS. But an authorized staff person should be able to say, “I know that area and there’s no problem here”, and release the hold with an explanation of why the hold is not applicable.

- When setting up assignment district boundaries in GIS, be sure there are no gaps or overlaps in the set of districts covering the jurisdiction or service area. This will help avoid lost inspections that fall in a gap between districts or duplicate inspections that get assigned in two overlapping areas.

- When broadcasting or assigning work activities, use dynamically-generated themes from information in the permit system to increase the user’s understanding of the situation. For example, if a city uses wireless inspection devices, inspectors can instantly update the database when each inspection is completed. A dynamic theme is created in GIS for “all of today’s inspections by inspection status”, with incomplete inspections as red dots and completed inspections as green dots. The map starts out all red in the morning, slowly turning green as inspections are completed. By mid-afternoon, the inspection supervisor can quickly see how many requests remain to be done by looking at the remaining red dots.

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