Title: As a Citizen, I want a system that is comprehensive and easy to use.

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Introduction
NWMaps.net, a flagship service of the eCityGov Alliance, empowers customers to view and research community information either within a single city or across jurisdictional boundaries. Information is aggregated both by geography -- information from the twelve participating cities is combined into a single database and thematically -- and by subject. The service also accommodates both users who prefer information presented as a tabular report and those who like to interact with a map.

The cities within in the service area form a “suburban crescent” around Seattle in the Central Puget Sound area including: Bellevue, Bothell, Issaquah, Kenmore, Kirkland, Mercer Island, Renton, Sammamish, Shoreline, Snoqualmie, Tukwila and Woodinville (Figure 1.). Many of the cities are experiencing high growth in residential and business activity and enjoy significant immigration from out of the area. All of the cities are pressed for money and staff time. They vary widely in size (from a few thousand citizens to over a hundred thousand citizens), and they also vary widely in the relative funding and sophistication of their GIS programs. Citizens in the region are from all over the world, and many work in technology and aerospace. The greater Seattle area, of which the Alliance cities are part, is a port city with a very diverse economic portfolio and many strong businesses sectors.

Figure 1. NWMaps.net Service Area
Many government mapping systems are harder to use than Google or Bing Maps. They’re built with the best of intentions, but they often offer a cornucopia of choices that only a few users really understand. Some use the stuffy language of bureaucracy. Others use the technical language of GIS professionals. The eCityGov Alliance – a group of governments working together - set out to create something better. Something that started with easy stories and themes, and captured the work people actually want to do.

The Alliance had a regional mapping portal available for about a decade. It was hard to use. It had buttons with symbols on them that meant far more to the GIS-literate than the student or homeowner. The user interface was blocky and less intuitive than commercial products. The statistics for user counts were anemic. So they set out to create a new portal that the public would love.

They began with user stories: descriptions of what people actually wanted to do. Samples include “I want to find the nearest park to my house.” And “I want to know what’s going on two blocks over where the construction cranes are setting up.” These stories evolved into themes, which are the core organizing tool for NWMAPS.net. Examples of themes are “Parks and Trails” and “Commercial Property.”

NWMAPS.net is a highly interactive mapping tool that provides property and community information, such as the location of active building permits, for rent/lease commercial property, local landmarks, public facilities, schools, environmental areas, parks, trails, as well as zoning and County tax assessor information.

In the past finding this type of information required separate searches on individual city and county websites. With the twelve participating cities, covering close to 150 square miles, customers can quickly locate a variety of property related information through a single web site. NWMAPS.net leverages and integrates data from several eCityGov Alliance information services, including NWProperty.net, MyBuildingPermits.com and MyParksAndRecreation.com.

Themes allow users to easily retrieve related layers of spatial data. For example, if a homeowner wants to establish a home- based business, he/she can enter an address and select the Zoning and Property theme to quickly retrieve and access data and information relating to the parcel. The system goes beyond reporting on zoning and permits, traditional uses of GIS technology. “It provides a lot more information than our first version,” says Darci Donovan, a permit center manager with the City of Sammamish, Washington. Residents will be able to use the system to determine their utility service districts, school district, voting district and census data for their community.

One new visitor to the website commented, “It’s extremely easy to use, and it’s cool that so much information is available in one place. I use this information all the time for my job. I will definitely be going there often.”

While the project was a technical success and well received by users, the real story of success is in the collaboration that went on between the Alliance member cities. This is especially remarkable in light of the efforts that went into setting standards, pulling data together, and making design decisions. There are some lessons to share around how large, complex, multi-jurisdictional efforts can be pulled off.
eCityGov background

History of the Alliance
In 1999, a group of local city managers sensed growing interest in government services moving on to emerging Internet technologies. The managers saw this as an opportunity but also recognized the fiscal and resource constraints.

To explore technical issues, assess organizational readiness, and gauge community support for Internet services, 23 cities conducted a joint Internet strategic planning exercise in 2000–2001 facilitated by the Alliance for Innovation (at the time known as the Innovation Groups).

Citizen and business surveys and focus groups conducted during the planning project indicated high expectations of local governments. At the conclusion, nine cities decided to move forward jointly with the development of Internet service portal projects. The partner cities reasoned that as a group they could address critical customer and resource issues more effectively. These Washington State cities formed the eCityGov Alliance as a formal interlocal agency in late 2001.

After planning work and subsequent customer focus groups, eCityGov reached the conclusion that traditional city-by-city Web sites would not meet the dual goals of (1) improved customer service and customer access and (2) lower development and implementation costs for localities. As a result, eCityGov set out to not only provide services online but to do so through an entirely new concept using cross-boundary Internet service portals.

Services provide by the alliance
The Alliance has successfully delivered a number of services over the past decade that address a variety of functional needs. Each service is used by all of the member cities. Additionally, other cities from outside of the Alliance subscribe to these services as well.

- NWProperty.net - Find commercial property for lease or sale, get offer details. (23 participating jurisdictions)
- MyParksandRecreation.com - Search and register for recreation activities, reserve park facilities (11 participating jurisdictions).
- NWMaps.net - Interactive mapping and property information (13 participating jurisdictions)
- MyBuildingPermit.com – Online permitting, status, inspection scheduling & tip sheets (12 participating jurisdictions)
- SharedProcurementPortal.com – B2G purchasing portal, six online vendor rosters (26 participating jurisdictions).
- GovJobsToday.com – Online job posting and applications (17 participating jurisdictions).

Core funding is provided by the Alliance partners and supplemented with subscription funding provided by other participating jurisdictions supports the services.
How the eCityGov model works
From the beginning, eCityGov Alliance has been a collaborative environment where the talents and insights of local government representatives are leveraged for better results. The organization conceives and implements business solutions that disregard traditional service delivery silos and replace them with seamless, cross-jurisdictional service delivery solutions focused on customer needs.

The initiative requires a high level of coordination and standardization to enable seamless access for citizens. The success of the venture depends on adhering to several key principles:

- Cost sharing is equitable.
- Risk is shared.
- Mission is not diluted.
- Include all sizes of partners
- Roles and responsibilities are clearly defined.
- Benefit is clear and direct to participants.
- Partners retain control and flexibility.
- Business drives technology.

Governance of the Alliance is three-tiered. The Alliance Executive Board is the governing body for eCityGov Alliance. The Alliance Executive Board is made up of the city manager, chief administrative officer or mayor of partner level member agencies. The Executive Board provides vision, policy direction, funding and advocacy.

Tactical oversight is provided by the Operations Board, which is a blend of Assistant City Managers and Chief Information Officers. This board reviews project plans, interacts closely with working teams and the Executive Board, troubleshoots problems, and reviews budget and project plan details.

The third level of governance includes project teams for each service. The NWMaps program is managed through a central GIS team that coordinates closely with business users. For example, from 2009 through 2011, the NWMaps team included a business team made up largely of the actual users of the themes that were developed in this first round. Future business sub-teams might include public safety, for example, if public safety is the next set of themes that are added.

The opportunities and challenges or regional collaboration

The eCityGov Alliance provides small cities access to IT solutions that they would not otherwise be able to afford with their limited resources. By pooling talent and funds, cities are able to invest in one solution that meets the needs of many jurisdictions.

[pull quote] “The City of Snoqualmie is the fastest growing city in the state, but without the cost effective online services provided by the eCityGov Alliance we would not be able to afford the cost of meeting the growing expectations of our community,” City Administrator, City of Snoqualmie.
While this approach offers economies of scale, it comes with compromise. Cities are not homogeneous and needs vary widely between a large, mature city and one that is recently incorporated and/or experiencing dramatic growth. While differences certainly exist, there is significant commonality between the information they maintain about their infrastructure and the services they need to provide their constituents.

As with most projects of any size, the biggest challenges are related to people and organizations rather than technology. Some fear giving up control by collaborating with neighboring jurisdictions. The pace and timing of decisions can be difficult within government organizations, a fact that is compounded when a dozen cities are involved. The recent recession and current slow recovery have further complicated regional projects as most governments have had to cut staff.

Some information technology departments are concerned that their roles and responsibilities were being usurped. These projects have to include appropriate IT representatives as stakeholders and be designed in a way that makes their lives easier and not more difficult.

The experience has been that resistance fades quickly as participants get positive customer feedback and become involved with the cross-jurisdictional project committees that offer great opportunities for staff development. Project meetings become highly anticipated events where creative collaboration gives participants a fun diversion from their normal routine.

In general, the findings of most participants are that regional work takes longer than doing the work alone, costs less in dollars (while costing more in time), and often yields a better work product for both the citizens and the staff. Regional work also requires strong support from management and staff alike.

NWMAPS, and all other eCityGov projects, undoubtedly benefit from a generalized commitment to working regionally. The cities cooperate on water, affordable housing, regional dispatch, transportation, and other areas. The online collaboration is supported by a history and strong framework for collaboration that has been built and nurtured over decades.

**NWMAPS.net Project Background**

**The first NWMAPS**

NWMAPS.net was originally implemented in 2003 by the City of Bellevue and transferred to the Alliance in 2005. The site was developed to provide interactive GIS and other property data for public use. The application was built using ArcIMS and was incrementally improved upon over the years though the base technologies remained unchanged.

While the original site was progressive for its time, and accomplished the goal of bringing location-based information online, it became dated as better tools and design ideas were developed in the GIS community at large. For example, it was not designed with a scalable user interface and data did not present seamless across participating jurisdictions. It proved difficult to maintain as data was updated or new datasets were added.
Goals for the re-write in terms of user benefit and maintenance efficiency

Goals for the new site were ambitious. A technology refresh was clearly needed. The Alliance also came up with a long list of requirements to ensure the new site improved upon the original and provided similar lasting value. A short summary of the Alliance goals:

- An ‘easy to use’ web mapping application that answers the primary questions asked by typical customers of city services. Information should be packaged for these questions, such that answers are quick and do not require the user to understand GIS or put forth much effort assembling the information.
- An application designed to be scalable for future enhancements and potential addition of new member cities
- Easy to maintain with reduced dependency on eCityGov Alliance staff for posting data updates; desired ability to post data independently.
- Has the ability to display data from disparate sources to provide a seamless customer experience
- Integration with other eCityGov applications such as MyBuildingPermit.com, MyParksandRecreation.com and NWProperty.net.
- Provides a system architecture that allows Alliance GIS web developers to add functionality and data sets using system tools and templates.

The Customer Profile

Citizens today expect a high level of self-service access to community information across a variety of topics. Conceptually, the customer is many people: residents/citizens, business persons, visitors and government employees. Each of these users was considered when deciding on the functional scope of the system and prioritization of features. Typical tasks these customers may be performing:

- Looking for a good community in which to raise a family,
- Conducting a quick real estate research,
- Finding potential locations to start or expand a business,
- Checking the status of a building permit,
- Facilitating a wide variety of citizen queries.

The range of customers was consolidated into a few archetype user personas used continually throughout the project. Keeping the personas constantly in the conversation helped ensure that day-to-day decisions always considered the target users and their needs.

A novel (for eCityGov) project approach

The new NWMaps.net followed the Agile Scrum software delivery framework from its inception. The application of Agile started with requirements gathering where the project team employed user stories as a means to develop the product backlog. The user story backlog was included in the RFQ used to procure a software development consultant to implement the new solution. This allowed for respondents to take a creative approach to accomplishing the user stories and portrayed the system better in terms of end user requirements versus more abstract functional requirements.
Design of the user interface followed a modern and efficient two-stage process. The first stage involved wireframing a number of user interface concept options. These were iterated on until a preferred interface layout was selected. The second stage applied aesthetic design options to the preferred wireframes and was also iterated several times.

The implementation phase of the project also followed Agile with the user stories rationalized to a feature backlog. A trace matrix was used to maintain a clear lineage from the user stories to implemented features. Three sprints were organized along logical increments of system functionality. Search and Tabular Results comprised the first sprint, Map Interaction was the focus of the second and the third sprint included the remaining features that had dependency on the product of sprints 1 and 2.

**Scope of the project in terms of internal and external data**

The new site serves the same data as the original site, adds new data sets and provides integration with other Alliance, county and commercial information services. The site is capable of accommodating future data that is desired but not currently available. Current datasets provided through the site include:

- Parcels
- Street Network
- Addresses
- Zoning
- Comprehensive Plan City/County Boundaries
- Bike Routes
- Buildings
- Landmarks
- Neighborhood
- Floodplain/Floodway
- Landslide Hazard Areas
- Liquefaction Hazard Areas
- Steep Slopes
- Water Bodies
- Streams/Stream Buffers
- Shoreline Jurisdiction Areas
- Wetlands/Wetland Buffers
- Wetland Management Areas
- Erosion Hazard Areas
- Seismic Hazard Areas
- Mine Hazard Areas
- Fish and Wildlife Habitat
- Critical Aquifer Recharge Areas
- Geology
- Soils
- City Projects
- Urban Growth Boundaries
- Schools
- School Districts
- Subdivisions
- Parks
- Voting Districts
- Trails
- Elevation Contours
- Fire Service Areas
- Police Service Areas
- Garbage Service Areas
- Power Service Areas
- Sewer Service Areas
- Storm Service Areas
- Water Service Areas
- Street Maintenance Service Areas
- Census Boundaries

Each city compiled a database that adhered to a standard template. The template was developed by the technical committee and contains core attributes. In addition to the datasets originated by the cities, the site integrates other sources via web services. Several are from
other eCityGov information services. Active permit data is provided from MyBuildingPermit.com. Detailed Park Information comes from MyParksandRecreation.com, and commercial property sale and lease information comes from NWProperty.net. Demographic summaries are provided via Esri’s business analyst online (BAO) API. King County Metro Transit provides transit routes, park and ride lots, and transit stop locations. Property details are accessed via hyperlink from the King County Assessor and Snohomish County Assessor.

One of the goals of the project was to help simplify user interaction with the voluminous data listed above. The NWMaps.net Committees noted the themes that emerged from the User Stories to group these data and associated user views into thematic groups that generally fall into the following categories:

- Property and parcel information
- Neighborhood information
- Public service providers (city, county, garbage provider, utility districts, school district, etc)
- Emergency and public safety information
- Community services and events (parks, food banks, community centers like senior center, city hall, farmer’s market)

These general thematic categories are reflected in the site structure and functionality. On the report page, individual data elements are grouped into thematic “panels”. That are re-ordered depending on the focus of the search. To simplify interaction on the map page, individual data layers are grouped along the same set of themes and can be toggled on and off, as one would expect a layer group to be.

**The Solution**
When developing user stories to help revamp the site, it became apparent that users wanted efficient access to information, and not necessarily a map. These user needs and expectations required that some functionality be built around the map to extend the experience for the user.

For example, the project team knew that many NWMaps users employ one of three things for finding information: an address, a place name or — if they are researching specific properties — a parcel number. To accommodate these three modes in a world where search engines have simplified search to a single box, the site now provides a single search box that can work with any of those three types of information. In addition, users were provided with both a type-ahead suggest feature and a search disambiguation that enables fuzzy searches and contextual results.

**Overview of the design including the site structure**
Another newly introduced element of the homepage is a "quick search" feature that allows the user to focus their search based on a variety of themes such permitting, parks and recreation, construction projects and more. This functionality involved the integration of tabular and spatial data from member city departments, other Alliance applications, agencies outside of the Alliance members and commercial sources. Once a theme has been selected, the site provides a set of contextual results that promotes relevant topics and presets a map display with
corresponding layers. For most users — what SpatialDev referred to as "the Finders" — the endpoint for the information they need is quickly reached. However there is another group of users, "the Explorers," who do not have a place, address or parcel number to start with. For them, it is better to start with the homepage's "skip this and go to map" link, which takes them to a fully featured, traditional map experience. The user can find properties of interest, select them to query, and access information in both map mode and in "report" (tabular) mode. The overall site architecture is illustrated at a concept level below (Figure 2.).

Figure 2. NWMaps.net Site Layout

Biasing results to best match the customer’s interest
NWMaps contains a wide variety of data for customers to access. In recognition of a need to avoid overwhelming the user and provide for some specific use cases, the concept of “Quick Search” was developed. Each search is comprised of a set of themes that best match a particular interest a customer may have. For example a customer may be interested in the specifics of a property with respect to its zoning, services and school districts. That person would select the “Get Zoning and Property Information” quick search and the system will promote the most relevant data themes as top results and present a map snapshot with related layers visible.

Another example is a customer looking for commercial property to lease. Choosing the “Research Commercial Property” quick search will promote the commercial property related
themes and provide a map with commercial zoning and active property listings (Figure 3.).

Figure 3. NWMaps.net themed results.

Technical features of the implementation
The eCityGov Alliance and its members are longtime users of Esri ArcGIS products. The original version of the NWMaps portal was built using first generation ArcIMS and extended with the .NET framework. For the revamp, Esri business partner, Seattle-based Spatial Development International (SpatialDev), was selected to provide a modern solution that was "future proof." The firm was tasked with creating a site that would be both easily extensible to accommodate new information themes and also sustainable with the direction of Esri products (Figure 4.).

Although they work together on joint projects through the eCityGov Alliance, each city still manages enterprise GIS programs to support individual work programs. This means that each city structures and organizes data differently in response to organizational structure, IT portfolio and enterprise priorities. To achieve an orderly federation, the revamp project’s technical committee designed a standard data model with which to normalize data into a single repository on top of which new map services are built.
Figure 4. NWMaps.net Technical Architecture.

With the new design comes a streamlined process to update data for a single city or for a single data layer within a city. New data are simply loaded as a geo-database to a central server where an automated process takes up the task of updating. The process includes validation, verification, notification, archiving, updating and finally a refresh of the map services.

**Deployment and maintenance**

Maintenance of the original NWMaps was a major pain point. In the past, a complex and largely manual extract, transform and load process was used to maintain the database. For the new site, this process was significantly streamlined with the help of a standard data model and a data aggregation process automated using python. Each member city maintains their own corporate databases, updating on their own schedules. For NWMaps, major updates are scheduled quarterly and small updates can be run ad hoc. The process includes several steps. First, the “sniffer” script detects new data submissions from each city. The scope of the update is configurable by setting parameter options in the script to specify layers or cities or both. The scripts then validate new submissions against the standard schema, notify submitters of any issues in the data, archive obsolete features, append new data and refresh the services to make the changes accessible to end users. The flow chart below (Figure 5.) illustrates the process at a high level.
Due to the size of the service area and the volume of data layers, the original plan was to pre-cache the map tiles. During deployment it was discovered that the cached map tiles were too large to easily transfer between the staging and production servers. To mitigate this issue, the maps are served on demand that required some changes to the design of the services.

Results and next steps

Lessons learned
All totaled, the site's member cities collectively spent more than 6,000 hours making the new site happen — work that involved requirements gathering, database design, data preparation and oversight of the development efforts.

Cross-jurisdiction efforts usually rely on one or two lead cities to be successful. This project was unique in that it was a truly collaborative effort and while individual cities stepped up from time to time to meet critical needs, each city fully participated and produced for the project and had equal influences over the decisions and outcomes.

According to recent site traffic statistics, new monthly visits are up 50 percent and repeat visitors are up more than 100 percent. Beyond numerical measures, user response is positive:

"NW Maps is a very useful first stop for my real estate research. It provides a portal to information that I use in every project, from zoning and permitted development projects to the geological characteristics of an area. It’s very helpful to have access to so much information from one site." Anonymous User.

Enhancements planned
The Alliance plans to revisit the original user stories and determine which can be implemented in a next phase. In addition, the alliance will investigate how the new NWMaps infrastructure can be leveraged to improve the mapping capabilities across the portfolio of eCityGov information services. Specially, the Alliance will look to the following four areas for enhancements:
• Enhancements to existing themes (Zoning and Property, Permits and Construction, Parks and Trails, Commercial Property, Environmental, Community Information, Service Areas and Districts, Demographics, and Transit). Those may include but are not limited to the reports enhancement, printing and mapping enhancements.

• New themes such as public safety, tourism, health, and emergency management.

• Development of a mobile version

• Merging or changing integration between eCityGov GIS-based applications, with particular attention to considering whether this is wise and/or technically feasible to combine functionality of NWMaps, NWProperty, and the Parks and Trails portion of MyParksandRecreation.com