

# Production and Publication A Concept for Geographic Information Environments

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## Introduction

This paper describes architecture and configuration considerations for geographic information system (GIS) deployment. These configuration considerations are based on needs most jurisdictions have for maintaining current land records information and making that information available to departments, and the public. In some states, there are initiatives for state-wide geographic information distribution and access. The concepts described here support those types of systems such as the emerging Wisconsin Land Information System (WLIS), as well as local government information maintenance.

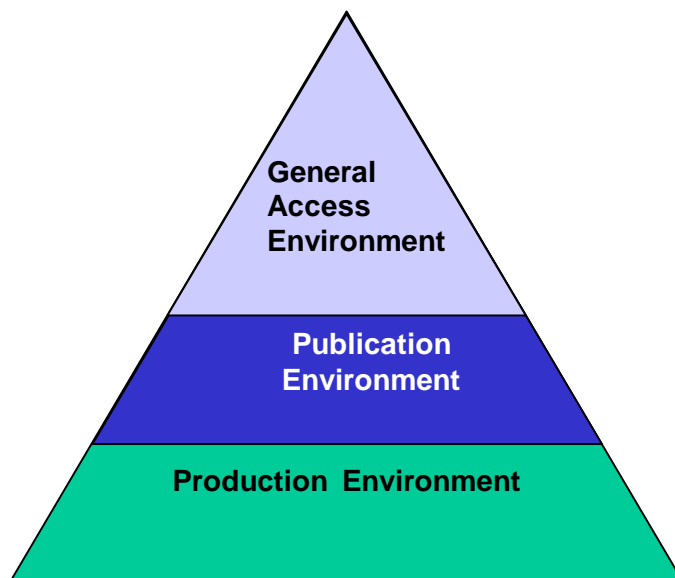


Figure 1 - Geographic Information Pyramid

An overview of the basic concept is shown in Figure 1 as a geographic information pyramid. The concept is that there are three basic conditions or states for the geographic information, with each condition being represented as an environment. The production environment is the maintenance of databases, maps and production of information products. The publication environment handles inter-departmental support, and the general access environment is for queries, simple analysis, and distribution to the public.

As defined here, an environment is a combination of four components, servers and infrastructure (hardware), software, people and data. The mix of hardware, software and people depends on which environment is being addressed. For example, a production environment may rely more heavily on the skill sets of the staff and a general access environment may need more sophisticated error trapping and interfaces on the software side to support general users.

Each environment is described below with a discussion of how the combined information pyramid might work in a county and then combined to form a cross jurisdictional information system much like the federated system being proposed for Wisconsin.

## **Production Environment**

The production environment is the production and maintenance component for geographic information. It is used by the internal maintenance staff and contains the currently maintained data. Often information in the production environment is under various stages of construction. For example, attributes related to parcel ownership transaction might be processed before images of the transaction

### Geographic Production Environment

- Used by Data Producers and Data Custodians
- Connects to and Manages Currently Maintained Data
- Transaction Updates and Linkages to Data as it Changes

Figure 2 - Production Environment Characteristics

documents are connected to those attributes. Transactional information might be captured before the spatial extent of attributes. The spatial extent is maintained and updated on parcel maps. The maintenance cycle may be transactional based. For example, the parcel maintenance cycle may include transactional processing in the Register of Deeds office. Every jurisdiction will be different in terms of defining when a single geographic unit, such as a parcel, has completed its maintenance cycle. Typically, units should be through a defined maintenance phase, with metadata information attached, before it is ready for publication. However, the frequency of maintenance, the maintenance cycle and the determination of "ready to publish" depends on information policies within the jurisdiction.

There are often two levels of maintenance activities. At the data custodian level, a data custodian updates, adds, and deletes information from the data set they maintain. For example, a real property lister adds new geometry through parcel splits and combines, assigns and retires parcel numbers, and updates assessment data. These staff need read access to all GIS layers with full edit control over the attributes and graphics they manage. Attribute only custodians may interface with databases with customized views, windows or screens. An example would be updates to assessment information. Attribute and spatial custodians could include geometry updates and linkages in the geometry to the attribute information. Custodians create updates of the data for the other systems; for example, assessment attributes might be exported for an AS/400 tax billing system.

A second level of maintenance activity is system administration. These functions connect the software and people to data resources and include things like the primary management of the spatial data structure and design, license management, and system configuration. This activity adds new themes or layers to the GIS database, adds users

to the system at all levels, and performs all system configuration management. This is the focal point for back up and for assuring vertical integration of all spatial information.

Table 1 illustrates activities, basic functionality provided by and basic data requirements for a production environment

Table 1 - Examples of Production Environment Activities

<b>Activity</b>	<b>Basic Functionality</b>	<b>Basic Data</b>
<b>Parcel Maintenance</b>	Update parcel transaction information, add and update new geometry	Parcel maps, ownership, assessment and tax rolls, zoning, orthos, historical parcels, address, transaction documents
<b>Address Maintenance</b>	Query parcels, update addresses, Secure Log In	Parcels, Site Address, Assessment Roll
<b>Permit Maintenance</b>	Process new permit applications, track review processes, permit workflow	Site Address, permit information, digital signatures, parcels, tax and assessment rolls, resource information, soils, orthos
<b>Document Maintenance</b>	Maintain transaction documents, indices, and collect fees	Tract index, format requirements, parcel numbers, signature, pay fees, Imaging Systems, parcel maps, cashiering system
<b>Base Data Maintenance</b>	Update base information including geodetic control, least squares analysis, ortho updates and other base features	Survey control, geodetic networks, base data attributes and maps
<b>System Maintenance</b>	Add and subtract system users, connectivity, permissions, data dictionaries and descriptions, and other enterprise level functions	Users, staff, system architecture, data architecture, Case Tools

### Publication Environment

The geographic information publication environment supports intra-departmental activities within a jurisdiction. The publication environment might be putting data on shared drives on a local network or packaging publication data periodically for other departments to use.

The publication environment is for departmental support. Often a jurisdiction selects a GIS viewer software such as GeoMedia or ArcView for the software to use in this environment, although customized visual basic programs can also be developed or GIS browser software can be customized for ease of use.

### Geographic Publication Environment

- Used by County Departments or similar level for analytical needs
- Retrieves published data for use in other applications
- May be linked to other Departmental Production Environments for departmentally maintained data
- May run “thick client” Applications

Figure 3 - Publication Environment Characteristics

The publication environment provides information within the jurisdiction to departments for decision-making support and to support other maintenance activities. Some of the analytical needs in this environment may be spatial functions like nearest neighbor, overlay, combine and join. This environment connects to attribute data sets and can create subsets of the data sets for further analysis or reporting. Often internal county departments such as emergency government are candidates for using geographic information at the publication environment level.

Just as with the production environment, in the publication environment the currency or frequency of the data needs to be analyzed and determined for each jurisdiction. A recurring problem is that once a deed or land transaction is completed, the new owner may want a new farm plan, a driveway permit, or a septic permit that same day. This frequency demand can put stress on any maintenance cycle and even more stress on a publication cycle. It may be possible to post intermediate information from a maintenance cycle to support intra-departmental activities. For example simple transaction information might be available to a departmental publication environment immediately, but the completed transaction might not be posted to a general access environment until it is through the full cycle. These are sticky problems and need to be guided by the jurisdiction's information policy.

Table 2 illustrates the basic activities and functionality for the publication environment.

Table 2 - Examples of Publication Environment Activities

<b>Activity</b>	<b>Basic Functionality</b>	<b>Basic Data</b>
<b>Permit Support</b>	Parcel query, buffers, mailing label generation, permit form pre-completion, submit electronic form of application.	Parcel maps, ownership, tax and assessment rolls, zoning, orthos, resource data, past permits, address
<b>Redistricting / Political Support</b>	Scenarios for new election districts	Census, current geopolitical, Parcels, School Districts, Voting Wards
<b>Document Support</b>	View a document	Tract index, image format requirements, parcel numbers, Imaging Systems
<b>Law Enforcement Support</b>	Use of public access for E911 Purposes	Crime Scenes, Site Address, Road Centerlines, ESN Boundaries, MSAG.

### **General Access Environment**

The general access environment includes retrieve, query, display, and printing functions. This basic functionality allows users to find graphic information and its related attributes. The information can be queried by attribute or location and reports can be produced based on simple criteria. The reports may include summarizing queries and should include maps and attribute summaries.

#### General Access Environment

- Used by the general public or e-commerce users
- Retrieves published data for use in other applications
- May be web based or a counter Kiosk or public terminal.
- May be a thick or thin client.

Figure 4 - General Access - Publication Environment Characteristics

This environment supports putting data sets out on the web, on front counter kiosks or other methods to provide data remotely to any user. Jurisdictional departments are not excluded from this environment and may even prefer it for simple retrieval and data downloads. Web mapping, data distribution, and public access defined by others are

parts of this environment. Table 3 contains a summary of examples of functions and basic data for this environment.

Table 3 - Examples of General Access Environment Activities

<b>Activity</b>	<b>Basic Functionality</b>	<b>Basic Data</b>
<b>Core Citizen Query</b>	Query parcels - obtain existing parcel specific data	Parcel maps, orthos, ownership, assessment and tax rolls, address, road centerlines, and hydrography.
<b>Land Surveyor Query</b>	Present and past surveys - all records	Remonumentation, survey index, control surveys
<b>Environmental Query</b>	Query an area and return all available resource data, buffers, scenarios	Land Use, Zoning, Wetlands, Floodplains, Soils, Contours, Orthos.

### Combining Environments in a Jurisdiction

The three environments need to be combined in a logical way to make the geographic information work best for the jurisdiction. There are well known efficiencies that arise from automating data, completing vertical integration, and combining data in new ways. Additional benefits of geographic information come from publishing the maintained information to departments and providing general access. One configuration for these environments is as shown in Figure 5.

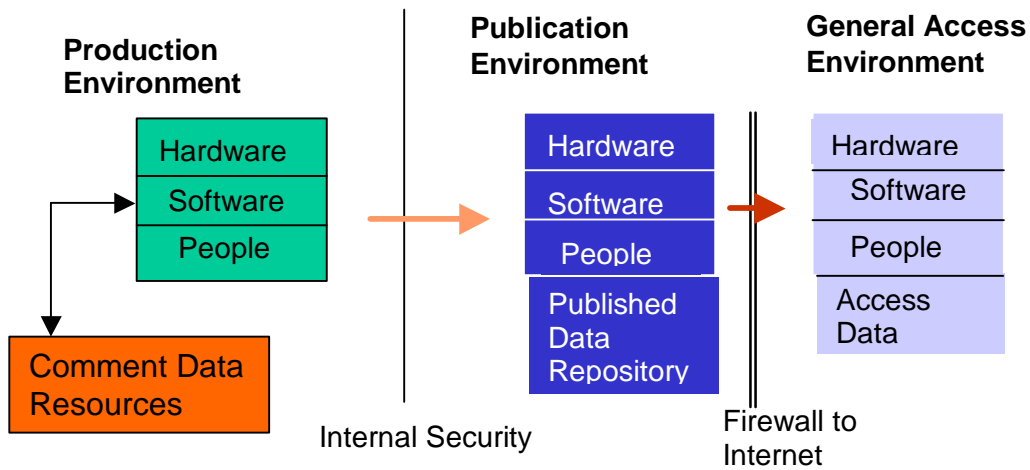


Figure 5 - Combined Environments

The production environment is shown connected to a common data repository. The concept here is that all custodians would have the access they need with the proper permissions to view, reference and update data. The common data resource implies that the custodians would duplicate data maintenance. So if one department updates an address all other custodians would have access to this updated information.

For example one scenario for multiple departments using data for maintenance is as shown in Figure 6.

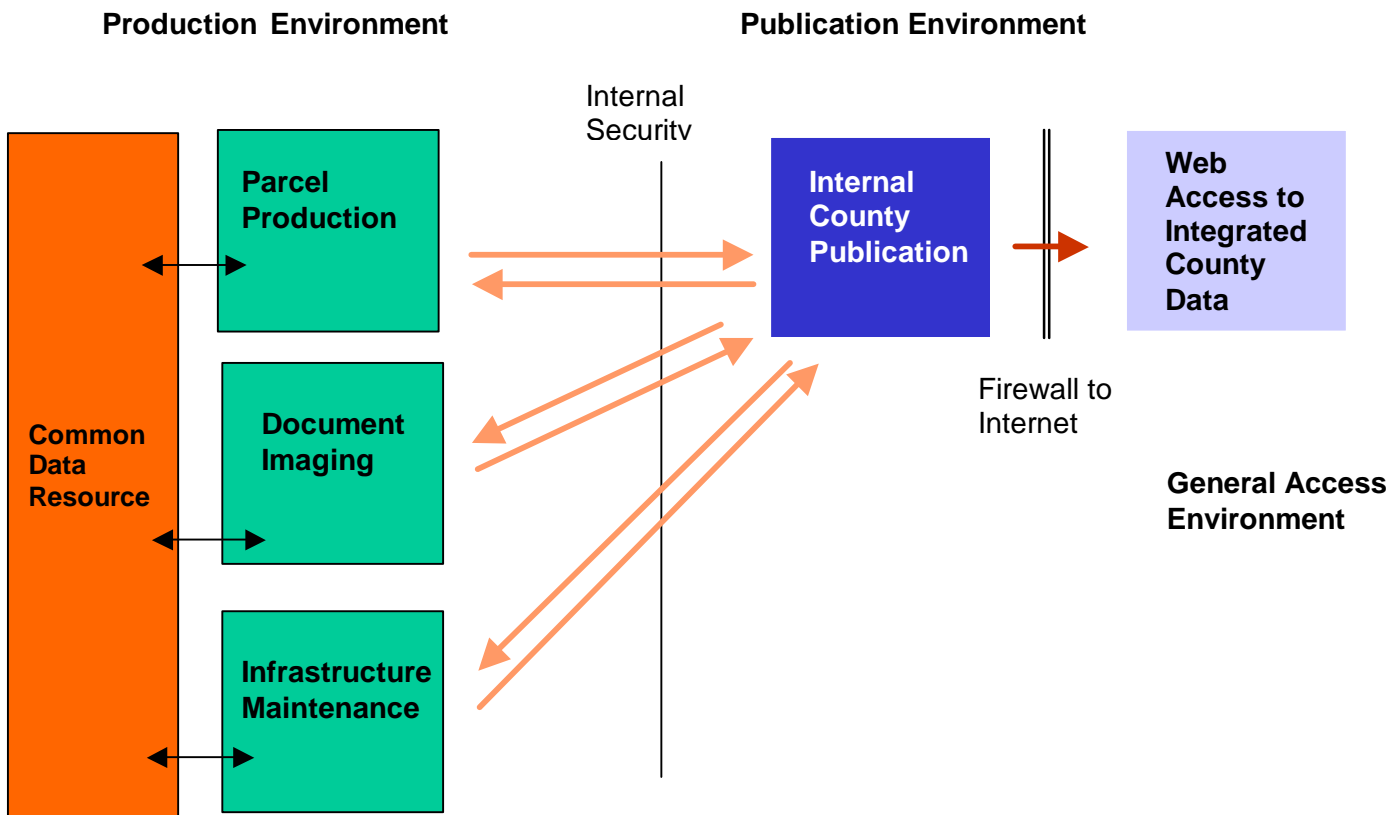


Figure 6 - Multiple Department Maintenance

### Combining Environments Across Multi-Jurisdictions

Geographic Information Pyramids can be combined across jurisdictions as shown in Figure 7. In the case of Figure 7, citizens or other users can have access to information from a variety of sources. There needs to be discussion on standard presentation and data integration among jurisdictions to present a seamless and continuous view for citizen access at the center. But the concept of varying geographic information environments is that the production environment and publication environment can be carried out within the various jurisdictions supporting the policies, mandates and workflow of those jurisdictions. The general access environment requirements can be agreed upon among jurisdictions.

If the goal of a state-wide system, a federated system or a National Spatial Data Infrastructure is to provide general access and data distribution, than standards efforts should focus on the general access environment so that all jurisdictions push to a commonly understood web environment.

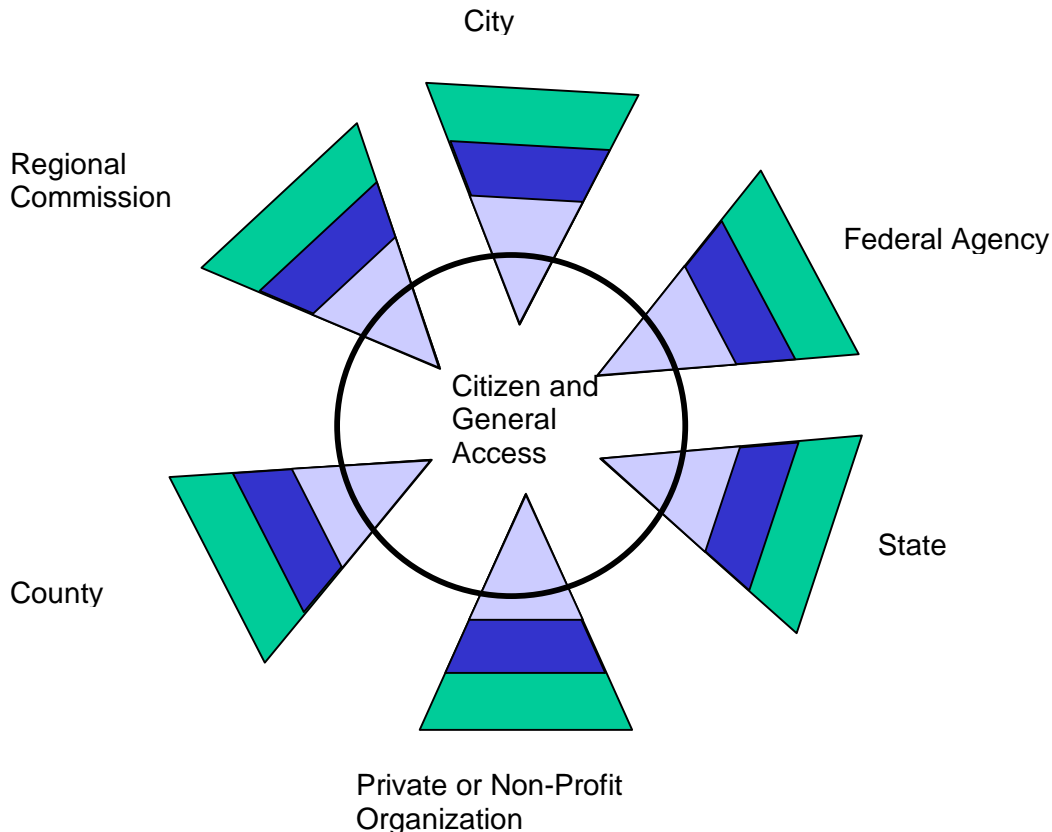


Figure 7 - Multiple Jurisdictional Geographic Information Pyramids

### The Software Component of Environments

There are many types of software that can reside on and be a part of production, publication, and web environments. The emergence of the world wide web as a mechanism to serve data is driving some jurisdiction's decisions on land records access. There are three basic types of land records software that will reside within environments; Web Browsers (thin clients), Thick Clients, and Desktop.

Web Browsers can be considered thin clients. The applications to view, query, display, and manipulate data are driven through browser software, such as Netscape or Internet Explorer. The user can be on any network, the Internet, an intranet or an extranet. Using browser software the user points to a network address to gain access to the information. On the server side the data and application software respond to the browser requests. The application software can be an application, which has to be open and ready to receive requests, running in the background on a server.

Thick Clients have an application running on their desktop. The application runs over an internal network or the Internet to get data to support the application. The current trend is to build these thick clients in Visual Basic or C++. Many jurisdictions are opting for developing a customized thick client that is designed to meet general access needs with simple to navigate tools and instructions. It is also possible to bundle data with a thick client in a "pack and go" application that can be updated over the web or through regular distribution of refreshed data sets.

Desktop delivery is packaged software that runs on the desktop. The custodian and administration levels of access typically require desktop delivery. Typically desktop delivery is shrink-wrapped software from GIS vendors such as Intergraph or ESRI or other vendors. Desktop software can be customized to support specific applications.

Table 4 summarizes the environments and software delivery. The general concept is that as the access needs require more functionality, there is a need for more robust and more complete applications or more complete delivery options. As the web functionality increases it may be possible to move more analytical functions to web browser delivery mechanisms. Therefore, thick client applications should be developed in a manner that they can be re-hosted to browser delivery with a minimum of re-coding.

Table 4 - Environments and Software Delivery

	Web Browsers	Thick Clients	Desktop
General Access	X	X	
Publication		X	X
Production			X

**Data Delivery**

The question of which data to serve to which users depends on the environment. For example, custodians and administrators need live data delivery to a live corporate database. This is the core information for a jurisdiction that is "live" data. Some jurisdictions develop working files that are maintained during the year and then integrated and translated to published data sets on a periodic basis.

Some jurisdictions have expressed an interest in providing live data delivery to general access customers as well. The issue for these jurisdictions will be to specify the version of data correctly so it remains in sync while it is being updated. Clear and consistent metadata must be captured and presented to general users in a form they can understand.

Another approach to data delivery is to define different types of data sets. Production Data, which is "live" and currently being maintained, publication data which is available to all local network users, and web data, which is published on the world wide web for all users. One advantage of classing data as production, publication, or web ready is that the production data can be kept at its atomic level with all the lines and points that are

used in construction. The final presentation of a tax parcel representation can be assembled from the parts and delivered as publication data. Web data can be optimized for use of slower speed phone lines and citizen web access. Another advantage to classifying data is that the attributes for parcels and the current maps can be synchronized at the time of publication and web access. This means that the production workflow can be optimized to meet the data custodians' timelines and then merged at a defined point in time. For example, mapping might lag behind attribute updates. The publication can be done when the maps are completed and match the attribute information.

## **Conclusion**

Understanding and configuring geographic information into production, publication, and general access environments can help jurisdictions structure their hardware and software requirements to maximize resources. Understanding and developing the information policy for a jurisdiction in terms of production, publication, and general access environments can help clarify data distribution, maintenance and access requirements.